AN ECONOMIC REPORT TO THE GOVERNOR OF THE STATE OF TENNESSEE

Matthew N. Murray, Associate Director and Project Director
Center for Business and Economic Research

PREPARED BY THE

Center for Business and Economic Research
Haslam College of Business
The University of Tennessee
Knoxville, Tennessee

IN COOPERATION WITH THE

Appalachian Regional Commission
Tennessee Department of Finance and Administration
Tennessee Department of Economic and Community Development
Tennessee Department of Revenue
and
Tennessee Department of Labor and Workforce Development

THE STATE’S ECONOMIC OUTLOOK
JANUARY 2015
CONTRIBUTORS

An Economic Report to the Governor of the State of Tennessee

AUTHORS

UT Center for Business and Economic Research
Matthew N. Murray, Associate Director and Project Director
William F. Fox, Director
Lawrence M. Kessler, Research Assistant Professor
Matthew C. Harris, Assistant Professor of Economics
Vickie C. Cunningham, Research Associate
Mary Elizabeth Glenn, Graduate Research Assistant

UT Department of Agricultural Economics
Harwood D. Schaffer, Research Assistant Professor, Agricultural Policy Analysis Center
Daryll E. Ray, Blasingame Chair of Excellence, Professor and Director of the Agricultural Policy Analysis Center

PROJECT SUPPORT STAFF

UT Center for Business and Economic Research
Betty A. Drinnen, Administrative Specialist
Carrie B. McCamey, Communications Coordinator

The preparation of this report was financed in part by the following agencies: the Tennessee Department of Finance and Administration, the Tennessee Department of Economic and Community Development, the Tennessee Department of Revenue, the Tennessee Department of Labor and Workforce Development, and the Appalachian Regional Commission.

This material is the result of tax-supported research and as such is not copyrightable. It may be freely reprinted with the customary crediting of the source.

UT Publication Authorization Number R01-1493-278-003-15.
PREFACE

This 2015 volume of An Economic Report to the Governor of the State of Tennessee is the thirty-ninth in a series of annual reports compiled in response to requests by state government officials for assistance in achieving greater interdepartmental consistency in planning and budgeting efforts sensitive to the overall economic environment. Both short-term, or business cycle-sensitive forecasts, and longer-term, or trend forecasts, are provided in this report.

The quarterly state forecast through the first quarter of 2017 and annual forecast through 2024 represent the collective judgment of the staff of the University of Tennessee’s Center for Business and Economic Research in conjunction with the Quarterly and Annual Tennessee Econometric Models. The national forecasts were prepared by IHS Global Insight, Inc. Tennessee forecasts, current as of January 2015, are based on an array of assumptions, particularly at the national level, which are described in Chapter One. Chapter Two details evaluations for major sectors of the Tennessee economy, with an agriculture section provided by the University of Tennessee Agricultural Policy Analysis Center. Chapter Three discusses Tennessee’s role in the international economy and presents the long-run outlook and forecast for the state. Chapter Four presents Tennessee’s labor market before and after the Great Recession.

The primary purpose of this annual volume—published, distributed, and financed through the Tennessee Department of Finance and Administration, Tennessee Department of Economic and Community Development, the Tennessee Department of Revenue, the Tennessee Department of Labor and Workforce Development, and the Appalachian Regional Commission—is to provide wide public dissemination of the most-current possible economic analysis to planners and decision-makers in the public and private sectors.

Matthew N. Murray
Associate Director and Project Director
Center for Business and Economic Research
CONTENTS

EXECUTIVE SUMMARY.........................................................................................................................VIII

CHAPTER 1: THE U.S. ECONOMY ...........................................................................................................1
  1.1. Introduction......................................................................................................................................1
  1.2. The U.S. Economy: Year in Review ...............................................................................................2
      Components of GDP ........................................................................................................................2
  1.3. U.S. Forecast ..................................................................................................................................10
      Consumption ....................................................................................................................................11
      The Labor Market ..........................................................................................................................11
      Investment .....................................................................................................................................11
      Interest Rates and Prices ...............................................................................................................12
      Federal Budget .............................................................................................................................12
      International Trade ......................................................................................................................13
  1.4. Alternative Scenarios ...................................................................................................................15
  1.5. Forecast Summary and Conclusions ............................................................................................15

CHAPTER 2: THE TENNESSEE ECONOMY: SHORT-TERM OUTLOOK .............................................17
  2.1. Introduction ....................................................................................................................................17
  2.2. The Current Economic Environment ............................................................................................19
  2.3. Fiscal Update ..................................................................................................................................23
      National Perspective .......................................................................................................................23
      Tennessee and Southeastern States .................................................................................................24
  2.4. Short-Term Outlook .....................................................................................................................24
      Tennessee Forecast at a Glance .......................................................................................................29
  2.5. Situation and Outlook for Tennessee Agriculture ...........................................................................29
      Overview of Agriculture in Tennessee ............................................................................................29
      Agricultural Sector Outlook ............................................................................................................31
      Ag Sector Issues .............................................................................................................................34

CHAPTER 3: THE TENNESSEE ECONOMY: LONG-TERM OUTLOOK ..............................................37
  3.1. Introduction ....................................................................................................................................37
  3.2. Job Growth ....................................................................................................................................38
  3.3. Unemployment and Population ......................................................................................................40
  3.4. Income, Earnings, and Output .........................................................................................................42
  3.5. Workforce Quality – Education and Health Status ........................................................................43

CHAPTER 4: TENNESSEE’S LABOR MARKET – BEFORE AND AFTER THE GREAT RECESSION ........49
  4.1. Introduction and Overview ............................................................................................................49
CONTENTS

4.2. Labor Market Outcomes by Select Demographic Group..................................................................................51
   Labor Market Outcomes by Age ..................................................................................................................51
   Labor Market Outcomes by Education ..........................................................................................................51
   Labor Market Outcomes by Race and Gender .............................................................................................52

4.3. Changes in Industrial Composition........................................................................................................53
   Supersectors ................................................................................................................................................53
   One Level Down – “Three-Digit Industries” ..................................................................................................55
   Recovery or Continuation? ...........................................................................................................................55

4.4. Occupation Data........................................................................................................................................58
   Growth and Contraction in Major Occupations ............................................................................................58
   Detailed Occupational Categories .............................................................................................................59

4.5. Underlying Patterns ................................................................................................................................61
   Policy Implications .....................................................................................................................................63

4.6. Data Appendix..........................................................................................................................................64

APPENDIX A: FORECAST DATA........................................................................................................................1
Quarterly Forecast Tables ................................................................................................................................2
Annual Forecast Tables ................................................................................................................................26

APPENDIX B: HISTORICAL DATA ....................................................................................................................41
Quarterly History Tables ................................................................................................................................42
Annual History Tables ................................................................................................................................66

FIGURES AND TABLES

CHAPTER 1: THE U.S. ECONOMY....................................................................................................................1
Figure 1.1: Vehicle Sales Continue to Grow but Are Below Prerecession Levels ..................................................3
Figure 1.2: Durable Goods are the Most Volatile Category of Consumption .......................................................4
Figure 1.3: The Housing Sector Continued to Rebound in 2014, but Not as Strongly as Hoped .........................5
Figure 1.4: The Unemployment Rate is Recovering from the Recession, While the Labor Force Participation Remains Low .........................................................................................................................8
Figure 1.5: Total Payrolls Reached their Prerecession Level in 2014 ................................................................9
Figure 1.6: The Economy is Expected to Have Strong Growth Throughout 2015 .............................................10
Figure 1.7: The Unexpected Drop in Energy Prices Led to Deflation at the End of 2014 ...............................11
Figure 1.8: Expectations are that the Fed Will Begin Raising Interest Rates in 2015 ........................................13
CHAPTER 2: THE TENNESSEE ECONOMY: SHORT-TERM OUTLOOK .................................................. 17
Table 2.1: Index of State Economic Momentum, December 2014 .................................................. 18
Figure 2.1: Two-Thirds of Tennessee Counties Have Experienced Job Growth .................................. 19
Figure 2.2: Tennessee’s Monthly Unemployment Rate is Third Highest among Southeast States, which is Inconsistent with the Strong Employment Growth Currently Observed in the State ......................... 20
Figure 2.3: The Unemployment Rate in Most Tennessee Counties is Higher Than the National Average ... 21
Figure 2.4: Per Capita Personal Income in Tennessee is Slightly Below the Southeast Average but still Fourth Highest in the Region, 2013 ........................................................................... 21
Figure 2.5: Per Capita Income is Lower than the U.S. Average in Most Counties ................................. 22
Figure 2.6: Building Permits in Tennessee and the U.S. are Growing but Remain Below the Pre-Recession peaks of 2005 ................................................................................................. 23
Table 2.2: Selected U.S. and Tennessee Economic Indicators, Seasonally Adjusted ......................... 25
Figure 2.7: Tennessee Will See Stable But Slightly Slower Quarterly Nonfarm Job Growth in The Quarters Ahead .................................................................................................................. 26
Figure 2.8: Most Broad Sectors of the Tennessee Economy are Projected to Enjoy Job Gains in the Near Term ........................................................................................................................................ 27
Figure 2.9: Tennessee’s Unemployment Rate Drifts Downwards but Remains above the National Rate .... 28
Figure 2.10: Leading Tennessee Commodities for Cash Receipts, 2013 ............................................ 32

CHAPTER 3: THE TENNESSEE ECONOMY: LONG-TERM OUTLOOK ...................................... 37
Table 3.1: Tennessee Nonfarm Employment by Sector ..................................................................... 38
Figure 3.1: Nonfarm Job Growth will Persist while Manufacturing Employment will Shrink During the Long Term Forecast Horizon .................................................................................................. 39
Figure 3.2: Nonfarm Employment in Tennessee Continues to Evolve ............................................. 40
Figure 3.3: Unemployment Rates in Tennessee Remain Elevated in Certain Areas ......................... 41
Figure 3.4: Tennessee’s Unemployment Rate is Falling But Will Not Reach Pre-Recession Levels Until 2023 ... 42
Figure 3.5: Educational Attainment in Tennessee Still Lags Behind the Nation ................................. 44
Figure 3.6: Educational Attainment Rates are Below the National Average in Most Tennessee Counties. Percentage of the Population Aged 25 Years or Older ................................................................. 45
Figure 3.7: Tennessee has the Fifth Highest Adult Smoking Rate in the Nation, 2013 ....................... 45
Figure 3.8: The U.S. Adult Smoking Rate has Dropped Steadily Since 2011, while Tennessee’s Rate has Increased. Adult Smoking Rates 2011–2013 ..................................................................................... 46
Figure 3.9: Tennessee has the Fourth Highest Obesity Rate in the Nation, 2013 ............................... 47
Figure 3.10: Obesity Rates in Tennessee have Increased at a Faster Rate than the National Average ..................................................................................................................................................... 47
Figure 3.11: More Tennesseans Report Serious Health Issues than do their National Counterparts .................................................................................................................................................. 48

CHAPTER 4: TENNESSEE’S LABOR MARKET – BEFORE AND AFTER THE GREAT RECESSION .... 49
Figure 4.1: Median Household Income Index, Tennessee and the U.S. .............................................. 50
Table 4.2: Fastest Growing/Contracting Industry Supersectors, U.S. and Tennessee, 2004–2009 (Recession Period) ................................................................. 54
Table 4.3: Fastest Growing/Contracting Industry Supersectors, U.S. and Tennessee, 2009–2013 (Post-Recession Period) ................................................................................................. 54
Table 4.4: Top Five Growing/Contracting Industries in Tennessee’s Top 30 Industries, 2004–2013 .......................................................... 55
Table 4.5: Top Five Growing/Contracting Industries in Tennessee’s Top 30 Industries During 2004–2009 (Recession Period) ................................................................. 56
Table 4.6: Top Five Growing/Contracting Industries in Tennessee’s Top 30 Industries During 2009–2013 (Post-Recession Period) ................................................................................................. 56
Table 4.7: Top 5 Growing/Contracting Major Occupations in Tennessee, 2004–2013 .............................................................................................................................. 58
Table 4.8: Top 5 Growing/Contracting Detailed Occupations in Tennessee, 2004–2013 .............................................................................................................................. 60
Table 4.9: Cognitive and Manual Tasks ................................................................................................................................. 62
Figure 4.2: Labor Force Participation and Unemployment by Education, 2004–2013 .......................................................... 65
Figure 4.3: Labor Force Participation and Unemployment by Race, 2004–2013 .............................................................................................................................. 66
Figure 4.4: Labor Force Participation and Unemployment by Age, 2004–2013 .............................................................................................................................. 67
Figure 4.5: Growth in Relative Income Shares from 2004–2013 .............................................................................................................................. 68
Figure 4.6: Employment Growth and Relative Income by Industry .............................................................................................................................. 69
Figure 4.7: Employment Growth/Contraction by Major Occupation and Income (2004–2009) .............................................................................................................................. 70
Figure 4.8: Employment Growth/Contraction by Major Occupation and Income (2009–2013) .............................................................................................................................. 71
Figure 4.9: Employment Growth/Contraction by Major Occupation and Income (2004–2013) .............................................................................................................................. 72
Figure 4.10: 2004 Median Income and Growth in Real Income from 2004–2013 – Major Occupations in Tennessee ......................................................................................... 73
Figure 4.11: Employment Growth and Median Income, Top 20 Detailed Occupations in Tennessee ......................................................................................... 74

APPENDIX A: FORECAST DATA .............................................................................................................................. 1
Quarterly Forecast Tables .................................................................................................................................................. 2
Annual Forecast Tables .................................................................................................................................................. 26

APPENDIX B: HISTORICAL DATA .............................................................................................................................. 41
Quarterly History Tables .................................................................................................................................................. 42
Annual History Tables .................................................................................................................................................. 66
CHAPTER 4: TENNESSEE’S LABOR MARKET – BEFORE AND AFTER THE GREAT RECESSION

In this chapter—

4.1. Introduction

4.2. Labor Market Outcomes by Select Demographic Group
   Labor Market Outcomes by Age
   Labor Market Outcomes by Education
   Labor Market Outcomes by Race and Gender

4.3. Changes in Industrial Composition
   Supersectors
   One Level Down – “Three-Digit Industries”
   Recovery or Continuation?

4.4. Occupation Data
   Growth and Contraction in Major Occupations
   Detailed Occupational Categories

4.5. Underlying Patterns
   Policy Implications

4.6. Data Appendix

4.1. Introduction and Overview

At first glance, the labor market in Tennessee appears to have recovered from the Great Recession. In May of 2014, the unemployment rate in Tennessee was half the rate that prevailed in 2009 and within one percentage point of its May 2004 value. There were a 100,000 more individuals in the labor force in 2014 than 2004, and median nominal incomes have increased 15 percent over the last decade.

While all progress from 2009 should be viewed as positive, it is incorrect to say Tennessee’s labor market has recovered; recovery implies that things are now as they were before the Great Recession. Labor force participation is still down more than three percentage points from 2007. Tennesseans work in different occupations than before the Great Recession. The number of Tennesseans employed in production occupations (e.g., fabricators, bakers, quality control inspectors) fell by 24 percent from 2004-2013, while the personal care and service occupations (e.g., hairdressers, pet groomers and personal trainers) grew by 47 percent. The industrial concentration of employment in Tennessee differs substantially from 2004. Manufacturing fell from the 2nd to the 4th largest sector of employment. Conversely,
the number of establishments existing to provide education and health services grew by 21 percent. These changes have differential impacts across different regions of the state, including rural and metropolitan areas.

Not all workers have been affected equally. Some of the observed effects on participation and incomes for different demographic groups are attributable to changes in the industrial and occupational composition of Tennessee’s labor market. As our economy continued to transition from a production and shipping economy to a service based economy, women fared better than men both in income growth and unemployment. The post-recession period from 2009-2013 was favorable for highly-educated, highly-skilled workers in professional or technical jobs, but not many other subsets of the labor market. Even workers with a Bachelor’s degree experienced a significant drop in mean inflation-adjusted incomes from 2004-2013 (-11.8 percent). Most troubling, the past decade has been hardest on young workers (ages 18-35). These workers still exhibit the largest losses in terms of lower labor force participation, higher unemployment rates, and the worst trajectory in incomes of any age group since 2004. Overall, while nominal median incomes have risen in the U.S. and Tennessee since 2004, incomes adjusted for price inflation have fallen, as the following figures show.

All of these changes (labor force demographics, industrial composition, and occupational composition) are interrelated. While many of these patterns are reflective of nation-wide trends, some changes have been specific to Tennessee. This chapter provides an overview of how the labor market in Tennessee has changed during and post-Great Recession. To that end, we compare snapshots of the labor market from three years: 2004 (pre-recession), 2009 (trough of recession), and 2013 (most recent annual data). We examine the labor market in each of these three periods along three dimensions: labor force participation, unemployment and mean/median incomes of key

**Figure 4.1: Median Household Income Index, Tennessee and the U.S.**

Source: U.S. Bureau of the Census.
4.1. Introduction and Overview, continued

demographics of workers; the industries in which Tennesseans are employed; and the occupations that Tennesseans hold. Where instructive, we include equivalent U.S. data as a reference point. Finally, we discuss the policy implications of these structural changes, such as how TN Promise and the ‘Drive to 55’ can yield the most success for our state.

4.2. Labor Market Outcomes by Select Demographic Group

The Great Recession and the post-recession period affected some workers more severely than others. In this section, we examine labor force participation rates, unemployment rates, and average incomes for various demographic groups. Incomes for some higher earnings groups are top-coded so that high earners don’t overly skew the distribution. Specifically, we examine these outcomes by age, education level, sex, and race. We then examine how the industrial and occupational composition of the state has changed to better understand the variation in the effects of the recession on groups of workers.

Labor Market Outcomes by Age

Both nationally and in Tennessee, young workers (aged 18-35) fared poorly over the last decade. Labor force participation decreased and unemployment increased. Median nominal incomes did not increase, meaning that young workers earning median incomes bore all cost of living increases out of pocket. In Tennessee, labor force participation among young workers fell by 2.4 percentage points from 2004 to 2009, while unemployment rose nearly 4 percentage points to 11.1 percent. During the post-recession period from 2009-2013, there was a partial correction in unemployment, but labor force participation continued to fall. In 2004, the jobless rate (including non-participants of the labor force and the unemployed) in the U.S. and Tennessee among young workers was approximately 26 percent. At the trough of the recession, this same jobless rate among young workers in Tennessee was 31.4 percent, compared to a 30.4 percent national jobless rate. At the time of the most recent American Community Survey, the jobless rate is still 30.4 percent among workers in Tennessee aged 18-35. The national jobless rate among workers aged 18-35 is also 30.4 percent, implying these persistent effects are not specific to Tennessee. Average inflation-adjusted income fell by 14.3 percent for young workers from 2004-2013, and the post-recession decline was as large as the pre-recession decline.

Mid-career workers (aged 36-50) in Tennessee exhibited greater-than-national-average decreases in labor force participation. Nationally, labor force participation among mid-career workers increased slightly during the recession, returning to pre-recession levels by 2013. Labor force participation among mid-career workers in Tennessee fell 2 percentage points from 2004-2013. Like the young workers, mid-career workers both nationally and in Tennessee experienced significant increases in unemployment rates during the recession. Unlike the young workers, the mid-career workers have largely recovered. Unemployment rates in 2013 were within 1 percentage point of their 2004 levels. Mid-career workers saw inflation-adjusted incomes fall by 3.3 percent during the recession and have experienced no gains after 2009.

Older workers (aged 50-65) were the least affected of any age group. They had the smallest increase in unemployment during the recession, the most complete rebound from 2009-2013 and virtually no change in labor force participation. Inflation-adjusted incomes fell 3 percent during the recession and an additional 3 percent after the 2009 trough of the Great Recession. In fact, the only age group to experience gains in the real median income was the group of workers typically ascribed to ‘retirement age’ – those aged 65 years and older.

Labor Market Outcomes by Education

Both nationally and in Tennessee, less educated workers experienced the most severe lasting effects
from the Great Recession. Among workers with only a high school degree, labor force participation fell six percentage points from 2004-2013 (three percentage points during the recession, and another three post-recession). As of 2013, unemployment is still nearly two percentage points higher (6.6 percent vs. 4.9 percent) than in 2004. Individuals with Associate’s Degrees exhibited similar patterns. Labor force participation fell five percentage points, with nearly all of that occurring post-recession. Unemployment rose among this group by 2.1 percentage points during the recession, but now has returned to within 0.5 percentage points of 2004 levels. In both education groups, 2004 labor force participation was 1.5 percentage points greater than the national average, a difference that no longer exists in 2013.

Individuals with Bachelor’s and Master’s degrees did not experience the same absolute changes as workers with at most a high school degree or Associate’s degree, but did experience more severe effects relative to the national average. Labor force participation fell by 3 percentage points among individuals with Bachelor’s or Master’s degrees after the recession. Those with professional degrees (MBA, JD) were affected the least. Unemployment rates for this group are below 2004 levels and labor force participation fell less than 2 percentage points from 2004.

Individuals with professional degrees were the only group to experience income growth from 2004-2013, adjusting for inflation. The median (mean) annual income for Tennesseans with professional degrees grew by 8 percent (9 percent) from 2004-2013. All other groups (high school dropouts, high school graduates, Associate’s Degrees, Bachelor’s Degrees, Master’s Degrees) experienced some growth in nominal income at the mean or median, but those gains were swamped by increases in the cost of living. Those with high school degrees and Bachelor’s degrees experienced the most severe inflation-adjusted income contraction – a decrease of approximately 15 percent from 2004-2013 at the median. While the real income losses for high school graduates were commensurate with the national average, Tennesseans with Bachelor’s degrees fared far worse than the national average median decline in real incomes of 4 percent.

### Labor Market Outcomes by Race and Gender

The recession and the post-recession period had more severe adverse effects for men than women. Labor force participation fell 6 percentage points for men from 2004-2013 (and almost as much after as during the recession). Labor force participation among women fell only 2 percentage points. Men also experienced worse unemployment than women. During the Great Recession unemployment among men in Tennessee rose 3 percentage points, from 4.7 percent to 7.9 percent, and is still near 6 percent. Women experienced a 1.5 percentage point increase. Among married women, labor force participation in the recession increased, though less in Tennessee than the national average. Median income decreased by 8 percent for men compared to 4 percent for women. While mean incomes for males fell by 9 percent from 2004-2013, mean income for women increased very slightly over the same period. These effects are consistent with national trends.

Whites and blacks were similarly affected during and after the recession, with labor force participation declining by 4 percentage points from 2004-2013. However, labor force participation fell most sharply for blacks during the recession and most sharply for whites after the recession. Whites and blacks exhibited similar changes in unemployment rates during and after the recession. Blacks and whites experienced similar declines in median incomes from 2004-2009 (11.5 percent vs. 9.8 percent) but again, blacks experienced the sharpest declines during the recession, whites after the recession. Mean incomes, by contrast, fell by only 4.6 percent for whites compared to 10.1 percent for blacks. The past decade has been primarily favorable to highly educated, high income workers, who are disproportionately white. From an income standpoint, whites in Tennessee experienced larger income decreases than the national average, but black income decreases were fairly representative.
4.3. Changes in Industrial Composition

Neither the observed changes in labor force participation and income, nor the variation in these outcomes occurs in a vacuum. Individuals make employment decisions based on their skills, knowledge, expected incomes, and the set of available jobs. As the set of available jobs changes, some individuals will be unable to find work, others will only find work earning a much lower income. Others still may benefit greatly. To better understand why we saw the recession and post-recession period affect some groups of workers more than others, we examine how the industrial composition of Tennessee’s employment sector has changed over the last two years. We first consider North American Industrial Classification (NAICs) Supersectors, the broadest category of industry, to understand the high level shifts that have occurred over the last decade. To better understand how the specific industries most vital to Tennessee have changed, we then drill down a level to the 20 most important ‘three digit industries’ in Tennessee in terms of number employed.

Supersectors

In this section, we examine how large industrial groups in Tennessee grew or contracted during and post-recession, compared to national trends. Tables 4.1-4.3 contain information on U.S. and Tennessee Supersectors the broadest industrial classification published by the BLS. In both the U.S. and in Tennessee, the construction, manufacturing, and information services industries experienced the most severe contractions over the last decade. Nearly all the growth in the last 10 years has been in the services sectors – education & health, business-to-business services, and leisure & hospitality. While natural resources & mining has undergone strong growth in Tennessee, only 11,000 Tennesseans (approx.) were employed in this sector in 2004.

Dividing the period into two sections, recession (2004-2009) and post-recession, we see that the Great Recession brought very similar structural changes to the industrial composition of Tennessee and the U.S. Employment contracted most sharply in the manufacturing sector in Tennessee (-24.7%) and the U.S. (-17.9%), followed by construction, and trade & transportation (Tennessee). During 2004-2009, the U.S. and Tennessee both saw growth primarily from sectors that were at least partially publicly funded: education & health and public administration were in the top four Supersectors. Leisure & hospitality and extraction & mining both grew from 2004-2009 as well.

Service industries grew post-recession in Tennessee, with professional & business services growing by nearly 20 percent, and education & health services and leisure & hospitality continuing to experience strong growth. These trends are broadly reflective of nationwide patterns. Employment in construction continued to decline, information services contracted most strongly, and manufacturing exhibited growth well-below average (0.75 percent/year) after the sharp decline from 2004-2009.

The relationship between post-recession income and employment growth is a point of concern. From 2009-2013, job growth was concentrated in low paying industries. Two of the fastest growing industries on the basis of employment, natural resources & mining and leisure & hospitality, are also the two lowest paying sectors. The other two fast growing sectors in employment, education & health and professional & business services, experienced the strongest contractions in real income of any Supersectors (-10.8 percent and -7.7 percent, respectively). By industry, the number of employed and income are strongly negatively correlated, as is employment and income growth. Increasing numbers of Tennesseans are being employed in low paying sectors, and real incomes in these sectors continue to fall. From an economic perspective, if demand for a type of worker increases, we expect to see increases in income and number of workers employed. Most of the patterns in employment and incomes are consistent with supply shifts – displaced workers from contracting industries are transitioning to industries that are hiring.

One Level Down – “Three-Digit Industries”
4.3. Changes in Industrial Composition, continued


<table>
<thead>
<tr>
<th>TENNESSEE</th>
<th>Growth</th>
<th>UNITED STATES</th>
<th>Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education and Health Services</td>
<td>25.2%</td>
<td>Education and Health Services</td>
<td>25.6%</td>
</tr>
<tr>
<td>Professional and Business Services</td>
<td>16.3%</td>
<td>Natural Resources and Mining</td>
<td>20.8%</td>
</tr>
<tr>
<td>Leisure and Hospitality Services</td>
<td>12.9%</td>
<td>Professional and Business Services</td>
<td>14.0%</td>
</tr>
<tr>
<td>Natural Resources and Mining</td>
<td>11.6%</td>
<td>Leisure and Hospitality Services</td>
<td>13.9%</td>
</tr>
<tr>
<td>Information</td>
<td>-10.9%</td>
<td>Information</td>
<td>-12.8%</td>
</tr>
<tr>
<td>Construction</td>
<td>-11.3%</td>
<td>Manufacturing</td>
<td>-15.9%</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>-22.5%</td>
<td>Construction</td>
<td>-15.9%</td>
</tr>
</tbody>
</table>


Table 4.2: Fastest Growing/Contracting Industry Supersectors, U.S. and Tennessee, 2004–2009 (Recession Period)

<table>
<thead>
<tr>
<th>TENNESSEE</th>
<th>Growth</th>
<th>UNITED STATES</th>
<th>Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education and Health Services</td>
<td>15.3%</td>
<td>Education and Health Services</td>
<td>13.9%</td>
</tr>
<tr>
<td>Natural Resources and Mining</td>
<td>6.4%</td>
<td>Natural Resources and Mining</td>
<td>6.5%</td>
</tr>
<tr>
<td>Leisure and Hospitality Services</td>
<td>3.9%</td>
<td>Public Administration</td>
<td>4.5%</td>
</tr>
<tr>
<td>Public Administration</td>
<td>3.2%</td>
<td>Leisure and Hospitality Services</td>
<td>4.3%</td>
</tr>
<tr>
<td>Trade, Transportation, Utilities</td>
<td>-4.9%</td>
<td>Information</td>
<td>-9.4%</td>
</tr>
<tr>
<td>Construction</td>
<td>-9.5%</td>
<td>Construction</td>
<td>-13.9%</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>-24.7%</td>
<td>Manufacturing</td>
<td>-17.9%</td>
</tr>
</tbody>
</table>


Table 4.3: Fastest Growing/Contracting Industry Supersectors, U.S. and Tennessee, 2009–2013 (Post-Recession Period)

<table>
<thead>
<tr>
<th>TENNESSEE</th>
<th>Growth</th>
<th>UNITED STATES</th>
<th>Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professional and Business Services</td>
<td>19.9%</td>
<td>Natural Resources and Mining</td>
<td>13.5%</td>
</tr>
<tr>
<td>Education and Health Services</td>
<td>8.5%</td>
<td>Professional and Business Services</td>
<td>12.1%</td>
</tr>
<tr>
<td>Leisure and Hospitality Services</td>
<td>8.5%</td>
<td>Education and Health Services</td>
<td>10.3%</td>
</tr>
<tr>
<td>Natural Resources and Mining</td>
<td>4.9%</td>
<td>Leisure and Hospitality Services</td>
<td>9.2%</td>
</tr>
<tr>
<td>Construction</td>
<td>-2.0%</td>
<td>Construction</td>
<td>-2.2%</td>
</tr>
<tr>
<td>Financial Activities</td>
<td>-3.3%</td>
<td>Public Administration</td>
<td>-3.6%</td>
</tr>
<tr>
<td>Information</td>
<td>-7.1%</td>
<td>Information</td>
<td>-3.7%</td>
</tr>
</tbody>
</table>

4.3. Changes in Industrial Composition, continued

In addition to employment growth in Supersectors, we also consider which specific industries have grown or contracted during and after the recession. The Supersectors are very broad, and by looking a level down we can examine the specific industries that are the foundations of the labor market in Tennessee. Table 4.4 describes the five fastest growing and contracting industries in Tennessee, including growth in employment from 2004-2013 and national employment growth in each industry. Consistent with the previous section, we see the strongest growth in healthcare industries, the social assistance sector, and in restaurants. The strongest contractions have occurred in manufacturing, construction and clothing retail.

Not only does employment change as industries grow and contract, but so does the percentage of total non-farm earnings attributable to each industry. Table 4.4 also contains data on how each industry’s share of total earnings has changed from 2004-2013. While the two statistics are not directly comparable, it is generally true that if the share of total payroll is growing (contracting) faster than employment, then average real incomes are growing (shrinking) in that industry. We unfortunately observe that in four of the five fastest growing industries, income share has grown slower than employment. In the five contracting industries, two experienced smaller income contractions than employment contractions, indicating rising incomes, but still with falling employment. The fourth and fifth columns in Table 4.4 serve to demonstrate that these phenomena are not specific to Tennessee, but generally reflect nationwide trends.

**Recovery or Continuation?**

Tables 4.5 and 4.6 take our analysis in Table 4.4 a step further by separately analyzing the fastest-growing industries in 2004-2009 and 2009-2013. If industry employment contracted during the recession, did it rebound post-recession? Of the five industries that experienced the greatest contraction during the recessionary period, only one, transportation equipment manufacturing, truly rebounded. While employment in transportation equipment manufacturing is still down five percent from 2004, employment in transportation equipment manufacturing grew 47 percent from 2009-2013 after contracting 35 percent during the recession. The other four industries that experience

### Table 4.4: Top Five Growing/Contracting Industries in Tennessee’s Top 30 Industries, 2004–2013

<table>
<thead>
<tr>
<th>Industry</th>
<th>TENNESSEE</th>
<th></th>
<th>UNITED STATES</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Level, 2004</td>
<td>Employ-</td>
<td>Level, 2004</td>
<td>Employ-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ments</td>
<td>Share</td>
<td>Share</td>
</tr>
<tr>
<td>Social Assistance</td>
<td>31,915</td>
<td>38.6%</td>
<td>31.2%</td>
<td>56.6%</td>
</tr>
<tr>
<td>Ambulatory Health Care Services</td>
<td>101,945</td>
<td>32.6%</td>
<td>21.5%</td>
<td>30.9%</td>
</tr>
<tr>
<td>Nursing and Residential Care Facilities</td>
<td>49,977</td>
<td>20.3%</td>
<td>15.5%</td>
<td>14.6%</td>
</tr>
<tr>
<td>Hospitals</td>
<td>87,075</td>
<td>18.6%</td>
<td>26.3%</td>
<td>11.8%</td>
</tr>
<tr>
<td>Food Service and Drinking Places</td>
<td>191,317</td>
<td>16.1%</td>
<td>10.3%</td>
<td>16.8%</td>
</tr>
<tr>
<td>Clothing and Accessories Stores</td>
<td>29,949</td>
<td>-15.2%</td>
<td>-35.0%</td>
<td>-1.5%</td>
</tr>
<tr>
<td>Construction of Buildings</td>
<td>28,546</td>
<td>-18.4%</td>
<td>-14.6%</td>
<td>-20.8%</td>
</tr>
<tr>
<td>Fabricated Metal Products Manufacturing</td>
<td>41,669</td>
<td>-18.9%</td>
<td>-13.9%</td>
<td>-4.5%</td>
</tr>
<tr>
<td>Machinery Manufacturing</td>
<td>34,214</td>
<td>-24.5%</td>
<td>-23.1%</td>
<td>-2.9%</td>
</tr>
<tr>
<td>Plastics and Rubber Products</td>
<td>28,561</td>
<td>-29.0%</td>
<td>-36.3%</td>
<td>-18.3%</td>
</tr>
</tbody>
</table>

### 4.3. Changes in Industrial Composition, continued

#### Table 4.5: Top Five Growing/Contracting Industries in Tennessee’s Top 30 Industries During 2004–2009 (Recession Period)

<table>
<thead>
<tr>
<th>Industry</th>
<th>Employment Level, 2004</th>
<th>Growth, 2004 to 2009</th>
<th>Growth, 2009 to 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambulatory Health Care Services</td>
<td>101,945</td>
<td>19.7%</td>
<td>20.4%</td>
</tr>
<tr>
<td>Social Assistance</td>
<td>31,915</td>
<td>18.6%</td>
<td>22.2%</td>
</tr>
<tr>
<td>Hospitals</td>
<td>87,078</td>
<td>17.3%</td>
<td>30.3%</td>
</tr>
<tr>
<td>Nursing and Residential Care Facilities</td>
<td>49,977</td>
<td>11.2%</td>
<td>20.0%</td>
</tr>
<tr>
<td>Insurance Carriers and Related Activities</td>
<td>37,310</td>
<td>8.2%</td>
<td>17.6%</td>
</tr>
<tr>
<td>Construction of Buildings</td>
<td>28,546</td>
<td>-15.8%</td>
<td>-9.9%</td>
</tr>
<tr>
<td>Fabricated Metal Products Manufacturing</td>
<td>41,669</td>
<td>-19.3%</td>
<td>-13.7%</td>
</tr>
<tr>
<td>Machinery Manufacturing</td>
<td>34,214</td>
<td>-23.9%</td>
<td>-20.5%</td>
</tr>
<tr>
<td>Plastics and Rubber Products</td>
<td>28,561</td>
<td>-28.8%</td>
<td>-28.4%</td>
</tr>
<tr>
<td>Transportation Equipment</td>
<td>62,582</td>
<td>-35.5%</td>
<td>-35.5%</td>
</tr>
</tbody>
</table>


#### Table 4.6: Top Five Growing/Contracting Industries in Tennessee’s Top 30 Industries During 2009–2013 (Post-Recession Period)

<table>
<thead>
<tr>
<th>Industry</th>
<th>Employment Level, 2009</th>
<th>Growth, 2009 to 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transportation Equipment</td>
<td>40,335</td>
<td>47.3%</td>
</tr>
<tr>
<td>Administrative and Support Services</td>
<td>153,283</td>
<td>27.8%</td>
</tr>
<tr>
<td>Social Assistance</td>
<td>37,861</td>
<td>16.8%</td>
</tr>
<tr>
<td>Ambulatory Health Care Services</td>
<td>121,979</td>
<td>10.8%</td>
</tr>
<tr>
<td>Food Service and Drinking Places</td>
<td>201,152</td>
<td>10.4%</td>
</tr>
<tr>
<td>Construction of Buildings</td>
<td>24,030</td>
<td>-3.1%</td>
</tr>
<tr>
<td>Clothing and Accessories Stores</td>
<td>25,819</td>
<td>-3.3%</td>
</tr>
<tr>
<td>Chemical Manufacturing</td>
<td>25,789</td>
<td>-3.4%</td>
</tr>
<tr>
<td>Merchant Wholesalers, Nondurables</td>
<td>43,495</td>
<td>-4.5%</td>
</tr>
<tr>
<td>Insurance Carriers and Related Activities</td>
<td>40,365</td>
<td>-4.6%</td>
</tr>
</tbody>
</table>

4.3. Changes in Industrial Composition, continued

the greatest contractions have not experienced any real rebound. Recall that when percentage growth in income share is less than percent growth in employment this means that average incomes are falling. By that definition, all five of the industries that experienced the strongest growth during the recessionary period also exhibited flat or growing incomes during that period. After the recession, all five industries that were “ports in a storm” in the recession experienced declines in average incomes. Individuals seeking work shifted into these industries, presumably from contracting industries, driving down real incomes during the post-recession period.

During the post-recession period, two of the five biggest gainers during the recession (ambulatory health care and social assistance) were again in the top 5 growth industries. Transportation equipment manufacturing rebounded as previously discussed. Additionally, the typically low-paying sectors of food services & drinking places and administrative & support services also experienced strong growth. Construction of buildings, chemical manufacturing, and wholesalers of non-durables exhibited contracting employment during the post-recession period. Clothing retail experienced both a contraction in employment and drastic losses in income share. The losses in incomes are strong enough to suggest structural changes in employment patterns within the clothing retail industry— but whether that is due to migration (and differences in pay scales) from boutiques to big-boxes, or from commissioned sales people to cashiers is undetermined. In summary, the post-recession period looks less like recovery than a continuation of an on-going process of structural change.

Two other observations regarding changing industrial composition help explain both falling mean/median inflation-adjusted incomes in Tennessee (and the U.S.) and increasing income inequality. First, employment is growing faster in industries which are relatively low-paying (see Figure 4.6). Using the ratio of income share to employment share as a measure of relative per-capita income, we see that aside from two industries (professional & technical services and ambulatory health care) there is a strong negative relationship between employment growth and relative income. It should be noted that although aggregate incomes are falling, some industries are doing relatively well compared to others. Figure 4.5 depicts the relationship between 2004 relative incomes and growth in relative incomes from 2004-2013. We see that the industries that paid relatively well in 2004 saw additional gains in the ratio of income share to employment share. Conversely, the low paying industries saw continued shrinking of their payroll share per worker from 2004-2013. For example, in 2004, professional & technical services had an income-share-to-employment-share ratio of 1.5, meaning an average worker in that industry made roughly 1.5 times the state average. From 2004-2013, that ratio grew by 15 percent. In 2004, the average worker in general retail earned an income approximately 50 percent of the state average. That ratio shrank by nearly an additional 10 percent from 2004-2013.

The two patterns of concern are: 1) relatively high employment growth in low paying industries and 2) shrinking incomes in those low paying industries relative to the shrinking state average. These patterns are still present when we examine employment by occupation rather than industry.

4.4. Occupation Data
In the previous section, we examined how the industrial composition of Tennessee, relative to the U.S., has changed during the recession and post-recession period. While that is informative about the composition of companies that are hiring in the state, additional insight can be gained from analyzing employment and incomes on an occupational as well as an industrial basis. For example, firms in manufacturing industries and professional services hire blue-collar workers and white-collar workers. If economic forces cause manufacturing industries to contract, that has different implications for workers of different education levels if they reduce employment on the shop floor, the front office, or the management suites. In this section, we analyze how the great recession affected the number of jobs and incomes for each major occupational category (22 of them). There is considerable variation in the number of Tennesseans employed in each major category. We therefore also examine the set of detailed occupations which employed more than 25,000 Tennesseans in 2004.

Growth and Contraction in Major Occupations

In both the U.S. and in Tennessee, incomes were slow to adjust during the Great Recession. Total employment contracted from 2004-2009, but median and mean incomes fell more sharply post-recession than during. Total employment contracted by 1.5 percent from 2004-2009, but grew by 2.8 percent from 2009-2013. Overall, Tennessee’s inflation-adjusted median income from employment fell by 0.9 percent from 2004-2009, but fell 3.3 percent post-recession. As was the case with industries, some occupations fared better than others during and after the recession.

Table 4.7 contains data on the five major occupational categories that grew (contracted) the most in terms of number employed from 2004-2013.

Several data points in Table 4.7 offer evidence on falling inflation-adjusted incomes and increasing disparities in income. The fast growing occupations are those typically associated with services industries. This is not surprising, given the data on change in industrial composition. Three of the fastest growing occupational categories are relatively high paying: business & financial, healthcare practitioners and computer & mathematical occupations. Tennessee’s median annual income in 2004 was $26,180. The median income in computer & mathematical and business & financial occupations is nearly twice that figure. The other two high-growth occupations, personal care and healthcare support, are quite low paying. It should be noted that even within the healthcare practitioners, there is evidence of increasing

Table 4.7: Top 5 Growing/Contracting Major Occupations in Tennessee, 2004–2013

<table>
<thead>
<tr>
<th>Major Occupation Category</th>
<th>TENNESSEE</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Employment</td>
<td>Median Annual Income</td>
<td>Employment</td>
</tr>
<tr>
<td>Personal Care and Services</td>
<td>44,530</td>
<td>48.0%</td>
<td>$19,140</td>
</tr>
<tr>
<td>Business and Financial Operations</td>
<td>77,810</td>
<td>27.3%</td>
<td>$51,960</td>
</tr>
<tr>
<td>Healthcare Practitioners and Technicians</td>
<td>149,670</td>
<td>24.1%</td>
<td>$41,410</td>
</tr>
<tr>
<td>Healthcare Support</td>
<td>61,840</td>
<td>23.8%</td>
<td>$20,223</td>
</tr>
<tr>
<td>Computer and Mathematical</td>
<td>38,200</td>
<td>20.7%</td>
<td>$53,550</td>
</tr>
<tr>
<td>Management</td>
<td>153,460</td>
<td>-3.1%</td>
<td>$58,310</td>
</tr>
<tr>
<td>Transportation and Material Moving</td>
<td>262,020</td>
<td>-3.1%</td>
<td>$24,380</td>
</tr>
<tr>
<td>Installation, Maintenance and Repair</td>
<td>117,450</td>
<td>-3.2%</td>
<td>$32,440</td>
</tr>
<tr>
<td>Construction and Extraction</td>
<td>105,420</td>
<td>-18.4%</td>
<td>$28,730</td>
</tr>
<tr>
<td>Production</td>
<td>321,480</td>
<td>-24.1%</td>
<td>$25,420</td>
</tr>
</tbody>
</table>

4.4. Occupation Data, continued

disparities in incomes. While the median income in this occupation has exhibited virtually no growth, the mean income has grown by 6 percent from 2004-2013. Much of this is growth in average inflation-adjusted income is captured by physicians. From 2004-2013, miscellaneous specialty physicians increased in number from 1,380 to 6,680 (1/4 of the absolute change in the number of employed health care practitioners), and their real mean annual income increased from $116,800 to over $180,000.

Along with growth in low- and high-income occupations, Table 4.7 also presents key evidence on losses in employment in occupations with near-median incomes. In 2004, more Tennesseans were employed in production occupations than any other major category except office & administrative support. As 2014 data are finalized, production is expected to be the 5th largest major occupational category in terms of employment. Except for management occupations, the sharpest contracting occupational categories share two very important common features:

- They have incomes near the median (these are the middle class); and
- They are all jobs where individuals work with their hands

Historically, four of the five fastest-shrinking occupational categories have represented good jobs for men with education levels less than associate's degrees. The fact that they are simultaneously contracting is especially problematic and may explain some of the declining labor force participation among males. When an individual loses a job, the first question is: “What are my transferrable skills? What else can I do?” Among the major occupations, the categories with the most transferability to production are: construction & extraction, installation, maintenance, & repair; and transportation & freight. All of these are contracting. These patterns are not unique to Tennessee. In fact, the economic shifts in Tennessee are quite representative of the overall trends in the U.S. economy, with one exception. Unlike the balance of the U.S., the very small occupational category of Farming and Fishing grew by 17.7 percent. Some of this is surely attributable to people needing to make a living despite the decline in construction and production occupations and a lack of other skills.

The overall patterns in occupational changes are summed up in Figures 4.7-4.10. In Figure 4.7, we see sharp contractions during the recession. Some of the sharpest contractions are in the middle class, “blue collar” jobs, and some are in high-skilled “white collar jobs” (e.g., management, legal, architecture & engineering). We also see employment growth in services occupations, both low paying (personal care, healthcare support) and high paying. Post-recession (Figure 4.8), we see very strong rebound growth in employment in the professional, white collar jobs that were affected during the recession. The middle class, blue-collar jobs do not come back. In some cases (construction, production), employment continues to contract. The sum of these two periods generates Figure 4.9, employment growth for major occupation categories from 2004-2013. Here, we see strong employment growth in: 1) low paying service occupations where many people are employed and 2) high paying professional occupations where fewer people are employed. These two facts combined with the stagnation or contraction in middle class blue-collar jobs explains some of the total decline in mean and median incomes since 2004. The rest can be seen in Figure 4.10, which plots 2004-2013 growth in real income on 2004 median income. With the exception of a few outliers, the income gains were greater (or at least less negative) in the high-paying occupations than the low-paying occupations.

Detailed Occupational Categories

Similar to the analysis of industries, this report also examines which detailed-level occupations exhibited the strongest growth/contraction from 2004-2009. Table 4.8 contains information analogous to Table 4.7, at the detailed occupation level.
4.4. Occupation Data, continued

Beyond reinforcing the evidence in the previous section, three additional observations are worth mentioning. First, there has been considerable substitution within the office and administrative support occupations. Higher paying executive secretaries are being replaced by non-executive secretaries. Second, all five of the fastest growing occupations in Tennessee are below median income. Four of the five most sharply contracting occupations are above the median real income. Third, while wholesaling and production declined, the occupation of stock clerks and order fillers grew. This is largely due to the “general merchandise stores” classification, which encompasses most big-box retailers and wholesale clubs (e.g., Costco). These stores have done well over the last 10 years and have increased employment.

Figure 4.11 contains a picture analogous to Figure 4.9 for the top 20 detailed occupations in Tennessee, as defined by number of people employed. Focusing on the key specific occupations of the state, we observe a pattern of high employment growth in low paying jobs and strong employment contraction in middle-income jobs. Unlike Figure 4.9, there are no high paying jobs that exhibit employment growth. The high paying major occupational categories employ insufficient numbers of people to warrant inclusion in the top 20 detailed occupations on the basis of employment.

Table 4.8: Top 5 Growing/Contracting Detailed Occupations in Tennessee, 2004–2013

<table>
<thead>
<tr>
<th>Detailed Occupation</th>
<th>TENNESSEE</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Employment</td>
<td>Income</td>
<td></td>
</tr>
<tr>
<td>Secretaries and Admin Assistants (excluding legal,</td>
<td>31,910</td>
<td>28.7%</td>
<td>$22,670</td>
</tr>
<tr>
<td>medical, and executive)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Combined Food Preparation and Serving Workers</td>
<td>43,760</td>
<td>27.9%</td>
<td>$13,640</td>
</tr>
<tr>
<td>(including fast food)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stock Clerks and Order Fillers</td>
<td>37,100</td>
<td>23.8%</td>
<td>$19,340</td>
</tr>
<tr>
<td>Labors and Freight, Stock, &amp; Material Movers, Hand</td>
<td>68,740</td>
<td>15.8%</td>
<td>$20,650</td>
</tr>
<tr>
<td>Waiters and Waitresses</td>
<td>47,300</td>
<td>11.0%</td>
<td>$13,320</td>
</tr>
<tr>
<td>Bookkeeping, Accounting, and Auditing Clerks</td>
<td>34,170</td>
<td>-14.8%</td>
<td>$26,230</td>
</tr>
<tr>
<td>General and Operations Managers</td>
<td>49,570</td>
<td>-16.1%</td>
<td>$62,720</td>
</tr>
<tr>
<td>Heavy and Tractor-Trailer Truck Drivers</td>
<td>63,170</td>
<td>-22.4%</td>
<td>$32,890</td>
</tr>
<tr>
<td>Team Assemblers (manufacturing line)</td>
<td>65,710</td>
<td>-27.7%</td>
<td>$24,710</td>
</tr>
<tr>
<td>Executive Secretaries and Administrative Assistants</td>
<td>27,380</td>
<td>-46.2%</td>
<td>$30,270</td>
</tr>
</tbody>
</table>

Note: Minimum 25,000 workers in 2004.
4.5. Underlying Patterns

While we have introduced these topics separately; the variation in labor force participation and unemployment by various demographic groups, the growth and contraction of specific industries, and the changing occupation and income landscape are clearly inseparable. For example, labor force participation decreased and unemployment increased for males during the recession; labor force participation among males continued to fall post-recession. Labor force participation for females was relatively flat over the last decade, and increased slightly during the recession. Whereas manufacturing and construction are industries typically populated by males, education, health care, and other services have historically employed more females. The observed demographic changes in Tennessee’s workforce from 2004-2013 are not just functions of changing cultural norms, but the relative performance of the industries in which men and women work. Additionally, as displaced males from construction and production transition to other occupations, they are likely transitioning to lower paying occupations (the high-paying growth sectors present significant entry costs for those without a college degree or relevant experience). This movement of male workers then places downward pressure on earnings in the sectors they migrate to. It is therefore unsurprising that working males saw a larger decrease in incomes over the sample period than working females.

Why were young and mid-career workers affected during and post-recession more than older workers? The answer has a lot to do with education and changes in the industrial and occupational composition of the state’s labor market (as well as worker seniority). Tennessee is below the national average in educational attainment. Twenty-three percent of its citizens over age 25 have a college degree compared to 28.8 percent of Americans in the same age group. Tennessee ranks near 40th in high school completion rates and the proportion of the population with Bachelor’s or advanced degrees. The labor force in Tennessee is therefore more reliant on production, maintenance, and transportation jobs than the national workforce. Tennessee also had a higher concentration of manufacturing and production in 2004 than the U.S. and experienced a larger decrease in the number of manufacturing establishments from 2004-2013 (a 15 percent decrease compared to a national average decrease of 10 percent). If older workers had started in production occupations, by the time they are older than 50, many have moved into management or office work. Even if such a worker possesses domain knowledge about a particular industry, their experience in functional roles in management/office settings makes them more viable in other industries than their younger shop floor or shipping line colleagues.

The reduced labor force participation, higher unemployment and lower incomes for young workers are particularly concerning. As individual workers progress through the life cycle, they accrue life and on-the-job experience, become more valuable, and earn gradually higher incomes. When young workers exhibit greater joblessness and declining wages, there is a strong compounding effect: not only are adverse effects felt today, but a young worker’s trajectory of income growth over their working life may be stunted. Many young workers today may bear these costs over their entire lifetime and never fully recoup the opportunities that were lost over the Great Recession.

We also noted in the demographic section that workers with Bachelor’s and Master’s degrees were not as adversely affected in absolute terms as their counterparts who only completed high school. Additionally, we saw that whereas the recessionary effects on high school educated workers in Tennessee were representative of the national average, Tennesseans with Bachelor’s and Master’s degrees did less well that the national average. Two key industries for highly-educated workers are professional and technical services and management of companies. While these industries grew in Tennessee over the relevant period (13 percent average) they grew considerably slower than the national average (combined 21 percent). The change in the industrial and occupational composition of Tennessee’s labor market may
4.5. Underlying Patterns, continued

Table 4.9: Cognitive and Manual Tasks

<table>
<thead>
<tr>
<th>Manual Non-Routine Tasks</th>
<th>Cognitive Non-Routine Tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Janitor</td>
<td>Engineer</td>
</tr>
<tr>
<td>Painter</td>
<td>Strategic Sales</td>
</tr>
<tr>
<td>Orderly</td>
<td>Detective</td>
</tr>
<tr>
<td>Assembly Line Worker</td>
<td>Manual Routine Tasks</td>
</tr>
<tr>
<td>Construction Laborer</td>
<td>Manual Routine Tasks</td>
</tr>
<tr>
<td>Tool Setter</td>
<td>Manual Routine Tasks</td>
</tr>
</tbody>
</table>

Why then, are inflation-adjusted incomes in the services sector falling? There are two candidate explanations. First, basic economic analysis holds that workers should be paid based on their productivity and contribution to their employer’s revenue generation. If workers in the service sectors are becoming less productive, incomes will fall. Data from the U.S. Bureau of Economic Analysis do not support this hypothesis. Output has grown by 50 percent in most service industries from 2004-2013. No Super Sector or 3-digit NAICs sector has exhibited that rate of employment growth in Tennessee, and yet incomes are falling. The second candidate explanation involves the migration of workers from other industries into the ‘port-in-a-storm’ service industries in the wake of the Great Recession. From a basic economic perspective, if supply increases, we expect prices to fall. In this case, if more people select into service occupations because the construction and production jobs are disappearing, incomes in the service sectors will fall. We do not observe broad-based evidence that consumer prices of services have fallen. This leaves the ‘crowding-in’ story as the most likely explanation — more workers queuing for jobs in the service sector has placed downward pressure on earnings.

From a policy perspective, it is important to remember that these trends are not unique to Tennessee. Tennessee’s experiences are in most ways typical of the overarching trends in the U.S., and part of an ongoing trend during the past 30 years. The economic term for the underlying trend is “Skill-Biased Technical Change” or SBTC (Autor et al., 2004). SBTC has been advanced as an explanation for burgeoning income inequality, and the simultaneous rise in output/decline in employment in manufacturing and some services sectors. The notion behind SBTC is that jobs can be divided into one of four categories, as shown in Table 4.9.

Historically, Cognitive Non-Routine tasks have paid very well; and Manual Non-Routine Tasks have not. Occupations that are intensive in manual
and cognitive routine tasks have historically been middle class jobs.

Computers (personal or industrial) are good substitutes for routine tasks, both cognitive and manual. Several bookkeepers can be replaced with a good database software package and a self-auditing algorithm. Several spot welders can be replaced with a robotic welder. Technology has a complementary effect on the “cognitive non-routine tasks” category. Technology makes workers in this category more productive. An engineer with a state-of-the-art computer assisted design (CAD) package is more productive than one with a slide rule, etc. As technology develops, workers in routine tasks become replaceable, and experience declining incomes and employment opportunities. Workers in the “high-skilled” cognitive jobs earn greater incomes and benefit from employment opportunities. Workers in the Manual Non-Routine category will likely face lower incomes (but a resulting increase in the number employed) as displaced workers from the routine sectors will seek other employment.

Policy Implications

Faced with the reality of the changing industrial composition of the U.S., layered with at least some Skill Biased Technical Change, the state of Tennessee has some alternatives to address falling average incomes and declining labor force participation. These alternatives include both the ongoing recruitment and retention of industries and firms that employ Tennesseans and the continued development of human capital in Tennessee’s workforce. The policy question most salient for improving the labor market is: “Is it more cost effective to train our people for the jobs that are in demand, or to recruit industries that have jobs for which our people are currently suited?”

Tennessee could take aggressive steps to bring jobs to the state that fit the skills of its workers. As many other states may be competing for a shrinking set of jobs, this may prove very costly in terms of targeted economic development incentives. If manufacturing jobs are successfully wooed to Tennessee, there is no guarantee that employment in those industries/occupations will not continue to shrink. In fact, long-term trends point to declining employment in manufacturing and smaller manufacturing establishments. (The state once attracted a large textiles and apparel cluster that is now vanishing. Will the state’s transportation equipment sector ultimately face the same fate?) As technology continues to progress at an increasing rate, traditional manufacturing comprised of assembly lines that employ massive numbers of workers will increasingly become a thing of the past. Industry profiles of modern American manufacturing demonstrate that modern manufacturing is great at producing high levels of output with large amounts of physical capital and relatively small numbers of people. The productivity gains in Tennessee’s manufacturing sector offer testimony to this statement. Industry recruitment alone may therefore do more for Tennessee’s Gross Domestic Product than labor market indicators. Nonetheless, those individuals who gain employment in manufacturing may be paid well especially in light of productivity trends.

Alternatively, Tennessee could put measures in place to develop the skills of its workers to match the demands of the changing economy. This is not to suggest that blue-collar jobs and manufacturing should be abandoned, but to emphasize that the skills and quantities of workers in production are different than in years past. Today’s production worker may be a member of a small team who are certified as welders/mechanics/machinists, (so they know a little about what they are working on) and have Associate’s degrees in Computer Science. They are skilled technicians on large industrial equipment rather than substitutable human cogs in an assembly process. Semiconductor and other research-driven manufacturing in places like North Carolina (CREE) and Texas (Philips) are examples of growing manufacturing enterprises where employment is driven, rather than threatened, by technological progress.

In practice, a combination of these strategies will be needed that can both attract jobs to the state and make Tennesseans more productive in
4.5. Underlying Patterns, continued

the workplace. Programs like TN Promise and the “Drive to 55” can help transition workers in Tennessee into high-skilled occupations in sectors that are growing, rather than contracting. However, if young Tennesseans are trained or educated in ways that misalign them with growing industries and occupations, these policies will be less effective. We examined the occupational placement of young people (younger than 26, out of school for less than 5 years) with Bachelor’s and Associate’s degrees. From 2000-2013, the proportion of individuals with Associate’s degrees working in food service more than doubled, while the number working in architecture, engineering, and health care techs fell by 50 percent. There is still considerable work to be done to determine what majors/fields of study students might be best steered towards, let alone how to incentivize students to focus in these targeted areas. However, policies like TN Promise are a crucial step in preparing Tennessee to attract high-paying jobs in high-growth sectors rather than competing for jobs in sectors that will inevitably continue to contract.

4.6. Data Appendix

The data on labor force participation and unemployment are taken from the American Community Survey. Data on employment and incomes by industry are taken from the Quarterly Employment Census of Workers from the Bureau of Labor Statistics. Data on employment and income by occupation are taken from Annual Occupational Employment Statistics, also from the Bureau of Labor Statistics (BLS). Because the data are all sample data from separate parts of the BLS, the aggregate averages exhibit slight differences.

Whether inflation-adjusted income is rising or falling depends on who you ask. Average income has risen, over the sample period, according to the Bureau of Economic Analysis. However, nearly all of the increases in income from 2009–present have been gone to the very highest earners in the population. We are interested in what the recession and post-recession period has meant to the labor market outcomes and earnings incomes of the “typical Tennessean.” Often, we refer to median incomes in this paper to avoid the impact of a very few high earners in the “average.” In order to calculate a relevant and useful mean, personal earnings were top-coded at $300,000 – i.e. we do not use actual income levels for high income earners. We kept high earners in the data, but the small numbers individuals who earned $350,000 or $3,500,000 were all treated as earning $300,000 per year.

Real incomes were calculated by using the CPI to convert 2013 and 2009 incomes to 2004 dollars. Using the Bureau of Economic Analysis’ GDP deflator as an alternative measure reduces the impact of inflation on incomes by approximately 10 percent. Using the GDP deflator to convert nominal incomes to real incomes has virtually no impact on the fundamental implications of the study.
4.6. Data Appendix, continued

Figure 4.2: Labor Force Participation and Unemployment by Education, 2004–2013

- Labor Force Participation, High School Graduate
- Unemployment Rate, High School Graduate
- Labor Force Participation, Associates Degree
- Unemployment Rate, Associates Degree
- Labor Force Participation, Bachelor’s Degree
- Unemployment Rate, Bachelor’s Degree
- Labor Force Participation, Master’s Degree
- Unemployment Rate, Master’s Degree
- Labor Force Participation, Professional Degree
- Unemployment Rate, Professional Degree
4.6. Data Appendix, continued

Figure 4.3: Labor Force Participation and Unemployment by Race, 2004–2013

- **Labor Force Participation, White**
  - Tennessee: 55.0% (2004), 60.0% (2009), 65.0% (2013)
  - National: 55.0% (2004), 60.0% (2009), 65.0% (2013)

- **Unemployment Rate, White**
  - Tennessee: 0.0% (2004), 2.0% (2009), 4.0% (2013)
  - National: 0.0% (2004), 2.0% (2009), 4.0% (2013)

- **Labor Force Participation, Black or African American**
  - Tennessee: 85.0% (2004), 75.0% (2009), 65.0% (2013)
  - National: 85.0% (2004), 75.0% (2009), 65.0% (2013)

- **Unemployment Rate, Black or African American**
  - Tennessee: 16.0% (2004), 14.0% (2009), 12.0% (2013)
  - National: 16.0% (2004), 14.0% (2009), 12.0% (2013)

- **Labor Force Participation, Hispanic**
  - Tennessee: 60.0% (2004), 65.0% (2009), 70.0% (2013)
  - National: 60.0% (2004), 65.0% (2009), 70.0% (2013)

- **Unemployment Rate, Hispanic**
  - Tennessee: 2.0% (2004), 4.0% (2009), 6.0% (2013)
  - National: 2.0% (2004), 4.0% (2009), 6.0% (2013)
Figure 4.4: Labor Force Participation and Unemployment by Age, 2004–2013

### Labor Force Participation, Age 18–35 Years

- **Tennessee**
- **National**

<table>
<thead>
<tr>
<th>Year</th>
<th>Tennessee</th>
<th>National</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>85.0%</td>
<td>55.0%</td>
</tr>
<tr>
<td>2009</td>
<td>80.0%</td>
<td>60.0%</td>
</tr>
<tr>
<td>2013</td>
<td>75.0%</td>
<td>65.0%</td>
</tr>
</tbody>
</table>

### Unemployment Rate, Age 18–35 Years

- **Tennessee**
- **National**

<table>
<thead>
<tr>
<th>Year</th>
<th>Tennessee</th>
<th>National</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>2.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>2009</td>
<td>4.0%</td>
<td>2.0%</td>
</tr>
<tr>
<td>2013</td>
<td>6.0%</td>
<td>4.0%</td>
</tr>
</tbody>
</table>

### Labor Force Participation, Age 35–50 Years

- **Tennessee**
- **National**

<table>
<thead>
<tr>
<th>Year</th>
<th>Tennessee</th>
<th>National</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>85.0%</td>
<td>55.0%</td>
</tr>
<tr>
<td>2009</td>
<td>80.0%</td>
<td>60.0%</td>
</tr>
<tr>
<td>2013</td>
<td>75.0%</td>
<td>65.0%</td>
</tr>
</tbody>
</table>

### Unemployment Rate, Age 35–50 Years

- **Tennessee**
- **National**

<table>
<thead>
<tr>
<th>Year</th>
<th>Tennessee</th>
<th>National</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>2.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>2009</td>
<td>4.0%</td>
<td>2.0%</td>
</tr>
<tr>
<td>2013</td>
<td>6.0%</td>
<td>4.0%</td>
</tr>
</tbody>
</table>

### Labor Force Participation, Age 50–65 Years

- **Tennessee**
- **National**

<table>
<thead>
<tr>
<th>Year</th>
<th>Tennessee</th>
<th>National</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>85.0%</td>
<td>55.0%</td>
</tr>
<tr>
<td>2009</td>
<td>80.0%</td>
<td>60.0%</td>
</tr>
<tr>
<td>2013</td>
<td>75.0%</td>
<td>65.0%</td>
</tr>
</tbody>
</table>

### Unemployment Rate, Age 50–65 Years

- **Tennessee**
- **National**

<table>
<thead>
<tr>
<th>Year</th>
<th>Tennessee</th>
<th>National</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>2.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>2009</td>
<td>4.0%</td>
<td>2.0%</td>
</tr>
<tr>
<td>2013</td>
<td>6.0%</td>
<td>4.0%</td>
</tr>
</tbody>
</table>
4.6. Data Appendix, continued

Figure 4.5: Growth in Relative Income Shares from 2004–2013
4.6. Data Appendix, continued

Figure 4.6: Employment Growth and Relative Income by Industry
4.6. Data Appendix continued

Figure 4.7: Employment Growth/Contraction by Major Occupation and Income (2004–2009)
4.6. Data Appendix, continued

Figure 4.8: Employment Growth/Contraction by Major Occupation and Income (2009–2013)
4.6. Data Appendix, continued

Figure 4.9: Employment Growth/Contraction by Major Occupation and Income (2004–2013)
Figure 4.10: 2004 Median Income and Growth in Real Income from 2004–2013 – Major Occupations in Tennessee
4.6. Data Appendix, continued

Figure 4.11: Employment Growth and Median Income, Top 20 Detailed Occupations in Tennessee