

APPENDIX H

Independent Analysis of Economic Forecasts and Sales Tax Revenue

The following reports were prepared independent of the Wake County Transit Plan, but are included here for the purpose of comparing revenue forecasts.

The first analysis was prepared in 2009 by Michael Walden, Ph.D., North Carolina State University, and develops a sales tax growth assumption using retail sales data for the region, national real gross domestic product and the consumer price index. For Wake County, the Walden analysis forecast sales tax growth percentages ranging from a high of 8.9 percent in calendar year 2012 to a

long-term average growth of 4.2 percent in calendar years 2020 through 2035.

Karl Smith, Ph.D., the University of North Carolina at Chapel Hill School of Government, prepared the second analysis forecasting long-term sales tax revenue growth assumptions in the Triangle region. The analysis used population growth forecasts, personal income and portion of income spent on goods applicable to the transit sales tax and identified a growth assumption averaging 5.9 percent in future years.

TRIANGLE ECONOMIC ACTIVITY FORECASTS

RELEVANT FOR TRANSIT PLANNING

Dr. Michael L. Walden

EXECUTIVE SUMMARY

Three tax revenue sources in the Triangle region are important generators of funding for transit planning: tax revenues from retail sales, from vehicle registrations, and from vehicle rentals. In order to project revenue availability for Triangle transit projects, forecasts were developed for each of these sources through the year 2035.

The procedure for developing the forecasts was straightforward. First, changes in the local economic *base* (retail sales, vehicle registrations, and for vehicle rentals – RDU enplanements) behind each of the revenue sources were statistically related to changes in underlying fundamental national economic factors – specifically real (inflation-adjusted) gross domestic product (GDP) and inflation. Second, forecasts for changes in real GDP and inflation were taken from a reliable source, the Congressional Budget Office (CBO). Third, the CBO forecasts were combined with the statistical relationships to produce projections in the Triangle economic bases and, by extension, in the tax revenue sources. For revenues from rental vehicles, a second set of forecasts was developed by directly relating rental vehicle tax revenues to the national economic factors.

The results suggested tax revenues from Triangle retail sales will grow in the 3% to 4% range in 2010, accelerate to 5% to 9% annually during the 2011-2013 period, fall back to growth of 4% to 6% between 2014 and 2019, and then average 3% to 4% in growth each year from 2020 to 2035. A similar pattern is projected for annual tax revenue growth from vehicle registrations: 2% in 2010, 3.5% to 6.5% in 2011 to 2013, 3% to 4% in 2014 to 2019, and 2% to 3% in 2020 to 2035.

Two sets of estimates were developed for tax revenues from rental vehicles. Using forecasts for growth in RDU enplanements: growth rates of 2.7% in 2010; 5% to 8% annually between 2011 and 2013; 3% to 5% in 2014 to 2019; and 3.4% annually for the period 2020 – 2035. The annual growth rates are 0.5 to 1.7 percentage points higher using results based on directly predicting rental vehicle tax revenues.

The forecasts can be adjusted as new projections for real GDP and inflation are released by the Congressional Budget Office.

**TRIANGLE ECONOMIC ACTIVITY
FORECASTS RELEVANT FOR
TRANSIT PLANNING**

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INTRODUCTION

This document provides forecasts for key Triangle economic activity measures that are important for transit planning. The measures are retail sales, vehicle registrations, and vehicle rentals. Each of these measures is an important economic base for the generation of public revenues for Triangle transit projects.

The methodology used for making the forecasts is straightforward. Each of the Triangle economic activity measures is related to an underlying determining factor, or factors. A statistical procedure is used to “predict” the Triangle economic activity measure from the underlying determining factor or factors. Then, forecasts for the underlying factor or factors are used to generate forecasts for the Triangle economic activity measure.

TRIANGLE RETAIL SALES

Annual data for each for each of the three Triangle counties (Durham, Orange, Wake) from 1970 to 2005 (latest year available using a consistent definition of retail sales) was related to national real GDP (Gross Domestic Product) and inflation (Consumer Price Index). Annual rates of change were used in calibrating the relationship, and allowances were made to permit the relationship to vary by decade.

The results of the statistical analysis are shown in Table 1.

Table 1. Estimated Relationships Between National Economic Growth and Inflation and Triangle County Retail Sales.

<i>County</i>	<i>For every % point increase in real GDP:</i>	<i>For every % point increase in the inflation rate:</i>
<i>Durham</i>	<i>retail sales increase by 1.36 % points</i>	<i>retail sales increase by 0.59 % points</i>
<i>Orange</i>	<i>retail sales increase by 1.21 % points</i>	<i>retail sales increase by 0.94 % points</i>
<i>Wake</i>	<i>retail sales increase by 1.72 % points</i>	<i>retail sales increase by 0.71 % points</i>

Source: Authors calculations using data from the North Carolina Data Center and the U.S. Bureau of Economic Analysis.

The findings make logical sense. All three Triangle counties show retail sales growing faster than the national economy, which is suggestive of the superior economic climate in the Triangle. As the largest county in the region with the largest number of retail outlets, the growth rate in Wake County is the highest. The results also show that national inflation is transmitted to the Triangle at less than a one-to-one rate, perhaps reflecting a more competitive economic environment and slower growth in input costs in the Triangle region than in the nation.

Now what are needed are forecasts for the percentage change in real GDP and the percentage change in inflation. Fortunately, the Congressional Budget Office periodically provides such estimates, and the latest annual projections through 2019 are in Table 2.

Table 2. Forecasted National Economic Growth Rates and Inflation Rates.

<i>Year</i>	<i>Real GDP Growth Rate</i>	<i>Inflation Rate</i>
2010	1.7%	1.7%
2011	3.5%	1.3%
2012	5.0%	1.0%
2013	4.5%	1.1%
2014	3.0%	1.5%
2015	2.7%	1.8%
2016	2.5%	2.0%
2017	2.3%	2.0%
2018	2.2%	2.0%
2019	2.2%	2.0%

Source: Congressional Budget Office, *The Budget and Economic Outlook: An Update*, August 2009.

One other element needs to be considered in the forecasts. The North Carolina retail sales tax base has been shrinking relative to the economy as consumers shift spending from taxed products to untaxed products – such as internet sales – and untaxed services. The retail sales tax base has been shrinking at the rate of 0.6% annually. To account for this effect, the forecasts generated by combining the national forecasts in Table 2 with the statistical results in Table 1

were reduced at the rate of 0.6% (0.006) compounded annually since 2005 (the last year in the statistical analysis). The results are in Table 3. Although the CBO forecasts only go to 2019, their forecasts for 2018 and 2019 are the same. Thus, it is reasonable to extent the CBO annual forecasts for years beyond 2019, which is what is assumed in Table 3 in developing the average annual forecasts for 2020 – 2035.

Table 3. Forecasted Annual Percentage Increases in Triangle County Retail Sales.

<i>Year</i>	<i>Durham</i>	<i>Orange</i>	<i>Wake</i>
<i>2010</i>	<i>3.2%</i>	<i>3.5%</i>	<i>4.0%</i>
<i>2011</i>	<i>5.3%</i>	<i>5.3%</i>	<i>6.7%</i>
<i>2012</i>	<i>7.1%</i>	<i>6.7%</i>	<i>8.9%</i>
<i>2013</i>	<i>6.4%</i>	<i>6.2%</i>	<i>8.1%</i>
<i>2014</i>	<i>4.7%</i>	<i>4.8%</i>	<i>5.9%</i>
<i>2015</i>	<i>4.4%</i>	<i>4.7%</i>	<i>5.6%</i>
<i>2016</i>	<i>4.3%</i>	<i>4.6%</i>	<i>5.3%</i>
<i>2017</i>	<i>4.0%</i>	<i>4.3%</i>	<i>5.0%</i>
<i>2018</i>	<i>3.8%</i>	<i>4.2%</i>	<i>4.8%</i>
<i>2019</i>	<i>3.8%</i>	<i>4.2%</i>	<i>4.8%</i>
<i>2020 – 2035</i>	<i>3.3%</i>	<i>3.7%</i>	<i>4.2%</i>

(average)

Source: Table 1, Table 2, author's calculations.

Averages for years 2020 – 2035 are not the same as values for 2018 and 2019 due to the continual reduction in the retail sales tax base.

Assuming a constant sales tax rate, sales tax revenues would be expected to also rise at the same rates as shown in Table 3.

TRIANGLE VEHICLE REGISTRATIONS

Vehicle registrations in each of the Triangle counties were related to real Gross Domestic Product using a statistical analysis for the years 1970 to 2007. Again, tests were made to determine if the associations varied by decade. The results are given in Table 4.

Table 4. Estimated Relationships Between National Economic Growth and Triangle Vehicle Registrations.

<i>County</i>	<i>For every % point increase in real GDP</i>
<i>Durham</i>	<i>Vehicle registrations increase by 1.05 % points</i>
<i>Orange</i>	<i>Vehicle registrations increase by 1.29 % points</i>
<i>Wake</i>	<i>Vehicle registrations increase by 1.30 % points</i>

Source: Authors calculations using data from the North Carolina Data Center and the U.S. Bureau of Economic Analysis.

The findings are supportive of a Triangle region growing faster than the nation, with Wake County being the fastest of the three counties. Using the CBO forecasts and the relationships in Table 4, Table 5 gives the projections for the growth in vehicle registrations in

the Triangle counties. **Once again, assuming a constant tax rate applied to the vehicle registrations, revenues would be expected to increase at the same rates as in Table 5.**

Table 5. Forecasted Annual Percentage Increases in Triangle County Vehicle Registrations.

<i>Year</i>	<i>Durham</i>	<i>Orange</i>	<i>Wake</i>
2010	1.8%	2.2%	2.2%
2011	3.7%	4.5%	4.6%
2012	5.3%	6.5%	6.5%
2013	4.8%	5.8%	5.9%
2014	3.2%	3.9%	3.9%
2015	2.8%	3.5%	3.5%
2016	2.6%	3.2%	3.3%
2017	2.4%	3.0%	3.0%
2018	2.3%	2.8%	2.9%
2019	2.3%	2.8%	2.9%
2020 – 2035	2.3%	2.8%	2.9%

Source: Table 1, Table 4, author's calculations.

RENTAL VEHICLE TAX

Two approaches were used to make forecasts for the rental vehicle tax. The first was based on enplanements being an important economic base for the rental vehicle tax. Data for the percentage change in enplanements at RDU International Airport were related to the annual growth rate in real GDP for the years 1985 -2007 (range of years for which data were available).

The statistical analysis showed the relationship between enplanements and national economic growth was weaker in the 2000s decade than in earlier years. This likely was a result of changes in the hub status and number of flights at RDU.

The statistical analysis indicated the annual percentage change in enplanements was 1.56 times greater than the annual change in real GDP. Using this relationship together with the CBO projections gives the forecasted annual percentage change in enplanements shown in Table 6. **If there is a one-to-one relationship between the change in enplanements and the change**

Table 6. Forecasted Annual Percentage Change in RDU Enplanements

<i>Year</i>	<i>Enplanements</i>
2010	2.7%
2011	5.5%
2012	7.8%
2013	7.0%
2014	4.7%
2015	4.2%
2016	3.9%
2017	3.7%
2018	3.4%
2019	3.4%
2020 – 2035	3.4%

Source: Table 4, author’s calculations.

in the rental vehicle tax, then revenues from the rental vehicle tax would be expected to rise at the same rates as in Table 6.

The second approach directly related rental vehicle tax revenues to underlying economic growth factors. Using data available for 1999 – 2008, the statistical analysis found that changes in the rental vehicle tax were associated with changes in annual real GDP. The association indicated the annual change in rental vehicle tax revenues was 1.90 times greater than the annual change in real GDP. Applying this association to the CBO projections gives the forecasts in Table 7.

Table 7. Forecasted Annual Percentage Change in Rental Vehicle Tax Revenues

<i>Year</i>	<i>Revenues</i>
2010	3.2%
2011	6.7%
2012	9.5%
2013	8.6%
2014	5.7%
2015	5.1%
2016	4.8%
2017	4.4%
2018	4.2%
2019	4.2%
2020 – 2035	4.2%

Source: Table 4, author's calculations.

These forecasts are close to, but slightly higher than, those in Table 6.

CONCLUSION

This paper presented a methodology for forecasting public revenue streams important for transit planning in the Triangle region of North Carolina. Statistical procedures were used to relate the economic bases of the revenue sources to underlying fundamental economic factors. Then, forecasts of the fundamental economic factors were used with their statistical associations to the economic bases to produce forecasts for the public revenues. In the case of the rental vehicle tax, tax revenues were also directly related to fundamental economic factors and forecasts from this analysis were also made.

An important benefit of this procedure is that updated revenue forecasts can be calculated as new forecasts for the fundamental economic factors – specifically the growth rate in real GDP and the CPI inflation rate – are developed. This will keep the forecasts in line with changing economic conditions.

The following piece is compiled from preliminary notes in preparation for a formal paper. However, the author stands by the calculations and conclusions.

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Sales Tax Revenue Projection for Wake, Durham and Orange Counties

Wake, Durham and Orange counties are considering a public referendum on ½ cent point of sale, sales tax. It is proposed that this tax, levied in perpetuity, will fund infrastructure for a major expansion of Transit Services within the region. This section will discuss the relevant economic issues and provide projections of the sales tax revenue.

The growth of sales tax revenue depends ultimately on three factors: the growth of population, the growth of per capita personal income and the fraction of income spent on goods and services covered under the tax. Each of these factors evolves somewhat independently. When combined they provide a more accurate forecast than simple naïve extrapolation of past experience.

Population Growth

Population growth is the most difficult variable to forecast for a local region. Population growth is the sum of births, deaths, in-migration and outmigration. Birth and deaths follow predictable long term trends. However, in and out migration are more difficult to forecast. For rapidly expanding localities long run migration trends depend crucially on the local economic environment, national employment and retirement trends, and international migration patterns.

As a baseline we will use projections from the NC State Demographer. Those projections show Wake County growing to 1.47 Million by 2030; Durham County growing to 380 Thousand by 2030; and Orange County growing to 161 Thousand by 2030.

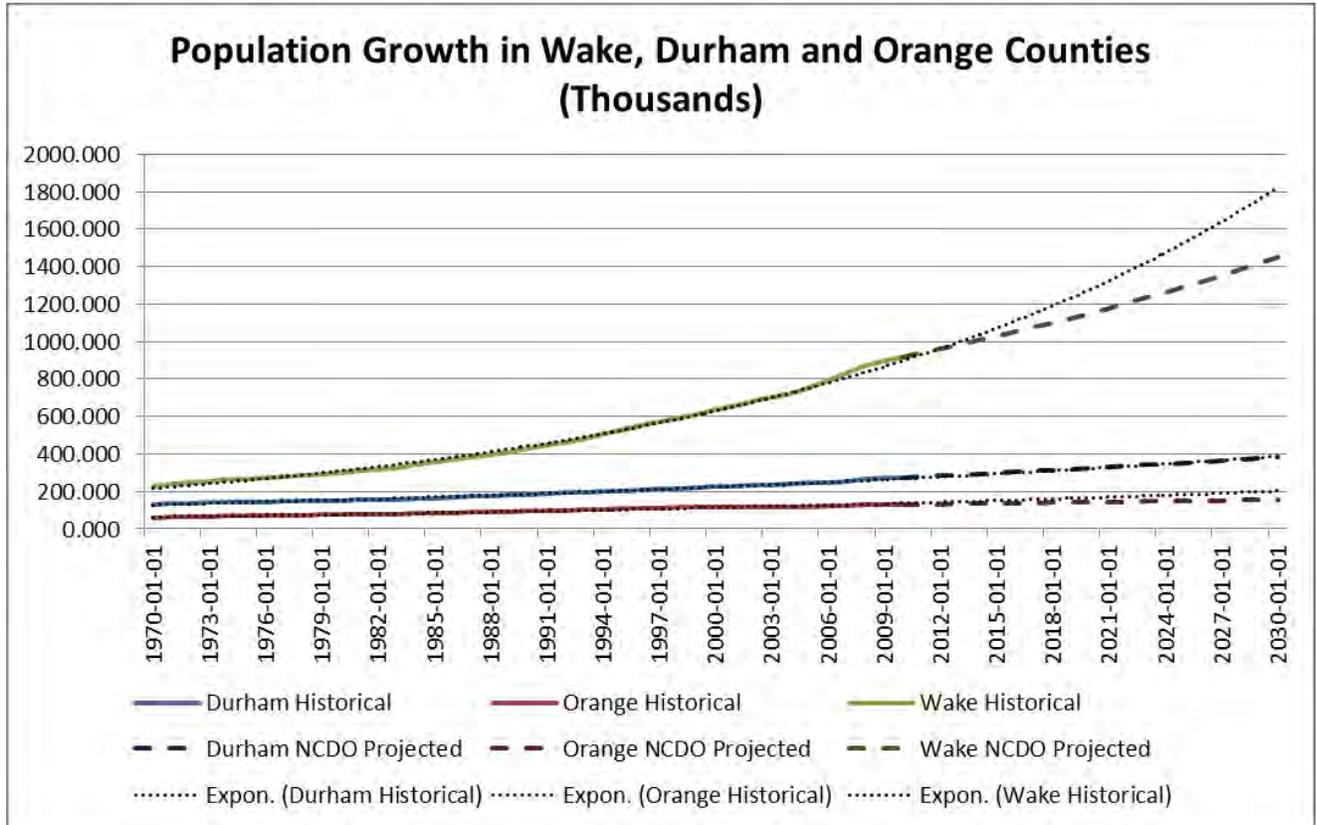
The associated annualized growth rates are 2.3% for Wake, 1.7% for Durham and 0.9% for Orange. The graph below compares historical population growth for all three counties with the estimates from the state demographer's office, as well as trend line extrapolation.

The dashed line, representing the state demographer's projections, match trend growth for Durham County, represented by the dotted line. The state demographer's projections fall slightly short of trend growth for Orange County and well short for Wake County. For example, if Wake county, continued its 40 year average growth rate for the next 20 years, then we would expect Wake County to have a population of approximately 1.8 million by 2030.

Because Wake County scores highly on measures associated with in-migration including: Educational Attainment, percentage employment in Information and Communication Technology, average January

temperature, and average per sqft housing price we might expect the NC Demographer’s estimate to be somewhat conservative.

That having been said, population growth is the most difficult variable to forecast and conservative estimates may be warranted.



These population growth numbers serve as the ground floor for constructing an estimate of sales tax revenue. Even if spending per resident were stagnant we would expect long run sales tax growth to keep pace with population growth. Stagnant spending, however, is not a reasonable assumption.

Real Per Capita Personal Income Growth

Real per resident spending increases over time because real personal income increases over time. In the short run personal income may decline – as will be discussed later. However, over the long run per capita personal income rises steadily. The entire structure of modern Western society is dependent on this trend. Even short term interruptions in this trend are experienced as painful recessions. A long term breakdown in real per capita personal income growth would force radical changes on our economy and our society. Fortunately, there is little reason to expect such a long term breakdown.

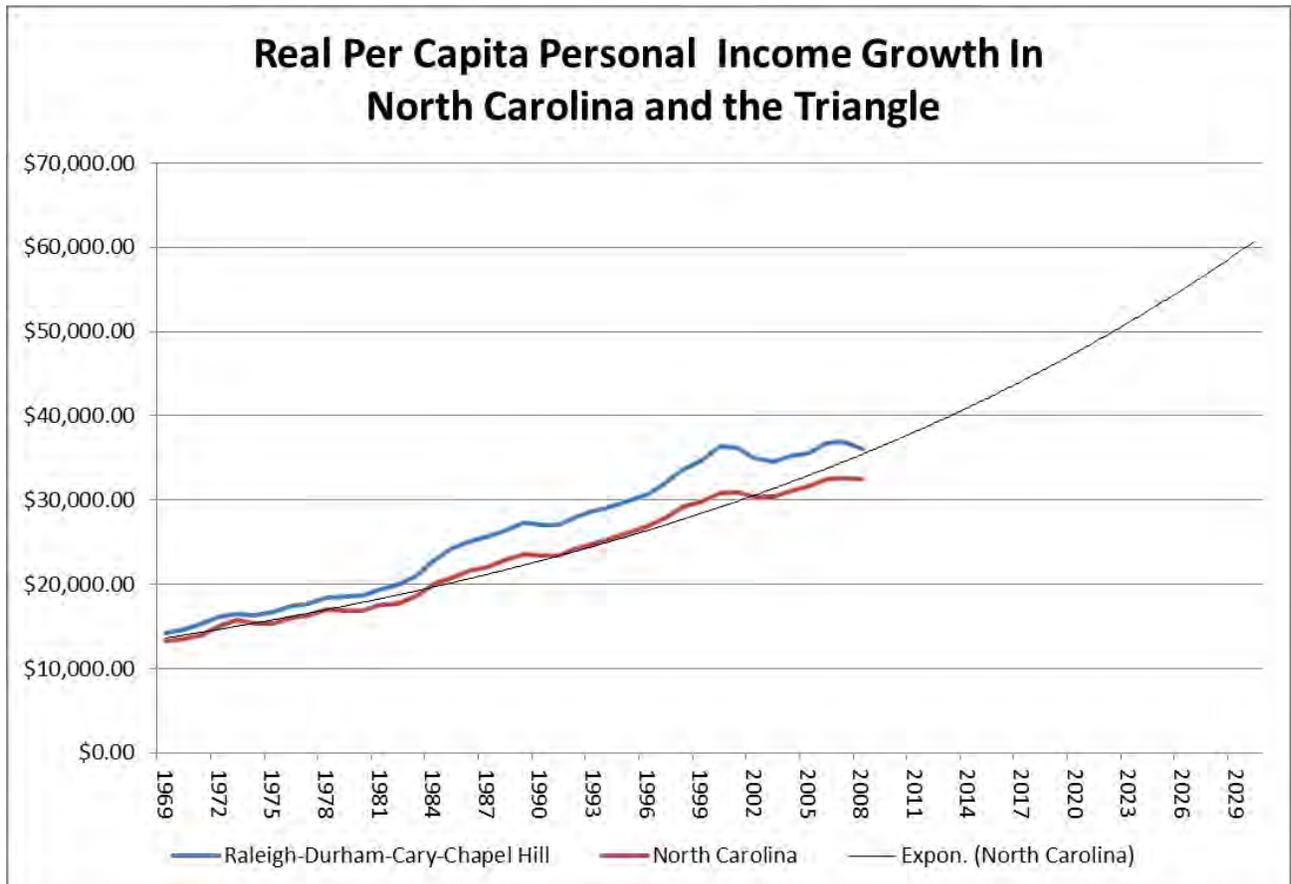
Real per capita personal income growth is driven by increases in worker productivity. These increases in productivity necessarily create induce either increases in real wages or decreases in real per unit labor

cost. In short, as workers become more efficient either their pay rises, company profits rise, or both. Since the late 1800s the share of income between labor and capital has remained relatively constant.

Over the last 30 years, however, worker incomes have remained stagnant. This stagnation in wages has led to fears that personal incomes may be stagnating as well. This concern, however, is unwarranted. Even if the distribution of income is changing in a fundamental and historic way, the overall growth of personal income is not.

In North Carolina we can see a microcosm of this overall trend. Personal income in the Triangle broke away from North Carolina overall, from 1970 to 2000 as inequality rose inside the state. Over the last decade the bursting of the tech and housing bubbles reduced the gap somewhat. Nonetheless, the Triangle remains above the long run trend in North Carolina personal income.

Since 1969 real per capita personal income in North Carolina has grown at roughly 1.9%. If we assume that the Triangle grows at North Carolina's trend rate then real per capita personal income in the Triangle will reach nearly \$60,000 by 2030.



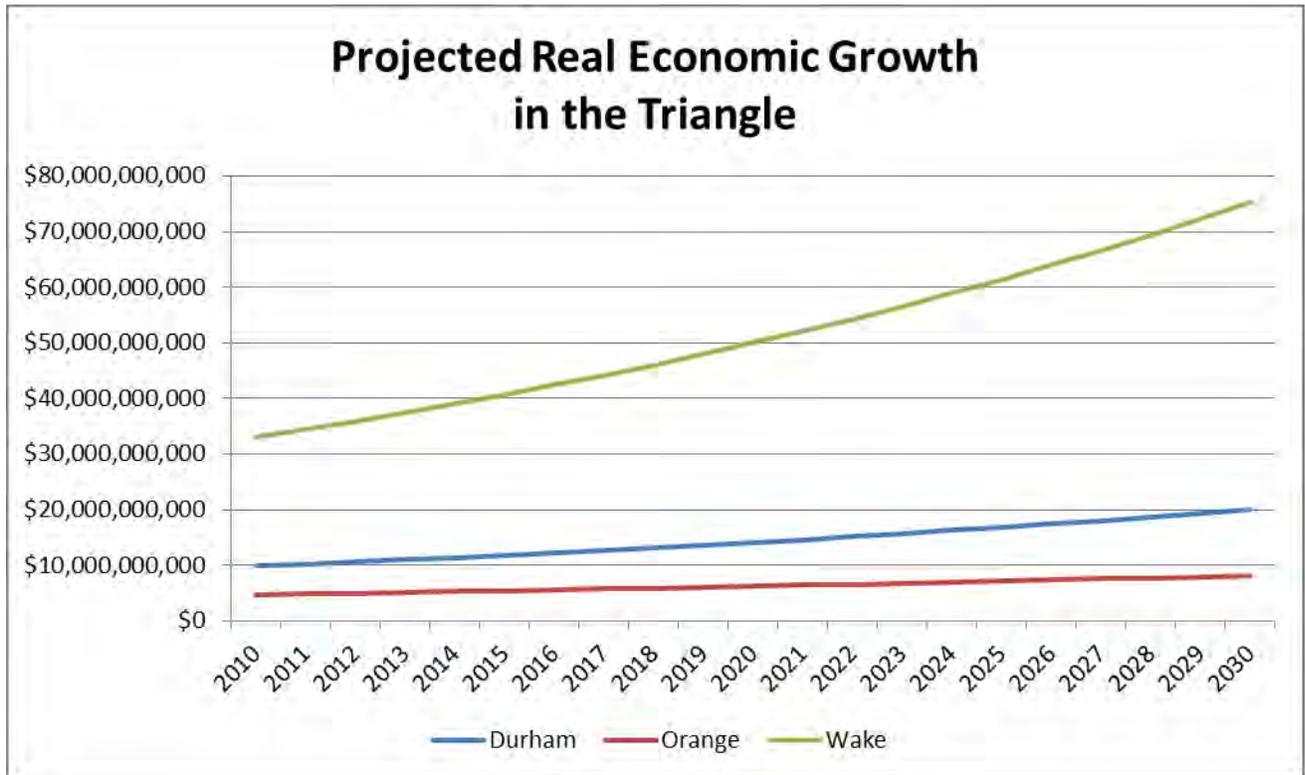
Using North Carolina's trend growth rate incorporates two conservative assumptions. First, it assumes that there will be no bounce back from the current recession. That is, the loss income transfers the Triangle to a permanently lower growth path. Secondly, it assumes that income divergence between the Triangle and the rest of North Carolina will come to an end.

In short, using North Carolina's growth rate as a baseline suggests that the period from 1984 until 2001 was an aberration which will be corrected over time. It assumes that the gap between the Triangle and the rest of North Carolina will continue to close, as it has over the last decade.

This scenario is possible, but unlikely given economic fundamentals. The Triangle possesses a more highly educated workforce and an industrial base more aligned with growth sectors of the economy. While there is no particular reason to believe the exceptional per capita income growth rates of the second half of the 90s (3.6% annual) will return, it is likely that trend income growth in the Triangle will exceed North Carolina as a whole.

Real Economic Growth in the Triangle

Combining population growth estimates with real per capita income growth estimates suggests that the real economic growth will be: 4.2% in Wake County; 3.6% in Durham and 2.8% in Chapel Hill. The chart below shows the projected real economic size of the three counties starting in 2010.



Inflation

Revenue forecasts are often done in purely real terms; that is without accounting for inflation. This is appropriate when current receipts are going to be used to finance current expenditures. Increases in inflation will tend to increase receipts but will also increase expenditures.

However, when revenues are used to finance debt the impact of inflation cannot be ignored. Bonds are typically issued with a fixed coupon. Increases in inflation will raise receipts but will not raise the coupon. In that since inflation is good for debt issuers.

However, bond buyers are aware of this phenomenon and bonds are priced with an expectation of future inflation built in. As of January 2011 bondholders were pricing in an expectation of 2.4% inflation over the next ten years, based on the trading prices of inflation-protected securities.

From the point of view of the debt issuers a conservative estimate would run slightly slower than the bond market forecast. For the purposes of this analysis we can use an expected inflation rate of 2%. Two percent is also consistent with the US Federal Reserve's implicit inflation target. That is the Federal Reserve seeks to expand or contract the overall supply of money in the economy so as to achieve an inflation rate of 2%.

Adding in the impact of inflation gives estimated nominal economic growth rates of 6.2% for Wake County, 5.6% for Durham County and 4.8% for Orange County. Said another way, when the total personal income numbers for each county are announced in 2030 we expect them be approximately \$110 Billion in Wake County, \$12 Billion in Orange County and \$30 Billion in Durham County.

Erosion of the Sales Tax Base

Over time the sales tax has captured a smaller and smaller portion of personal income. This occurs primarily because consumption patterns are shifting from goods, which are covered by the sales tax to services which are not. It also occurs because an increasing fraction of interstate sales occur over the internet for which sales tax revenue is difficult to collect and because of the proliferation of sales tax holidays, or periods in which the sales tax is suspended.

Estimating the percentage contribution of each source to the overall decline of the sales tax base is difficult. However, it's necessary to produce accurate forecasts. To the extent holidays and other special exemptions dominate the effect we might expect sales tax base erosion to decelerate as states attempt to raise revenue in the wake of the recession. To the extent base erosion is driven by internet sales we might expect base erosion be accelerating.

Benjamin Russo analyzed the trends in North Carolina consumption and estimates that between 1961 and 2007 sales tax base erosion shaved .17 percentage points off of growth. However, that same model estimates that by 2017 base erosion will begin shaving .26 percentage points off of growth.

An even more conservative estimate might suggest that base erosion could shave as much as .3 percentage points off of growth. Such an assumption must done in light of the fact that more extreme base erosion places additional pressure on the General Assembly to expand the taxation of services. However, let's assume that strong base erosion trends continue and no efforts are made to counteract them.

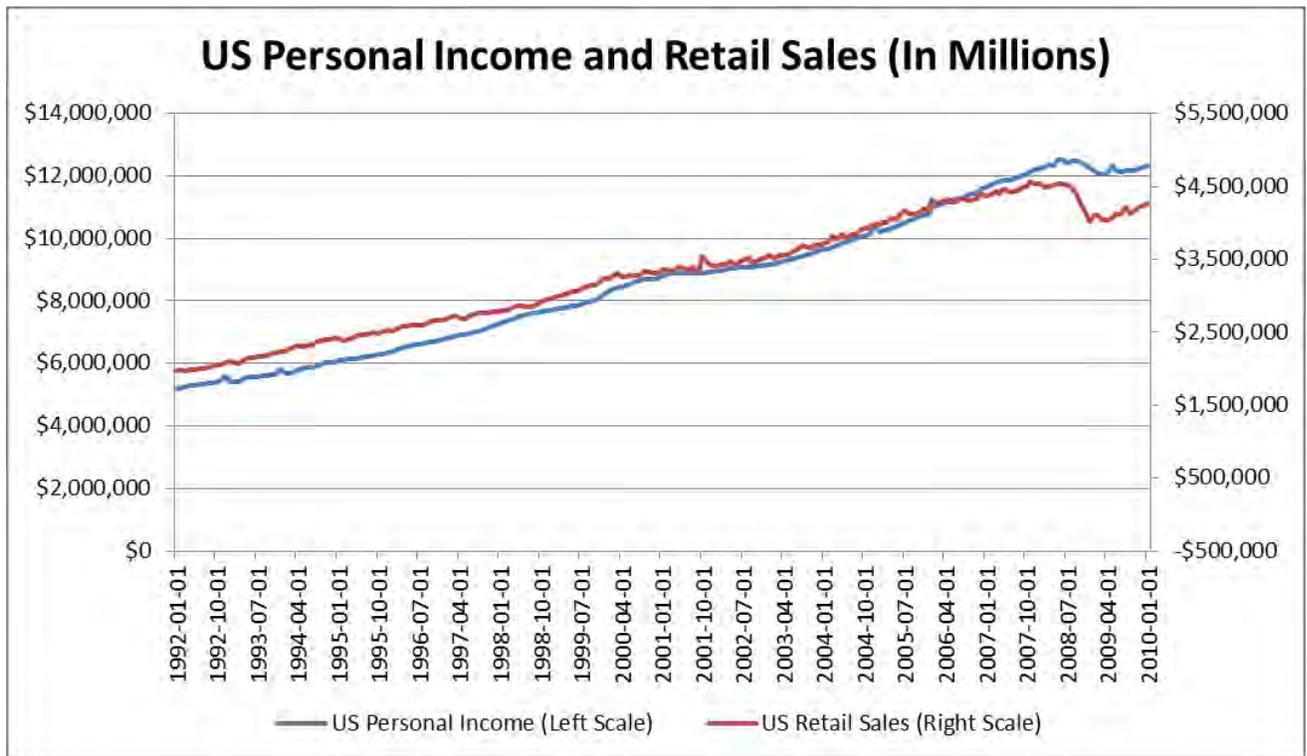
In that case we expect the net sales tax growth rates in Wake County to be 5.9%, for Durham County 5.3% and for Orange County 4.5%. We use these as our final baseline estimates for sales tax revenue growth in the three counties.

Possibilities for Disturbance

Most North Carolina counties experienced negative sales tax growth during 2008 – 2009. Revenues have yet to recover. In light of that estimates of sales tax growth in excess of 5% annually may seem optimistic. Indeed, I believe such numbers are conservative for several reason.

First, at each step of the analysis we have used more conservative estimates for real growth rates and inflation, as well as less optimistic assumptions about the erosion of the sales tax base.

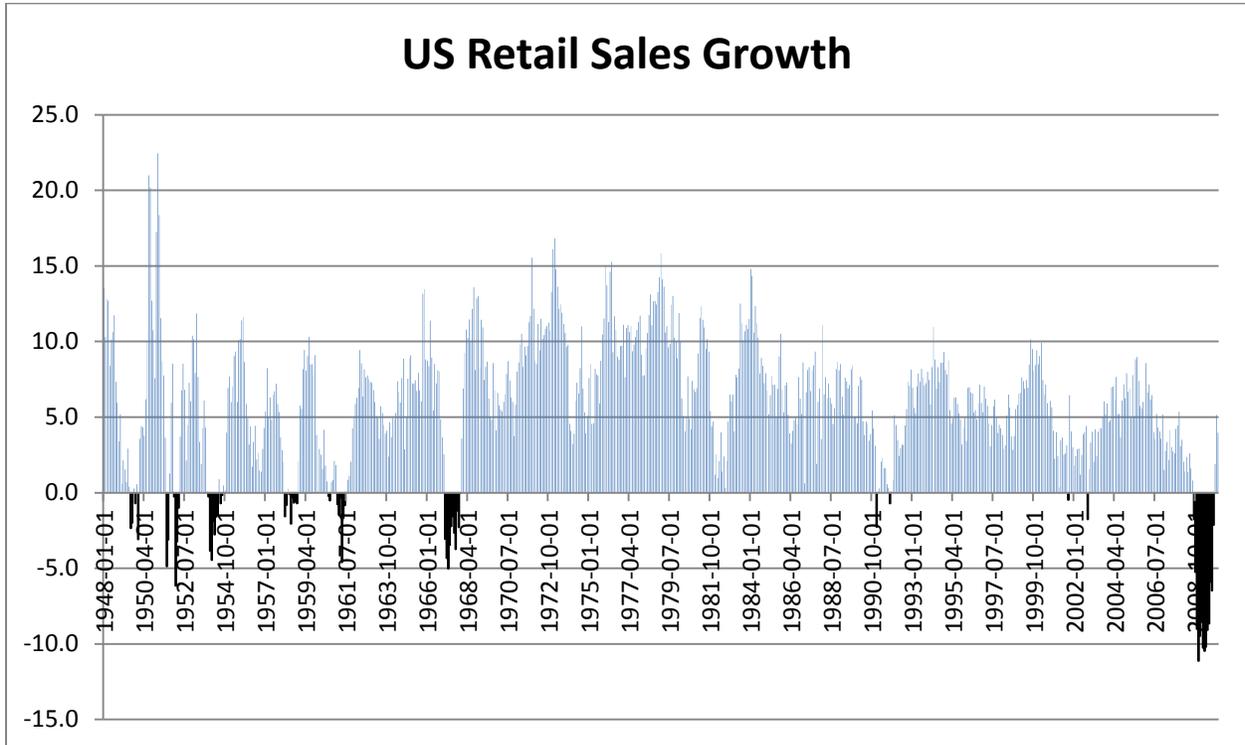
Second, projecting revenues forward at these rates assumes no bounce back in consumption. Our analysis has already assumed that the Triangle’s exceptional economic performance will not bounce back. However, retail sales suffered a great fall nationally than did personal income.



If we assume only long term trend growth from 2009 -2010 then we are assuming that there is no bounce back in terms spending as a percentage of personal income. That is, we are assuming that the last recession has permanently altered spending patterns in America. This is not unreasonable given that the Great Depression greatly increased trend savings rates in the United States.

However, over time that trend wore off and spending increased. We are assuming that this will not happen again and hence spending and sales tax revenues will be permanently depressed.

Lastly, it's important to note that the sales tax losses from the last recession were unprecedented. We suspect that sales tax losses were as great during the Great Depression. However, since the US government began keeping records in 1947, no period has seen a sales tax decline even approximating what we just experienced.



This was a once in 75 year storm and it is highly unlikely that we will experience anything of this magnitude in the near future.

Conclusions

Assuming long term sales tax growth rates for Wake County of 5.9%, for Durham County of 5.3% and for Orange County 4.5% represent reasonable yet conservative long run forecasts. These estimates have been generated using more conservative forecasts of population growth, income growth, spending patterns, and the revenue capturing ability of the sales tax.