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*Studies in the North Carolina Economy*

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## **Explaining Differences in North Carolina County Unemployment Rates**

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*Author's Note: This is the inaugural report in the "Studies in the North Carolina Economy" series. The series will address issues of current concern in the North Carolina economy and offer analysis and insights. The reports will be accessible to the general reader but with technical appendices included. Research presented in the reports is based on original work by the author. The reports will be issued periodically.*

**Abstract:** In any month, the unemployment rate in North Carolina's 100 counties varies widely. This study looks at the determinants of this variation during 2014, 2015, and 2016. In general, the results show counties with higher proportions of adults with a bachelor's degree, more rapid population growth, a higher percentage of business earnings in manufacturing, and lower percentages of residents with characteristics businesses might interpret as suggesting less productive workers (obesity, alcohol and drug overuse) have lower unemployment rates. However, as the state economy improved from 2014 to 2016, the impacts of education and alcohol/drug overuse lessened while the impact of population growth increased. Also, there is the question of the direction of causality between obesity and alcohol/drug overuse and unemployment. Do those characteristics lead to less hiring by businesses, or does less hiring by businesses motivate individuals not finding work to increase their levels of obesity and alcohol/drugs? Still, the findings suggest faster statewide economic growth generally improves employment in all counties.

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Unemployment rates for North Carolina's 100 counties are issued every month. A reading of any of the reports reveals one clear conclusion – unemployment rates in the state vary significantly between counties. For example, in March 2017, the county jobless rate ranged from a low of 3.7% in Buncombe County to a high of 12.3% in Hyde County.

In an effort to understand why jobless rates differ so much within North Carolina, a statistical analysis was applied to the annual unemployment rates for the state's counties for each of the last three years – 2014, 2015, and 2016. The analysis related several factors to county unemployment rates in a way that the individual effect of each factor was found while simultaneously accounting for the combined effects of the other factors.<sup>2</sup>

The factors cover four categories. First is the educational level of the county workforce. The nature of work has dramatically changed in the economy during the last half-century. More human work today requires cognitive skills learned in school. Whereas a century ago an eighth grade education sufficed for most jobs, fifty years ago this requirement was raised to a high school education, and increasingly today the minimal education requirement is a college degree. Indeed, many employers do not hire a person for their particular college major. Instead, employers often interpret an individual with a college degree in any major as having the skills and abilities to learn on-the-job and be productive.

Employers also prefer workers who will be consistent in their attendance and who do not bring personal issues that might detract from their job performance. Missing time from work and/or performing work in an inconsistent fashion are costly behaviors to employers. For employers providing medical care benefits, healthy employees are preferred to unhealthy employees.

Job growth is logically tied to population growth. The more people moving to and living in a county, the greater the need for jobs to provide the products and services used by the residents. While several counties in North Carolina have experienced rapid population growth in recent years, many other counties have had stagnant – or in some cases negative – job growth.

Last, the economic prospects of industries are different. At any time, some industries may be growing and adding jobs while others are declining and cutting jobs. Therefore, in analyzing the variation in unemployment rates among counties, it is important to recognize the differences in the economic composition of the counties.

Measurement of economic concepts is always based on available data. The annual unemployment rate for each county is the official county unemployment rate from the U.S. Bureau of Labor Statistics. This rate is measured as the number of adults (individuals 16 years of age and over) who are officially unemployed as a percentage of the number of adults employed plus those unemployed. To be officially unemployed, an individual must meet three conditions: not have job, want a job, and have actively looked for a job within the past month. There are broader measures of the unemployment rate at the statewide and national levels that

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<sup>2</sup> The statistical technique for accomplishing this is discussed in the Appendix.

## **Major Findings of Determinants of North Carolina County Unemployment Rates in 2014, 2015, and 2016.**

<i>Factor</i>	<i>Finding</i> <sup>3</sup>
% of adults with bachelor's degree or higher	Increases in the measure are associated with reductions in the county unemployment rate in 2014 and 2015
County population growth since 2010	Increases in the measure are associated with reductions in the county unemployment rate in 2015 and 2016
% of total county business earnings from manufacturing	Increases in the measure are associated with reductions in the county unemployment rate in all three years
County obesity rate	Increases in the measure are associated with increases in the county unemployment rate in all three years
% of adults in alcohol and drug treatment centers	Increases in the measure are associated with increases in the county unemployment rate in 2014 and 2015

relax the third condition, but none are available at the county level. The components of the unemployment rate are based on a monthly statistical survey.

Educational attainment in the county is the percentage of individuals aged 25 and older with a bachelor's degree or above. Population growth is the percentage increase in the county population from 2010 to the year of the unemployment rate. The county's industrial structure is measured by the percentage of business earnings in key economic sectors.

The most difficult category to measure – especially at the county level – is the personal characteristics of the local workforce that might deter employment. Two measures were used. One is the average obesity rate in the county, calibrated as the percentage of adults with a BMI (body mass index) of 30 or above. There is evidence some employers relate obesity to unwanted worker characteristics.<sup>4</sup> This measure is from the County Health and Roadmaps Program funded by the Robert Wood Foundation. The second measure is the percentage of adults in the county who are in an alcohol and drug treatment center, using data from the North

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<sup>3</sup> Increases or decreases cited from the factor are associated with "statistically significant" findings. See the technical appendix for further discussion.

<sup>4</sup> See "How Being Overweight Can Hurt Your Career," *Fox Business*, March 4, 2013, [www.foxbusiness.com/features/2013/04/how-being-overweight-can-hurt-your-career.html](http://www.foxbusiness.com/features/2013/04/how-being-overweight-can-hurt-your-career.html).

Carolina Department of Health and Human Services. Employers might expect this measure to correlate with the percentage of applicants in a county who might fail a drug test.<sup>5</sup>

The major findings from the statistical analysis are summarized in the table. Counties with a higher percentage of adults with bachelor's degrees had higher unemployment rates in 2014 and 2015, but not in 2016. The explanation may be that as the job market in the state improved over the three years and unemployment rates fell – especially among college educated individuals - employers may have had to broaden their search for workers.

The opposite results were found for population growth, with the measure being associated with lower county unemployment rates in 2015 and 2016 but not in 2014. Again, the reason for the differences may be the change in economic conditions. The rate of growth in the broadest measure of the North Carolina economy – real gross domestic product – increased in 2015 compared to 2014 and again increased in 2016 compared to 2015. It makes sense that population growth is not as potent of a generator of jobs when the overall economy is growing more slowly.

The only economic sector having an impact on county unemployment rates was manufacturing. Counties with a higher concentration of manufacturing had lower unemployment rates in each of the years. The explanation is manufacturing's relative performance during an economic recovery. Typically manufacturing is one of the hardest hit economic sectors in a recession due to purchasers' ability to delay buying manufactured products. However, once an economic recovery occurs (as it was in 2014, 2015, and 2016), "pent-up" demand for manufactured products serves as a strong boost to local economies.

Higher obesity rates are associated with higher unemployment rates in all three years. Higher rates for county residents in alcohol and drug treatment centers are associated with higher unemployment rates in 2014 and 2015, but not 2016. A possible explanation for the latter finding may again be the improving economy. Of the three years, the condition of the North Carolina economy was the strongest in 2016. As the employment market tightened, companies may relax some of their standards for hiring.

With respect to the obesity and alcohol/drug treatment measures, there may be a "chicken and egg" issue. That is, unemployment rates may be higher in counties with higher percentages of obese adults and adults in treatment centers because employers like to avoid hiring individuals with these characteristics. Alternatively, counties with higher unemployment rates and fewer job opportunities may create despondency among some individuals that lead to these health and behavioral issues.<sup>6</sup>

The conclusion is there is some explanation for why unemployment rates vary so widely among North Carolina's counties. It is a combination of differences among the counties in

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<sup>5</sup> For the legalities of employers conducting drug tests for potential employees, see FindLaw, "Drug Testing during Hiring," [www.smallbusiness.findlaw.com/employment-law-and-human-resources/drug-testing-during-hiring.html](http://www.smallbusiness.findlaw.com/employment-law-and-human-resources/drug-testing-during-hiring.html).

<sup>6</sup> A statistical test, called a "Granger Causality Test" lent support to the notion that the obesity and alcohol/drug treatment measures contributed to the determination of the unemployment rate, rather than the unemployment rate contributing to the determination of the obesity and alcohol/drug treatment measures.

educational attainment of the workforce, population growth, economic structure, and behavioral characteristics of the workforce. However, it is interesting that two of these factors – educational attainment and behavioral characteristics of the workforce relating to excessive alcohol and drug use – appear to decrease in importance, while one of the factors – population growth – appears to increase in importance as the state economy expands faster. So, while working to improve all the factors that lead to lower county unemployment rates is important, one important element that will generally help all counties is stronger statewide economic performance.

## Technical Appendix

The statistical investigation of the determinants of county unemployment rates in North Carolina was performed using multiple regression. Multiple regression is a technique that allows the calculation of the statistical impact of an independent factor on a dependent factor (here the unemployment rate) while simultaneously accounting for the combined effect of other independent factors.

There are four key outputs of a multiple regression shown in the accompanying table. The *parameter* associated with each factor shows the change in the unemployment rate when the independent factor changes by one unit. A positive sign on the parameter value means the change in the unemployment rate moves in the same direction as the change in the independent factor, while a negative sign on the parameter value means the change in the unemployment rate moves in the opposite direction as the change in the independent factor.

The *t-statistic* shows the degree to which the parameter estimate is “statistically significant” – that is, significantly different than zero. Three levels of statistical significance are shown: 0.001 (a 1 in 1000 chance the true parameter value is zero), 0.05 (a 5 in 100 chance the true parameter value is zero), and 0.10 (a 1 in 10 chance the true parameter value is zero). More than a 1 in 10 chance that the true parameter value is zero is considered statistically not significant. Statistically significant parameter estimates are highlighted in **bold**.

The  $R^2$  value shows the proportion of the variation in the dependent variable (the unemployment rate) that is collectively accounted for by all the factors. The *Adj.  $R^2$*  value adjusts this proportion by the number of factors used (usually using more factors increases the  $R^2$ , even if the parameter values of the factors are individually not statistically significant). The *F-value* indicates if the collective explanatory power of all the factors is statistically significant.

Looking first at the F-values, clearly the total explanatory power of all the factors is statistically significant. The  $R^2$  values for the three regressions are near 0.4, while the *Adj.  $R^2$*  values are near 0.35. This implies approximately 40% of the variation in the county unemployment rates in a given year is statistically explained by the factors, and 35% is explained once the number of factors is taken into account. Although these values may appear low, they

## Multiple Regression Results for County Annual Unemployment Rates in 2014, 2015, and 2016.

Factor	parameter	t-statistic		parameter	t-statistic		parameter	t-statistic
Intercept	5.18	<b>3.03***</b>		4.13	<b>2.54***</b>		2.91	<b>2.19***</b>
Bach degree %	-0.07	<b>-2.42**</b>		-0.05	<b>-1.93*</b>		-0.03	-1.25
Pop. Growth %	-0.05	-1.56		-0.06	<b>-1.69*</b>		-0.07	<b>-2.46**</b>
Manufacturing %	-0.03	<b>-1.84*</b>		-0.04	<b>-2.34**</b>		-0.03	<b>-2.69***</b>
Farming %	-0.03	-1.36		-0.02	-1.12		-0.00	-0.03
Retail %	-0.00	-0.03		-0.00	-0.01		0.04	0.70
Financial serv. %	0.04	0.33		0.06	0.52		0.04	0.42
Obesity	0.11	<b>2.94***</b>		0.12	<b>3.23***</b>		0.11	<b>3.72***</b>
Alcohol/drug treat.	5.89	<b>2.14**</b>		5.29	<b>2.02**</b>		2.16	1.01
R <sup>2</sup>	0.40	-		0.38	-		0.42	-
Adj. R <sup>2</sup>	0.35	-		0.32	-		0.36	-
F-value	<b>7.33***</b>	-		<b>6.88***</b>	-		<b>7.86***</b>	-

\*\*\*statistically significant at the 0.001 level; \*\*statistically significant at the 0.05 level; \*statistically significant at the 0.10 level

are consistent with other research estimating the determinants of county unemployment rates in states.<sup>7</sup>

The “intercept” parameter is interpreted as the value of the unemployment rate if values of all the independent factors were zero. The value is statistically significant in each equation and steadily declines from 5.18% in 2014 to 4.13% in 2015 to 2.91% in 2016 – indicating an improving labor market over these years.

The parameter value of the percentage of adults with a bachelor’s degree in the county declined from 2014 to 2016 as the state economy improved. In 2014 every 1 percentage point increase in the measure was associated with a 0.07 percentage point reduction in the county unemployment rate. In 2015 the associated jobless rate reduction was 0.05 percentage points, and in 2016 the effect of the bachelors’ degree share was not statistically significant.

Population growth had the opposite trend over time. There was no statistically significant association between the jobless rate and population growth in 2014. In 2015, every percentage point increase in the county’s population growth since 2010 was associated with a 0.06 percentage point reduction in the county unemployment rate, and in 2016 the associated reduction in the jobless rate was 0.07 percentage points.

Among the four economic sector measures (the percentage total county business earnings in manufacturing, in farming, in retail, and in financial services), only the manufacturing sector

<sup>7</sup> See Joslyn Sailer. “Explaining Differences in Unemployment Rates across Iowa Counties in the Early Stages of the Great Recession,” *Major Themes in Economics*, The University of Northern Iowa, Spring 2012, pp. 12-32; and Mark Partridge and Dan Rickman. “County Unemployment in Georgia: The Causes and Potential Role for Economic Development Policy,” *The Review of Regional Studies*, vol. 26, no. 1, 1996, pp. 17-39.

had a statistically significant impact on the county unemployment rate in 2014, 2015, and 2016.<sup>8</sup> The impact was consistent, with every increase in the percentage of total county business earnings from the manufacturing sector being associated either with a 0.03 or 0.04 percentage point reduction in the county unemployment rate.

The findings for the obesity measure were also consistent. Every 1 point increase in the BMI index was associated with either a 0.11 or 0.12 percentage point increase in the county jobless rate. For the alcohol/drug treatment factor, the results were different. First, in 2014 and 2015, there was a strong negative impact from this factor. In both years, every 1 percentage point increase in the percentage of county residents in alcohol or drug treatment centers was associated with between a 5 and 6 percentage point increase in the county jobless rate. While this association seems large, it should be kept in context with the size of this measure, which averaged 0.05% and ranged from a low of 0.002% to a high of 0.24%. In 2016 there was no statistically significant association between the alcohol/drug treatment measure and the county unemployment rate.

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<sup>8</sup> Due to disclosure rules, business earnings for all economic sectors are not available for all counties. For example, if a small number of firms dominate an industry in a county, earnings statistics will be suppressed to avoid disclosing the information for the firms.