

# Economic Impact of I-74 on the Triad\*

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## EXECUTIVE SUMMARY

This report estimates that the proposed I-74 project in Forsyth County will double economic growth in the area over the six to eight years after this portion of the urban loop is completed. We estimate the completion of I-74 will mean an increase in overall growth due to productivity enhancements and contingent development in Forsyth County by between 0.5% and 2.4% a year for approximately six to eight years, with a likely increase in economic growth of 1.7% a year. We forecast that this will mean around \$135 million a year in additional output for Forsyth County and \$135 million for Davidson, Davie, Guilford, Randolph, Stokes, Surry, and Yadkin counties. In addition, the completion of I-74 will raise growth in Guilford County by between 0.25% and 1.1% a year due to the ability to connect its segment of the interstate to the rest of the network. Other counties in the corridor region due to their more rural nature will see rises in the 1% to 1.5% range. All of these forecasts are for the six to eight year period after completion and then growth rates will return to trend. Our estimate of most likely outcome due solely to the construction of the Northern Beltway is that it will lead to an increase in economic output in Forsyth County of \$135 million a year for a six to eight year period and approximately \$135 million in the other seven counties combined (ranging from a little less than \$4 million a year in benefits for Yadkin and Davie counties to a high of over \$50 million a year for Guilford County). It will increase output for all seven counties that lie along the I-74 corridor by over \$580 million a year for the first six to eight years after completion and increase overall income by approximately \$810 for each household.

Failure to complete the project in a timely manner will lead to significant economic disruption as the right-of-way corridor has already been declared. This has led to a negative impact in property values as homeowners and business owners are unable to sell, given the uncertainty of when their properties will be acquired and paid for through the process of eminent domain. In addition, contingent development is unlikely to occur until project completion. We estimate the benefits of the entire project easily exceed costs, through construction impact, enhanced economic productivity and contingent development. This last item represents the bulk of the economic benefit from the project.

\* The views expressed in this paper are solely those of the authors and not necessarily those of Winston-Salem State University or the Winston-Salem Chamber of Commerce.

## BIOSKETCHES

Zagros Madjd-Sadjadi holds a Ph.D. in Political Economy and Public Policy from the University of Southern California, is Professor of Economics at Winston-Salem State University and the former Chief Economist of the City and County of San Francisco. He is the author or co-author of five books including *Modern State Intervention in the Era of Globalization*, *The Economics of Crime*, and *The Economics of Common and Civil Law*. He is an editor of two books on *Modern Competitiveness in the 21st Century* and *The US Economy and Neoliberalism*. Professor Madjd-Sadjadi has written more than two dozen refereed journal articles and book chapters that have appeared in outlets such as *Quantitative Finance*, *Polar Record*, and the *Journal of Peace Research*, is a former Fulbright Scholar to Canada, has taught in Canada, Jamaica, and the United States, has advised governments around the world, and was an American Institute for Economic Research faculty scholar.

Craig J. Richardson is Professor of Economics and Coordinator of the MBA Program at Winston-Salem State University, in Winston-Salem, North Carolina. His broad research interests include property rights and their importance for economic growth. He is the author of numerous economics articles that have appeared in places such as *African Affairs*, *Cato Journal*, *The Wall Street Journal*, *AEI Development Outlook*, *Barron's*, among others. He has also consulted with The World Bank, the Institute for Liberty and Democracy and the American Institute for Economic Research. Professor Richardson earned a B.A. with honors in Economics from Kenyon College, and his Ph.D. in Economics from The University of North Carolina at Chapel Hill.

Joel F. Kincaid is Associate Professor of Economics and Chair of the Department of Economics and Finance at Winston-Salem State University. His research interests include property rights and law and economics. He has used IMPLAN for many years to conduct economic impact studies and has published in numerous high-ranking economics and management journals including *Economics Bulletin*, *International Journal of Organizational Analysis*, *Journal of Managerial Psychology*, and *Multinational Business Review*. Professor Kincaid holds a Ph.D. from North Carolina State University.

## BACKGROUND

According to *Area Development*, the leading executive-level trade journal for site selection and relocation among top companies, the Winston-Salem MSA ranks last among the five most populous MSAs in North Carolina and 267<sup>th</sup> out of 380 metro areas in the nation in terms of its economic strength. This is despite the fact that only the Durham-Chapel Hill area has a better workforce in terms of its competitiveness. Indeed, Winston-Salem's prime workforce is ranked 73<sup>rd</sup> in the nation while the Greensboro-High Point MSA, located adjacent to us, is ranked 325<sup>th</sup>. Yet on other key indicators the Greensboro-High Point MSA outperforms the Winston-Salem MSA including year-over-year growth and economic strength.

One critical difference between the Winston-Salem MSA (which encompasses Forsyth County) and the other four MSAs (Durham-Chapel Hill, Greensboro, Charlotte, and Raleigh) is the presence of urban loops either completed or further along in construction. Charlotte's urban loop is scheduled for completing by the end of this year while Greensboro's urban loop is nearly two-thirds complete. Winston-Salem, on the other hand, still needs to build its initial northern beltway and there are four separate projects that are required to complete it while the southern beltway is not even on DOT planning documents.

The benefits to completing the project have been understated by previous cost-benefit studies conducted by the North Carolina Department of Transportation and have led to less impetus to move the project forward as a result. These previous studies have not accounted for the fact that Winston-Salem is the least connected urban center of the top five MSAs and thus would stand to receive the greatest benefit from the completion of its urban loop.

As seen in Table 1, found on the next page, there are two portions of the highway project associated with the I-74 beltway. Technically only U-2579 will be a part of I-74, a federal interstate project that will link Iowa to North Carolina, that will become an important commercial transportation route, R-2247 will connect to it and will therefore be inextricably linked to it. In addition, these projects link directly to I-40 and thus form part of an interstate connector corridor regardless of when the rest of I-74 is built. Still,

arguably, the Northern Beltway segment of I-74 is one of the more important segments of the entire chain because it links to three additional commercial transportation arteries in the area: I-40, the Piedmont Triad International Airport, and the Winston-Salem Southbound railway.

TABLE 1: Project Breakdown Costs for I-74 in Forsyth County

Project	Cost	Construction Cost	Right-of-Way Acquisition Cost	Notes
R-2247EB	\$142.8 million	\$116.8 million	\$26 million	I-74/US-52 interchange
U-2579 (all parts)	\$800.5 million	\$588.5 million	\$212 million	Northern Beltway (Western Section)
TOTALS	\$943.3 million	\$705.3 million	\$238 million	

Costs of acquiring right-of-ways are transfer costs that do not normally show up in economic impact calculations. However, one key consideration is the destruction of home values that has accompanied the announcement of the right-of-way acquisition program. One expert estimates that the DOT is paying as much as 30% less than the market value of the homes that would have been present under normal market conditions, in a “take it or leave it” type of offer. The depression of home values is a major ongoing negative economic impact that will be lifted once right-of-ways have been purchased.

While costs are imposed immediately on the county, benefits are not acquired until project completion. Furthermore, benefits from interstate highways and connectors to the interstates are found predominantly in prospective development. Given that Winston-Salem already acts as a hub for rail, air, and road traffic but very little links the outlying portions of the city to that hub, a significant boost to economic activity can be expected due to network externalities resulting from the creation of a second such interstate (I-74). Firms located in the region will be able to transport goods along an additional pathway that connects numerous new states to the Winston-Salem MSA. This activity is of greater

importance than other urban loops precisely because it does not merely reduce congestion but also creates significant new activity. This will be discussed in the following section.

## OVERVIEW OF BENEFITS OF INTERSTATE CONSTRUCTION

A number of different economic studies over the years have explored the multitude of economic benefits brought by highways to the local and state economies. These benefits are both short term and long term, and result in a net infusion of economic income and tax revenue.

The short term benefits occur during the road's construction. The spending for the road construction leads to a cascading sequence of new spending in the area as a result of the road building. Local labor must be hired, and material sourced such as gravel and cement (which because of its weight, typically comes from local industries, and also provides an economic boost). Typically, at least 75% of wages paid out to workers in the area go towards consumption goods such as groceries, gasoline, local entertainment and restaurants. This creates a multiplier effect where the initial government spending on road construction spurs a recurring cycle of income, spending, income and spending.

But the real benefits of road construction must come from the long-term, as a road with no purpose means resources have been diverted from productive private sector purposes to unproductive public sector ones. In order to justify dollars spent on road construction, the road must stimulate not only short term spending, but more importantly serve as a catalyst for long term economic growth in the region. We refer to this type of development as *contingent development* since its occurrence is contingent on the construction occurring and it is the single biggest component of economic impact for the region in the case of I-74.

There are two ways a new interstate will drive long term economic growth and serve as an important driver of economic development, as described by Forkenbrock and Foster (1990).

First, the improvement in the competitive position of the beltway reduces the cost of transportation for manufacturers in the greater Winston-Salem area. Obvious benefits are created for trucks making deliveries, for example. This lowers production costs and prices

of manufactured goods. In addition, it tends to enhance productivity, which creates less upward pressure on wages, and again increases firms' bottom line. The result from lower labor and transportation costs is an improvement in profits for area businesses and acts as a further inducement for new businesses to locate there.

Second, there is an increase in roadside service growth and increased business opportunities for roadside service businesses (e.g. motels, restaurants, gasoline stations, and tourist activities) along the highway. As a result, tax revenue for localities as well as the state is expected to increase (Forckenbrock and Foster 1990, p. 306).

These types of substantive improvements in transportation times are what spur long-term economic growth in the Winston-Salem region.

#### Evidence:

The most comprehensive review of the literature on the effect of government stimulus concludes that while for the overall US economy, stimulus is modest, it can have a profoundly positive impact on localities, especially those that are economically stagnant, such as is the case for Forsyth County (Ramey 2011).

A study by Rephann and Isserman (1994) found that:

- Interstate highways have a positive economic impact on urbanized counties (i.e., counties with cities of 25,000 or more) and much less on non-urbanized counties.
- The largest impacts occur in what the authors term "spillover counties" -- i.e., counties near or containing large cities. Initial impacts were found to center on population growth; over time, the increased population stimulates industrial development, and these areas develop viable economic bases centered on primary and secondary industries. (Those counties without a city or nearby metropolitan area exhibited little effect on total income or earnings, which is not the case with the I-74 bypass).

While Aschauer (1989) and Munnell (1990) have argued that virtually all of the decline in total factor productivity has been due to the decline in infrastructure spending, the research by Nadiri and Mamuneas (1996) is now the most widely accepted formulation in a

large body of research on the macroeconomic impacts of investment in highways, and specifically of investment in the Interstate and their findings are a bit more nuanced. These include:

- Interstate highway investments have lowered production and distribution costs in virtually every industry sector. **Cost elasticities** – the percentage change in industry costs for a given percentage change in highway capital -- for each of the 35 industry sectors indicated that an increase in highway capital reduced costs in all but three industry sectors. On average, U.S. industries realized production and distribution cost savings averaging 24 cents annually for each dollar invested in the non-local road system. This means a payback period in terms of total economic income of just about 4 years.

- **Productivity:** The term refers to the value of output per dollar of input for all factors of production. Interstate highway investments have made significant contributions to U.S. productivity growth, with declining impacts over time. This decline occurs because subsequent investment is oftentimes of a replacement of decline stock variety. Repaving or regrading or even widening an existing highway corridor will have less impact on productivity than building a new highway. During the 1950s, highway network investments' contribution to annual productivity growth was 31 percent; it averaged 25 percent in the 60s; by the 1980s, it contributed 7 percent to U.S. productivity growth in the 1980s. In a local area such as Winston-Salem that lacks a northern beltway, the contribution to the greater Winston-Salem area could well exceed the baseline of a 7 percent contribution to productivity growth and will likely be closer to the 25% return that we saw in the 1960s. This would suggest at least a 33% improvement in overall GDP growth simply due to increases in productivity and not based upon additional investment.

- **Net Social Rate of Return:** The average lives of paving, structures and grading are assumed to be 14, 50, and 80 years respectively (Nadiri and Mamuneas 1996, 37). Thus, when we look at the rate of return we need to consider the effect of the depreciation of the highway capital stock. The Net Social Rate of Return refers to the net benefits to private industries (net of depreciation of highway capital stock) that share use of the public highway or non-local road network. The term "social" refers to the fact that the highway

network is a shared investment by all industries in the economy. Net rate of social return on highway capital was about 35% in the 1950s and 60s; it declined to about 10% in the 1980s, or just about equal to rates of return on private capital. Nonetheless, this is at the aggregate nationwide level and net social rate of return for a region is likely much higher.

- **Multipliers** give a sense of how much economic activity is stimulated per \$1 injection of government spending. A multiplier of 3, for example, means \$1 of increased government spending leads to a cascade effect of \$3 in total, as the dollars stimulate further expenditures on goods and services. In contrast to Ramey (2011), Leduc and Wilson (2013) find that multipliers for federal highway spending are substantial and far more than multipliers for government spending as a whole. The reason is that spending on the military, does not lead to productive uses in the same way as highway construction does. They find initial multipliers range anywhere from 1.5 to 3 and within 6 to 8 years, the multipliers range between 3 and 8. Even at the state level, they find long-term multipliers of 2. This is due to substitution towards areas that are close to an interstate and away from those that are further away, leading us to conclude that the impact in close proximity to the interstate would be even greater.

This is highlighted by survey research conducted by Jack Faucett Associates (Weiss 2005). They looked at a number of new highway corridors, finding that:

- Wisconsin I-43 Corridor - manufacturing employment increased by about 30% in the corridor.
- Virginia I-81 Corridor – there was about an 18% increase in manufacturing employment between 1971 and 2000 in the corridor.
- I-16 - Laurens County Georgia (between Savannah and Macon) - 40% increase in population and 100% increase in employment between 1969 and 2002 was observed. The area developed as major logistics and warehousing center.

All of these corridors exhibited a significant rise in employment in what are known as "export-oriented" sectors. This type of employment arises from significant capital



investments that tend to increase tax revenues net of the extra costs associated with bringing services to these areas. Commercial and industrial spaces tend to be net tax contributors in contrast to residential sites that require far more government services than employment centers. This, coupled with enhancements to productivity growth, should ensure that new developments can be financed through tax increment funding (TIF) mechanisms that will essentially ensure that the development pays for itself. However, the interstate is required for any of this to occur.

Within the region, there are significant opportunities to exploit. The interstate can revitalize a declining manufacturing base and complement existing transportation networks to create major enhancements in productivity for existing logistics facilities such as the FedEx hub in Greensboro through what are known as network and agglomeration effects.

A network effect occurs when increased use by one user of a product increases the value to all other users. The addition of an interstate has this basic feature. The more people who use the interstate, the more valuable the interstate becomes and connecting the interstate to the rest of the transportation network will only enhance the totality of the system. Since I-74 will link to I-95, I-77, I-85, and I-40 as well as the Winston-Salem Southern Railway and passes near the Piedmont Triad International Airport, it has these characteristics. Indeed, FedEx plans to establish the Airport as its Mid-Atlantic regional hub but it is currently operating at roughly 10% of planned capacity. The construction of I-74 will go a long way towards ensuring that FedEx is able to maximize the value of its investment and create over a thousand highly paid jobs in the process.

Agglomeration effects occur because of spatial clustering. As noted by Madjd-Sadjadi and Pagiavlas (2011), as areas obtain a focal point due to comparative advantages (such as occurs when one has an interstate), new investment in similar industries come in to take advantage of this. This causes a positive feedback loop that drives productivity even higher in the affected industries since the higher concentration of workers in an industry enhances networking opportunities that can propel all business in the industry to a higher level. The reason Silicon Valley has so many software engineers is not merely because

Google is there. Google is there because Silicon Valley has so many software engineers. Furthermore, the enhancement to productivity goes far beyond Google. It benefits by being located near other internet companies but also those other internet companies benefit by locating near Google in a synergetic and symbiotic fashion.

As more people congregate and the regional transportation network is enhanced, the Triad will find transportation costs drop since businesses will be closer in terms of time to their customer base. The region will also be able to generate additional gas tax revenues that can be used to subsidize mass transit. Smart growth works best when there exists a large concentration of people in a small area and that occurs only when there are adequate transportation facilities to allow ease of entry into and exit from a region (such as an interstate provides). Contrary to popular belief among many, this has the impact of *reducing*, rather than increasing, the strain on our existing transportation network because interstates are predominantly about making those connections between cities rather than within. Additionally, a well-maintained and extensive road network reduces carbon emissions, especially with commercial vehicles, due to reduction in congestion and increases in overall travel speed, enhancing the quality of life for all concerned.

Cost-benefit analyses must also take into account the lifespan of the construction as well as how the dollars are spent among the different aspects of construction. The oft-cited article by Nadiri and Mamuneas (1996) assumes capital expenditures related to construction activity are distributed in the following way; 52 percent to paving, 26.5 percent to grading and 21.5 percent to structures. These figures do not account for environmental impact changes and are meant merely to illustrate that roadways will not last forever and that because of this significant ongoing costs will be required. These costs will be paid for quite easily if contingent development occurs but that only happens if the roadway is completed. Given that roads need to be repaved frequently and the costs of paving is a little over half of the overall construction costs, the need for alacrity in the building of interstate freeways cannot be overstressed. Once roads are built, their repairs will tend to pay for themselves as wear and tear on freeways is accounted for and recouped through state and federal gasoline taxes.

## METHODS OF MEASURING ECONOMIC IMPACT

There are two major methods that we used to examine the economic impact of construction. The first is IMPLAN (IMPact analysis for PLANing) and the second is RIMS II (Regional Input/Output Modeling System). Both are similar in that they are input-output models that tell us what the impact of spending (inputs) will be on the rest of the economy (outputs). They work by using multipliers that show the cascading impact of dollars spent in one area of the economy (here, a road) on other parts of the economy. A multiplier of say 3.0 means that for every dollar spent in the area, a total of 3 dollars of market activity (or local GDP) is generated as a result. There are advantages and disadvantages of each estimation method.

IMPLAN is the same system as is used by the North Carolina Department of Transportation to create its economic impact analyses used in the scoring of various transportation projects. IMPLAN is more sophisticated than RIMS II since it is more customizable. With IMPLAN users create their own Input-Output model using multipliers based on differing assumptions about trade flows and the nature of the production function (the method by which inputs are changed into outputs).

RIMS II, on the other hand, provides only “one size fits all” multipliers and is generally cheaper for a particular region. Thus factors that are unique to a region are not incorporated into the model. For example, prices and wages may differ at a region from the average national price. Since wages are lower in the south and thus employers will tend to hire more workers, RIMS II will tend to underestimate employment effects. There is no multiregional capability for RIMS II so we must predefine our region (the group of counties) that we are using in advance. For example, if one has the multipliers for Forsyth County and for Guilford County, one can do an estimation for either Forsyth County or Guilford County, but not both. To look at the combined effect requires the definition of a new region (Forsyth and Guilford counties together) and the payment of a corresponding fee to the Bureau of Economic Analysis, which produces RIMS II.

This stands in contrast to IMPLAN. Once you have Forsyth County and Guilford County, you can ask IMPLAN to run the model for Forsyth County alone, Guilford County alone, or for the total impact on both counties at the same time. Thus we will report both the RIMS II results and the IMPLAN results for Forsyth County but only the IMPLAN results for a three-county region. We also use the three-county region, as opposed to just Forsyth County, to account for the fact that economic benefits from the construction will generally benefit three counties: Forsyth, Guilford and (to a much lesser extent) Randolph.. The direct effect of the construction (which is the construction of the road itself) and the indirect effect of the construction (the sourcing of materials for the construction) will be confined mostly to the surrounding area. Since input-output models have no conception of geographic location, when you expand from a one-county to a three-county region, direct impacts and indirect impacts will simply shift between the various counties and there is no reliable way of separating these out (unlike for induced impact, which is based on spending patterns of consumers who work in a particular region, direct and indirect impacts are notoriously sensitive to the actual geographic location of the project within a county). To give an example, while the same group of construction workers will tend to find employment on any large-scale construction project in a county, the sourcing of materials, such as concrete will more likely occur within the boundaries of a county when the project is located in its geographic center than if it is on its border. Given this issue, we confine our direct and indirect effects to a three-county region.

Most of the impact outside of an immediate construction area will be felt via what is known as the induced effect, which is the result of spending by employees who receive wages in exchange for their work on the project. As can be seen later in this report (Table 5), most of the spending that occurs as a result of wages earned by workers actually benefits those outside of Forsyth County, with the majority of that external benefit going to Forsyth County and Randolph County. When we expand the study area to the 6 counties surrounding Forsyth County, Forsyth County itself, plus Randolph County, we can account for virtually all of the induced impact in North Carolina.. We use RIMS II to check the consistency of the input-output model we have developed under IMPLAN. If the two are comparable, we can assume that our IMPLAN analysis is generally sound. We then go back

and using the original construction costs, we use multipliers from a recent article published in the National Bureau of Economic Research's *NBER Macroeconomics Annual 2012* to determine how highway construction funding will affect economic output six to eight years in the future. Then to undertake long-range estimates, we perform return on investment calculations. This generates the equivalent of an annuity in order to show the likely long-term impact of this highway construction project on economic development in the region.

In summary, both IMPLAN and RIMS II can be used to examine the economic impact of construction projects. IMPLAN is a more sophisticated method of analysis but like many predictive models, it is more difficult to explain to a lay audience. RIMS II has a more direct albeit cruder estimation method, but it serves as an excellent way to reinforce the conclusions brought by IMPLAN.

However, neither IMPLAN nor RIMS II is able to capture the contingent development of a project since each covers only the time period of project construction. They cannot discern impact based upon the usefulness of the project. *Contingent development* is the development that will only occur contingent on the completion of a project. For example, an equally expensive bridge to nowhere and an interstate freeway are essentially identical in terms of economic impact according to these models. Yet the bridge to nowhere will have very little, if any, contingent development because it is of little use. On the other hand, an interstate by the mere fact that it is connected to other locales creates enormous investment incentives. Still these models serve as a good measurement of the economic benefits to the local economy that accrue from the actual construction process, even if the final results are a lower bound on long term economic activity.

## RESULTS

We ran input-output analyses using both IMPLAN and RIMS II and found similar results. For RIMS II, we used both an intermediate input method using Type I multipliers and a bill-of-goods method using Type II multipliers for RIMS II. The difference between a bill-of-goods method and an intermediate input method is that the bill-of-goods method simply takes the total dollar figure for a project while the intermediate input method requires us to break the project up into various parts determining how much spending occurs on paving, how

much is used for grading, etc. The intermediate input method requires detailed knowledge of construction in the area and is generally more accurate than the bill-of-goods method for this reason. Still, the bill-of-goods method serves as a reliable secondary check to ensure that the overall results are reasonable. Type I multipliers account for direct and indirect impacts. Let's take an example using the construction industry. Here, the direct impact is the impact only on the construction industry itself, whereas the indirect impact would be the effect on other industries. For example, when a construction worker is hired, he receives a wage. This is a direct impact of the construction spending in the construction industry. An indirect impact is the effect on other industries. By spending \$1 on concrete, the construction industry affects the concrete industry.

Type II multipliers, on the other hand, include induced effects, which are the effects that occur because of changes in household income. The \$1 the construction worker is paid causes an increase in household income that results in more spending at restaurants. This is different from the contingent effect that cannot be accounted for by an input-output model. A contingent effect occurs only after the construction has occurred and it is based on spending that is *contingent* on the completion of the project. Thus induced effects will occur regardless of whether the construction actually is completed and will tend to peter out in a relatively short period of time, while contingent effects continue for many years after the project completion. Induced effects occur regardless of the usefulness of the project. Contingent effects only arise when the completed project is useful. Thus, paying one person to dig a ditch and then paying another person to fill it in will provide only direct, indirect, and induced effects. It will provide contingent effects. On the hand, building a flood control channel will prompt development in the original flood plain but this development is *contingent* on the completion of the flood control channel.

As can be seen, a Type II multiplier is a superior one for examining the impact on the local economy. However using final bill-of-goods figures tends to exaggerate overall economic activity because the RIMS II model is based on national figures, but Forsyth is relatively lower cost area than the country as a whole.

As a result, using Type II multipliers in RIMS II will overestimate economic impact. RIMS II analysis suggests a low of \$930 million and a high of \$1.15 billion for just Forsyth County (see Table 2). IMPLAN analysis suggests approximately \$940 million in economic impact for just Forsyth County (Table 2). As shown in Table 5, when we look at the induced impact (which is the economic impact beyond that found for the actual construction), IMPLAN suggests that \$28 million will accrue to Forsyth County and \$23 million will go to Guilford, and Randolph Counties while an additional \$15 million will go to the other five counties that surround Forsyth County (Davidson, Davie, Stokes, Surry, and Yadkin). This figure is important because it also gauges the potential economic impact of prospective development, which will be discussed later. After accounting for construction effects, 45% of the benefits from increased income in Forsyth County accrue to Guilford and Randolph counties and 57% of the benefits accrue to seven other counties (Davidson, Davie, Guilford, Randolph, Stokes, Surry, and Yadkin).

All of the foregoing analysis deals only with those benefits accruing directly from the construction of the project and does not include contingent development, which will be discussed later in this report. Based on the location of the Northern Beltway and the likely linkage of it with Piedmont Triad International Airport, these figures seem quite plausible and we expect that a little less than half of the benefits will accrue to Forsyth County with the majority of the remainder going to Guilford County. These figures, as well as additional information from IMPLAN regarding our economic analysis are summarized in Tables 2 through 5 and in Figure 1 and Figure 2, for ease of use:

TABLE 2: Economic Impact from Northern Beltway Construction

Data Tool	Input	Output Using Intermediate Inputs	Output Using Bill-of-Goods Method
IMPLAN	\$705.3 million	\$0.94 billion	Not undertaken -- see text
RIMS II	\$705.3 million	\$0.93 billion	\$1.15 billion

TABLE 3: Results from IMPLAN analysis (3 county effect)

<b>Impact Type</b>	<b>Employment</b>	<b>Labor Income</b>	<b>Value Added</b>	<b>Output</b>
Direct Effect	6,121	\$ 349,885,224	\$376,625,310	\$ 705,300,000
Indirect Effect	1,238	\$ 68,423,738	\$ 101,029,367	\$ 191,357,221
Induced Effect	414	\$ 17,119,079	\$ 30,047,970	\$ 51,273,600
<b>Total Effect</b>	<b>7,773</b>	<b>\$ 435,428,041</b>	<b>\$ 507,702,647</b>	<b>\$ 947,930,821</b>

TABLE 4: Results from IMPLAN analysis (Forsyth County Alone)

<b>Description</b>	<b>Employment</b>	<b>Labor Income</b>	<b>Value Added</b>	<b>Output</b>
Architectural, engineering, & related services	219	\$13,757,821	\$13,862,341	\$26,749,959
Employment services	73	\$1,804,679	\$1,807,908	\$2,587,467
Food services and drinking places	66	\$1,254,667	\$1,779,698	\$4,170,746
Transport by truck	48	\$3,167,446	\$4,266,765	\$8,233,710
Wholesale trade businesses	46	\$4,127,980	\$6,997,859	\$9,505,808
Retail Stores - General merchandise	40	\$942,773	\$1,410,201	\$2,162,293
Insurance carriers	34	\$3,152,551	\$4,884,999	\$14,509,283
Services to buildings and dwellings	33	\$844,490	\$1,025,511	\$2,294,618
Real estate establishments	32	\$763,064	\$4,077,636	\$5,474,537
Mining and quarrying stone	30	\$2,846,416	\$5,940,114	\$9,241,942



TABLE 5: Results from IMPLAN analysis

Impact Type	Employment	Labor Income	Value Added	Output
Induced Effect – Forsyth County	218	\$ 8,426,400	\$ 16,148,172	\$ 28,060,352
Induced Effect – 3 counties*	414	\$ 17,119,079	\$ 30,047,970	\$ 51,273,600
Induced Effect – 8 counties**	533	\$ 20,969,379	\$ 37,679,476	\$ 64,990,903
Induced Effect – Statewide	527	\$ 21,123,112	\$ 38,911,765	\$ 66,369,738

\*3 counties model consists of Forsyth, Guilford and Randolph counties

\*\*8 county model consists of Davidson, Davie, Forsyth, Guilford, Randolph, Stokes, Surry, and Yadkin counties

FIGURE 1: Increase in Employment in Forsyth, Guilford and Randolph Counties

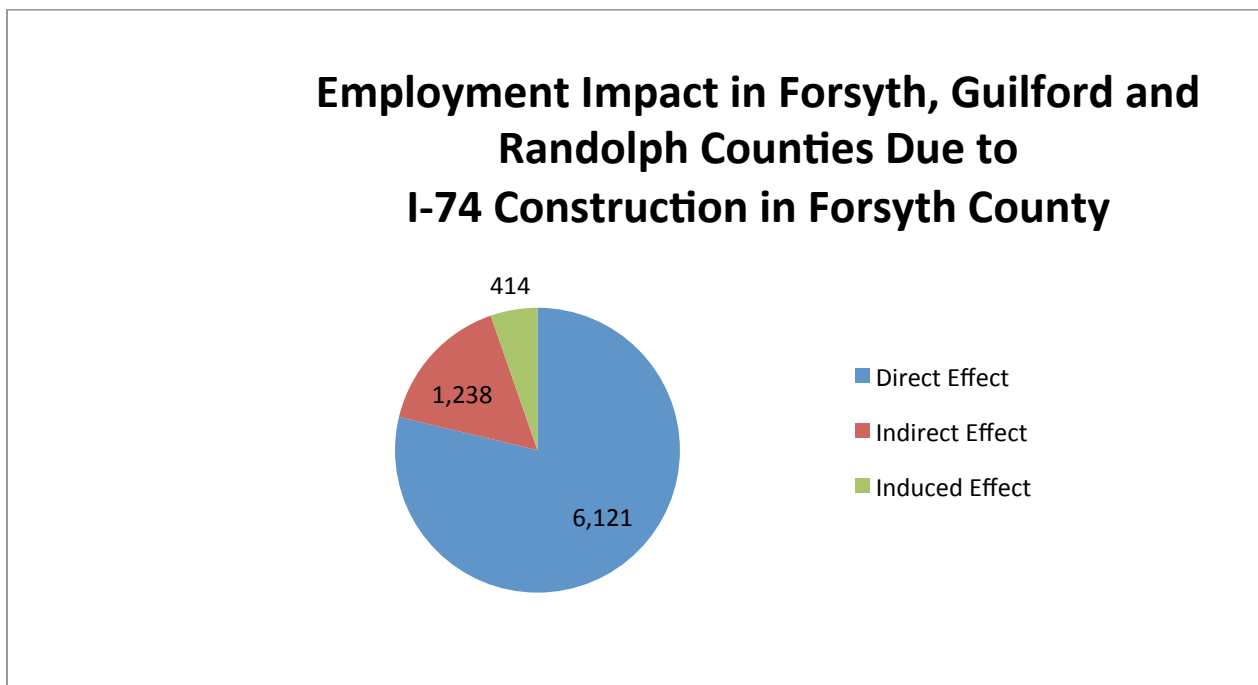
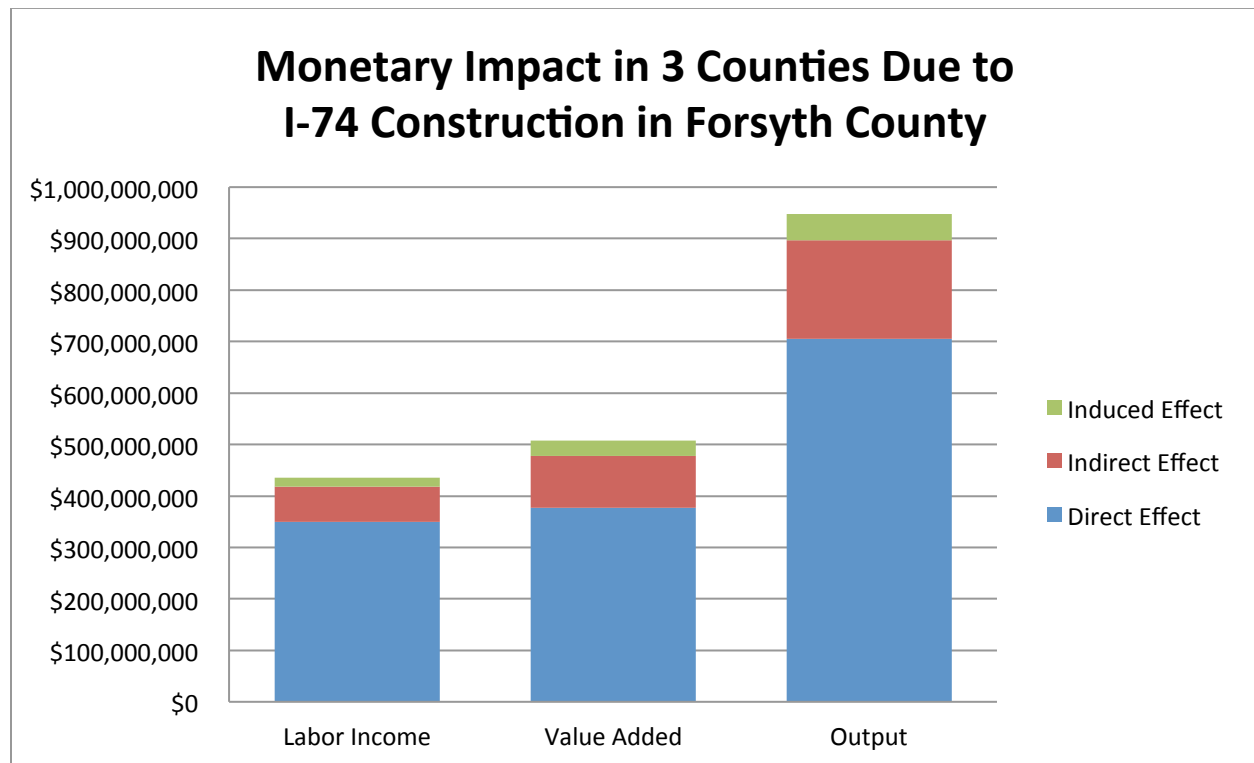


FIGURE 2: Monetary Impact in Forsyth, Guilford and Randolph Counties



As seen in Table 3 and in Figures 1 and 2, we anticipate that the construction of the highway will create more than 7,500 jobs, provide more than \$700 million in income, and generate more than \$900 million of economic output, of which more than \$507 million is value added. Value-added is the additional local value that is created in the process of production, output is the actual price that is paid and labor income is the amount that goes to workers.

For example, suppose that a retailer in Winston-Salem purchases a new washing machine from a manufacturer in Ohio. The retailer buys the washing machine for \$500 and sells it to a customer in the city for \$750. It pays its employees \$150 as a commission for the sale (assume all employees only work for commission). The output would be \$750, the sales price of the washing machine. The value added would be the difference between the sales price and the cost of the washing machine from the manufacturer,  $\$750 - \$500 = \$250$ . The labor income would be the commission of \$150. In other words, in this example, for output of \$750, there is value added of \$250 and labor income of \$150.

## CONTINGENCY FACTIONS

However, construction projects do not end with the construction of the road or structure. They have an ongoing value from their use. This use could be reductions in travel time. We account for this based on productivity gains arising from both reduced congestion and from the opening of alternative routes. However, previous studies from the state DOT assume that there is little or no contingent development that takes place. In other words, even though the road increases the flow of goods and people in a region, it is assumed that building it provides no benefit other than to make life easier for those people already in the region. This is appropriate when we are dealing with improvements to existing interstates or with existing interstates that merely go through rural counties since little contingent development is expected in such cases. It is not, however, appropriate when a new interstate comes to an existing urban center.

## GO SLOW VERSUS COMPLETE NOW

Like most projects, the Northern Beltway is described as being one where it will be completed over a number of years. However, this diminishes the overall economic impact of the project. The longer the project languishes, the less the competitive benefits from its construction. Interstate projects are not really interstate projects until they actually connect to other states. Thus virtually all of the benefits from contingent development will arise after project completion. Based on the finding of Leduc and Wilson (2013) that the economic impact of a highway project six to eight years out is a multiple of its cost by a factor of 3 to 8, we deduct the initial total construction impact (\$947 million) found in our IMPLAN model from the figures that we generate using the Leduc and Wilson multipliers (\$2.12 billion to \$5.64 billion) to arrive at a new estimate for contingent investment and productivity gains. This gives us a total (after rounding) impact for contingent investment and productivity gains of between \$1.2 billion and \$4.7 billion

According to Leduc and Wilson (2013), this impact will build out roughly 6 to 8 years after project completion. Even with expected ROI (return on investment) of as low as 5%, this would lead to a conservative estimate of \$60 million every year in terms of economic impact and a best case estimate of \$475 million with an ROI of 10% (see Table 6). Once

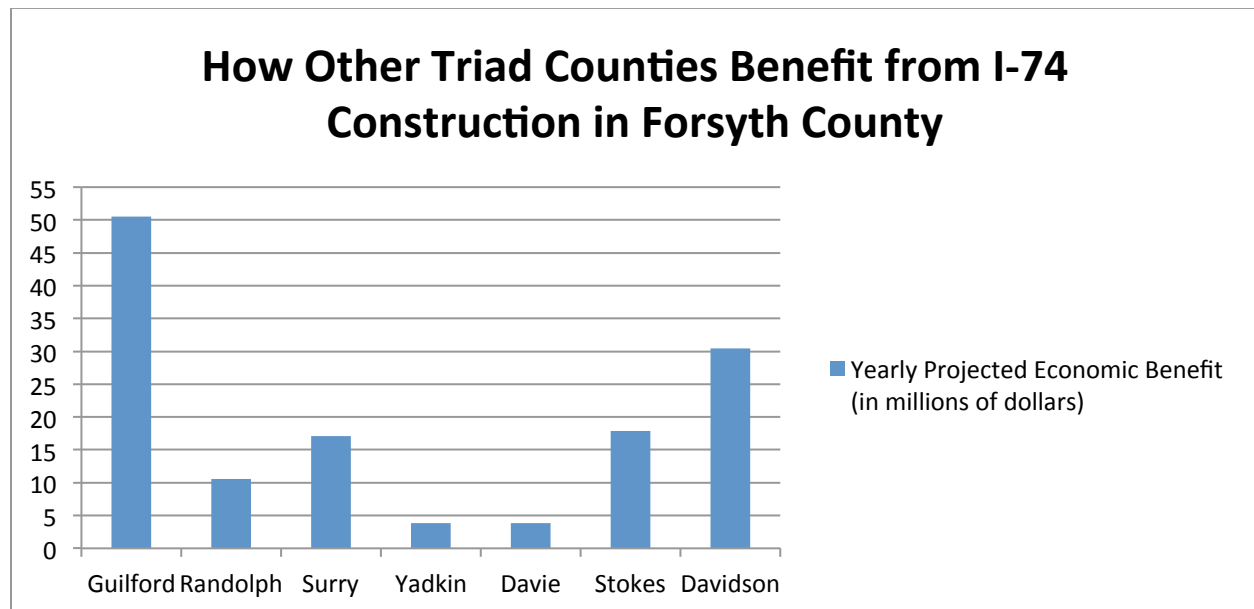
again taking the midpoint of these estimates, we believe that there will be roughly \$270 million of new activity per year generated for six to eight years after project completion (with total investment and productivity gains of \$3.6 billion), meaning that the project will pay for itself in terms of increased economic activity within the region within 5 years of completion.

Of this, we forecast that approximately half the economic impact of productivity and investment will accrue to the six counties that surround Forsyth plus Randolph County, which lies immediately south of Guilford County in the I-74 corridor. This is in line with expectations, as Paul Norby, Director of Planning for Winston-Salem, states, much of its available commercial and industrial land is land-locked with no easy road access to I-74. Land-locking will tend to cause businesses to relocate to the counties of Surry, Davidson, Guilford, Randolph, Stokes, Yadkin, and Davie. Thus, for a period of six to eight years after the completion of the interstate, these surrounding counties will see between \$30 million and \$240 million in additional benefit each year, with a most likely amount being \$135 million a year in ongoing economic benefits (see figure 3 for a breakdown by county). Even still, Forsyth's benefit is still substantial. These figures are over and above the results for the initial construction phase and are summarized in Table 6 and Figure 3.

TABLE 6: Estimated annual benefit to Triad counties from I-74

ROI	Conservative Scenario	Best Case Scenario
5%	\$60.97 million	\$237.29 million
10%	\$121.93 million	\$474.58 million

FIGURE 3: Other Triad Counties Benefit from Forsyth County I-74 construction

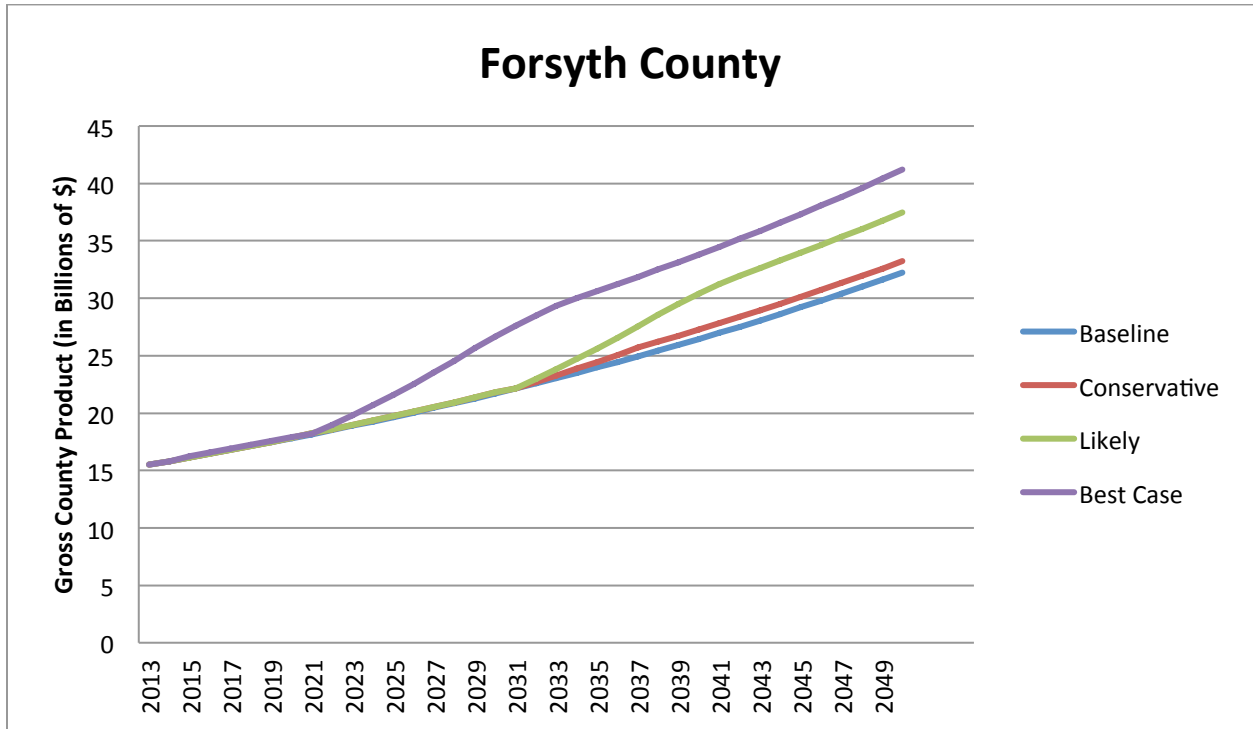


To show this visually, given that gross county product for Forsyth County is about \$15.5 billion per year and examining the growth that the project adds means that it will provide benefits of somewhere between 3.9% and 15.2% to the gross county product over the medium-term, resulting in an additional 0.5% and 2.4% extra annualized growth during this time period (see Figure 4). As noted, this representation is for visual clarity so one can see the impact that the project has. Thus, we estimate that the project should nearly double Forsyth's economic growth rate for the six to eight years after completion before returning back to trend.

However, if the project is delayed, these benefits will be pushed out into the future, diminishing the overall economic impact considerably. The economic uncertainty and reduction of property values in the proposed right-of-way negatively impacts the region the longer that we wait to complete the project. We estimate that this is in the neighborhood of providing a 35% discount off of fair market value or roughly a \$150 million loss of property values that is currently impacting the county and those whose homes have not been bought. This negative valuation will no longer be carried once the

project is completed and thus represents a pure social transfer. It also means a loss of roughly \$2 million in tax revenues between the city of Winston-Salem and Forsyth County that must be made up with higher taxes on existing residents or lower levels of services.

FIGURE 4: Impact of I-74 Completion on Forsyth County



If anything, these figures are likely underreporting ongoing economic impact for the Triad. The addition of a major interstate artery in the form of I-74 coupled by its proximity to the Piedmont Triad International Airport, the major rail line that runs through Winston-Salem, and the incoming I-73 corridor through Greensboro serves to make the Piedmont Triad region an ideal hub region for logistics and a highly desirable manufacturing location.

Figure 4 demonstrates that the vast majority of any gain is due to contingent development and productivity enhancements that come only with the completion of the project. Since the project is likely to take several years to complete (even in the best case scenario, we anticipate it taking 5 years to complete and most likely it will not be completed before 2030), the impact of construction will barely cause a blip in overall county employment and income and the county will not realize much benefit until it is completed.

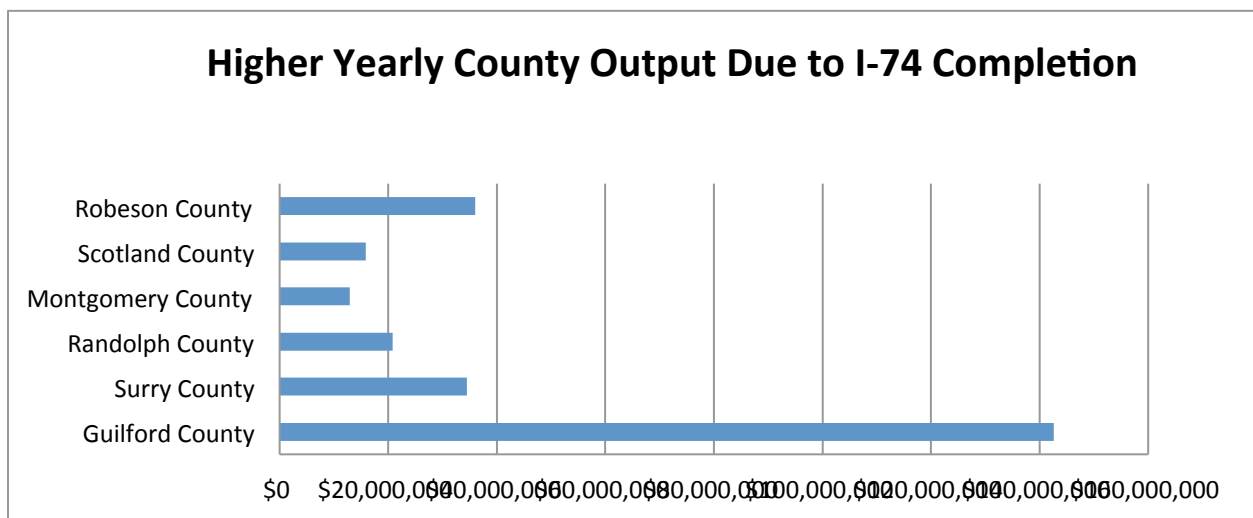
## ADDITIONAL BENEFITS TO COUNTIES WITH I-74 SEGMENTS FROM COMPLETION OF I-74

In addition to the benefits that are realized from the Northern Beltway completion, Guilford, Surry, Randolph, Montgomery, and Robeson counties are also benefit from contingent development and productivity increases since their I-74 segments will be connected to the interstate highway. These benefits are over and above that generated by the Northern Beltway segment completion but will not be realized until the Northern Beltway segment is completed. It is thus in the interest of all of these counties to see the entirety of I-74 finished. Forsyth County is not included in this section because its enhanced benefits were reported earlier in this paper.

Based on the multiplier effect of interstate completion on urban counties, we estimate this impact at between 0.25% and 1.1% of Guilford County's overall economic output for six to eight years after I-74 is completed. This impact will predominantly be realized in the City of High Point due to its proximity to the interstate corridor with a lesser amount going to the City of Greensboro, especially the area around Piedmont Triad International Airport. It is our professional belief that the most likely scenario is a 0.6% gain in growth during this period, which translates into approximately \$140 million in additional output each year for Guilford County. In the case of Surry, Randolph, Scotland and Montgomery counties, growth in the immediate vicinity of the interstate will be higher given that these counties have more limited transportation access outside of the interstate and the fact that they are predominantly rural counties and they currently have a lower level of overall economic development. However, this growth will tend to center around exit points. As such, given what we know from the literature on how rural counties respond to interstates, they will likely have less growth than their more urbanized neighbors for the six to eight year period (somewhere in the 1% to 1.5% range). Even with that lower growth we estimate that this will add, at the low end, about \$13 million in Montgomery County and, at the high end, around \$35 million in Surry County each year for the six to eight year period after the interstate is completed. Robeson county, given that I-95 already goes through the county and it has a higher population already than the other counties, will experience enhanced growth closer to 1% a year, bringing in about \$35 million a year. The figures for Surry and Guilford counties will be higher overall because we do not account for the Northern

Beltway's impact on contingent development in calculating these figures. In addition, there will be spillover effects in Stokes County that will occur from the Surry County segment that are not separated out for this analysis. The overall economic impact for all of these counties will also be significantly higher due to interstate construction when it occurs in those counties. However, calculation of the construction impact with the exception of the Northern Beltway is beyond the scope of this report due to cost uncertainties. For a visual representation of this, see Figure 5 below.

FIGURE 5: Annual Expanded Economic Output from I-74\*



\*Note: The figure for Surry County also includes benefits to Stokes County

When we add all of the benefits together for both completing the I-74 segment in Forsyth County (the so-called eastern portion of the Northern Beltway) and the benefits to all counties in the I-74 interstate corridor from completing the corridor (which would require the completion of the I-74 segment in Forsyth County), we find that there will be over 33,800 jobs created in the state as a result of this completion (more than the total employed population of Surry County). Figure 7 summarizes the job totals by county, ranging from a low of 250 jobs in Davie and Yadkin counties (due to their distance from the I-74 corridor) to a high of nearly 12,500 jobs for Guilford County.



Table 7: Total Permanent Employment Increase from Project if Interstate is Completed

County	Increase in Permanent Employment
Guilford County	12,500
Forsyth County	8,800
Robeson County	2,350
Stokes County	2,300
Surry County	2,200
Davidson County	2,000
Randolph County	1,350
Scotland County	1,050
Montgomery County	850
Davie County	250
Yadkin County	250

Overall, all North Carolina counties along the I-74 corridor can expect to see over \$580 million a year in new economic growth for a six to eight year period as a result of the completion of the interstate. This growth translates into an average increase in income for current county households that will be approximately \$800 higher than if the interstate were not to be built (since approximately 20% of the enhancement is due to increased productivity and 80% is due to additional investment resulting from new businesses and the expansion of existing businesses).

This will translate into significantly higher property and sales tax revenues as well as lower welfare and social services spending in the affected counties (at the same time because there will be more workers and more commercial activity, there will be some costs that will offset some of these revenue enhancements, however, on balance, there will be a strong positive impact on county and state balance sheets due to productivity gains).

Taxes to all levels of government will rise by over \$220 million a year (an amount that exceeds the combined annual state general fund allocation to Winston-Salem State University and UNC-Greensboro) with about 57% going to Raleigh and 43% going to cities and counties. We estimate enhanced productivity and investment will translate into somewhere around \$57 million more annually in sales tax revenues for the region (with about \$40 million going to state coffers and \$20 million to localities), while additional

investment should add from \$3 billion to \$8 billion to property tax rolls across the entire corridor. This translates into anywhere from \$30 million to \$120 million a year in additional property taxes depending on the mil rate. Our best estimate is that this will be around \$75 million total. Our estimates of overall tax benefits on a yearly basis for sales, property and income taxes are given in Table 8.

Table 8: Enhancements to Revenue of North Carolina and Localities

Local Sales Taxes	\$ 20 million
Local Property Taxes	\$ 75 million
<i>SUBTOTAL FOR COUNTY AND CITY GOVERNMENTS</i>	<i>\$ 95 million</i>
State Sales Taxes	\$ 40 million
Personal Income Taxes	\$ 80 million
Corporate Income Taxes	\$ 9 million
<i>SUBTOTAL FOR STATE GOVERNMENT</i>	<i>\$129 million</i>
<b>Total for ALL North Carolina Governments</b>	<b>\$224 million</b>

This would point the way to potential TIF (tax-increment financing) models for additional development projects in all affected counties. As to the lower welfare and social services spending, we have no way of estimating its impact except to state that the overall bill will be lower on a per capita basis due to the enhancements to income created by the productivity gains. There will also be additional enhancements to government revenues from various fee collections that go beyond the ability for us to estimate. In any case, it is safe to state that the figures given are conservative ones and that the actual benefits to county and city revenues will likely be higher. Of course, there will also be additional costs but the overall impact to city and county residents should be tax neutral or even slightly advantageous allowing for a potential reduction in overall property taxes due to the higher value of land usage.

In conclusion, the completion of I-74 through North Carolina should result in:

\* More than 33,800 new permanent jobs created

- \* \$800 a year in higher income for residents of counties along the corridor
- \* \$95 million more annually in tax revenues for cities and counties in the corridor
- \* \$129 million more annually in tax revenues for the State of North Carolina
- \* A substantial increase in economic growth for a period of six to eight years in the corridor region due to contingent investment and productivity gains
- \* \$190 million in yearly increased economic output for Guilford County and a permanent cumulative economic boost of over \$2.5 billion to the county (not counting impact of construction in Guilford County of I-74).
- \* \$135 million in yearly increased economic output for Forsyth County and a permanent cumulative economic boost of over \$2.5 billion in the county (including impact of construction in Forsyth County of I-74).
- \* Anywhere from \$3.8 million for Davie County and Yadkin County to around \$35 million for Surry County on an annual basis for the six to eight years after I-74 is completed.

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