

Tennessee Graduate Schools: Building the Workforce for the Future



**Tennessee Conference of Graduate Studies
July 2017**



FORWARD

Amongst the goals of the Tennessee Conference of Graduate Schools (TCGS) is fostering an accurate understanding of the state of graduate education in Tennessee. This can provide the basis for concerted action on the part of state legislators, higher education leaders, policy makers and other interested parties to ensure that our state remains an active player in, and benefits from, the massive expansion on new knowledge that is taking place in the national and international research, innovation and economic development market places. Towards this end, the TCGS commissioned this report in 2017 for the benefit of its members and Tennesseans as a whole. The TCGS is appreciative of the support provided by the graduate schools of the University of Memphis and the University of Tennessee Health Sciences Center that helped ensure that the study could be completed and the report finalized for distribution across the state in an effort to spark deliberate discourse about the role and value of graduate education in Tennessee. It is my hope that this report will provide the empirical foundation for policy discussions pertaining to the role of graduate education in the larger education landscape of Tennessee.

The time has come for the state government and legislators to focus on boosting graduate education to complement the innovative strides that have been made in recent years in improving K-12, community college and undergraduate education. Our graduate students represent the best and brightest segment of our society – it is imperative that we provide them appropriate avenues for engagement and self-fulfillment that make full use of their inherent skills and research competencies to move our state forward in a complex and competitive world.

Jasbir Dhaliwal, Ph.D.

President, Tennessee Conference of Graduate Schools

2016-2017

Introduction

Graduate education and research combine to form the engine that drives innovation, prosperity, and economic mobility. The Tennessee Conference of Graduate Schools was founded in 1977 for the purpose of considering matters of common interest related to graduate study and research, articulating the needs of graduate education, and influencing public opinion and legislation for the improvement and advancement of graduate education.

Graduate education in Tennessee, as nationally, faces significant challenges; online degree programs, massively-open online courses, soaring tuition costs, increasing student debt load, and reductions in federal and state funding, to name a few. In addition, Tennessee is a net importer of graduate talent; so in order to compete effectively, Tennessee must continue to encourage robust, cutting-edge graduate education programs to ensure a highly-skilled workforce for the 21st century global economy.

The purpose of this report, which is commissioned by the TCGS and compiled by the Sparks Bureau of Business and Economic Research at the University of Memphis, is to present current trends in graduate education in Tennessee and to examine the economic impact of graduate education on the citizen and on the state's economy. A well-prepared workforce is one of the top considerations in attracting new businesses to Tennessee. An investment in graduate education also represents an investment in the best and brightest of Tennessee talent to provide a strong foundation for new industry and innovation in the state.

Why Tennessee Needs to Support Graduate Education

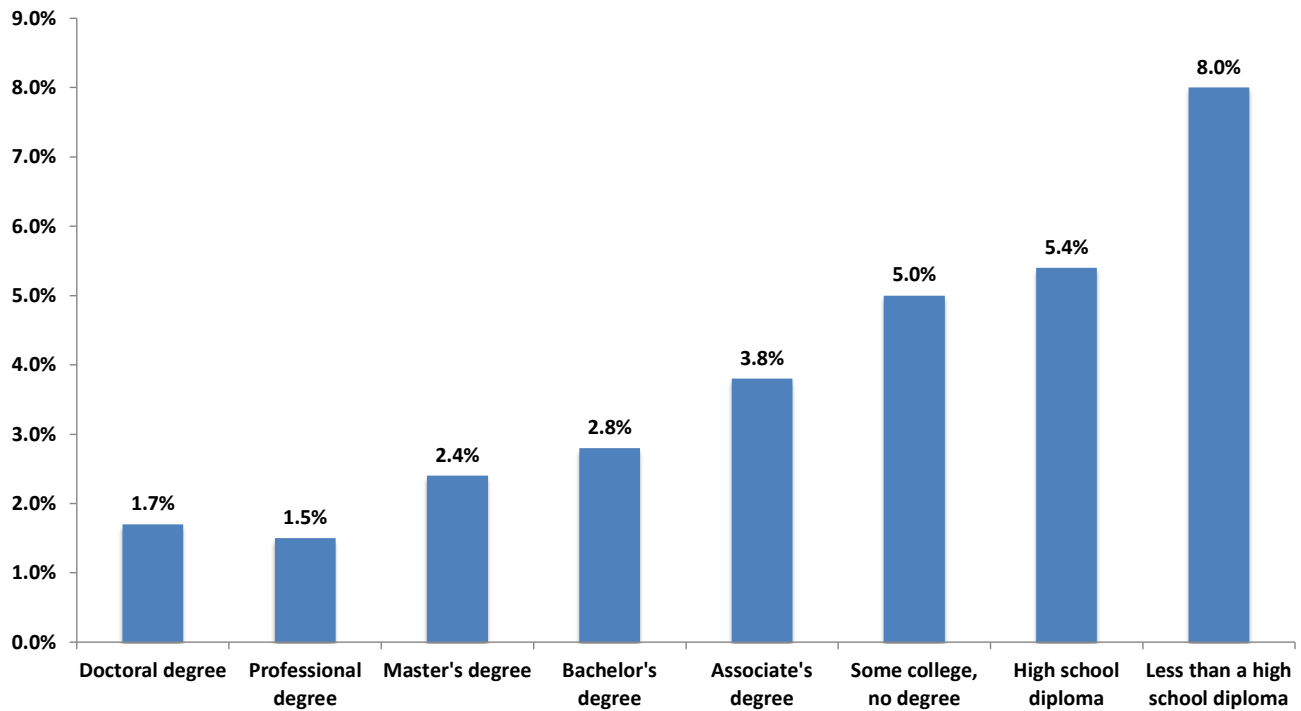
- **Given:** Individuals in Tennessee with a graduate education earn more than do those with a bachelor's alone or no college degree.
- **Given:** Tennessee's demand for workers with graduate, doctoral, and professional degrees is projected to grow by 18.0 percent by 2022.
- Tennessee graduate degree production is insufficient to meet labor force demands.
- Tennessee lags in total higher education R&D expenditures, which drives graduate education.
- Modest increases in graduate education will return billions in increased earnings and tax revenue to Tennessee.

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Tennessee needs to utilize more of its scarce resources for investments in human capital. Understanding human capital development has been an important part of the economic theory that explained the growth of this and other nations. (See, Theodore W. Shultz, "Investment in Human Capital," *American Economic Review*, 1961:1-17; and Gary S. Becker, "Investment in Human Capital: A Theoretical Analysis," *The Journal of Political Economy*, October 1962.)

Similarly, investments in education and training are an important part of the explanation of the divergent growth of states. Those states and communities that have invested the most in education and training for their citizens have prospered the most. Investments in higher education (particularly graduate education) are the key to providing employers with the most highly-productive and profitable employees and providing individuals with the ability to prosper in a highly-competitive, global economy.

Unemployment Rate by Educational Attainment in the US, Ages 25 and Over, 2015

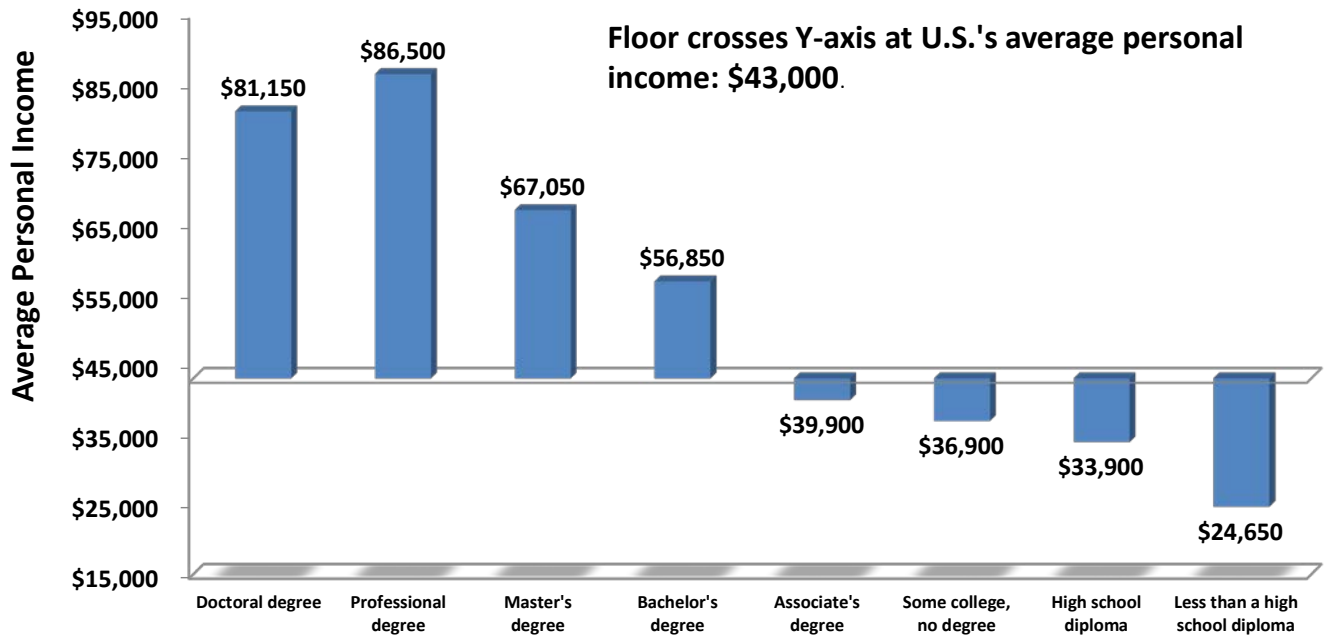


Source: US Bureau of Labor Statistics, Current Population Survey.

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One of the early observations about the operation of the modern labor market was related to the highly-divergent pattern of unemployment rates experienced by labor force participants. Even in the worst recession, employers tend to retain their most educated and experienced employees because they are the most productive, profitable, and expensive to replace. The steady expansion of the economy since the Great Recession has reduced the nation's unemployment rate for all workers, but particularly for highly-educated workers. People with a master's degree or higher experience the lowest rates of unemployment, and those with a doctoral degree follow closely behind.

Average Personal Income by Educational Attainment in the US, Ages 25 and Over, 2015

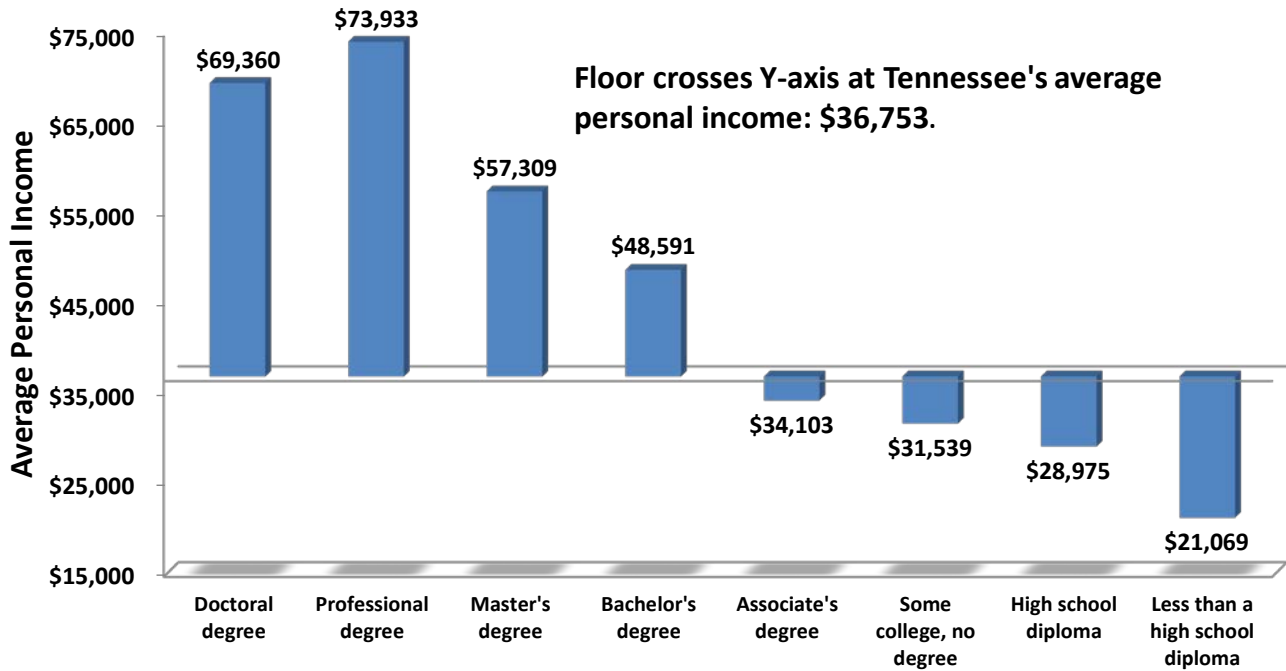


Source: US Bureau of Labor Statistics, Current Population Survey.

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Income levels vary significantly by the level of education of labor force participants. Those workers with a college degree or more, and particularly those with advanced degrees, can expect to make the most money. While the income advantages persist over each person's lifetime, some erosion may occur as newly-educated labor force participants bring the latest knowledge and skills to the marketplace. Investing in a lifetime of education and training is the only way to maintain individual advantages. Investing in higher education, and especially graduate education, is the only way for states and communities to compete in an increasingly-demanding economy.

Average Personal Income by Educational Attainment in TN, Ages 25 and Over, 2015



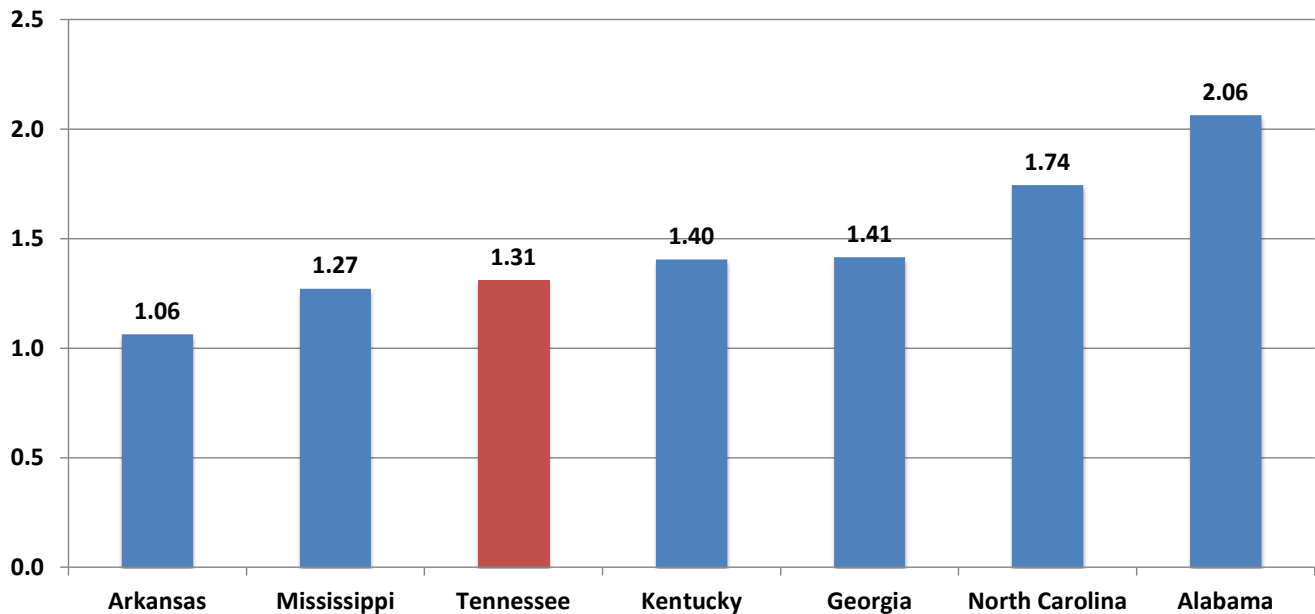
Source: US Bureau of Labor Statistics, Current Population Survey.

Income levels in Tennessee are substantially lower for all levels of education. Throughout the South, the economic development patterns that historically focused on agriculture and low-wage industrial development did little to encourage individuals or state and local governments to invest in education. But, times have changed, and the competition for educational excellence has changed people's attitudes about the importance of education as a driver for economic development.

Ample evidence exists to show the return on investment in education at all levels, but especially for the most highly educated people with a graduate degree. In 2015, people in Tennessee with a professional degree made over \$25,000 more than those with a bachelor's degree and nearly \$45,000 more than those with a high school diploma. Income inequality is directly related to differences in investments in education. State-to-state income variations also are directly related to investments in education.

Graduate Degree Production by State, 2015

Total Per 1,000 Population

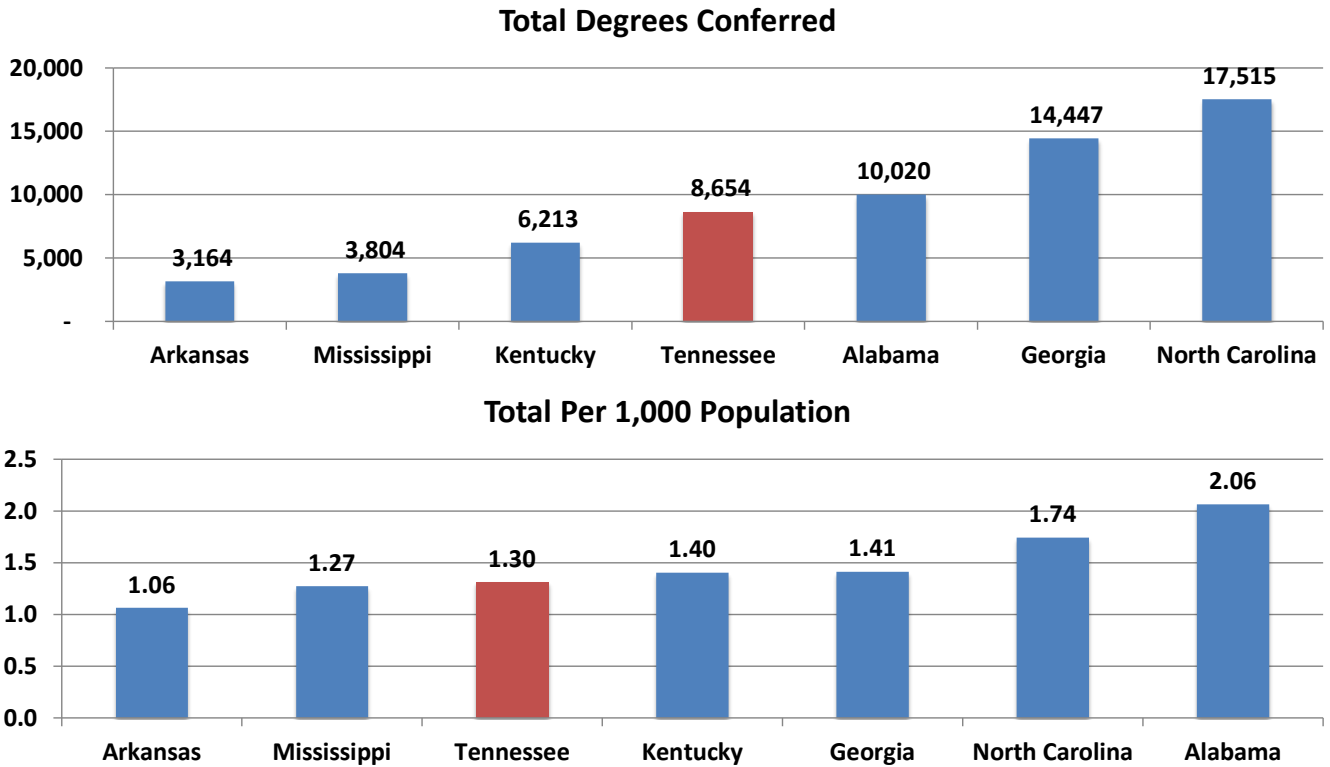


Sources Graduate Council State Snap Shots, 2016 .

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Variations in graduate degree production by state make it easy to see the states that are winning the race to achieve educational excellence. Tennessee will fall farther and farther behind other regional states unless it adopts and supports an economic development model that focuses on expanding investments in graduate education. Investments in graduate education need to be the top priority for the state of Tennessee. Tennessee cannot fall farther behind other states and hope to compete in a national and global economic race for employment and income superiority.

Graduate Degree Production by State, 2015

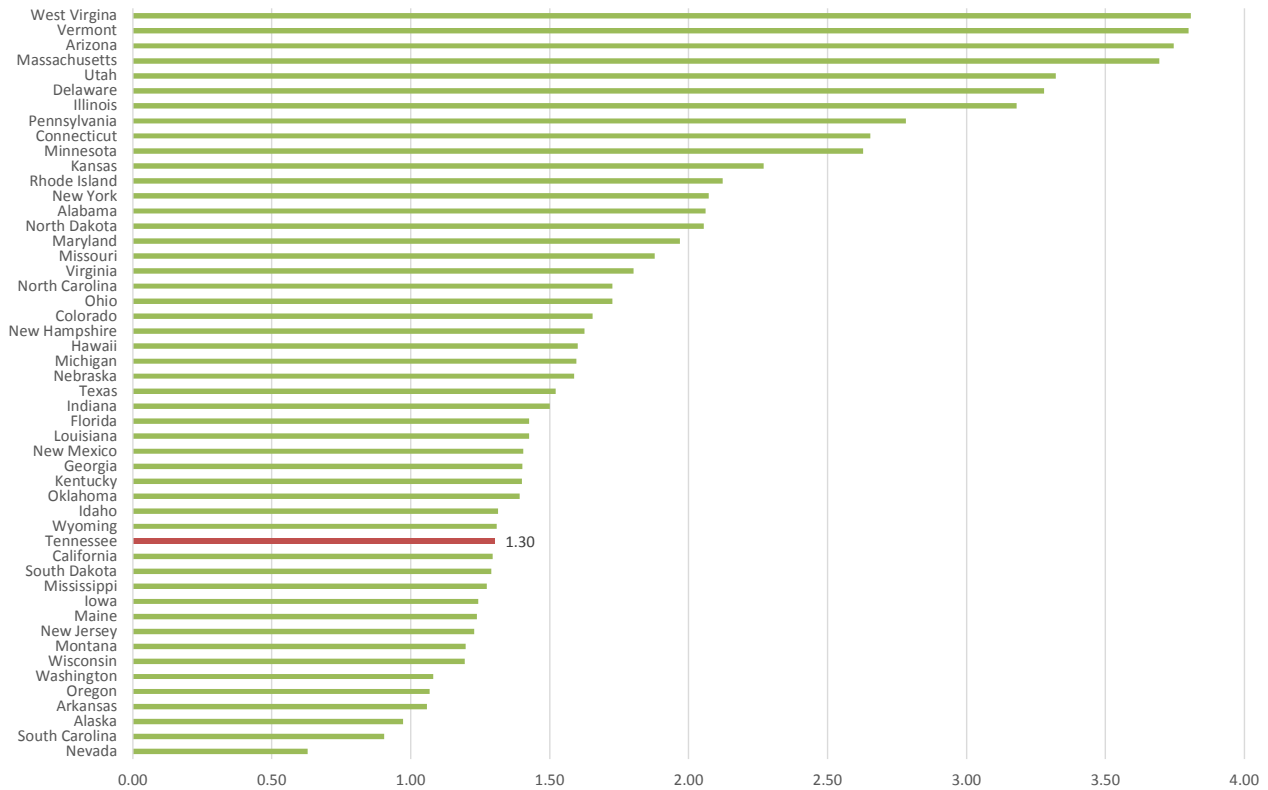


Source: Graduate Council State Snap Shots, 2016.

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The data on graduate degree production by state in 2015 indicate that over 8,600 graduate degrees were awarded statewide in Tennessee. While an impressive number and a major contributor to the economic well-being of the Tennessee economy, the dramatic gap between Tennessee and Alabama demonstrates the highly-divergent growth paths that can and will occur in the economic future of both states. The income and employment gains in Tennessee cannot compare to those in states where producing graduate degrees is a higher priority. The future of Tennessee will depend on its commitment to higher and graduate education.

Graduate Degree Production by State Per 1,000 Population, 2016

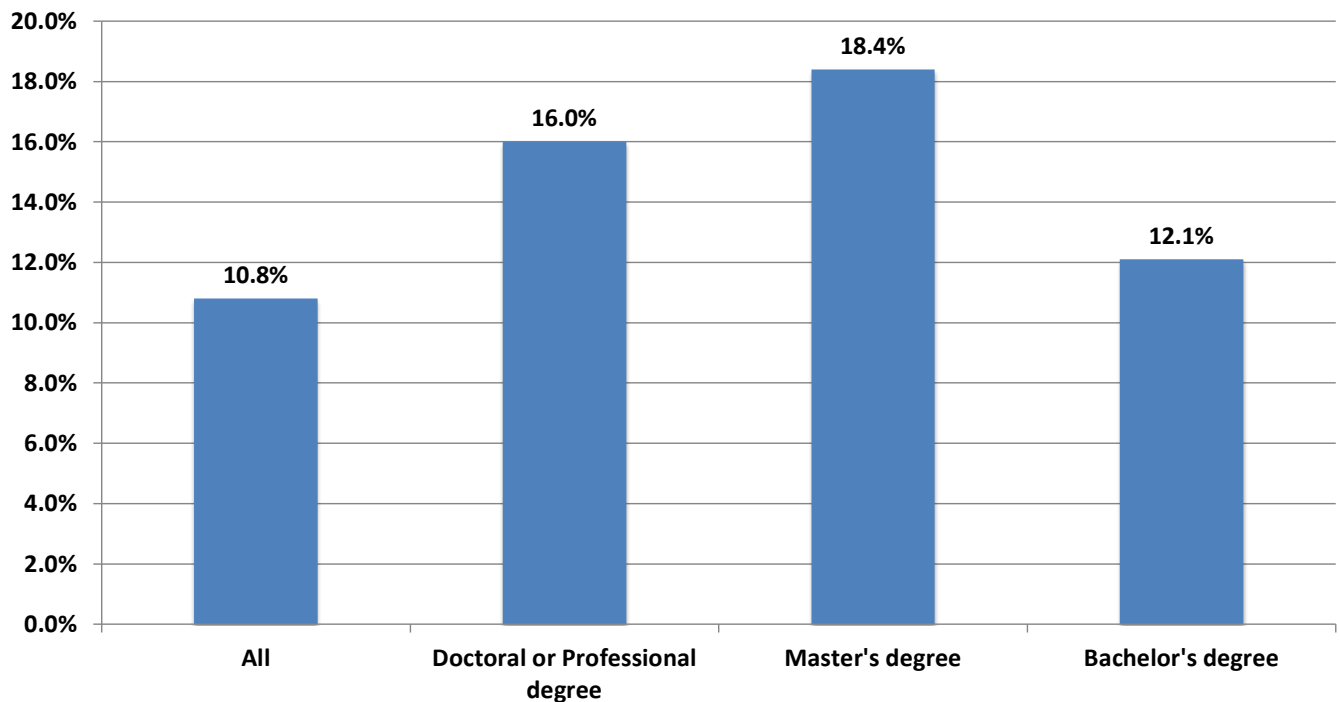


Source: Council of Graduate Schools. See: <http://cgsnet.org/state-snapshots-select-data-graduate-education>.

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Competition among the states for the jobs of the future is evident in the data on graduate degrees. Each state varies by size so the data are adjusted to accommodate differences between small states that make major commitments to graduate education and large states that might not make the same level of investment. The data indicate that Tennessee falls far below most states in the production of graduate degrees. Graduate degree production rates in 10 states are over twice the rate in Tennessee. Five other states have graduate degree production rates more than 50.0 percent higher than the rate for Tennessee. It is very clear that the race for high-income jobs and for highly-educated workers is being lost.

Projected Job Growth between 2012 and 2022 by Typical Entry-level Education



Source: Council of Graduate Schools, Master's degree requirements & the U.S. workforce, 2016.

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Jobs will be generated in the nation if the economy continues to grow. Those jobs that require higher or graduate levels of education are forecast to grow faster than those in any other categories. As a result, the states that produce the most graduate degrees are also expected to expand at higher rates. The future of the Tennessee economy will depend on the state's commitment to expanding the number of advanced degrees produced to meet the demands of jobs of the future.

Projected Job Growth between 2012 & 2022 by Typical Entry-level Education

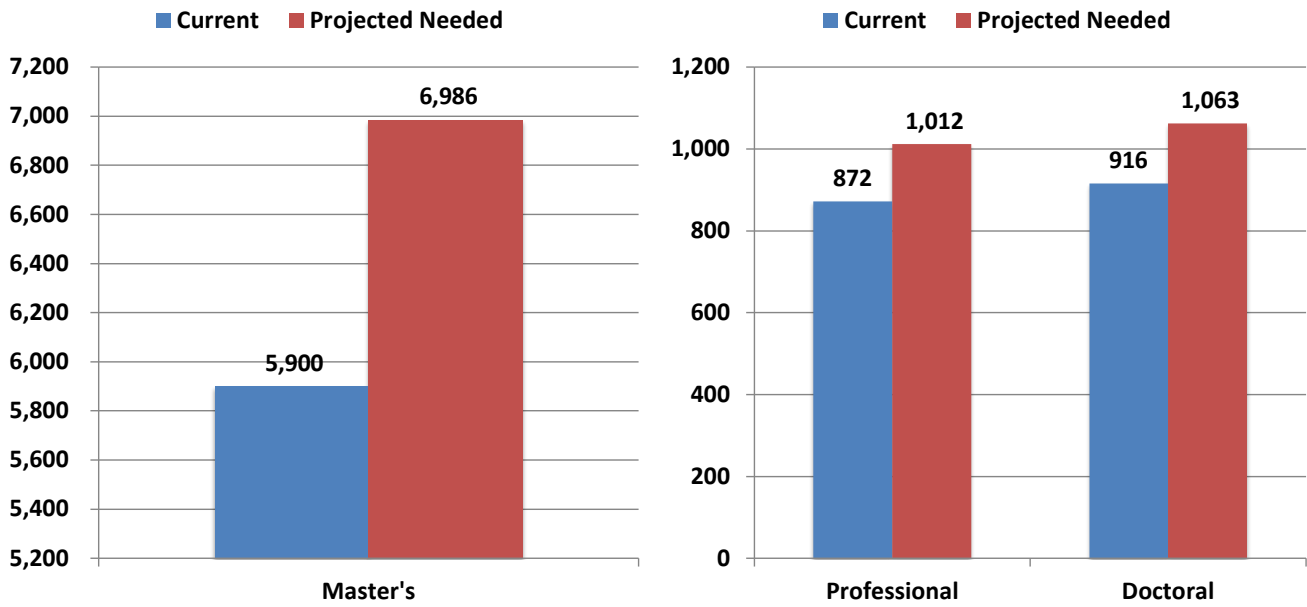
- Jobs that require a master's degree at entry-level are projected to be the fastest growing segment of the workforce between 2012 and 2022.
- Jobs that require a master's degree at entry-level, but do not require previous work experience are projected to grow even faster by 20.3 percent.
- These jobs include, but are not limited to counselors, social workers, therapists, nurses, and social scientists, and represent an additional 369,400 jobs by 2022.

Source: Council of Graduate Schools, Master's degree requirements & the U.S. workforce, 2016.

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Job growth projections are always dependent on the interaction of supply and demand factors for each occupation. The projections vary by state and locality and reflect variations in investments in education and complementary capital infrastructure. High-growth occupations are not always education-intensive, but high-income and high-growth occupations are always education-intensive. Jobs that require a master's degree or more are in high demand in competitive labor markets around the world.

Current Number of Tennessee Graduate Degrees and the Number Needed Per Year to Meet Projected Demand by 2022



Source: Council of Graduate Schools, Master's degree requirements & the U.S. workforce, 2016

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The state of Tennessee currently produces far fewer graduates with at least a master's degree than the labor market will need in the future. Graduate programs are time- and resource-intensive, and all investments in education are long term. The job requirements of the future must be addressed now in order to reach the growth goals of the state. Investing in education, and particularly graduate education, is the only viable option for meeting the needs of employers in the future.

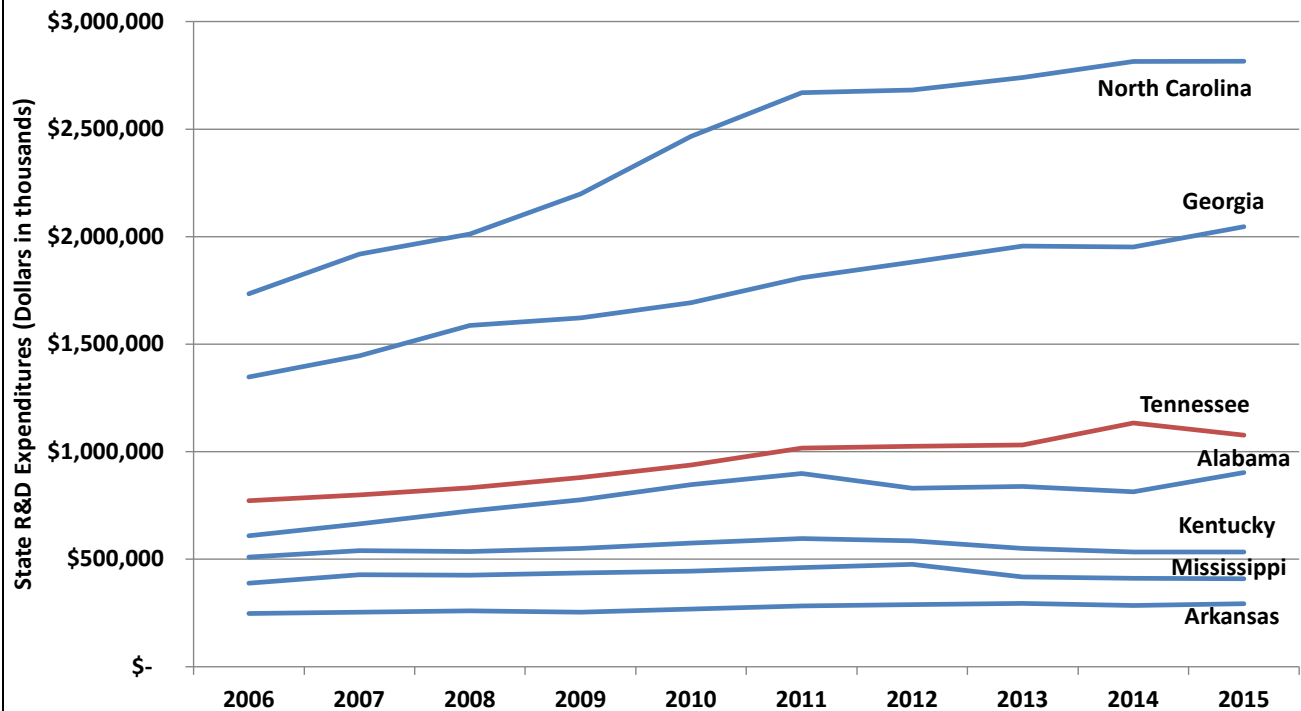
Current Number of Tennessee Graduate Degrees and the Number Needed Per Year to meet Projected Demand by 2022

- Tennessee needs to increase the number of Master's degrees by 1,086.
- Tennessee needs to increase the number of Doctoral or Professional degrees by 147.
- Tennessee's total demand is projected to increase by 18%.

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The number of graduates with advanced degrees needed to meet demand by 2022 is simply to sustain the state's growth. Creating the jobs of the future with high-income opportunities for employment will be required to meet the demands of new and existing employers. Standing still is not an option. States either grow and prosper or they fall behind other states that have made the investments essential to support growth.

Higher Education R&D Expenditures, by State, FY2006 – FY2015



Source: Higher Education Research and Development Survey, Fiscal Year 2015, NCES.

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The state of Tennessee ranks third among its adjacent states in terms of total higher education research and development expenditures. But, North Carolina and Georgia nearly double Tennessee's total expenditures—primarily as a result of federal government spending. Alabama follows closely behind Tennessee in terms of total spending. Research and development spending sets the stage for economic growth and is a key indicator of the demand for students with graduate and professional degrees.

Higher Education R&D Expenditures, by State and Source of Funds, FY 2015 (In \$000)

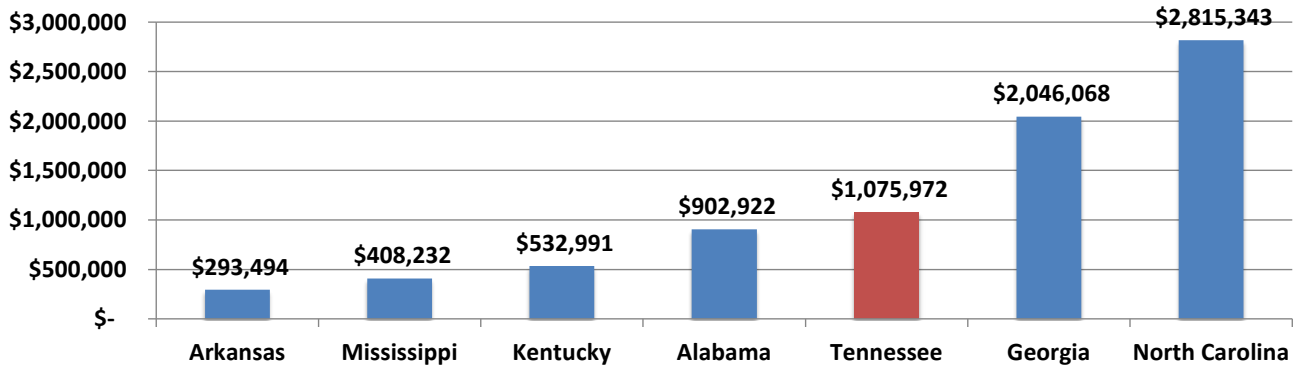
State	All R&D expenditures	Source of funds					
		Federal government	State and local government	Institution funds	Business	Nonprofit organizations	All other sources
United States	68,667,801	37,876,879	3,812,408	16,711,730	4,000,614	4,236,993	2,029,177
Alabama	902,922	529,899	47,849	227,015	60,729	24,229	13,201
Arkansas	293,494	98,709	64,221	90,629	12,521	2,252	25,162
Georgia	2,046,068	1,210,757	53,130	570,182	107,007	81,742	23,250
Kentucky	532,991	227,125	58,830	177,031	16,054	22,964	30,987
Mississippi	408,232	194,209	92,269	90,166	22,370	7,682	1,536
North Carolina	2,815,343	1,600,445	147,577	540,057	337,324	152,002	37,938
Tennessee	1,075,972	626,143	31,129	315,223	52,200	38,807	12,470

Source: Higher Education Research and Development Survey, Fiscal Year 2015, NCES.

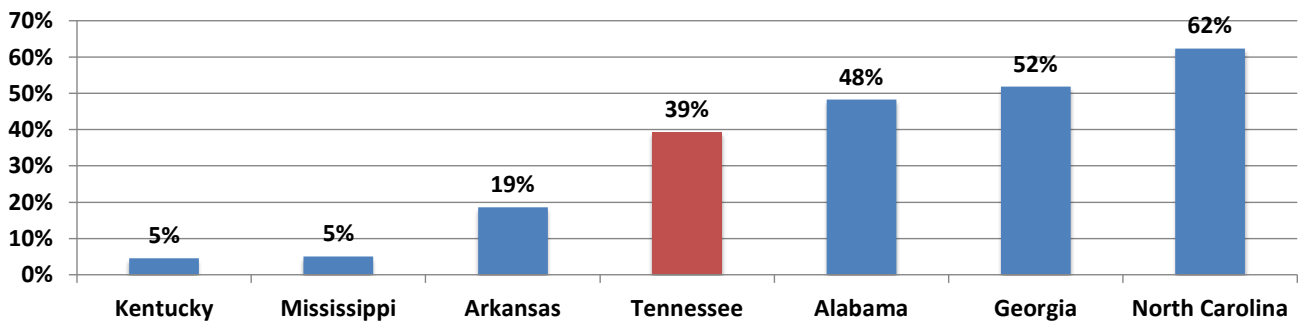
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North Carolina and Georgia also surpass Tennessee in terms of all other sources of support for research and development spending. Tennessee ranked last in state and local government spending as a source of funding for research and development but was third in terms of institutional support.

Change in Higher Education R&D Expenditures, by State, FY2006 – FY2015



Percent Change



Source: Higher Education Research and Development Survey, Fiscal Year 2015, NCES.

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The growth of research and development spending is an important metric for measuring the changes taking place among competing states. R&D spending in Tennessee increased 39.0 percent between 2006 and 2015—an impressive result. But, R&D spending in North Carolina, Georgia, and Alabama increased at an even faster rate. It is important for the state government to make a conscious decision as to which group of states Tennessee wants to be associated with in relation to R&D expenditures that directly drive graduate student production.

Change in Higher Education R&D Expenditures, by State, FY2006 – FY2015

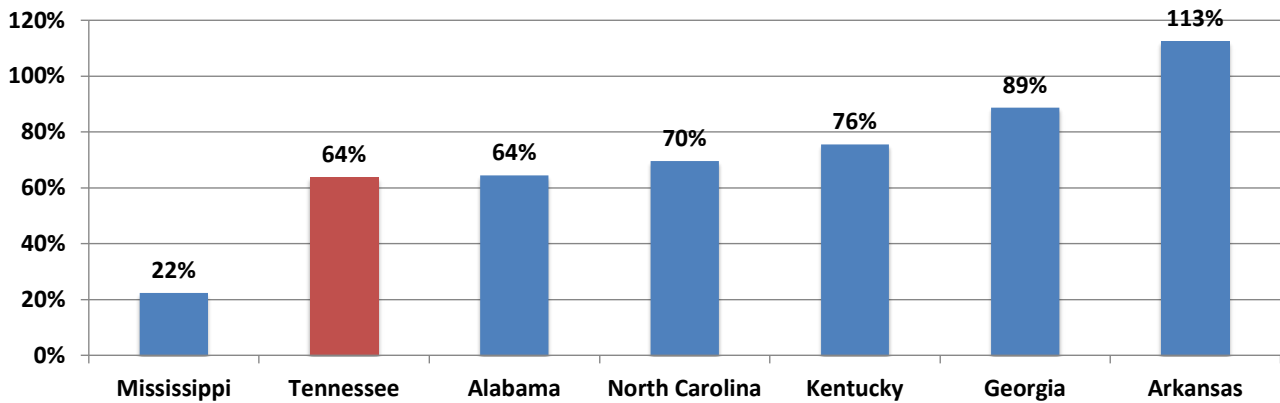
- States like Arkansas and Alabama are rapidly increasing their expenditures on R&D.
- Tennessee needs to increase its expenditures on higher education R&D to remain competitive.
- Graduate students are the backbone of R&D projects in Tennessee universities.

Source: Higher Education Research and Development Survey, Fiscal Year 2015, NCES.

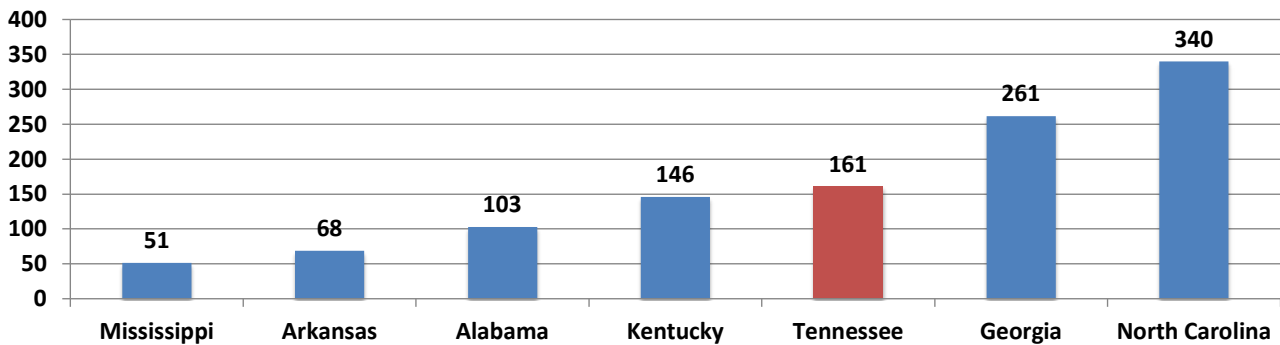
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Graduate education and research and development spending go hand in hand. If Tennessee wants to improve its rank for R&D spending, it must increase support for graduate education. Graduate students are the “work horse” for research and development activity that yields new technologies and innovations of the future.

Number of Patents By State, 2010-2015



Number of Patents per 1 million population from 2015

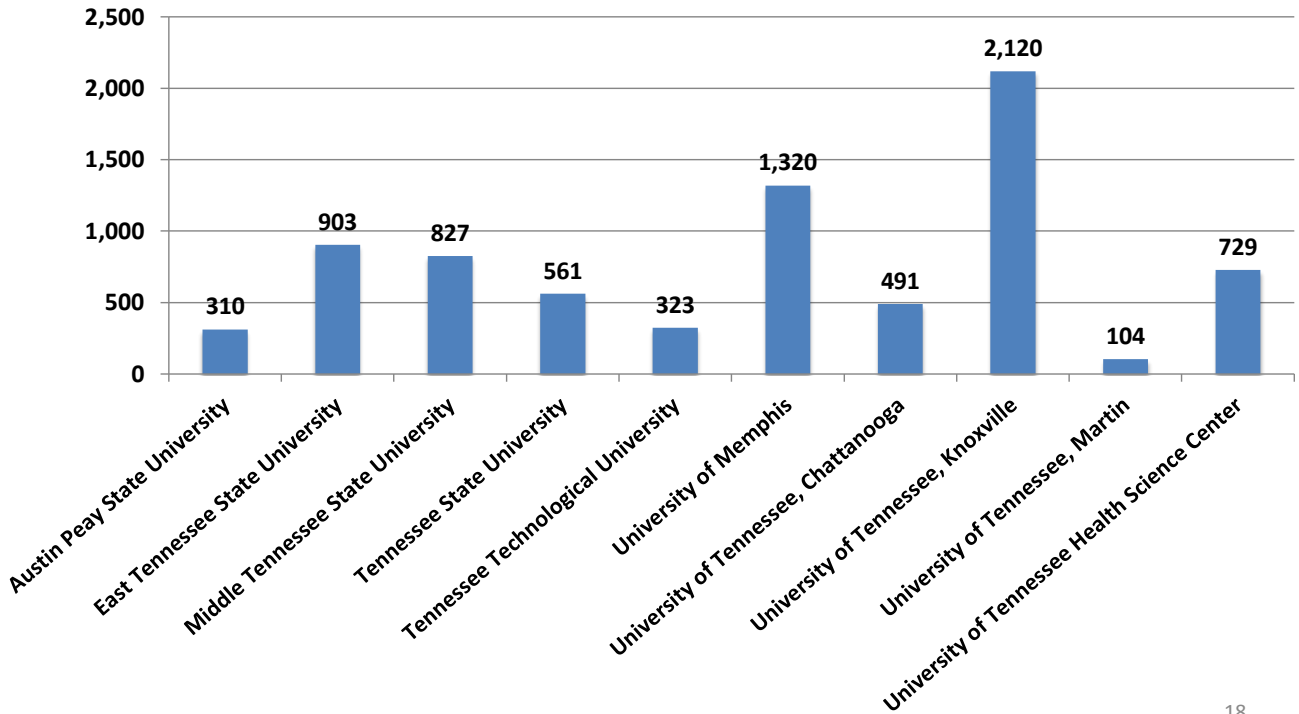


Source: US Patent and Trade Office, US Census, American Community Survey, 2016

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Patents are another metric for assessing the future status of the state economy. R&D spending and patent development data are highly correlated and are both highly dependent on spending on graduate education. Tennessee ranks third in terms of the number of patents developed but lags behind every state except Mississippi in terms of the growth of patents over time. Generating a state commitment to graduate education and the creative processes and industries that encourage patent development will elevate the future growth prospects for Tennessee.

Total Graduate Degrees Awarded by Tennessee Public Universities



Source: Tennessee Department of Higher Education, 2014-2015 Tennessee Higher Education Fact Book, Table 2.4.

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Substantial variations occur in the number of graduate degrees awarded by universities in Tennessee. The University of Tennessee in Knoxville and the University of Memphis award the most graduate degrees. East Tennessee State University, Middle Tennessee State University, University of Tennessee Health Science Center, and Tennessee State University all awarded 500 or more graduate degrees according to the 2014-2015 fact book on higher education. Each university makes an important contribution to the state total degrees awarded, the state economy, and the future labor force available in Tennessee.

Public Graduate Degree Awards by Discipline in Tennessee, 2014

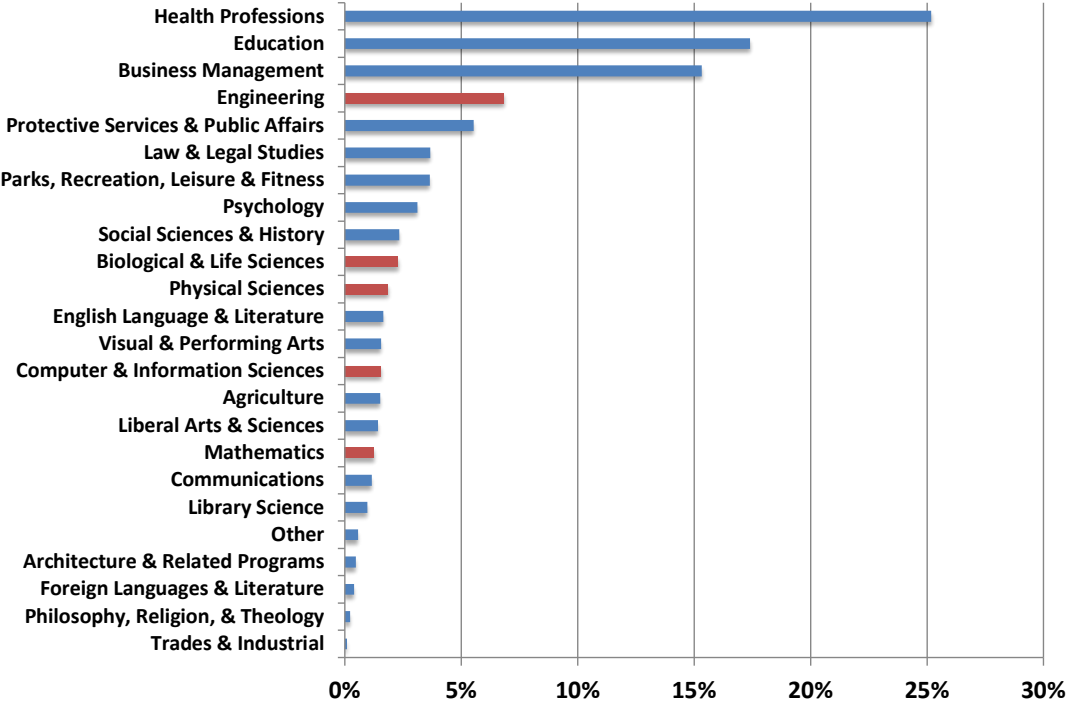
Major Field	Total
Health Professions	1,935
Education	1,338
Business Management	1,178
Engineering	524
Protective Services & Public Affairs	425
Law & Legal Studies	282
Parks, Recreation, Leisure & Fitness	280
Psychology	239
Social Sciences & History	180
Biological & Life Sciences	174
Physical Sciences	143
English Language & Literature	127
Visual & Performing Arts	120
Computer & Information Sciences	119
Agriculture	117
Liberal Arts & Sciences	110
Mathematics	96
Communications	89
Library Science	75
Other	44
Architecture & Related Programs	37
Foreign Languages & Literature	31
Philosophy, Religion, & Theology	18
Trades & Industrial	7
Total	7,688

Source: Tennessee Department of Higher Education, 2014-2015 Tennessee Higher Education Fact Book, Table 2.5.

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Programs vary by institution, and the graduate degrees awarded reflect the array of program choices offered statewide. The largest programs include Health Professions, Education, and Business Management, followed by Engineering and Protective Services & Public Affairs. Graduate degree recipients in Tennessee are spread across the range of occupations that make up the state's labor market. State universities currently meet part of the demand for workers with graduate degrees. The growth of the state's economy will increase the job opportunities for graduate degree recipients and vice versa.

Percentage of Public Graduate Degree Awards by Discipline in Tennessee, 2014



Source: Tennessee Department of Higher Education, 2014-2015 Tennessee Higher Education Fact Book, Table 2.5.

Over half of all Tennessee graduates were in the top three degree programs—health, education, and business. The other graduates were spread across the wide range of graduate programs offered in the state. Employment opportunities are not exclusively linked to the degree of the graduates, but increased degree specialization is typically linked to employment in specific occupations or industries.

Size & Scope of U.S. Graduate Education, 2013-2014 Academic Year

- Nearly three million students are enrolled in post-baccalaureate programs.
- Over 900,000 graduate and professional degrees conferred.
 - 754,475 master’s degrees
 - 177,580 doctoral degrees (including professional practice degrees)
 - 54,070 research doctorates (2014)

Source: National Science Foundation, Survey of Earned Doctorates, 2016, Table 1; U.S. Department of Education, Digest of Education Statistics, 2015, Tables 303.80, 323.10, and 324.10.

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Nationally, it is widely recognized that the economic strength of America rests on the quantity and quality of the nation's labor force. Investments in higher education, particularly graduate education, are a national priority. In 2014-15, approximately three million students were enrolled in graduate programs, and over 900,000 graduates were added to the national labor force. Clearly, the annual infusion of hundreds of thousands of highly-educated workers into the labor market drives the economy forward. The demand for highly-productive talent will increase over time as the evolution of the economy continues.

U.S. Graduate Degree Attainment, 2013-2014 Academic Year

- Master's degrees
 - Women earned 60% of all master's degrees.
 - Minority representation is improving but still low:
 - African American (14%), Hispanic/Latino (9%), Asian/Pacific (7%), and American Indian /Alaskan Native (less than 1%)
 - Education and business accounted for nearly half (46%) of all master's degrees conferred.
 - Number of master's increased by 34% since 2003.
 - There was 3.4% average annual increase at the master's level.
- Doctoral Degrees
 - The number of doctoral degrees has increased by 41% since 2003.
 - 177,580 doctoral degrees (including professional practice degrees) were conferred.
 - There was a 4.1% average annual increase in degree production.

Data Source: U.S. Department of Education, Digest of Education Statistics, 2015, Tables 323.10, 323.20, and 324.10.

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The diverse backgrounds of students are demonstrated by the data on women and minority master's and doctoral graduates. The growth of graduate programs is closely correlated with the number of women and minority workers with advanced degrees.

Higher Education Research and Development



Higher Education Research and Development

- **Why spend resources on higher education R&D?**
 - R&D expenditures provide an indication of the state's overall investment climate and capacity to create and disseminate knowledge.*
 - *Higher Ed. Institutions are critical in this role.*
 - R&D expenditures support:
 - Intellectual property development and licensing;
 - New technologies;
 - Formation of new businesses;
 - A higher standard of living in the long run.

*Center for Innovative Technology. See www.cit.org.

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The state of Tennessee can change its image and its future by focusing economic development efforts on increasing the quantity and quality of graduate programs in the state. Increasing the state's commitment to graduate programs is an investment strategy that yields superior returns for the state. All levels of education are important. But, investing in the development of nationally-recognized graduate programs will determine the future of Tennessee.

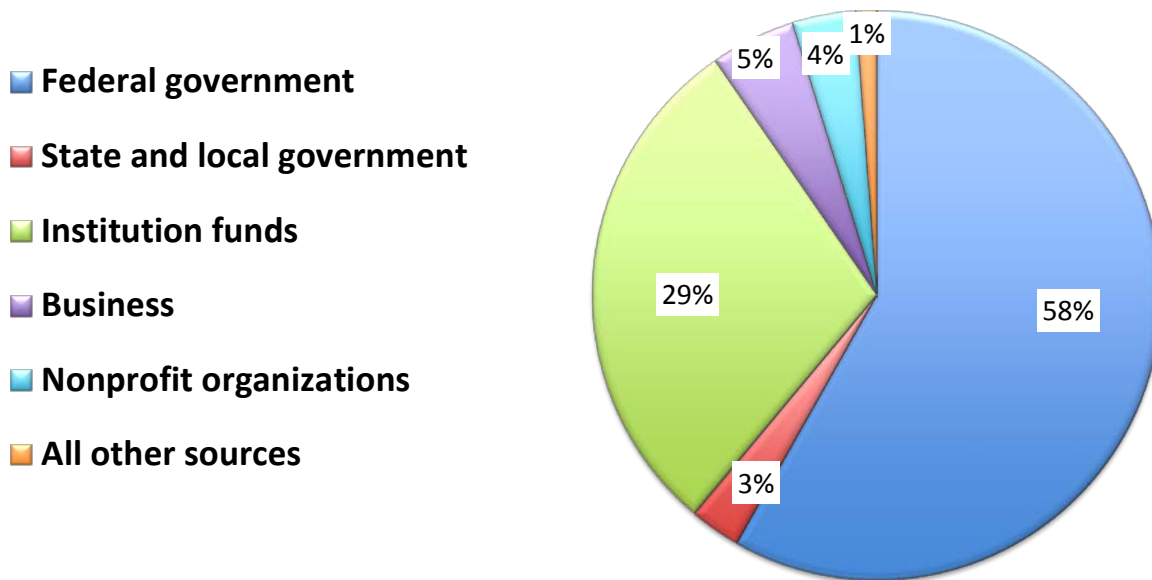
The Economic Impact of Higher Education R&D Expenditures in Tennessee, 2015

- Total: \$1.1 billion.
- Sources: Majority from federal funds (58.2%).
- Nearly 30.0% comes from the Institutions while the remainder comes from a variety of sources.
- State and local government funding accounts for just 2.9%.

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Only 2.9 percent of the research and development spending in Tennessee in 2015 came directly from the state. Thirty percent of the R&D spending came from educational institutions—partly funded by the state. Institutions within the state are challenged by budget shortfalls that limit additional spending. Budget excesses at the state could be the source for funding expansions of graduate programs statewide. Expanding graduate programs could be the economic development initiative that defines the future of the state. The choice between attracting high-paying jobs and low-paying ones is stark and clear as reflected in support for R&D expenditures.

Source of Tennessee Higher Education R&D Expenditures, 2015



Source: Higher Education Research and Development Survey, Fiscal Year 2015, NCES.

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Federal sources of support will only increase if research and development initiatives become a high priority for the new administration. So far the investment programs highlighted by the administration seem focused on physical infrastructure and not on developing the nation's human capital. The State of Tennessee has the opportunity to provide stronger leadership in this regard.

The Economic Impact of Higher Education R&D Expenditures in Tennessee, 2015

- **Higher Education R&D expenditures also provide a measurable economic impact in the *short run*.**
 - Effects estimated using the *IMPLAN*®* economic impact methodology for Tennessee.
- **Economic Impact Basic Premise: One person's spending becomes another's income.**

*See www.implan.com for more information.

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Measuring the economic impact of investments in research and development in Tennessee is very important. Every state faces difficult decisions about how to allocate and invest taxpayer dollars. Evaluating the return on investments in education and training is no exception to the rule—good investments have positive returns. The IMPLAN model used in the analysis is a widely-recognized model for conducting economic impact studies. The impact analysis is divided into three parts: First, the economic impact of higher education research and development expenditures; second, the economic impact of graduate education on lifetime earnings; and third, the economic impact of an additional 1,000 master's and PhD graduates on the state of Tennessee.

The Economic Impact of Higher Education R&D Expenditures in Tennessee, 2015

- **In 2015, \$1.1 billion in Higher Education R&D expenditures in Tennessee supported:**
 - Nearly 13,000 jobs;
 - Labor income of almost \$900 million;
 - Tennessee produced value added of \$1.2 billion;
 - Output (the total value of goods and services produced) of just over \$2.2 billion.
 - Also helped generate an estimated \$52.9 million in state and local tax revenues.

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Over \$1.1 billion in research and development spending in 2015 supported almost 13,000 jobs, \$900 million in labor income, and generated \$2.2 billion in output. An additional \$52.9 million in state and local taxes were generated as a result of the added economic activity. However, less than 3.0 percent of Tennessee's total research and development spending was a result of direct state spending choices—hardly a strong state commitment to research and development. But, changes can and do occur as a result of state leadership.

Top Ten Industries Benefited by Higher Education R&D Expenditures in Tennessee, 2015

Description	Employment
Scientific research and development services	5,591.5
Food services and drinking places	716.1
Employment services	567.9
Services to buildings and dwellings	515.6
Real estate establishments	338.1
Private hospitals	235.4
Offices of physicians, dentists, and other health practitioners	227.4
Management, scientific, and technical consulting services	196.7
Civic, social, professional, and similar organizations	180.3
Wholesale trade businesses	177.2

Source: SBBER estimate generated via the IMPLAN methodology.

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The list of the top 10 industries impacted by research and development expenditures simply reflects the diverse impact of the spending on businesses of all types. The impact of economic growth is spread across the broad range of businesses represented in Tennessee.

The Impact of Graduate Education on Lifetime Earnings



Worklife Expectancy in Years by Educational Attainment at Age 25

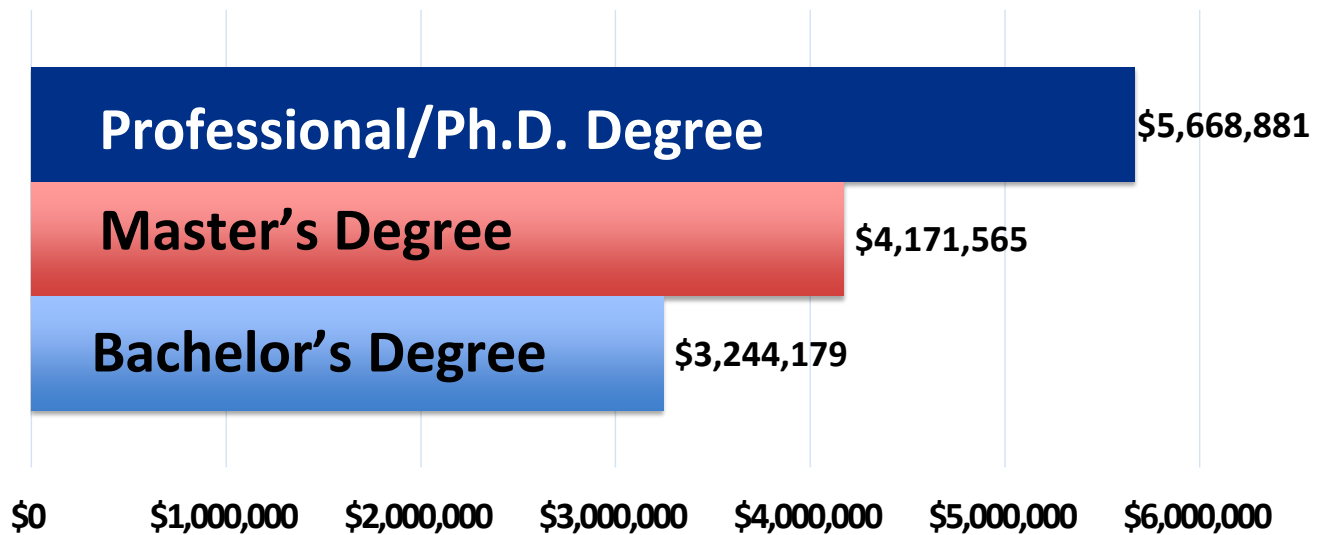
Education Level	Men	Women	Average
High School	33.41	27.98	30.70
Some College	33.88	30.71	32.30
Associate's Degree	35.14	33.28	34.21
Bachelor's Degree	36.42	32.96	34.69
Master's Degree	38.42	34.58	36.50
Professional/Ph.D. Degree	40.09	37.12	38.61

Source: Gary R. Skoog, James E. Ciecka, and Kurt V. Krueger, "The Markov Process Model of Labor Force Activity: Extended Tables of Central Tendency, Shape, Percentile Points, and Bootstrap Standard Errors," *Journal of Forensic Economics* 22(2), 2011, 165-229.

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People who invest more in their educational achievement also work longer. The longer participation in the labor market reflects greater earnings, job satisfaction, and professional commitments associated with each educational level. Graduate degree recipients work approximately 6-8 years longer than do people with a high school diploma.

Lifetime Earnings by Educational Attainment



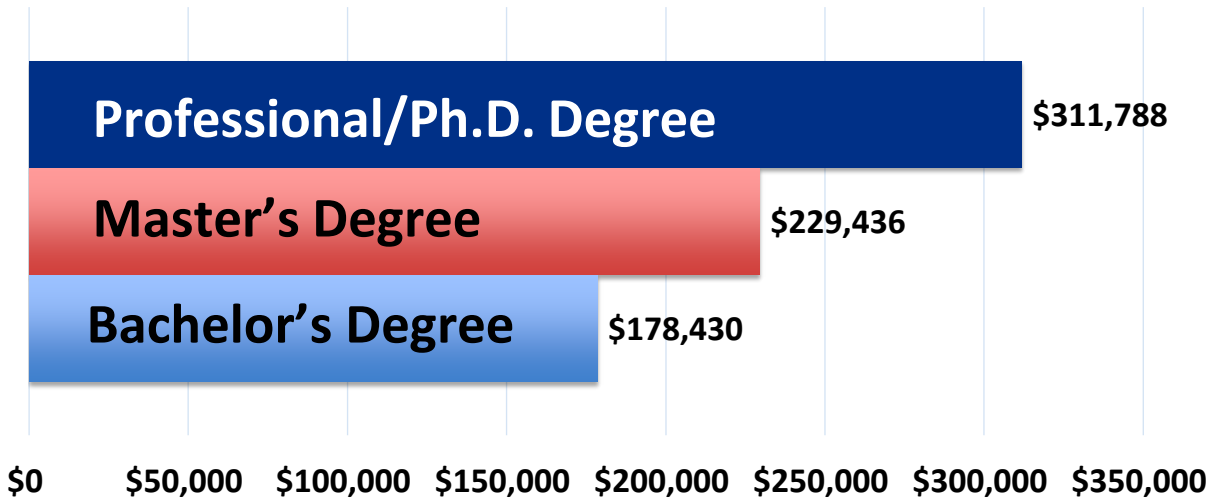
Sources: U.S. Bureau of Labor Statistics, Current Population Survey, and Gary R. Skoog, James E. Ciecka and Kurt V. Krueger, *The Markov Process Model of Labor Force Activity: Extended Tables of Central Tendency, Shape, Percentile Points, and Bootstrap Standard Errors*, *Journal of Forensic Economics* 22(2), 2011, pp.165-229.

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The work life expectancies of people with different levels of education vary substantially. The work life of PhD level graduates is over six years longer than that of people with some college but no degree. There is a direct relationship between different levels of education and the length of a person's work life. Workers with more education make more money and work longer.

As a direct result of investing in higher levels of education, lifetime earnings increase as educational achievements increase. Master's degree recipients earn nearly \$4.2 million, and Professional and PhD recipients can expect to make nearly \$5.7 million over a lifetime. It is easy to see that substantial financial rewards are associated with each level of higher education, and the gains increase with graduate education.

Lifetime State and Local Taxes by Educational Attainment



Sources: U.S. Bureau of Labor Statistics, Current Population Survey, and Gary R. Skoog, James E. Cieccka and Kurt V. Krueger, *The Markov Process Model of Labor Force Activity: Extended Tables of Central Tendency, Shape, Percentile Points, and Bootstrap Standard Errors*, *Journal of Forensic Economics* 22(2), 2011, pp.165-229.

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The commitment of the state to higher education is directly rewarded by the taxes paid by workers in the state. A master's degree graduate is estimated to pay nearly \$230,000 in state and local taxes over a work life. Professional and PhD graduates are similarly estimated to pay nearly \$312,000 in state and local taxes. Spending on higher education generates substantial long-term tax benefits for the state.

Economic Impact* of Adding 1,000 Master's Graduates and 1,000 Professional/Ph.D. Graduates in Tennessee Over a Work Life

	Employment	Labor Income	Value Added	Output
1,000 Master's	6,855.8	\$327,144,749	\$567,482,705	\$921,655,283
1,000 Professional/Ph.D.	17,924.9	\$855,337,890	\$1,483,714,659	\$2,409,718,291
Total	24,780.7	\$1,182,482,639	\$2,051,197,364	\$3,331,373,574

*Impacts are attributable to the difference in earnings between MA over Bachelor's and PROF/PHD over Bachelor's. Impacts were calculated using the IMPLAN methodology. Results are specific to Tennessee. For more information see implan.com.

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It pays to invest in graduate education. The total impact of an additional 1,000 master's and PhD graduates on Tennessee over a work life amounts to over \$3.3 billion dollars. Clearly, adding an additional 1,000 PhD level graduates has a larger impact, \$2.4 billion, than adding 1,000 MAs, \$921.7 million. Both initiatives would generate large amounts of economic activity and would set the stage for increases in overall economic growth.

Benefits of More Master's Graduates, and Professional/Ph.D. Graduates

- **Increased Worklife**
 - Master's degree results in nearly two years more over a Bachelor's.
 - Professional/Ph.D. results in almost four years more than a Bachelor's.
- **Increased Earnings**
 - Over a work life, a Master's degree results in \$927,386 more than a Bachelor's degree.
 - Similarly, a professional/Ph.D. degree results in \$2.4 million more than a Bachelor's degree.
- **Increased Tax Payments to State and Local Governments**
 - vs. a Bachelor's degree, 1,000 more Master's graduates in Tennessee would result in **\$3.5 billion** more tax revenue to Tennessee over their expected work lives, or a net present value of \$1.6 billion.
 - vs. a Bachelor's degree, 1,000 more Professional/Ph.D. graduates would result in **\$5.0 billion** more tax in tax revenue over their expected work lives, or a net present value of \$2.7 billion.

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The economic and social benefits from investing in higher education, especially graduate education, are very important to the future of the state and its communities. The outlook for Tennessee can be changed as a result of investing in its future. Graduate education is the key to transforming the state and will set the stage for a powerful growth surge.

Why Support Graduate Education in Tennessee?

- More graduate education leads to:
 - Greater productivity;
 - Lower unemployment;
 - Higher incomes and a higher standard of living;
 - Additional tax revenue for Tennessee.
- A better workforce plus more R&D expenditures will result in more employers and increased opportunities for all Tennessee residents.