Evaluating the Private Sector Returns to Transportation Investments in Tennessee

Research Final Report from Howard H. Baker Jr. Center for Public Policy, University of Tennessee, Knoxville | Matthew N. Murray and Jilleah G. Welch | March 19, 2021

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16. Abstract

This report explores the way in which TDOT investments in state roads and interstate highways affect economic growth in Tennessee counties as measured by nonfarm employment, business establishments, personal income, per capita personal income and population. The goal is to estimate the private sector economic returns to public sector transportation investments. The analysis relies on a complete inventory of major state road and interstate projects supported by TDOT between 2001 and 2018 that are linked to counties across the state.

We find that both descriptive methods and rigorous statistical modeling fail to identify strong linkages between roadway investments in Tennessee and county-level measures of economic wellbeing. Descriptive methods reveal a mix of high return and low return investment projects in the same counties across the state. In the econometric models, the null findings are robust across a wide range of different model specifications. In virtually none of the modeling did we find statistically valid positive associations between transportation investments and economic outcomes.

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Executive Summary

This report explores the way in which Tennessee Department of Transportation (TDOT) investments in state roads and interstate highways affect economic growth in Tennessee counties as measured by nonfarm employment, business establishments, personal income, per capita personal income and population. The objective of the study was to estimate the private sector economic returns to public sector transportation investments. The analysis relied on a complete inventory of major state road and interstate projects supported by TDOT between 2001 and 2018 that are linked to counties across the state. Using both descriptive methods and sophisticated statistical modeling, we sought to identify relationships between various measures of TDOT infrastructure spending and local economic growth. Both descriptive and rigorous statistical methods failed to identify strong linkages between roadway investments in Tennessee and county-level measures of economic wellbeing.

The vast literature on how transportation infrastructure investments influence economic growth was reviewed to inform the research, help specify econometric models and interpret findings. This literature identifies a range of empirical pitfalls and produces widely divergent findings on the effects of transportation investments on economic growth. There is no clear consensus in the literature regarding whether transportation infrastructure causes economic growth or whether it is instead an important accommodating force.

Descriptive methods revealed a mix of high return and low return investment projects in the same counties across the state. In the econometric models, the null findings are robust across a wide range of different model specifications. In virtually none of the modeling did we find statistically valid positive associations between transportation investments and economic outcomes.

There are several possible explanations for these results. First, some of the modeling and empirical challenges that were identified in the literature also affect this research project. Second, there were unique challenges for this study including the relatively short window of time—2001 to 2018—to enable a significant private sector response to TDOT investments. A third possibility that we cannot dismiss is that TDOT has made sound choices in its long-range planning and investment processes that have enabled communities to continue to grow largely consistent with their historical trajectories. In other words, transportation investments have accommodated economic growth in Tennessee rather than caused economic activity to expand (or contract). This is consistent with the view that there are unique, long-term reasons for the pattern of economic growth that has emerged across the state's metropolitan and non-metropolitan counties. These unique features, including location and demographic characteristics, are the underlying forces of regional growth, not necessarily the transportation investment decisions made by TDOT.

The analysis presented here does not yield actionable policy options for the state. However, there are three avenues for research that might be pursued. First is a longer time window, enabling an analysis that would capture the completion of major projects rather than *segments* of large projects. Second is an alternative approach to capturing spillovers that arise since projects in one county can produce benefits for other counties. Third would be an alternative modeling structure built around the production function framework that commonly appears in the literature. We chose not to pursue this line of inquiry because of data demands and other issues that are noted in the literature review.

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Chapter 1 Introduction

Communities across Tennessee are hungry for transportation infrastructure investments that can enhance the prospects for economic growth and alleviate congestion through an expanded transportation network.[1] These networks are a visible ingredient to regional economic development, facilitating the performance of the labor market via commuting and connecting intra-regional and interregional business-to-business trade. Transportation infrastructure also enhances quality of life by connecting people to amenities like parks and to other people and family within the community and in other places. Roads and highways are also critical to enabling access to rural communities across Tennessee which often do not have other modes of transportation at their disposal.

A challenge for transportation planners is identifying specific investment projects that can yield the largest benefits for residents of the state. As custodians of public funds, this is an essential way to view transportation investments. In practice, however, this is exceedingly difficult to do. In a perfect world, planners would identify all candidate investment projects, calculate the range of benefits and costs associated with the various alternatives and then choose the projects with the greatest returns that can be supported by available investment dollars. Many potential projects are in fact evaluated rigorously using the tools of cost-benefit analysis; in other instances, decisions are based on more limited information and rules of thumb.

Transportation planners seldom, if ever, have the opportunity to conduct ex-post evaluations of the economic returns to completed transportation infrastructure projects. This is the task of the research project presented in this report. The analysis relies on comprehensive data on transportation investments supported by TDOT between 2001 and 2018, including all major state road and interstate projects. These investment data are coded at the county level and linked to other county data that reflect different dimensions of private sector economic prosperity, including population, personal income, per capita personal income, nonfarm employment and business establishments.

Together, the data allow us to estimate the private sector returns to TDOT investments by isolating the way in which private sector outcomes like population and employment respond to previous transportation investments across Tennessee counties. The primary conclusion that emerges from this research is that TDOT investments do not, at least on average, alter the growth trajectory of Tennessee counties. In general, TDOT investments neither increase or retard private sector outcomes in a statistically significant way. These findings are largely consistent with the mixed findings embedded in a vast body of research reviewed below that examines the effects of infrastructure spending—including transportation investments—on national and subnational growth. This literature points to a range of methodological and data issues that constrain researchers' capacity to isolate (or in strict econometric terms *identify*) the

[1] The authors thank Bill Fox and David Greene for comments on an earlier draft of this report.

effects of infrastructure investments on economic growth.[2] The research presented here suffers from many of the same problems that other researchers have encountered. However, it is nonetheless striking that our largely null findings are very robust across a wide range of methods, model specifications and choices of data.

It is possible that known methodological issues and unique problems associated with the current application are the culprit behind our null findings. This is not only possible but it is likely to be the case. Another possibility appeals to the underlying characteristics of places that affect regional growth. In general, communities grow because of their unique characteristics, including features of the labor force, the scope of private capital investment, natural resources, location, amenities and so on. Places without the proper ingredients for growth cannot reasonably expect transportation infrastructure, on its own, to be an engine of economic development. On the other hand, places with the necessary economic foundation may be able to grow even in the face of transportation constraints. This perspective, coupled with our null findings, suggests TDOT has done an effective job in choosing investment projects that accommodate economic growth consistent with the unique characteristics and historical trends of Tennessee counties.

The remainder of the report is organized as follows. In the next section, we discuss the importance of making the most from infrastructure investments—*optimal investments*. This is followed by a review of the literature on how various forms of transportation infrastructure affect economic growth, with an emphasis on roadways. Included in this section are some basic lessons to help guide the investment decision-making process for policymakers. Subsequent sections delve into the formal data analysis and in sequence address database construction, descriptive analysis of projects with high-versus-low return on investment and rigorous econometric analysis of how transportation investment affects local private sector outcomes as measured by population, personal income, per capita personal income, nonfarm employment and business establishments.

1.1 Optimal Investments in Transportation Infrastructure

Transportation infrastructure is funded by users through dedicated revenue streams, like national and state fuel taxes, as well as earmarks and general fund revenues. As such, transportation investments should be guided to their best possible use and greatest possible impact on society. The words *use* and *impact* highlight the fact that transportation infrastructure is more than the mere expenditure or transfer of public funds—it is the expenditure of public dollars to produce a material impact for direct and indirect users of the transportation network. Making optimal investments requires knowledge of how and the extent to which transportation investments affect people and the economy.

The importance of optimally allocating transportation investments that are linked to economic outcomes has received increasing attention over time. In a recent *Economic Report of*

[2] A fundamental challenge in econometric analysis is attributing statistical relationships to causality. The presence of a statistical association does not necessarily indicate causation—the chicken's crowing does not bring forth the sun. Addressing the *identification* problem in practice can be exceedingly difficult.

the President (2018), the impact of investments in infrastructure on productivity and output are discussed, as well as the importance of project selection and allocation of investments in an effort to choose and fund high-value projects. Competitive grant programs stemming from the Better Utilizing Investments to Leverage Development (BUILD) program, which replaced the previous Transportation Investment Generating Economic Recovery (TIGER) program, emphasized the importance of cost-benefit analysis and economic benefits in their selection criteria. Ansar et al. (2016) note that in China, the failure to follow the guidance of cost-benefit analysis has led to excessive debt accumulation and the risk of financial instability. There are many similar cautions in the academic and applied research literature regarding the importance of careful planning practices.

As noted in a recent American Association of State Highway Transportation Officials (AASHTO) Bottom Line Report (Pisarski and Reno, 2015), public sector analyses that extend modeling beyond the direct benefit of users to include overall economic impacts such as jobs have been limited but are of increasing interest to policymakers and researchers. A report by Pew and the Rockefeller Foundation (2011) found that most states do not measure the impact of transportation spending on measures like jobs and commerce, but that some states are moving in this direction. For example, the report notes that Missouri predicts jobs generated by industry and uses jobs as an estimated return on investments; Michigan examines performance in terms of jobs, state gross domestic product (GDP), personal income, and personal travel time savings. The slow movement in this direction can be explained in part by the intensive data and methodological demands of such research, as will become clear in the discussion below.

Through interviews with state Departments of Transportation, the Center for Neighborhood Technology (2012) and Cambridge Systematics (2009) find that the degree to which states incorporate economic outcomes into transportation planning vary widely. Some states have established economic goals for transportation planning or measure and incorporate economic outcomes into their analyses while others primarily include economic benefits in discussions with local officials and the public. The important point is that there is evidence of growing interest in and emphasis on the broader economic impacts of investments in transportation. In principle, this offers the promise of greater returns to future investments in transportation infrastructure through the selection of more promising projects.

An important issue is identifying the knowledge base to guide this decision making on an ex ante basis. Certainly, transportation planners cannot be expected to precisely estimate all economic gains (and potential losses) associated with every alternative transportation investment option. This first-best approach is simply not feasible as it demands too many financial resources and takes too much time. At the same time, investments cannot occur in a vacuum. The practical second-best approach is to use rigorous cost-benefit analysis, especially when the stakes are high, and rely on other data and information to guide decision making, whether this is formalized in modeling and scenario analysis or used to support expert judgement (i.e., the so-called *Delphi* method). In principle, the extensive research on linkages between transportation investments and economic outcomes should be able to offer some lessons and help fill the information void.

Chapter 2 Literature Review

2.1 Infrastructure and Economic Growth

The infrastructure crisis of the 1980s, motivated in part by the nation's emerging productivity slowdown, generated a huge volume of research on the impact of various types of infrastructure on economic growth. The natural linkage here is clear: if the effects of infrastructure on economic growth can be identified, it should be possible to make reasoned, optimal investments based on measurable rates of return. This, in turn, should translate into a more productive and competitive economy. Aschauer (1989) offered a seminal contribution to this literature by estimating the output elasticity of public capital with respect to infrastructure, i.e., the responsiveness of private sector production to the stock of the nation's infrastructure. He concluded that streets, highways, airports, mass transit, sewer and water systems had significant impacts on private sector productivity. Aschauer emphasized that infrastructure is an investment that provides a flow of benefits over time rather than simply the expenditure of public funds.

Since Aschauer's work, hundreds of papers have been published on the same topic, many of which inform the review below and appear in the lengthy list of references at the end of this report. A surprising and especially noteworthy feature of this body of work is that the core research question—the impact of infrastructure on economic growth—has no clear answer. While the literature frequently identifies positive impacts from infrastructure investments, there are many instances of null impacts and negative impacts. A variety of modeling challenges and nuances affect these research findings, including data and empirical methods. For example, Bom and Ligthart (2014) and Nunez-Serrano and Valazquez (2017) provide recent reviews of this literature and conduct meta-analyses of research findings. They conclude that the magnitude of the positive effect of public infrastructure on productivity depends on the type of infrastructure, the analytical methods used, and other factors such as geography (e.g. national versus subnational regions) and the time period studied (periods of economic slack versus periods of strong economic growth). Focusing more specifically on transportation infrastructure, Shatz et al. (2011) review the literature on highways at the national and sub-state levels. At the national level, rates of return and impacts on productivity were estimated to be higher than for states while more heterogeneous effects were found at the sub-state level and depended, for example, on the type of highway.

The approach of focusing on infrastructure's effect on output is natural for economists, as it builds on the classic production function framework which relates inputs (including labor and private capital, along with public capital or infrastructure) to output. Other research has explored alternative measures of impact. This includes metrics that directly impact users, like travel time, travel costs, access, congestion, safety, noise and carbon emissions. Broader economy-wide measures include population and population density, firm location, business productivity, output, labor market effects (wages and employment), land prices and land use. Here too, the evidence is mixed rather than clear and compelling, a conclusion based in part on the premise that there is a bias toward publishing research that has statistically-significant findings. Holmgren and Merkel's (2017) meta-analysis concludes that there is evidence of publication bias in the empirical literature. This is not intended to challenge all research findings, but it does serve as an important caution when interpreting the findings in the literature.

Redding and Turner (2015) review empirical studies which conducted ex post examinations of the impact of transportation improvements (e.g., roads, railroads, and public transportation) on outcomes including population density, land rents, and output. Other studies that have more narrowly focused on roads have considered outcomes such as employment growth (Duranton and Turner, 2012), trade flows (Duranton et al., 2013), population density (Baum-Snow, 2007), and driving (Duranton and Turner, 2011). Duranton and Turner (2012) find that a 10 percent increase in the quantity of interstate highways (measured in kilometers) causes a 1.5 percent increase in employment over the period of 1984 to 2004. Duranton and Turner (2011) find that driving increases one percent for each one percent increase in roadways, a finding which is now labeled as the *Fundamental Law of Road Congestion.* Baum-Snow (2007) finds that a 10 percent decrease in the distance to a highway, a simple measure of access, is associated with a 0.13 percent increase in population density.

Some studies have emphasized the importance of returns associated with maintenance and repair projects (Kahn and Levinson, 2011 and Glaeser, 2017) and the impact of quality rather than quantity on economic outcomes (Hulten, 2005). While Duranton and Turner focus on the national highway system, there are studies that examine the impact of transportation in an intercity versus intracity framework. For example, Chandra and Thompson (2000) and Michaels (2008) examine how wages or aggregate earnings (by industry group) change for a county that gains access to the interstate highway system. Chen et al. (2016) conclude that inter-city highways (and railroads) have a greater impact on the growth of cities than intracity transportation infrastructure. When studies are extended to accommodate national and subnational roadways, the evidence suggests that the return on investment is higher when building an entire system or a major expansion to a network while smaller additions to an already established network may have only modest effects (Shatz et al. 2011).

2.2 Fragility of Research Findings

This brief review is just the tip of the iceberg as can be seen from the full set of references to this report. But it provides a flavor of the *scope* of existing research, which is both broad and diverse in focus. At the same time, the discussion fails to convey the *fragility* of research findings.

One explanation for the fragile and inconsistent results is that researchers are often addressing different questions--researchers are studying different petri dishes with different types and doses of intervention. Two broad categories of differences include (i) different measures of transportation infrastructure and (ii) different outcome measures presumably affected by transportation investments. The literature review presented above discusses some of these differences. For example, studying the impact of national transportation investments will likely yield different findings than a study of state highways because the scope of spillovers differs. How transportation infrastructure is measured is also important. For example, Elburz et al. (2017) show that monetary measures of transportation infrastructure generally produce estimates showing lower rates of return than when investments are measured in miles. There is also tremendous diversity in outcome measures, as indicated above.

A second challenge confronting researchers is that transportation investments and economic outcomes are typically determined simultaneously. For example, while transportation investments may affect GDP and employment, GDP and employment also affect transportation spending. Places with strong growth likely receive additional transportation dollars to alleviate congestion, enhance access and use. This *facilitates* a continuation of the regional growth process rather than *creating* the underlying foundation for growth. On the other hand, stagnant or declining places will likely see fewer transportation investment dollars. Few would disagree with this assessment of the relationship between economic outcomes and transportation investment. Researchers have struggled to address this simultaneity problem; many researchers simply ignore it.

In regression analysis, the commonly-used tool in the literature that evaluates the impacts of transportation investments, a set of fixed and predetermined (i.e., exog*enous*) explanatory variables is used to explain an outcome variable. The presumption is that the exogenous variables *causally influence* the outcome variable in question. The outcome variable may be a measure of output like GDP or another measure like employment or population. An important task for the modeler is to include the array of factors that may affect this outcome, including but not limited to characteristics of the transportation investment. But including transportation investments as an explanatory variable is inappropriate if these investments hinge in whole or in part on economic outcomes—in fact, they are *not* fixed and predetermined in the empirical model. This is referred to as *simultaneity bias* with the implication that resulting estimates are skewed away from their underlying true values. In practice, a researcher may have few if any viable alternatives to address the problem of simultaneity bias. Much of the research literature, especially older literature, is plagued by this problem.

Traditional regression models generally require the full specification of all of the material factors that may affect the outcome of interest. For example, when modeling local employment growth with a regression model, you would want to identify the full range of factors that influence growth, including characteristics of the local labor force like educational attainment (labor supply) and measures of local industry structure (labor demand). Data availability quickly becomes an issue. Since different researchers specify the models differently, it is no surprise that results differ, sometimes appreciably.

Finally, there is the basic question noted above regarding whether transportation infrastructure has a causal influence on economic growth. If local economic conditions are not supportive of growth, transportation investments will have little or no effect on local economic outcomes. If rapid community growth gives rise to congestion, then transportation investments can enable the economy to continue to grow. The lack of consistency in the empirical literature may reflect the fact that transportation infrastructure, at least on average, largely serves to accommodate growth. While there may be specific instances where investments enhance growth, these are elusive to isolate in empirical models. If this interpretation is the case, it contributes to explaining the mixed findings in the literature.

2.3 Factors Affecting Return on Investment

We have reviewed the literature on the impacts of transportation investments in search of lessons to help guide both formal modeling like cost-benefit analysis and judgmental approaches to choosing investment projects. Unfortunately, and importantly, the empirical evidence is too mixed to produce crystal clear findings to support most modeling strategies. A good example is spatial spillovers, i.e., the way in which one transportation investment project may affect the network well beyond the actual site of construction. In the context of the current research strategy, an important question is: How do transportation investments in one county affect economic outcomes in other Tennessee counties? While the literature indicates that spillovers are important, there is no simple way of summarizing this for inclusion in cost-benefit analysis since the effects are project-dependent. While it may be difficult or simply not practical to precisely evaluate these spillover benefits, knowledge that these spillovers exist may still affect the decision to invest in a single project and should not be ignored. Knowledgeable transportation planners should have a sense of where spillovers might be most important.

In what follows, we highlight some of the most important factors that should be considered when evaluating the returns to investments in transportation infrastructure, based on our careful review of the literature. An important caveat, consistent with concerns raised above about research modeling and estimation, is that research findings vary substantially. In many instances, empirical findings are in conflict with one another. For example, one researcher may find that transportation infrastructure leads to growth in the manufacturing sector while another researcher finds the opposite effect; the same is true of transportation infrastructure and the service economy. These are simply examples of other inconsistencies found in the literature.

Time lags—consider the long run. In the short run, while roadway construction is underway, there may be constraints on economic activity because of congestion and/or reduced access to the existing network. This can reduce business traffic, recreational travel and commuting; local businesses can be adversely affected because of reduced access on the part of business and household consumers. Construction and its associated congestion can shift traffic to other parts of the network, creating winners and losers. If an adjacent artery is subject to increased congestion, this has the same adverse impacts on economic activity as road construction itself; some business activity (e.g. retail and restaurant sales) might shift temporarily or permanently to alternative roadways.

At the same time, there may be substantial short-term benefits that arise from construction itself. This includes construction jobs and related supply-chain jobs that enable construction. These jobs may enhance business profits and boost some government revenue sources, like the local sales tax. However, these transitory benefits will typically accrue to workers and businesses located outside the zone of construction. Construction workers are generally drawn from a broad geographical labor market while suppliers may be located in other regions and states.

It is conceivable that an empirical exercise evaluating the private sector returns from transportation investments—for example, job creation—would yield negative impacts from the construction phase of the project due to disruptions of local business activity. The desirable returns to investments occur over the long run. Once an investment is complete, transportation activity can begin to return to normal. Over time, the presumption is that the economic return to investment will grow because of less congestion and easier transportation access. Of course it is common for road investments to be staggered along the same roadway or within the same network. The full realization of benefits cannot be realized until all investments are complete.

There is ample anecdotal evidence and strong empirical evidence from the literature to support the case that benefits increase over the long run. An ex post cost-benefit study that was completed shortly after an infrastructure project was completed would understate benefits, potentially by a wide margin. For example, Block and Street (2017) find that GDP rises by just $0.91 per dollar of transportation investment spending in the short run, but the returns rise to somewhere between $3.06 and $5.98 in the long run. Ozbay et al. (2007), who study county-level transportation investments in New York and New Jersey also find that benefits increase substantially over time. Elburz et al. (2017) produce similar findings. This is a potential issue for the new empirical work that is presented below which relies on a relatively short window of time, 2001-2018.

Type of highway. Not all transportation investments and roadways are the same. Local roads, for example, connect localized areas and may provide direct or indirect access to a broader transportation network. Other roads, like state highways and interstates, connect broader regions and offer richer access to the network. The greater is the connectivity that enables commerce and recreation, the greater are the potential economic returns. There is a natural hierarchy where national roadways like interstates tend to yield greater impacts than state highways, while state highways tend to yield greater returns than local roads. Local roads produce benefits for local road users while statewide and national components of the network yield benefits that span states and broader regions.

An important issue here is how to evaluate the returns of different types of roadways, in particular, whether the lens is that of a state or the nation. Measuring the state-level returns to national transportation infrastructure may yield smaller returns than measuring national returns to the same investments. The same would be true of state roadways—measurement of state-level benefits would be expected to exceed the localized benefits of the state roads. The broader region allows for greater spillover benefits from road construction.

As intuitive as the conclusion is that regional infrastructure produces greater returns than more localized infrastructure, research has produced mixed results. For example, Kim (2005) examines how different roadways affect employment in Missouri and concludes that interstates have no impact on employment. Jiwattanakulpairsarn et al. (2012), on the other hand, find that state highway capacity has a positive impact on private sector output, though the benefits are small. Hulten (2004) makes the persuasive argument that additional investments in mature transportation networks serves largely to reallocate existing economic activity while investments in underdeveloped networks can enhance productivity and output.

Spatial spillovers. Spatial spillovers are the root source of the interregional benefits of transportation infrastructure discussed above. In fact, the spillovers across regions are synonymous with private returns. A number of research papers have tried to directly estimate these benefits. This highlights the importance of *connectivity* across the transportation network—a roadway with limited connectivity, even a national roadway, would be expected to produce muted gains since spillovers cannot be fully realized. The key to network benefits, all else the same, is connectivity that more fully enables commerce and recreation.

The same measurement issue arises with spatial spillovers as is the case with national versus regional transportation infrastructure: failure to account for spillovers across regions will diminish estimated returns to investments. In practice, a state will act in its own self-interest, focusing on own-costs of roadway development relative to own-benefits from the same investment. This is exactly why the federal government subsidizes interstate highways and states subsidize roads that connect counties and cities within their border.

In practice it can be difficult to actually measure spatial spillovers. But transportation policymakers who properly understand the network can anticipate where spatial spillovers might be largest. These components of the network should receive some priority in the planning process.

There is some empirical evidence that spillovers are an important source of benefits from transportation investments. Chen and Haynes (2015) look at the impact of public transportation infrastructure investments in the northeast region of the U.S. and conclude that transportation infrastructure has a significant impact on regional growth and spillovers are the primary source. Ozbay et al. (2007) find the spillover effects wane as distance from the investment increases. But research also produces ample evidence of *negative* regional spatial spillover effects, as with Kim (2005) and the meta analysis conducted by Elburz et al. (2017). One possible explanation is increased competition among subregions, particularly with respect to services (Jiwattanakulpaisarn et al., 2010), that leads to job losses.

Export sectors. Improved transportation infrastructure can lower business costs, improve competitiveness and promote economic growth. This can be especially important for goods (e.g. manufactured products and agricultural products) and some services (e.g. engineering services) that are exported out of a region to other places in the U.S. or abroad. These *tradable sectors* are the primary beneficiaries of improved transportation access. On the other hand, the *non-tradable sector*, which includes locally-provided services, may suffer from improved transportation access that opens up easier access to neighboring communities and creates greater competition.

Melo et al. (2010) find that increasing highway (and railroad) access in Portugal promotes new plant openings, consistent with the view that transportation investments lower business costs. Tong et al. (2013) study the effects of road and rail infrastructure across the states and show that these investments enhance agricultural production; Sheng et al. (2018) provide evidence that road improvements raise the value of farm land, a signal of enhanced productivity. Block and Street (2017) show that infrastructure spending improves business productivity and competitiveness in international markets. Similarly, Liu et al. (2017) and Tong et al. (2014) find that road infrastructure enhances exports.

Population. Intuition suggests that population and population density should enhance the returns to transportation investments since roadway expansions impact more individuals across the network. However, there is very little research to support this conclusion. One exception is Shin and Kim (2019) who find that places with more people do realize greater benefits from infrastructure expansion.

Agglomeration Economies. Agglomeration economies arise as workers and firms with similar characteristics locate in proximity to one another, producing efficiency gains and cost reductions. The greater the density of workers and firms, the greater are the agglomeration economies. Examples include financial centers like New York and London and Silicon Valley. Note that the workers and firms do not need to directly interact or trade with one another to produce agglomeration economies. For workers with specific skills, the nearby location of multiple potential employers can improve the job search matching process, benefiting both the worker and the firm. Workers may receive higher earnings. While businesses may pay more for the worker in this example, the worker is presumably a better match and more productive to the firm, warranting the higher wage. Melo et al. (2009) conduct a meta-analysis that demonstrates generally the importance of agglomeration economies for metropolitan areas.

Transportation infrastructure has traditionally been an important means of facilitating connections between workers and firms that yield agglomeration economies; see Chatman and Noland (2011). (Travel cost savings from transportation investments are distinct from agglomeration economies—the latter are an *additional* benefit from investing in roadways.) The global build-out of transportation networks, coupled with the ongoing rise in sophisticated methods of remote communication, have likely diminished some portion of transportation-induced agglomeration economies. But they remain very important, especially in urban settings and around industrial hubs.

Unfortunately, there is little empirical evidence on the relationship between transportation networks and agglomeration economies, in part a reflection of the challenge of precisely measuring agglomeration itself (see Melo et al. 2009). One exception is Chatman and Noland (2014) who consider urban transit systems and find that improvements in the network promote agglomeration economies.

Congestion and capacity constraints. Intuition suggests that investments that ease congestion and capacity constraints should yield substantial benefits. Surprisingly, there is little or no attention to this in the formal literature evaluating the returns to investments in roadways. Boarnet (1997) concludes that efforts to reduce congestion may produce stronger benefits than outright expansions in streets and highways. Hulten (2004) finds that addressing constrained transportation networks enhances production.

Summary. Despite a vast literature, there are few if any hard and precise lessons to draw from the existing research to guide formal cost-benefit analysis. Even a search for basic rules of thumb is compromised by limited or inconsistent research findings. This provides a compelling motivation to conduct an independent empirical evaluation of TDOT investments across Tennessee.

Chapter 3 Methodology

3.1 Database Construction

Three types of county-level data were compiled and merged to support the research agenda of this project, yielding a panel of data tracking Tennessee counties over time. First are transportation investment data acquired from TDOT, which includes interstate and state road projects spanning the years 2001 to 2020. Other essential elements include the award amount for each project, start and completion dates, and the county or counties in which the transportation projects were located. Second are measures of private sector county economic activity that are plausibly linked to transportation infrastructure development: employment, income, per capita income, business establishments and population. These will serve as outcome metrics in the analysis that follows. Third are county characteristics that might influence community economic outcomes as well as the efficacy of transportation investments. In regression models that seek to explain variations in private sector outcomes as a function of transportation investments, these variables are essential to avoid creating empirical (i.e., omitted variable) bias.

Both the data on private sector returns and county characteristics span from 2000 to 2018, covering years prior to project start dates through the latest year in which the data was consistently available. In the statistical analysis of rate of return below, road projects extending beyond 2018 had to be excluded since we had not counterpart economic data. Each category of data is discussed in turn in the discussion that follows.

3.2 TDOT Investment Data

The database provided by TDOT includes 395 projects, covering the period 2001 to 2020.[3] Of the total number of projects, 72.2 percent are confined to a single county while the remaining 27.8 percent are multi-county projects. Just 5.3 percent cover three counties and the rest are spread across two counties. Accounting for multiple projects, there are 526 *county-level projects* captured in the data. Across the state, 126 county-level projects are in TDOT Region 1, 105 are in Region 2, 179 are in Region 3 and the remaining 116 fall in Region 4. Ninety-nine (or 25.1 percent) of the projects represent interstate investments and 288 (or 72.9 percent) are state road projects; eight projects are uncategorized.

The average value of an interstate project investment is $17.1 million, with an average start-to-completion date of 2.1 years. The smallest investment was $146.4 thousand and the largest was $109.3 million. The first interstate project in the database had a contract start date in 2006 and the latest project had a contract start date of 2018.

The average value of a state route project is $12.8 million, with an average start-to-completion date of 2.6 years. The smallest project had a value of $132.4 thousand and the largest project

[3] The original database included 397 projects but two of these were incomplete and dropped from the analysis. Maps and other descriptive data in the report include all projects between 2001 and 2020, not just those through 2018.

value was $102.5 million. The first project for which a contract was issued was in 2001 and the last was in 2018.

While projects are spread across the state and across TDOT regions, nine counties saw no transportation dollars between 2001 and 2020 in terms of *new* contracts let within this window of time. (See Appendix Table 1 for a listing of the number of projects by type for all counties.) This includes Bledsoe, Hawkins, Hancock, Scott, Jackson, Crockett, Rhea, Weakley and Dyer Counties. Another 19 counties had a single project and 11 counties had two projects; seventeen counties had 10 or more projects. The top five include Williamson County (20 projects), Knox County (22 projects), Davidson County (23 projects), Fayette County (26 projects) and Shelby County (41 projects). As one would expect, more projects and dollars flow to large and growing counties than to smaller counties. Figures 1-3 show the distribution of total projects, interstate projects and state route projects across Tennessee counties.

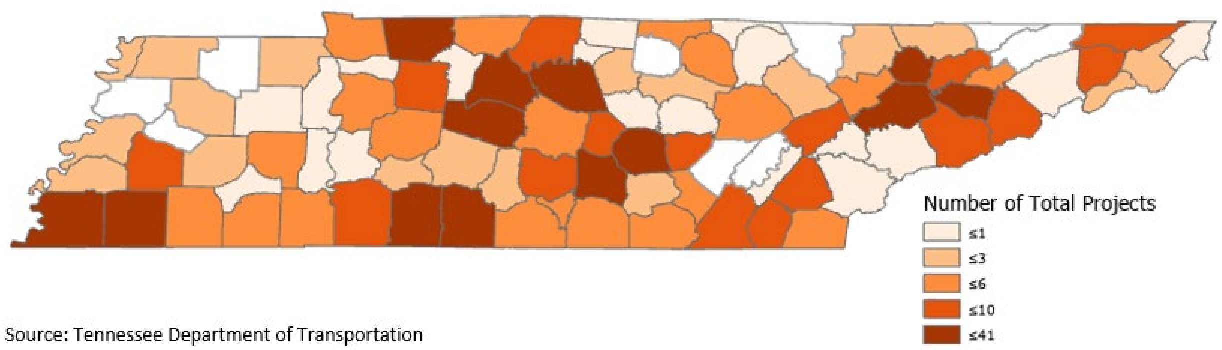

Figure 1 Number of TDOT Projects by County

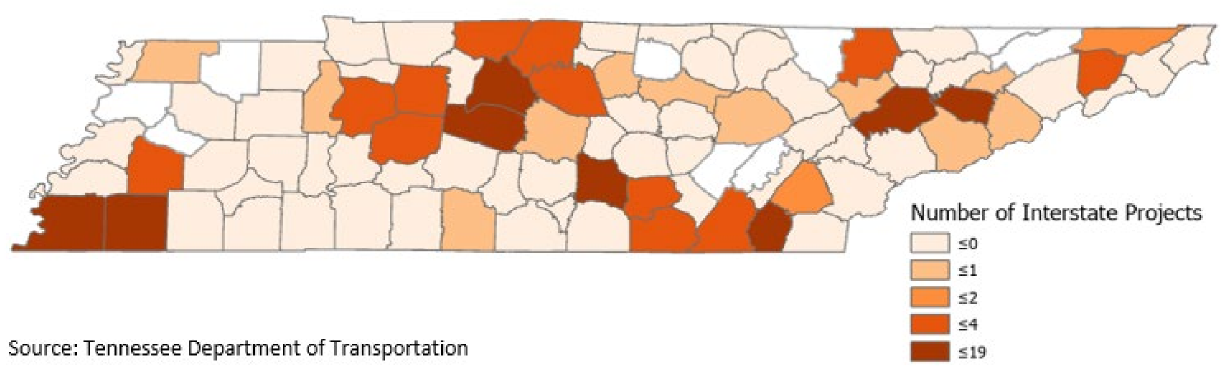

Figure 2 Number of Interstate Projects by County

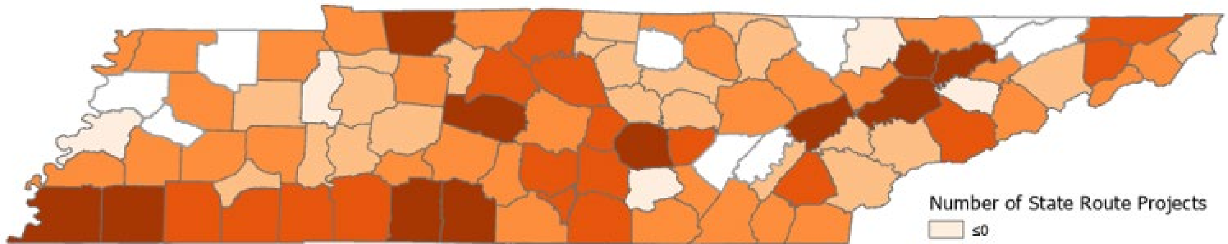

Figure 3 Number of State Route Projects by County

Contract award data are largely consistent with the project count figures across counties. Ten counties had total awards under $10 million, 37 counties had total awards between $10 million and $50 million, 17 counties had awards between $50 million and $100 million and the remaining 22 counties had awards in excess of $100 million. The top county was Shelby ($861.2 million) followed by Davidson ($493.2 million). Appendix Table 2 lists the value of project awards by type (i.e. state route versus interstate) for all counties in Tennessee.

3.3 Measures of County Economic Activity

Five complementary measures of county-level economic activity are included in the database created for this project: nonfarm employment, personal income, per capita personal income, business establishments and population. These measures are used as outcomes to capture the private sector returns to transportation investment in the empirical and descriptive analyses below. Each is plausibly linked to transportation investments since expanded network capacity enables greater mobility and higher levels of economic activity. Nonfarm employment measures the number of jobs in each county based on the situs of employers (as opposed to where people live). Personal income includes all income earned by residents of a county regardless of source and location and accounts for wages and salaries, proprietors' income, rental and dividend income, interest income, "other" income (specific types of fringe benefits) and transfer income. Per capita income is simply personal income divided by population. Business establishments account for the presence of businesses entities across sectors, from retail to manufacturing. Finally, population is included since its growth can be retarded by transportation congestion and facilitated by an expanded transportation network.

Table 1 provides a summary of the data for each county, including data values in 2000 and 2018 and the percent change over the same period of time.[4] The state as a whole saw nonfarm job growth of 12.3 percent between 2000 and 2018, a period that captures a modest recession in 2001 and the Great Recession between 2007 and 2009. It is rather striking that while 42 counties saw job growth between 2000 and 2018, the remaining 53 counties of the state saw county jobs contract. Seven counties experienced job losses that represented more than one

[4] For a more detailed discussion of the data and trends discussed here, see various issues of the *Economic Report to the Governor of the State of Tennessee*, developed by the Boyd Center for Business and Economic Research at the University of Tennessee, available at https://haslam.utk.edu/boyd-center/publications?subject=1137.

third of the jobs base in 2000. On the other hand, many other counties, especially those in middle Tennessee centered around Nashville, saw exceptionally strong job growth.

Statewide business establishments grew by just 5.6 percent between 2000 and 2018. In many sectors, including manufacturing, the number of establishments has actually fallen. Fifty-six counties in Tennessee had fewer business establishments in 2018 than existed in 2000; rural and isolated counties across the state performed the worst. But even some of the state's metropolitan counties performed poorly, including Shelby and Sullivan Counties. Williamson County had the best performance with business establishments growing by a remarkable 66.3 percent; tiny Lake County performed the worst, losing 24.5 percent of its businesses.

Real (i.e., inflation-adjusted) personal income has generally seen decent growth with only one county (Haywood) experiencing a fall in income over the period of this study. Personal income in Williamson County jumped 181.7 percent between 2000 and 2018, far surpassing statewide income growth of 41.0 percent. Per capita income was up at the slower rate of 18.8 percent. Trousdale County is the only county in the state that had per capita income contract (just 0.6 percent). Williamson County led the state with per capita income growth of 55.7 percent.

Tennessee's population stood at 6,770,010 in 2018, reflecting 18.7 percent growth since 2000. Fifteen rural counties suffered population losses while the other counties of the state experienced growth. Growth in middle Tennessee was exceptionally strong. Population projections point to growing population losses in rural Tennessee in the years ahead.[5] This represents the continuation of an ongoing trend of movement to cities and their suburbs.

Together, these various measures capture different facets of county economies across the state. The research question of this study is the extent to which transportation investments have a material effect on these private sector measures of county economic prosperity.

[5] See https://tnsdc.utk.edu/estimates-and-projections/boyd-center-population-projections/.

TABLE I
MEASURES OF ECONOMIC ACTIVITY BY COUNTY, 2000 AND 2018

County	Total Employment			Total Establishments			Personal Income (thousands of 2018 $)			Personal Income per Capita (2018 $)			Population		
	2000	2018	Percent change 2000 to 2018	2000	2018	Percent change 2000 to 2018	2000	2018	Percent change 2000 to 2018	2000	2018	Percent change 2000 to 2018	2000	2018	Percent change 2000 to 2018
Anderson County	39,564	40,846	3.2	1,720	1,545	-10.2	2,653,704	3,200,965	20.6	37,189	41,853	12.5	71,357	76,482	7.2
Bedford County	13,592	14,661	7.9	752	784	4.3	1,271,491	1,827,436	43.7	33,633	37,266	10.8	37,806	49,038	29.7
Benton County	3,527	3,271	-7.3	339	298	-12.1	484,021	544,766	12.6	29,270	33,661	15.0	16,537	16,184	-2.1
Bledsoe County	1,350	815	-39.6	136	113	-16.9	324,345	387,774	19.6	26,178	26,281	0.4	12,390	14,755	19.1
Blount County	38,420	43,205	12.5	2,174	2,336	7.5	3,816,194	5,646,861	48.0	35,937	42,991	19.6	106,193	131,349	23.7
Bradley County	40,128	39,977	-0.4	1,871	1,921	2.7	3,078,899	4,172,873	35.5	34,906	39,099	12.0	88,206	106,727	21.0
Campbell County	7,754	7,491	-3.4	647	597	-7.7	1,070,869	1,344,519	25.6	26,852	33,967	26.5	39,880	39,583	-0.7
Cannon County	1,352	1,732	28.1	168	203	20.8	424,213	522,263	23.1	32,854	36,113	9.9	12,912	14,462	12.0
Carroll County	7,363	5,590	-24.1	531	424	-20.2	917,655	1,005,915	9.6	31,189	35,900	15.1	29,423	28,020	-4.8
Carter County	9,991	9,020	-9.7	743	699	-5.9	1,605,582	1,948,555	21.4	28,272	34,579	22.3	56,789	56,351	-0.8
Cheatham County	6,710	6,857	2.2	524	607	15.8	1,374,492	1,776,583	29.3	38,203	43,932	15.0	35,979	40,439	12.4
Chester County	3,398	3,094	-8.9	244	243	-0.4	468,598	581,205	24.0	30,137	33,642	11.6	15,549	17,276	11.1
Claiborne County	8,123	7,831	-3.6	469	445	-5.1	874,627	1,123,652	28.5	29,223	35,384	21.1	29,930	31,756	6.1
Clay County	1,369	1,138	-16.9	118	111	-5.9	220,563	239,329	8.5	27,682	31,013	12.0	7,968	7,717	-3.2
Cocke County	6,866	5,904	-14.0	511	472	-7.6	899,908	1,142,683	27.0	26,788	31,942	19.2	33,595	35,774	6.5
Coffee County	21,532	19,142	-11.1	1,193	1,226	2.8	1,671,775	2,153,167	28.8	34,666	38,656	11.5	48,224	55,700	15.5
Crockett County	3,164	2,078	-34.3	283	222	-21.6	505,227	523,830	3.7	34,735	36,560	5.3	14,545	14,328	-1.5
Cumberland County	12,271	15,430	25.7	969	1,086	12.1	1,527,269	2,184,825	43.1	32,476	36,613	12.7	47,027	59,673	26.9
Davidson County	398,547	457,334	14.8	18,600	19,981	7.4	29,801,130	45,752,132	53.5	52,243	66,060	26.4	570,439	692,587	21.4
Decatur County	3,354	3,064	-8.6	257	218	-15.2	355,388	499,132	40.4	30,408	42,639	40.2	11,687	11,706	0.2
DeKalb County	5,136	4,679	-8.9	308	300	-2.6	521,178	808,169	55.1	29,879	40,132	34.3	17,443	20,138	15.5
Dickson County	13,404	14,200	5.9	886	974	9.9	1,526,066	2,167,581	42.0	35,193	40,556	15.2	43,362	53,446	23.3
Dyer County	15,110	12,782	-15.4	951	788	-17.1	1,264,196	1,516,758	20.0	33,870	40,642	20.0	37,325	37,320	0.0
Fayette County	4,212	6,932	64.6	446	615	37.9	1,129,744	2,242,636	98.5	38,846	55,364	42.5	29,083	40,507	39.3
Fentress County	3,108	3,840	23.6	286	265	-7.3	482,325	587,178	21.7	29,003	32,232	11.1	16,630	18,217	9.5
Franklin County	8,208	11,891	44.9	673	706	4.9	1,228,357	1,628,684	32.6	31,257	38,880	24.4	39,298	41,890	6.6
Gibson County	16,428	11,241	-31.6	1,079	926	-14.2	1,584,465	1,895,809	19.6	32,924	38,654	17.4	48,125	49,045	1.9
Giles County	9,639	9,146	-5.1	574	527	-8.2	1,003,601	1,143,709	14.0	34,067	38,766	13.8	29,460	29,503	0.1
Grainger County	2,910	2,602	-10.6	246	234	-4.9	593,337	775,121	30.6	28,729	33,490	16.6	20,653	23,145	12.1
Greene County	23,037	23,908	3.8	1,198	1,126	-6.0	2,168,788	2,761,451	27.3	34,381	39,971	16.3	63,081	69,087	9.5
Grundy County	1,507	1,231	-18.3	188	153	-18.6	381,891	413,872	8.4	26,694	31,011	16.2	14,306	13,346	-6.7
Hamblen County	32,387	28,981	-10.5	1,404	1,300	-7.4	1,971,151	2,365,532	20.0	33,851	36,636	8.2	58,230	64,569	10.9
Hamilton County	174,770	192,101	9.9	8,846	9,053	2.3	13,895,203	18,849,184	35.7	45,034	51,743	14.9	308,547	364,286	18.1
Hancock County	621	447	-28.0	64	55	-14.1	143,519	177,098	23.4	21,149	27,042	27.9	6,786	6,549	-3.5
Hardeman County	6,553	5,708	-12.9	422	339	-19.7	698,032	742,228	6.3	24,821	29,430	18.6	28,124	25,220	-10.3
Hardin County	6,412	7,608	18.7	521	491	-5.8	799,257	1,015,237	27.0	31,256	39,387	26.0	25,571	25,776	0.8
Hawkins County	12,095	10,919	-9.7	630	608	-3.5	1,624,905	1,932,663	18.9	30,276	34,188	12.9	53,669	56,530	5.3

Haywood County	4,539	4,836	6.5	381	313	-17.8	601,200	555,125	-7.7	30,357	32,023	5.5	19,804	17,335	-12.5
Henderson County	8,067	6,399	-20.7	529	506	-4.3	825,751	995,462	20.6	32,262	35,748	10.8	25,595	27,847	8.8
Henry County	10,272	8,913	-13.2	747	709	-5.1	1,037,585	1,358,694	30.9	33,329	41,989	26.0	31,131	32,358	3.9
Hickman County	2,338	2,488	6.4	307	293	-4.6	578,517	821,576	42.0	25,749	32,780	27.3	22,467	25,063	11.6
Houston County	1,091	1,004	-8.0	110	102	-7.3	225,778	271,209	20.1	28,166	32,822	16.5	8,016	8,263	3.1
Humphreys County	4,675	4,458	-4.6	320	319	-0.3	581,604	714,756	22.9	32,456	38,665	19.1	17,920	18,486	3.2
Jackson County	1,603	884	-44.9	109	107	-1.8	302,429	366,717	21.3	27,371	31,189	13.9	11,049	11,758	6.4
Jefferson County	10,636	11,598	9.0	649	726	11.9	1,407,645	1,937,197	37.6	31,585	35,866	13.6	44,566	54,012	21.2
Johnson County	2,658	3,285	23.6	245	230	-6.1	396,816	573,328	44.5	22,614	32,249	42.6	17,547	17,778	1.3
Knox County	187,198	220,940	18.0	11,174	11,572	3.6	16,653,602	23,142,740	39.0	43,495	49,738	14.4	382,887	465,289	21.5
Lake County	682	653	-4.3	94	71	-24.5	156,898	172,160	9.7	19,753	23,230	17.6	7,943	7,411	-6.7
Lauderdale County	6,656	4,633	-30.4	389	298	-23.4	719,000	753,762	4.8	26,524	29,187	10.0	27,108	25,825	-4.7
Lawrence County	11,851	8,396	-29.2	800	738	-7.8	1,219,931	1,541,698	26.4	30,544	35,252	15.4	39,940	43,734	9.5
Lewis County	2,039	2,251	10.4	215	210	-2.3	302,056	416,143	37.8	26,484	34,432	30.0	11,405	12,086	6.0
Lincoln County	7,282	8,503	16.8	637	579	-9.1	1,013,339	1,412,046	39.3	32,291	41,388	28.2	31,381	34,117	8.7
Loudon County	10,362	13,547	30.7	743	927	24.8	1,469,479	2,572,634	75.1	37,460	48,491	29.4	39,228	53,054	35.2
McMinn County	17,189	16,827	-2.1	939	897	-4.5	1,501,957	1,912,780	27.4	30,560	35,897	17.5	49,148	53,285	8.4
McNairy County	9,209	4,714	-48.8	453	404	-10.8	793,995	841,426	6.0	32,170	32,573	1.3	24,681	25,832	4.7
Macon County	4,075	3,661	-10.2	308	312	1.3	634,967	807,948	27.2	31,017	33,297	7.4	20,472	24,265	18.5
Madison County	53,253	53,356	0.2	2,621	2,509	-4.3	3,546,457	4,169,688	17.6	38,528	42,720	10.9	92,048	97,605	6.0
Marion County	5,395	6,217	15.2	434	435	0.2	886,115	1,098,700	24.0	31,934	38,450	20.4	27,749	28,575	3.0
Marshall County	11,510	8,353	-27.4	499	495	-0.8	952,731	1,264,812	32.8	35,466	37,550	5.9	26,863	33,683	25.4
Maury County	30,012	30,521	1.7	1,500	1,821	21.4	2,740,677	4,027,977	47.0	39,349	42,696	8.5	69,651	94,340	35.4
Meigs County	1,436	1,661	15.7	94	102	8.5	294,680	412,567	40.0	26,569	33,526	26.2	11,091	12,306	11.0
Monroe County	12,038	12,302	2.2	657	723	10.0	1,019,932	1,545,436	51.5	26,066	33,338	27.9	39,130	46,357	18.5
Montgomery County	33,511	45,920	37.0	2,243	2,961	32.0	4,978,836	8,450,339	69.7	36,734	41,031	11.7	135,536	205,950	52.0
Moore County	745	1,090	46.3	58	77	32.8	176,872	264,618	49.6	30,878	41,276	33.7	5,728	6,411	11.9
Morgan County	1,860	1,338	-28.1	168	159	-5.4	508,518	633,992	24.7	25,681	29,380	14.4	19,801	21,579	9.0
Obion County	14,988	8,625	-42.5	753	631	-16.2	1,209,080	1,230,831	1.8	37,195	40,666	9.3	32,507	30,267	-6.9
Overton County	3,577	3,839	7.3	301	330	9.6	549,284	743,704	35.4	27,203	33,701	23.9	20,192	22,068	9.3
Perry County	2,785	1,754	-37.0	113	109	-3.5	244,003	276,336	13.3	32,050	34,268	6.9	7,613	8,064	5.9
Pickett County	1,078	799	-25.9	78	78	0.0	128,000	201,682	57.6	25,948	39,686	52.9	4,933	5,082	3.0
Polk County	2,034	1,348	-33.7	260	224	-13.8	481,049	570,682	18.6	29,819	33,772	13.3	16,132	16,898	4.7
Putnam County	28,229	31,203	10.5	1,716	1,840	7.2	2,128,008	3,115,009	46.4	34,055	39,509	16.0	62,487	78,843	26.2
Rhea County	8,533	8,676	1.7	487	497	2.1	834,747	1,128,368	35.2	29,363	34,147	16.3	28,428	33,044	16.2
Roane County	8,389	8,952	6.7	712	735	3.2	1,733,206	2,177,677	25.6	33,358	40,980	22.8	51,957	53,140	2.3
Robertson County	13,898	20,325	46.2	964	1,191	23.5	2,089,267	2,989,874	43.1	38,128	42,104	10.4	54,795	71,012	29.6
Rutherford County	71,694	114,621	59.9	3,450	5,417	57.0	7,264,935	13,330,633	83.5	39,569	41,031	3.7	183,600	324,890	77.0

TABLE I, CONTINUED

Scott County	6,030	3,865	-35.9	346	328	-5.2	535,414	655,828	22.5	25,292	29,758	17.7	21,170	22,039	4.1
Sequatchie County	2,400	1,981	-17.5	168	188	11.9	332,593	565,340	70.0	29,386	38,003	29.3	11,318	14,876	31.4
Sevier County	27,639	42,108	52.3	2,523	2,802	11.1	2,417,388	3,864,190	59.8	33,679	39,474	17.2	71,776	97,892	36.4
Shelby County	477,299	438,508	-8.1	21,343	19,478	-8.7	41,455,636	46,287,828	11.7	46,153	49,465	7.2	898,211	935,764	4.2
Smith County	4,925	4,180	-15.1	306	270	-11.8	579,061	752,641	30.0	32,561	37,742	15.9	17,784	19,942	12.1
Stewart County	1,165	1,432	22.9	146	153	4.8	358,487	540,440	50.8	28,807	39,853	38.3	12,444	13,561	9.0
Sullivan County	64,386	63,829	-0.9	3,643	3,337	-8.4	5,577,867	6,717,573	20.4	36,457	42,606	16.9	152,995	157,668	3.1
Sumner County	35,077	48,105	37.1	2,545	3,274	28.6	5,296,546	9,106,005	71.9	40,368	48,656	20.5	131,207	187,149	42.6
Tipton County	9,709	9,594	-1.2	736	705	-4.2	1,771,464	2,373,768	34.0	34,346	38,547	12.2	51,577	61,581	19.4
Trousdale County	1,233	1,448	17.4	120	111	-7.5	223,965	331,348	47.9	30,286	30,090	-0.6	7,395	11,012	48.9
Unicoi County	3,733	3,714	-0.5	259	236	-8.9	573,589	664,676	15.9	32,432	37,423	15.4	17,686	17,761	0.4
Union County	2,061	1,844	-10.5	189	204	7.9	466,689	623,971	33.7	26,085	31,693	21.5	17,891	19,688	10.0
Van Buren County	655	454	-30.7	50	44	-12.0	154,372	177,387	14.9	28,032	30,770	9.8	5,507	5,765	4.7
Warren County	13,839	10,560	-23.7	776	723	-6.8	1,182,124	1,388,611	17.5	30,808	33,970	10.3	38,371	40,878	6.5
Washington County	51,649	52,669	2.0	2,748	2,880	4.8	3,789,387	5,568,591	47.0	35,260	43,299	22.8	107,469	128,607	19.7
Wayne County	2,889	2,770	-4.1	247	206	-16.6	377,540	479,547	27.0	22,447	28,962	29.0	16,819	16,558	-1.6
Weakley County	9,933	7,777	-21.7	647	557	-13.9	1,071,932	1,246,898	16.3	30,691	37,316	21.6	34,927	33,415	-4.3
White County	6,829	5,574	-18.4	406	410	1.0	650,568	880,353	35.3	28,090	32,477	15.6	23,160	27,107	17.0
Williamson County	69,912	129,892	85.8	4,362	7,254	66.3	7,805,529	21,984,700	181.7	60,918	94,872	55.7	128,134	231,729	80.8
Wilson County	26,581	41,574	56.4	2,043	2,752	34.7	4,007,931	6,903,539	72.2	44,922	49,092	9.3	89,220	140,625	57.6
Tennessee	**2,390,322**	**2,683,214**	**12.3**	**130,876**	**138,269**	**5.6**	**225,178,992**	**317,514,944**	**41.0**	**39,479**	**46,900**	**18.8**	**5,703,719**	**6,770,010**	**18.7**

Source: Employment and establishment data is from the U.S. Census Bureau, County Business Patterns. Personal income and per capita personal income were obtained from the U.S. Department of Commerce, Bureau of Economic Analysis. Population estimates stem from the U.S. Census Bureau, Population Estimates Program.

3.4 County Characteristics

The third set of data collected for this project capture an array of community characteristics. Most of these data are intended to control for factors other than transportation infrastructure which might affect regional economic growth. One example is the educational attainment of the adult population. In general, one would expect counties that have better educated populations to enjoy greater economic prosperity. Better educated people can enhance the performance of the local labor market and typically earn higher incomes than other people. In the regression models that are estimated below, we use educational attainment and other local data to control for various factors that affect a community's growth trajectory. The primary goal is to ensure that we can isolate the *independent* effect of transportation investment spending on local economic growth.

Other community data include population density; percent of the adult population that is female, shares of the adult population that are White, Black and Hispanic; county poverty rate; percent of the adult population with a bachelor's degree; unemployment rate; education spending per pupil; and manufacturing employment. Appendix Tables 3 and 4 provide descriptive data for these community characteristics. The role that these factors play in affecting the private sector outcome measures (e.g., business establishments and employment) is discussed in the empirical section below.

Finally, data have been gathered that provide a county-level characterization of driving and commuting patterns. Included is the percent of individuals who drive alone, percent that carpool, percent using public transportation, percent that walked to work, percent that used other means to commute, percent that worked at home, mean travel time to work, percent of county residents that work in the county, percent of county residents that work in another county and percent of county residents who work in another state. These data are summarized in Appendix Tables 5 and 6. The use of these data in the descriptive and statistical models will be discussed in turn below.

Chapter 4 **Results and Discussion**

4.1 A Descriptive Assessment of High Return and Low Return Project Investments

In a unique opportunity to examine the returns to completed projects, this section uses ex-post, descriptive methods to identify which county-level factors are associated with low or high ROI projects. The transportation investment data are identical to the aforementioned TDOT data that includes interstate and state road projects, going back to 2001. Other details include the award amount for each project, start and completion dates, and the county or counties in which the transportation projects were located. The project data are merged with county-level variables including measures of economic returns (i.e., employment, business establishments, personal income, personal income per capita, and population) and factors that may impact returns to investments. *To calculate the ROI for each project, the difference in economic activity after and before construction is divided by the investment dollars for each project.* For example, this would be the change in employment after project completion relative to the project start date, divided by the cost of the transportation project. (As noted above, projects in 2018 and beyond are omitted from this analysis as 2018 was the last available year in which county-level data were consistently available and measures of economic activity after project completion are essential in calculating the return on investment.)

For each private sector economic outcome, transportation projects are ranked to identify projects with high and low ROIs. Appendix Tables 7 through 11 show the detailed data for projects in the top and bottom 20 for each measure of ROI. Analysis of this project-level data reveals that projects in Knox and Davidson County are often in the top twenty lists, especially for returns to employment, business establishments, and personal income. Projects in Shelby County are often in the bottom twenty projects for ROI, although some projects in Davidson, Knox, Hamilton, and other counties also appear in the bottom list. Projects with the lowest returns tend to be in counties where economic outcomes have actually deteriorated over time (e.g., employment within a county decreases or the number of business establishments declines). Shelby County, for example, has had the largest number of TDOT projects, but Shelby County has also experienced more or larger declines in economic outcomes from year to year, compared to Davidson and Knox County.

Appendix Tables 7 through 11 also demonstrate how several projects that are in the bottom or top lists are multi-county projects, but only a single county experiences a significantly larger or smaller ROI. This suggests that there are many factors in addition to transportation dollars that might affect trends in the economic outcome variables. Given this challenge in isolating the impact of transportation investments on measures of activity, we supplement this descriptive analysis with an econometric analysis of the returns to investments, which is discussed in detail below. However, identifying associations between county characteristics and either high or low ROI is still informative.

Table 2 reveals some of these associations by comparing the average of county variables for projects in the bottom versus top 20 for ROI. For example, when looking across the returns to the various measures of economic activity, including employment, business establishments, personal income, personal income per capita, and population, a county being metropolitan or next to a metropolitan county does not seem to impact whether a project has a low or high ROI. In fact, most projects in the top and bottom lists and overall are in metropolitan areas. Similarly, mean travel time to work and the percent of workers who work from home seem to be consistent across projects with high and smaller returns to investment.

Table 2 also displays instances where there is a positive or negative association between a county-level variable and whether a project has a high or low ROI. For example, a higher share of manufacturing employment is associated with lower ROI projects, especially for returns to employment, business establishments, and population. Places with lower bachelor degree attainment rates, higher unemployment rates, and higher poverty rates are associated with low ROI projects, across all the different measures of ROI. For instance, when examining returns to employment, projects in the bottom 20 have an average county poverty rate of 19.3 while the average county poverty rate for projects in the top 20 is 14.3. Likewise, the average county bachelor's attainment rate is 28.5 for projects with the lowest returns to employment while the average bachelor's attainment rate is 33.0 for projects with the highest returns to employment. These variables are closely correlated with metropolitan and nonmetropolitan status; metropolitan counties tend to have higher levels of educational attainment, lower unemployment rates and lower poverty rates than nonmetropolitan counties. Descriptive analysis alone cannot disentangle these effects.

TABLE II

AVERAGE OF COUNTY VARIABLES FOR LOW AND HIGH ROI PROJECTS USING FIVE METRICS FOR ROI

Variables	Employment ROI		Establishments ROI		Personal Income ROI		Personal Income per Capita ROI		Population ROI	
	Bottom 20	Top 20	Bottom 20	Top 20	Bottom 20	Top 20	Bottom 20	Top 20	Bottom 20	Top 20
Award (Nominal $)	4,084,107	1,826,865	3,348,212	1,342,621	5,581,656	1,391,313	5,043,911	894,919	5,687,894	1,434,439
Metropolitan County	1.0	1.0	0.9	1.0	1.0	1.0	0.8	0.8	0.4	1.0
Adjacent to Metropolitan County	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Population Density (per Square Mile)	1,028.9	858.0	971.6	753.1	1,016.9	800.3	782.8	510.6	275.7	843.6
Poverty Rate	19.3	14.3	19.4	13.9	19.5	14.4	18.7	15.6	21.6	14.2
Manufacturing Employment Share	8.3	6.5	9.2	7.8	8.7	8.1	15.0	16.0	22.0	7.4
Percent with at least a Bachelor's Degree	28.5	33.0	26.7	32.2	25.7	32.9	23.6	26.5	16.1	33.2
Unemployment Rate	8.8	4.1	8.7	4.1	8.4	4.2	8.2	5.4	8.1	4.5
Elementary-Secondary Current Spending per Student (2018 $)	10,055	9,548	9,849	9,341	9,970	9,463	9,616	9,466	9,360	9,496
Percent Drove Alone	82.1	82.2	82.7	82.8	82.9	82.6	83.6	82.3	85.5	82.5
Percent Worked at Home	3.0	4.2	3.0	4.2	2.6	4.2	2.6	4.3	2.6	4.1
Mean Travel Time (minutes)	22.5	22.9	22.8	23.3	22.6	23.0	23.3	25.4	25.2	22.7
Percent Work in County	87.7	81.3	85.4	78.1	88.0	79.5	78.9	68.5	64.3	81.8
Percent Work Outside County	8.6	17.5	11.2	20.5	7.0	18.9	17.6	29.4	29.3	16.7
Percent Work Out of State	3.7	1.3	3.5	1.4	5.0	1.6	3.5	2.1	6.3	1.4

Source: Awards are from the Tennessee Department of Transportation. Population estimates are from the U.S. Census Bureau, Population Estimates Program. Poverty rates are from the U.S. Census Bureau, Small Area Income and Poverty Estimates (SAIPE). Manufacturing employment is from the U.S. Census, County Business Patterns. Unemployment rates were obtained from the U.S. Bureau of Labor Statistics. Current spending for all elementary-secondary school systems was obtained from the U.S. Census Bureau, Annual Survey of School System Finances and is aggregated for counties. Educational attainment and commuting patterns are from the U.S. Census (2000) and the American Community Survey 5-year Estimates (2009-2018), and linear interpolation was used to calculate values between 2001 and 2008.

Notes: The table lists the average of county variables for the top 20 and bottom 20 projects according to ROI, which was calculated using five different metrics (employment, establishments, personal income, personal income per capita, and population). Metropolitan county is equal to one for metropolitan counties and zero otherwise. Adjacent to metropolitan county is equal to one for metropolitan counties or counties adjacent to a metropolitan county and zero otherwise.

Table 2 also demonstrates how low ROI projects have higher average awards compared to high ROI projects. Across the different measures of ROI, average transportation awards are 2.2 to 5.6 times larger for projects in the bottom versus top 20. This finding could simply reflect the way in which ROI is calculated, with investment dollars in the denominator. It is also possible that smaller projects are more targeted to alleviating bottlenecks that constrain growth, while larger projects require a longer post-completion window of time to realize benefits. Regression analysis will help us clarify how investments impact the economy by controlling for the broader set of factors influencing local economic growth.

4.2 Econometric Analysis: Panel Vector Autoregressive (VAR)

The discussion immediately above focused solely on *associations* between TDOT investments and economic outcomes. Here we follow the work of Granger (1969) and seek to establish *Granger causality* between infrastructure investments and various outcome measures of private sector economic activity. In the regression models, we do not use ROI as calculated above. Instead, TDOT investments are used as an explanatory variable to determine whether or not they affect economic outcomes. While the discussion below includes many technical details to document our approach, we draw out the implications of the econometric modeling as possible using basic logic and intuition.

Granger causality is explored using a panel vector autoregressive (VAR) model in which outcomes are expressed in terms of their own lags (i.e., economic outcomes in previous years) and lags of other variables (i.e., infrastructure investments). Granger causality is typically used to test whether there is a causal relationship between two time series variables. That is the spirit of this analysis where it is assumed that over time transportation investments affect economic outcomes like employment. As discussed elsewhere in this report, we rely on this approach to deal with the fact that transportation investments are simultaneously determined with the private sector economic outcomes of interest (i.e., economic outcomes are not exogenous).

The panel data used for the VAR analysis is identical to the data used for the descriptive analysis. Total award dollars for TDOT projects are distributed evenly across construction years in order to create a panel of annual infrastructure spending by county that spans from 2001 to 2018, the latter being the most recent year in which all control variables were available. (See below for a discussion of an alternative treatment of the investment data.) This data is merged with measures of local economic growth including total employment, the total number of business establishments in a county, total personal income, per capita personal income, and county population. Note that this approach does not rely on individual project data but project data aggregated to the county level.

The VAR method requires that the time series for each variable is stationary. From a practical perspective, time series for investment and private sector outcomes variables are considered stationary if statistical properties such as the mean are constant over time. Alternatively, a time series can be considered trend-stationary if it has a stable, long-run trend, and the time series reverts back to the trend after experiencing economic shocks, or events that impact measures of economic performance. It is common to transform variables by either using the difference in outcomes between years or taking the log of variables to ensure stationarity. The importance of addressing these issues is to ensure that the estimated VAR models are not simply picking up a common trend among the variables of interest that may not in fact reflect causality.

Test results indicate that annual total awards by county are stationary. However, various test statistics reveal that economic outcomes are not stationary, but the time series for these variables register as stationary when a logarithmic transformation is used.[6] Therefore, all economic outcomes are expressed in logs in the VAR model, and total infrastructure spending by county is expressed in levels or total dollars (i.e., not transformed or logged). An exception is total personal income and per capita personal income, both of which exhibit some inconsistencies in registering as stationary across various test statistics even after taking the log of these variables. We discuss implications of results for these two outcomes further below.

To examine how infrastructure investments Granger cause changes in economic outcomes, the following specification is used for regressions

$$E_{it} = \beta_0 + \sum_{m=1}^{k} \delta_m E_{i,t-m} + \sum_{m=1}^{k} \beta_m I_{i,t-m} + \alpha_t + \rho_i + \varepsilon_{it} \qquad \text{Eq. 1}$$

The economic outcome variables—employment, establishments, personal income, per capita personal income, and population—are represented on the left-hand side of this equation by E_{it} for county i in year t. In words, the regression models seek to explain variations in these outcomes across counties and time by variations in transportation investments across counties and time (the term $I_{i,t-m}$). It is in this sense that we seek to isolate the way in which transportation investments have a causal impact on the various economic outcomes. Annual lags of these variables are represented by $E_{i,t-m}$, and annual lags of infrastructure awards are represented by $I_{i,t-m}$. Lags are important statistically and intuitively: it takes time for a measure like employment to fully respond to changes in local transportation investments.

County *fixed* effects are accounted for with the term ρ_i, and control for characteristics of counties that do not change over time (i.e., time-invariant county characteristics). This is a common and convenient way to account for a range of factors that might uniquely affect individual counties.[7] Lastly, *time fixed effects*, which control for common or general time trends that impact all counties, are accounted for by the term α_t. Everything else the same, different years might produce unique behaviors—e.g., a recession year versus a boom year or a year with COVID-19 or a year without the pandemic. Essentially, measures of economic growth such as total employment for a county, are being modeled as a function of previous levels of

[6] To formally test whether the economic variables explored are stationary or non-stationary, an Augmented Dickey Fuller test was performed on all of the outcomes of interest in addition to annual infrastructure spending by county.

[7] Fixed effects cannot generally be used in panel data models due to the lack of intertemporal variation. This has implications for this study. For example, railroad networks might be highly complementary to some TDOT investments and in principle should be included in the empirical analysis. But since the vast majority of county-level rail networks do not change over time, especially for the window of time covered here, they cannot be included in the modeling. The same would be true of a range of other factors like Tennessee's grand divisions, county geographic area and proximity to another state border, all of which might benefit interstate commerce and commuting.

employment in the county, previous infrastructure spending in the county, and time and county fixed effects. Other factors that might affect economic outcomes are discussed below.

Statistical tests were performed to determine how many lags to include in the regression models.[8] Results indicate that three lags are optimal for the economic outcomes and infrastructure spending (i.e., $k = 3$ in Equation 1). However, we also examine the sensitivity of results to other lag lengths, and results are consistent when using one, two, or three lags of the variables (i.e., using only the previous year, two previous years, or three previous years of data to model the relationship between economic outcomes and infrastructure investments).

Equation 1 was estimated separately for the following outcomes for Tennessee counties using annual data for each county: total number of employees, total number of business establishments, total personal income, per capita personal income, and county population. *Estimation results indicate that generally individual lagged, annual values of infrastructure spending do not have a statistically significant impact on economic outcomes.* In other words, transportation awards in the previous year did not significantly affect the various measures of economic growth in the current year. Likewise, infrastructure spending two years ago (and three years ago) did not significantly impact current economic outcomes.

While spending in *individual* years may not affect outcomes, it is possible that there is a significant impact from the accumulation of spending across years. This makes intuitive sense since economic activity may not show a response until all of a project has been completed. To assess whether the accumulation of award dollars in previous years jointly impacted these outcomes, the net impact of three individual years of lagged award dollars on the outcomes of interest is calculated. (Note that we are not summing all investments over three years but are using the coefficients from each of the three lags to determine if together the three years of spending has an impact.) Results are presented below for each outcome in Table 3.

TABLE III

BASELINE VAR RESULTS USING EQUATION 1

	(1) Employment	(2) Establishments	(3) Personal Income	(4) Per Capita Personal Income	(5) Population
Lagged Infrastructure Spending	3.01e-10	6.85e-11	2.61e-10***	2.31e-10**	-1.56e-11
	(2.75e-10)	(1.38e-10)	(9.40e-11)	(9.24e-11)	(3.78e-11)
Lagged Economic Outcomes	0.754***	0.781***	0.893***	0.769***	0.968***
	(0.018)	(0.016)	(0.011)	(0.016)	(0.006)
F-test	0.748	0.915	0.042	0.071	0.923
Observations	1,499	1,520	1,520	1,520	1,520

Notes: The table lists the net impact of three years of lagged infrastructure spending on the following economic outcomes: total employment (Column 1), total establishments (Column 2), personal income (Column 3), per capita personal income (Column 4), and population (Column 5). Also shown is the net impact of three years of lagged economic outcomes on each economic outcome. The F-test lists the p-value from the joint hypothesis that all lagged values of infrastructure spending jointy equal zero. All results are from estimating Equation 1 separately for each economic outcome. Standard errors are in parentheses under each coefficient. *** p<0.01, ** p<0.05, * p<0.10

[8] Model fit statistics including the Akaike information criterion (AIC) and Bayesian information criterion (BIC) are used to determine the optimal number of annual lags of variables.

Table 3 lists the coefficient for the net impact of award dollars on each outcome, and standard errors are listed in parentheses under each coefficient. Also listed is the net impact of lagged values of each economic variable, which consistently registers as significantly impacting current values of each economic variable. For example, total employment in the three years prior significantly affects the current level of employment. This implies inertia in employment growth which makes sense. The same is true of the other economic variables.

In examining the impact of infrastructure spending, the cumulative impact of annual award dollars does not significantly impact total employment, the number of establishments, or population. However, investment across the three lag years does affect both personal income and per capita income.[9] If infrastructure spending in the previous three years increases by $1, then total personal income increases by 2.61e-08 percent. A more convenient and consistent interpretation is that if previous infrastructure spending increases by $1 million, then total personal income increases by 0.026 percent. For perspective, the average total personal income across all counties and years is about $2.77 billion (in 2018 dollars), and .0261 percent corresponds to roughly $722,970 in total personal income. This demonstrates that while infrastructure spending may significantly impact personal income and per capita personal income from a statistical perspective, estimated coefficients and thus economic returns are relatively small. It should be noted that alternative models have produced somewhat different findings. A common theme, however, is small-to-insignificant impacts of transportation dollars on private sector outcomes.

The coefficients for the net impact of lagged economic outcomes are interpreted differently than lagged infrastructure since all economic variables are expressed in logs while transportation awards are expressed in levels, i.e. dollars. For example, baseline results suggest that if previous employment increases by one percent, then current employment is expected to increase by 0.75 percent.

4.3 Reverse Causality

As noted in the literature review and elsewhere above, there is the possibility that transportation investments and economic outcomes are simultaneous, i.e., jointly determined. This raises the issue of *reverse* causality. While infrastructure investment may impact economic outcomes such as employment, the opposite may be true as well. In other words, growth in employment may affect the need for and the decision to invest in infrastructure within a county or region. Failure to account for this possibility raises the risk of inappropriately attributing job growth to infrastructure spending.

The possibility of reverse causality is examined by estimating the following equation. While similar to Equation 1, it regresses annual award dollars (instead of economic outcomes) on

[9] Included in Table 3 is the p-value for the joint F-test for infrastructure spending, which tests the joint hypothesis that $\beta_1 = \beta_2 = \beta_3 = 0$ from Equation 1. These results were consistent with the significance of the net impact of award dollars in that the p-values were greater than .10 for total employment, establishments, and population, which implies that previous annual infrastructure spending is not jointly impacting these outcomes. P-values for total personal income and per capita personal income are significant at the five and ten percent level, but again, estimates of the net impact are modest.

lagged values of award dollars and lagged values of economic outcomes. In other words, we reverse the possible path of causality so the economic outcomes may be the drivers of infrastructure investment rather than the other way around:

$$I_{it} = \gamma_0 + \sum_{m=1}^{k} \pi_m E_{i,t-m} + \sum_{m=1}^{k} \gamma_m I_{i,t-m} + \alpha_t + \rho_i + \varepsilon_{it} \qquad \text{Eq. 2}$$

Similar to Equation 1, Equation 2 is estimated using available data, and the net impact of annual lags of economic outcomes (e.g., employment, personal income, etc.) on infrastructure spending is computed. Results indicate that the net impact of employment, the number of establishments, and population do not significantly impact annual infrastructure spending.[10] This is somewhat comforting from an econometric perspective since it diminishes the risk of simultaneity bias. But it does seem somewhat odd that these measures do not affect transportation investment decisions. One possible explanation is that the planning horizon for TDOT investment decision making is lengthy and not tied to *recent* economic conditions. On the other hand, results indicate that reverse causality may be possible for total personal income and per capita personal income, implying that these economic measures may significantly affect changes in infrastructure spending. This raises the threat of simultaneity bias in the empirical results, something that cannot be formally addressed with existing data.

4.4 Robustness Checks

To examine the robustness of the results while at the same time considering other important issues that might influence the findings, the baseline specification shown in Equation 1 is altered in a number of different ways. In general, these extensions do not alter the core finding that there is little evidence of a connection between transportation investments and local economic returns.

Spatial Effects. First, we examine the possibility that transportation investments in one county have spillover impacts on economic outcomes in other counties. Spatial effects are potentially very important as they capture the network impact of investments in places other than where the spending actually takes place. Estimating these impacts requires that a *spatial weight matrix* be added to the baseline VAR model in Equation 1. There are many different ways of specifying spillover effects in the empirical models. We take two different and complementary approaches that are both intuitive. First, spatial effects are measured by assuming that infrastructure spillover impacts are confined to adjacent counties. This means that the extended model accounts for how one county's infrastructure spending potentially affects economic outcomes in adjacent counties. The second approach assumes that spillovers occur across all counties across the state network. The distance between a county and all other counties within Tennessee is used to weight infrastructure spending in other counties. This distance-weighted approach means that a county's infrastructure investment has a smaller and smaller impact on

[10] A joint F-test is performed for the measures of economic growth, which tests whether the economic variables are jointly different from zero (i.e., $\pi_1 = \pi_2 = \pi_3 = 0$ from Equation 2).

economic outcomes the further away other counties are.[11] For example, highway expansion in Davidson County has a greater impact on travelers in Williamson County than Hamilton County.

For both measures of spillover effects, *individual* years of lagged infrastructure spending in other counties generally did not significantly impact economic outcomes in a county. The *accumulation* of infrastructure spending in other counties generally did not affect employment or population either. However, the number of business establishments, personal income, and per capita personal income are significantly and positively impacted by transportation awards in other counties. For example, if the net-of-infrastructure spending in *adjacent* counties increases by $1 million (over the past three years), then the number of establishments in a county increases by .022 percent. If infrastructure spending in *all Tennessee counties* (weighted by distance) increases by $1 million (over the past three years), then the number of establishments in a county increases by 9.45 percent. For perspective, the average number of establishments across counties and time is 1,397, and .022 and 9.45 percent represent less than one establishment and 132 establishments, respectively. Below we discuss the sensitivity of the baseline results to including these spillover effects.

Community Characteristics that May Affect Economic Outcomes. Another modeling consideration is other factors that could influence county-level economic outcomes and economic development. Failure to account for these factors may lead to bias in the findings. Equation 1 is modified to include the addition of county-level variables that change over time that might affect county economic conditions; county fixed effects control for county characteristics that do not change over time and are already included in the baseline model. Specifically, the additional control variables include the percent of the population that is female, percent white, percent Hispanic, the poverty rate, educational attainment (i.e., percent of the population that holds a bachelor's degree or higher award), the unemployment rate, and K-12 education spending per pupil for public school districts within the county. These controls capture characteristics of a county that reflect the size and quality of the local labor force, which in turn impacts economic growth. For example, places with a well-educated workforce tend to enjoy stronger economic growth than other places.

Table 4 shows results for these additional items. Column 1 lists baseline results, which are identical to those shown in Table 3 and were estimated using Equation 1. Columns 2 and 3 show results when spatial impacts are added to Equation 1 to account for the possibility of spillover effects. Column 2 accounts for infrastructure spending in surrounding counties using indicators equal to one for adjacent counties. Column 3 uses the distance measure that accounts for infrastructure investments in all other counties in Tennessee. Column 4 does not include spatial effects, but adds county-level controls (e.g., characteristics of the labor force and education spending) to Equation 1. Lastly Column 5 shows results when both the spatial weights that use the distance measure of spillovers and county-level controls are added to Equation 1. All coefficients represent the net impact of three years of lagged infrastructure spending on the outcomes listed. Standard errors are shown in parentheses under each

[11] Specifically, the inverse of distance squared is multiplied by each county's respective annual infrastructure spending, and then the weighted infrastructure spending is summed across all counties in Tennessee.

coefficient, and p-values from the joint F-test are under each standard error. Asterisks indicate statistical significance.

As shown in Table 4, the net impact of transportation investments on personal income and per capita personal income remain significant across the specifications. However, these results should be interpreted with care given the aforementioned concerns regarding endogeneity and stationarity. Transportation award dollars consistently show no impact on employment. The net impact of infrastructure investments does not have a statistically significantly impact on establishments and population in most of the specifications, but awards are significant when using the spatial weight matrix that uses the distance between counties. Note, however, that coefficients are negative and small. Together, results from the VAR analysis do not reveal that transportation awards result in large and statistically significant positive impacts on economic development. In conducting the literature review presented above, we found many similar findings. We return to this issue in the conclusion to this report.

TABLE IV

ROBUSTNESS CHECKS FOR THE NET IMPACT OF INFRASTRUCTURE SPENDING ON ECONOMIC OUTCOME

	(1) Baseline	(2) Spatial weights matrix using indicators for adjacent counties	(3) Spatial weights matrix using the inverse of distance squared	(4) Controls	(5) Controls and spatial weights matrix using the inverse of distance squared
A. Employment	3.01e-10	2.95e-10	-9.36e-08	7.55e-11	-6.86e-08
	(2.75e-10)	(2.75e-10)	(6.01e-08)	(2.76e-10)	(5.88e-08)
	0.748	0.764	0.384	0.973	0.642
B. Establishments	6.85e-11	7.04e-11	-9.44e-08***	-2.89e-11	-8.82e-08***
	(1.38e-10)	(1.38e-10)	(2.99e-08)	(1.44e-10)	(3.02e-08)
	0.915	0.920	0.014	0.935	0.026
C. Personal Income	2.61e-10***	2.63e-10***	-1.10e-07***	1.67e-10*	-1.03e-07***
	(9.40e-11)	(9.36e-11)	(2.03e-08)	(9.68e-11)	(2.03e-08)
	0.042	0.038	1.87e-06	0.374	9.05e-06
D. Per Capita Personal Income	2.31e-10**	2.30e-10**	-4.75e-08**	1.84e-10*	-5.67e-08***
	(9.24e-11)	(9.24e-11)	(2.00e-08)	(9.43e-11)	(1.98e-08)
	0.071	0.070	0.124	0.215	0.042
E. Population	-1.56e-11	-1.46e-11	-2.50e-08***	-1.35e-11	-2.88e-08***
	(3.78e-11)	(3.78e-11)	(8.35e-09)	(3.61e-11)	(7.70e-09)
	0.923	0.922	0.013	0.809	0.001

Notes: The table lists specification checks for the net impact of lagged infrastructure spending on the following economic outcomes: total employment (Row A), total establishments (Row B), personal income (Row C), per capita personal income (Row D), and population (Row E). Column 1 lists baseline results using Equation 1. Columns 2 through 5 differ from the baseline specification in one way. Column 2 adds a spatial matrix to account for spillover effects using indicators equal to one for adjacent counties. Column 3 adds a spatial matrix using the inverse of distance squared. Column 4 adds controls. Column 5 includes both controls and a spatial matrix using the inverse of distance squared. Standard errors are in parentheses under each coefficient, and the p-value from the joint F-test are under each standard error. *** p<0.01, ** p<0.05, * p<0.10

Interstate versus State Road Awards. Separate models were estimated for interstate and state road award dollars to examine whether these award dollars differentially impacted local economic growth. This is important since different types of roadways have different consequences for the overall network and thus the potential for growth. Consistent with the results for total awards, individual lagged values of interstate and state road award dollars (β_1, β_2 and β_3 from Equation 1) did not significantly impact any of the economic variables, and results are consistent across a variety of specifications. Regarding the net impact of award dollars, both interstate and state road awards did not significantly impact total employment, establishments, or population, and these results were robust to the specifications shown in Table 4. Results indicate that the impacts to personal income and per capita personal income identified above may stem more from state road projects; interstate awards did not significantly impact these outcomes for several of the specifications.

Metropolitan versus Non-Metropolitan Counties. We examine whether transportation dollars differentially impact economic growth in metropolitan versus non-metropolitan counties. The results are similar across these regions, consistent with the baseline findings. Individual lagged values of infrastructure investments remain insignificant for metropolitan and non-metropolitan counties, and the net impact of transportation awards on employment, establishments, and population continue to be insignificant for both sets of counties. Once again, there are some inconsistencies in results on the impact of infrastructure investments on personal income and per capita personal income. Yet these inconsistencies do not differ by whether a county is within or outside of a metropolitan area. In summary, transportation awards do not seem to impact local economic growth differently between metropolitan and non-metropolitan counties.

Distribution of Award Dollars. The transportation award data for this study do not allow isolation of specific levels of spending across project years since we only know *total* spending. So in the analyses presented above we have simply assumed that this spending is uniform across all years of a given project, dividing the total award by the number of years of the project. Instead of evenly distributing award dollars across all construction years for a project, we alternatively placed total project dollars in the last year of construction to see if this lump sum affected post-investment economic returns. Results are generally the same when allocating investment dollars in this way. Individual lagged values of transportation awards continue to be insignificant for all of the economic variables. The net impact of total awards is insignificant and robust to the specifications shown in Table 4 for employment, establishments, and population. Additionally, several of the results for personal income and per capita personal income turn insignificant when all dollars are allocated to the last year of construction. Overall, results indicate that changing how total awards are allocated across construction years does not greatly alter the findings.

Manufacturing. A common argument in the research literature is that transportation spending, especially interstate projects, have a material effect on the performance of the manufacturing sector by lowering shipping and time costs thus enhancing access to markets. The empirical evidence from the literature on this question is mixed. We extend the modeling here to consider this possibility. Once again and consistent with baseline results, we find that individual lagged values of infrastructure spending do not significantly impact county manufacturing employment. Likewise, the net impact of previous awards across years does not significantly affect manufacturing employment. These results are robust to various specifications. Overall, results from the VAR analysis indicate that transportation awards do not significantly impact local manufacturing employment.

Travel Time to Work and Commuting. Using county-level data from the *American Community Survey*, models were estimated to determine whether infrastructure investments impact the mean travel time to work and the propensity of workers to work outside of their county of residence. Results suggest that annual investments in infrastructure do not significantly impact the average travel time for residents within a county or the propensity of residents to work outside of their county. While the average travel time for a county may not be impacted, it is possible that there are impacts to travel time if an analysis was done at a more granular level than the county, such as a more localized specific area near construction projects.

Level-Level Regressions. As discussed above, the VAR models estimated here required use of the logarithmic transformation of all economic outcomes explored. Here, we briefly discuss results if *levels* rather than logs are used (i.e., no transformation or logs are taken) for measures of economic growth. An important caveat is that these results need to be interpreted with caution because these models are not supported by the preliminary statistical tests behind Table 3 and Table 4 above. When using levels for the economic variables, many of the individual lagged values of infrastructure spending continue to be insignificant, but some positive and significant impacts are present for the most recent year of awards (i.e., the first lag or β_1 from Equation 1) for outcomes such as employment, personal income, and per capita personal income. However, while some of these impacts register as statistically significant, they are small in economic magnitude.

For the net impact of transportation awards, results differ when using levels versus the log of variables. For example, when using the log of employment, transportation awards consistently did not impact employment. Yet when the level or total employment is used in Equation 1, the net impact of infrastructure spending significantly and positively impacts employment. Results suggest that if the net-of-lagged transportation awards increases by $1 million, then total employment would increase by 35 workers. For perspective, average employment across counties and years is 25,316, and 35 workers represents a small fraction of the total. This demonstrates that while the net effect of transportation awards turns statistically significant when levels rather than logs are used for employment, the estimated economic impact is small to inconsequential.

The same results hold true for establishments and population, as estimated net impacts are significant when using levels, but the magnitude of impacts are small. Stationarity of the data is a requirement of VAR models, so results from the previous specifications that include the log of the economic variables are preferred to the findings presented here. Nonetheless, as a robustness check, it is informative to examine whether results are sensitive to this data transformation since these models would be expected to produce the strongest—and potentially misleading—findings. While some results do change when the log transformation is not used, the estimated impacts continue to be either statistically insignificant or statistically significant with small economic impacts. In summary, this further supports the overall findings that annual transportation awards are not significantly impacting local economic growth.

Summary of VAR Results. In summary, a panel VAR model is used to examine whether infrastructure spending impacts local economic growth for Tennessee counties. Baseline results indicate that individual lagged values of transportation awards and the summation of previous awards across years do not lead to large, significant, and positive impacts on economic growth. Numerous additional specifications are explored including changing the number of lags for variables, accounting for spillover effects, adding county-level controls, and including both controls and spillover effects to the baseline specification. Results from these various robustness checks continue to support the notion that large and significant changes in economic outcomes such as employment, establishments, and population do not seem to stem from transportation awards. While these results might seem surprising and counterintuitive, the lack of stable and positive impacts is consistent with many of the findings in the literature.

Chapter 5 Conclusion

This report explores the linkages between transportation infrastructure investment and economic growth across Tennessee counties between 2000 and 2018. The analysis builds on TDOT data that account for 395 interstate and state road projects, including multi-county projects. These data are then connected to five different county-level economic outcome measures that serve to capture the private sector benefits—i.e. returns—to transportation investment. The specific outcomes include nonfarm employment, business establishments, personal income, per capita income and population. Together the data allow examination of the local return on investment to state roadway projects using different measures of local economic performance.

The descriptive analysis and econometric models presented in this report provide no robust, consistent evidence that transportation investments in Tennessee affect county-level growth. While some positive findings are identified for some outcome measures including personal income and per capita income, they are typically subject to underlying statistical anomalies and not robust to alternative model specifications. Moreover, the magnitude of implied economic impact is generally very small, with few exceptions. These findings offer no basis for a change in TDOT policy regarding project selection.

What is the explanation for these findings? There are many possibilities. First, as discussed in the literature review to this report, we have noted that the empirical evidence is in fact inconsistent and mixed on the role of transportation investments on economic growth and development, especially at the subnational level. There are many studies that produce null findings and findings with estimated model coefficients that are statistically significant and yet possess the incorrect sign suggesting that transportation dollars hurt growth. Many of the problems that plague the literature apply to the current study. Perhaps the best example is the challenge in accounting for the joint determination of economic outcomes and transportation funding decisions. While the models we have employed (VAR) are intended to address this underlying simultaneity problem, there is evidence that the problem persists at least for some outcome measures. Another issue is the challenge in accounting for the way in which investments affect activity across a complete transportation network.

There are other possible explanations for our findings that are unique to this application to Tennessee. First, while we have individual project data, it is common for multiple projects to be underway either within one county or across nearby counties, as well as projects that are sequential in nature. It is possible that the methods used here focused on counties as the unit of analysis are simply not capable of isolating unique county-level impacts over the set of related network investments. A second issue is the window of time for the research. The window between 2001 and 2018 includes the Great Recession between 2007 and 2009. This significantly altered the growth trajectory of the state as well as its counties, especially rural counties which suffered greatly in the recession's aftermath. This same period of time includes an unanticipated downward shock to the Shelby County economy (including population loss) and dramatic growth in the middle Tennessee region centered around Nashville. These changes may confound our ability to find a strong link between roadway investments and economic outcomes. Finally, our post-project outcome measures stop in 2018. It is possible that it takes a longer period of time for investments to bear economic fruit; projects completed in 2017 or 2018 would not have the capacity to have large economic impacts so closely on the heels of their completion. To address this possibility, we have re-estimated the VAR models, focusing solely on projects completed between 2001 and 2010. This allows a minimum of eight years of post-project economic outcome data for a project completed in 2010 and 17 years of post-project data for a road investment completed in 2001. The empirical results from this application are qualitatively the same as those reported above.

Finally, it is possible that a county's growth is not materially affected by transportation investments, at least on average, but rather the underlying ingredients to growth like population, the labor force, location and so on. This means that transportation investments have helped maintain the trajectory of historical growth that relies on inertia and the unique characteristics of each county. This conclusion is consistent with TDOT's long-range planning and decision-making process regarding transportation investments which would be based on long-term patterns of regional growth.

This conclusion does not mean that TODT investments are wasted public resources. To the contrary, if TDOT were to stop making roadway investments, at some point congestion and decay would in fact adversely affect economic activity. On the other hand, if TDOT built roads to nowhere, this would become apparent through the lack of any new economic activity tied to the same investment. While the typical infrastructure project does not appear to affect county growth, it is possible and quite likely that specific, targeted investments do in fact matter; regression analysis cannot capture these unique cases. TDOT appears to have crafted an investment strategy that doesn't pick winners and doesn't throw resources at declining regions. Instead, TDOT has been able to make investments across the state that allow communities to continue to grow largely consistent with their unique characteristics and historical patterns of growth.The relationship between infrastructure investments and local economic growth will remain an important policy and research question. As resources permit, we would suggest three possible paths for additional research. First would be a longer time window for TDOT research projects. It takes time for the market to respond to transportation investments. Moreover, TDOT generally pursues the development of project segments that are a part of a much larger project. In practice, the entire project may need to be developed before meaningful economic impacts can be observed. Second, spatial spillovers are a major component of the benefits of transportation investments. The models employed here (i.e., VAR models) are just one approach to the isolation of spillover impacts. Alternative modeling strategies could be employed to estimate spillover effects. Finally, much of the research on transportation infrastructure utilizes the production function framework to structure modeling and guide data selection choices. This production function is simply a formal way of embedding transportation infrastructure into a model as a productive component that enhances regional economic growth. While data demands for such an application are daunting, it is a potentially insightful alternative to the models presented in the body of this report.

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Appendices

APPENDIX TABLE I

NUMBER OF TDOT PROJECTS BY TYPE FOR ALL COUNTIES

County	Number of Total Projects	Number of Interstate Projects	Number of State Route Projects	Number of Projects Not Categorized	Percent Interstate	Percent State Route	Percent Not Categorized	Percent of Total Projects in Tennessee
Anderson	5	1	4	0	20.00	80.00	0.00	0.95
Bedford	7	0	7	0	0.00	100.00	0.00	1.33
Benton	1	1	0	0	100.00	0.00	0.00	0.19
Bledsoe	0	0	0	0	-	-	-	0.00
Blount	1	0	1	0	0.00	100.00	0.00	0.19
Bradley	8	5	3	0	62.50	37.50	0.00	1.52
Campbell	3	3	0	0	100.00	0.00	0.00	0.57
Cannon	8	0	8	0	0.00	100.00	0.00	1.52
Carroll	1	0	1	0	0.00	100.00	0.00	0.19
Carter	2	0	2	0	0.00	100.00	0.00	0.38
Cheatham	1	0	1	0	0.00	100.00	0.00	0.19
Chester	1	0	1	0	0.00	100.00	0.00	0.19
Claiborne	2	0	2	0	0.00	100.00	0.00	0.38
Clay	4	0	4	0	0.00	100.00	0.00	0.76
Cocke	10	1	3	6	10.00	30.00	60.00	1.90
Coffee	13	5	8	0	38.46	61.54	0.00	2.47
Crockett	0	0	0	0	-	-	-	0.00
Cumberland	5	1	4	0	20.00	80.00	0.00	0.95
Davidson	23	18	5	0	78.26	21.74	0.00	4.37
Decatur	1	0	1	0	0.00	100.00	0.00	0.19
Dekalb	1	0	1	0	0.00	100.00	0.00	0.19
Dickson	8	4	4	0	50.00	50.00	0.00	1.52
Dyer	0	0	0	0	-	-	-	0.00
Fayette	26	9	17	0	34.62	65.38	0.00	4.94
Fentress	1	0	1	0	0.00	100.00	0.00	0.19
Franklin	6	0	6	0	0.00	100.00	0.00	1.14
Gibson	3	0	3	0	0.00	100.00	0.00	0.57
Giles	14	1	13	0	7.14	92.86	0.00	2.66
Grainger	10	0	10	0	0.00	100.00	0.00	1.90
Greene	1	0	1	0	0.00	100.00	0.00	0.19
Grundy	3	3	0	0	100.00	0.00	0.00	0.57
Hamblen	4	1	3	0	25.00	75.00	0.00	0.76
Hamilton	8	4	4	0	50.00	50.00	0.00	1.52
Hancock	0	0	0	0	-	-	-	0.00
Hardeman	6	0	6	0	0.00	100.00	0.00	1.14
Hardin	5	0	5	0	0.00	100.00	0.00	0.95
Hawkins	0	0	0	0	-	-	-	0.00
Haywood	7	3	4	0	42.86	57.14	0.00	1.33
Henderson	4	0	4	0	0.00	100.00	0.00	0.76
Henry	2	0	2	0	0.00	100.00	0.00	0.38
Hickman	5	4	1	0	80.00	20.00	0.00	0.95
Houston	1	0	1	0	0.00	100.00	0.00	0.19
Humphreys	5	4	1	0	80.00	20.00	0.00	0.95
Jackson	0	0	0	0	-	-	-	0.00

APPENDIX TABLE I, CONTINUED

Jefferson	11	5	0	6	45.45	0.00	54.55	2.09
Johnson	1	0	1	0	0.00	100.00	0.00	0.19
Knox	22	7	15	0	31.82	68.18	0.00	4.18
Lake	2	0	2	0	0.00	100.00	0.00	0.38
Lauderdale	2	0	0	2	0.00	0.00	100.00	0.38
Lawrence	18	0	18	0	0.00	100.00	0.00	3.42
Lewis	3	0	3	0	0.00	100.00	0.00	0.57
Lincoln	4	0	4	0	0.00	100.00	0.00	0.76
Loudon	1	0	1	0	0.00	100.00	0.00	0.19
McMinn	7	2	5	0	28.57	71.43	0.00	1.33
McNairy	6	0	6	0	0.00	100.00	0.00	1.14
Macon	1	0	1	0	0.00	100.00	0.00	0.19
Madison	3	0	3	0	0.00	100.00	0.00	0.57
Marion	6	3	3	0	50.00	50.00	0.00	1.14
Marshall	2	0	2	0	0.00	100.00	0.00	0.38
Maury	2	0	2	0	0.00	100.00	0.00	0.38
Meigs	1	0	1	0	0.00	100.00	0.00	0.19
Monroe	1	0	1	0	0.00	100.00	0.00	0.19
Montgomery	12	0	12	0	0.00	100.00	0.00	2.28
Moore	6	0	6	0	0.00	100.00	0.00	1.14
Morgan	3	0	3	0	0.00	100.00	0.00	0.57
Obion	3	1	2	0	33.33	66.67	0.00	0.57
Overton	4	0	4	0	0.00	100.00	0.00	0.76
Perry	1	0	1	0	0.00	100.00	0.00	0.19
Pickett	1	0	1	0	0.00	100.00	0.00	0.19
Polk	4	0	4	0	0.00	100.00	0.00	0.76
Putnam	2	1	1	0	50.00	50.00	0.00	0.38
Rhea	0	0	0	0	-	-	-	0.00
Roane	9	0	9	0	0.00	100.00	0.00	1.71
Robertson	5	3	2	0	60.00	40.00	0.00	0.95
Rutherford	5	1	4	0	20.00	80.00	0.00	0.95
Scott	0	0	0	0	-	-	-	0.00
Sequatchie	4	0	4	0	0.00	100.00	0.00	0.76
Sevier	7	1	6	0	14.29	85.71	0.00	1.33
Shelby	41	19	22	0	46.34	53.66	0.00	7.79
Smith	2	1	1	0	50.00	50.00	0.00	0.38
Stewart	4	0	4	0	0.00	100.00	0.00	0.76
Sullivan	9	2	7	0	22.22	77.78	0.00	1.71
Sumner	10	3	7	0	30.00	70.00	0.00	1.90
Tipton	2	0	2	0	0.00	100.00	0.00	0.38
Trousdale	1	0	1	0	0.00	100.00	0.00	0.19
Unicoi	2	0	2	0	0.00	100.00	0.00	0.38
Union	12	0	12	0	0.00	100.00	0.00	2.28
Van Buren	7	0	7	0	0.00	100.00	0.00	1.33
Warren	11	0	11	0	0.00	100.00	0.00	2.09
Washington	10	3	7	0	30.00	70.00	0.00	1.90
Wayne	8	0	8	0	0.00	100.00	0.00	1.52
Weakley	0	0	0	0	-	-	-	0.00
White	1	0	1	0	0.00	100.00	0.00	0.19
Williamson	20	9	11	0	45.00	55.00	0.00	3.80
Wilson	11	3	8	0	27.27	72.73	0.00	2.09
Total	**526**	**132**	**380**	**14**	**25.10**	**72.24**	**2.66**	**100.00**

Source: Tennessee Department of Transportation

Notes: The table lists the number of TDOT projects by type for all counties in Tennessee. Nine counties, including Bledsoe, Hawkins, Hancock, Scott, Jackson, Crockett, Rhea, Weakley and Dyer Counties, saw no transportation dollars between 2000 and 2020 in terms of new contracts let within this window of time.

Appendix Table II

Value of TDOT Project Awards by Type for all Counties

County	Total Awards (Nominal $)	Interstate Awards (Nominal $)	State Route Awards (Nominal $)	Awards Not Categorized (Nominal $)	Percent Interstate	Percent State Route	Percent Not Categorized	Percent of Total Awards in Tennessee
Anderson	53,717,059	1,463,712	52,253,347	0	2.72	97.28	0.00	0.82
Bedford	62,641,039	0	62,641,039	0	0.00	100.00	0.00	0.95
Benton	8,268,517	8,268,517	0	0	100.00	0.00	0.00	0.13
Bledsoe	0	0	0	0	-	-	-	0.00
Blount	2,116,547	0	2,116,547	0	0.00	100.00	0.00	0.03
Bradley	59,641,059	21,671,233	37,969,827	0	36.34	63.66	0.00	0.91
Campbell	29,406,971	29,406,971	0	0	100.00	0.00	0.00	0.45
Cannon	68,134,409	0	68,134,409	0	0.00	100.00	0.00	1.04
Carroll	13,176,896	0	13,176,896	0	0.00	100.00	0.00	0.20
Carter	39,509,459	0	39,509,459	0	0.00	100.00	0.00	0.60
Cheatham	2,274,415	0	2,274,415	0	0.00	100.00	0.00	0.03
Chester	20,293,957	0	20,293,957	0	0.00	100.00	0.00	0.31
Claiborne	3,990,818	0	3,990,818	0	0.00	100.00	0.00	0.06
Clay	60,985,269	0	60,985,269	0	0.00	100.00	0.00	0.93
Cocke	137,146,086	1,399,622	52,136,682	83,609,783	1.02	38.02	60.96	2.09
Coffee	82,398,370	25,964,340	56,434,030	0	31.51	68.49	0.00	1.25
Crockett	0	0	0	0	-	-	-	0.00
Cumberland	42,825,128	6,691,082	36,134,046	0	15.62	84.38	0.00	0.65
Davidson	493,212,786	364,759,393	128,453,393	0	73.96	26.04	0.00	7.50
Decatur	14,323,133	0	14,323,133	0	0.00	100.00	0.00	0.22
Dekalb	20,656,513	0	20,656,513	0	0.00	100.00	0.00	0.31
Dickson	30,614,972	15,988,455	14,626,517	0	52.22	47.78	0.00	0.47
Dyer	0	0	0	0	-	-	-	0.00
Fayette	238,858,294	104,516,674	134,341,620	0	43.76	56.24	0.00	3.63
Fentress	16,420,746	0	16,420,746	0	0.00	100.00	0.00	0.25
Franklin	100,579,579	0	100,579,579	0	0.00	100.00	0.00	1.53
Gibson	53,824,975	0	53,824,975	0	0.00	100.00	0.00	0.82
Giles	141,034,636	9,424,224	131,610,412	0	6.68	93.32	0.00	2.14
Grainger	16,467,143	0	16,467,143	0	0.00	100.00	0.00	0.25
Greene	11,192,324	0	11,192,324	0	0.00	100.00	0.00	0.17
Grundy	13,406,099	13,406,099	0	0	100.00	0.00	0.00	0.20
Hamblen	43,791,821	20,281,305	23,510,516	0	46.31	53.69	0.00	0.67
Hamilton	196,022,225	58,990,824	137,031,401	0	30.09	69.91	0.00	2.98
Hancock	0	0	0	0	-	-	-	0.00
Hardeman	100,737,094	0	100,737,094	0	0.00	100.00	0.00	1.53
Hardin	152,477,014	0	152,477,014	0	0.00	100.00	0.00	2.32
Hawkins	0	0	0	0	-	-	-	0.00
Haywood	53,705,075	12,261,855	41,443,220	0	22.83	77.17	0.00	0.82
Henderson	56,847,981	0	56,847,981	0	0.00	100.00	0.00	0.86
Henry	16,219,168	0	16,219,168	0	0.00	100.00	0.00	0.25
Hickman	21,802,971	20,959,588	843,382	0	96.13	3.87	0.00	0.33
Houston	327,200	0	327,200	0	0.00	100.00	0.00	0.00
Humphreys	46,398,429	20,959,588	25,438,841	0	45.17	54.83	0.00	0.71
Jackson	0	0	0	0	-	-	-	0.00

Appendix Table II, continued

Jefferson	116,917,281	33,307,498	0	83,609,783	28.49	0.00	71.51	1.78
Johnson	14,137,513	0	14,137,513	0	0.00	100.00	0.00	0.21
Knox	248,922,619	132,041,637	116,880,982	0	53.05	46.95	0.00	3.78
Lake	29,431,066	0	29,431,066	0	0.00	100.00	0.00	0.45
Lauderdale	27,596,379	0	0	27,596,379	0.00	0.00	100.00	0.42
Lawrence	195,716,395	0	195,716,395	0	0.00	100.00	0.00	2.98
Lewis	35,071,478	0	35,071,478	0	0.00	100.00	0.00	0.53
Lincoln	116,904,869	0	116,904,869	0	0.00	100.00	0.00	1.78
Loudon	7,176,216	0	7,176,216	0	0.00	100.00	0.00	0.11
McMinn	79,652,367	6,788,889	72,863,478	0	8.52	91.48	0.00	1.21
McNairy	96,647,971	0	96,647,971	0	0.00	100.00	0.00	1.47
Macon	15,419,073	0	15,419,073	0	0.00	100.00	0.00	0.23
Madison	31,044,065	0	31,044,065	0	0.00	100.00	0.00	0.47
Marion	51,457,490	13,406,099	38,051,391	0	26.05	73.95	0.00	0.78
Marshall	28,459,435	0	28,459,435	0	0.00	100.00	0.00	0.43
Maury	17,788,467	0	17,788,467	0	0.00	100.00	0.00	0.27
Meigs	13,186,938	0	13,186,938	0	0.00	100.00	0.00	0.20
Monroe	15,525,215	0	15,525,215	0	0.00	100.00	0.00	0.24
Montgomery	177,835,815	0	177,835,815	0	0.00	100.00	0.00	2.70
Moore	38,634,280	0	38,634,280	0	0.00	100.00	0.00	0.59
Morgan	42,152,019	0	42,152,019	0	0.00	100.00	0.00	0.64
Obion	48,355,567	29,988,201	18,367,366	0	62.02	37.98	0.00	0.74
Overton	67,898,261	0	67,898,261	0	0.00	100.00	0.00	1.03
Perry	439,500	0	439,500	0	0.00	100.00	0.00	0.01
Pickett	1,935,997	0	1,935,997	0	0.00	100.00	0.00	0.03
Polk	62,074,922	0	62,074,922	0	0.00	100.00	0.00	0.94
Putnam	22,528,624	21,495,412	1,033,212	0	95.41	4.59	0.00	0.34
Rhea	0	0	0	0	-	-	-	0.00
Roane	101,383,973	0	101,383,973	0	0.00	100.00	0.00	1.54
Robertson	28,176,274	6,577,788	21,598,486	0	23.35	76.65	0.00	0.43
Rutherford	44,629,614	671,989	43,957,625	0	1.51	98.49	0.00	0.68
Scott	0	0	0	0	-	-	-	0.00
Sequatchie	30,794,600	0	30,794,600	0	0.00	100.00	0.00	0.47
Sevier	124,545,006	15,647,552	108,897,455	0	12.56	87.44	0.00	1.89
Shelby	861,204,587	691,436,499	169,768,088	0	80.29	19.71	0.00	13.09
Smith	8,753,521	5,975,335	2,778,186	0	68.26	31.74	0.00	0.13
Stewart	71,723,247	0	71,723,247	0	0.00	100.00	0.00	1.09
Sullivan	85,701,402	9,047,101	76,654,301	0	10.56	89.44	0.00	1.30
Sumner	120,016,901	6,577,788	113,439,113	0	5.48	94.52	0.00	1.82
Tipton	20,170,487	0	20,170,487	0	0.00	100.00	0.00	0.31
Trousdale	11,010,676	0	11,010,676	0	0.00	100.00	0.00	0.17
Unicoi	10,858,101	0	10,858,101	0	0.00	100.00	0.00	0.17
Union	29,150,192	0	29,150,192	0	0.00	100.00	0.00	0.44
Van Buren	66,302,946	0	66,302,946	0	0.00	100.00	0.00	1.01
Warren	102,015,430	0	102,015,430	0	0.00	100.00	0.00	1.55
Washington	132,387,543	16,681,197	115,706,346	0	12.60	87.40	0.00	2.01
Wayne	109,364,575	0	109,364,575	0	0.00	100.00	0.00	1.66
Weakley	0	0	0	0	-	-	-	0.00
White	5,471,630	0	5,471,630	0	0.00	100.00	0.00	0.08
Williamson	331,595,393	99,394,293	232,201,100	0	29.97	70.03	0.00	5.04
Wilson	153,978,323	79,780,051	74,198,272	0	51.81	48.19	0.00	2.34
Total	**6,577,590,419**	**1,905,230,808**	**4,477,543,665**	**194,815,945**	**28.97**	**68.07**	**2.96**	**100.00**

Source: Tennessee Department of Transportation

Notes: The table lists the value of TDOT project awards by type for all counties in Tennessee. Nine counties, including Bledsoe, Hawkins, Hancock, Scott, Jackson, Crockett, Rhea, Weakley and Dyer Counties, saw no transportation dollars between 2000 and 2020 in terms of new contracts let within this window of time.

APPENDIX TABLE III

POPULATION DENSITY AND POPULATION BY GENDER AND RACE FOR ALL COUNTIES

County	Population Density (per Square Mile)			Percent Female			Percent White			Percent Black			Percent Hispanic		
	2000	2018	Percent change 2000 to 2018	2000	2018	Percent change 2000 to 2018	2000	2018	Percent change 2000 to 2018	2000	2018	Percent change 2000 to 2018	2000	2018	Percent change 2000 to 2018
Anderson County	211.6	226.8	7.2	52.3	51.3	-1.8	93.8	91.7	-2.3	3.9	4.0	3.6	1.1	3.1	176.8
Bedford County	79.8	103.5	29.7	50.4	50.9	1.0	89.8	87.0	-3.1	8.6	8.4	-2.2	7.5	12.6	67.2
Benton County	42.0	41.1	-2.1	51.6	51.0	-1.0	96.8	94.7	-2.1	2.1	2.5	18.3	0.9	2.5	166.2
Bledsoe County	30.5	36.3	19.1	45.4	41.1	-9.5	94.8	90.6	-4.4	3.7	7.1	92.2	1.1	2.5	121.9
Blount County	190.1	235.1	23.7	51.6	51.5	-0.2	95.2	93.8	-1.4	2.9	3.0	4.3	1.1	3.5	227.0
Bradley County	268.3	324.6	21.0	51.3	51.4	0.2	94.0	90.9	-3.4	4.0	5.2	28.8	2.1	6.3	205.5
Campbell County	83.1	82.4	-0.7	51.8	50.9	-1.9	98.3	97.5	-0.9	0.3	0.5	74.7	0.7	1.3	95.1
Cannon County	48.6	54.4	12.0	50.9	50.3	-1.1	97.4	95.8	-1.6	1.5	1.8	24.2	1.2	2.5	100.9
Carroll County	49.1	46.8	-4.8	52.0	51.1	-1.8	88.2	86.7	-1.7	10.4	10.2	-2.5	1.3	2.8	109.2
Carter County	166.4	165.2	-0.8	51.4	51.1	-0.7	97.8	96.4	-1.5	1.0	1.6	58.6	0.9	1.9	119.8
Cheatham County	119.0	133.7	12.4	49.9	50.3	0.8	97.3	95.2	-2.1	1.5	2.0	30.7	1.2	3.2	165.3
Chester County	54.4	60.5	11.1	51.3	51.9	1.2	88.5	87.2	-1.4	10.2	9.5	-7.0	1.0	2.8	189.8
Claiborne County	68.9	73.1	6.1	51.7	51.1	-1.2	98.0	96.4	-1.7	0.8	1.2	52.3	0.6	1.3	99.3
Clay County	33.7	32.6	-3.2	51.3	50.8	-1.1	97.0	96.3	-0.7	1.4	1.6	15.0	1.4	2.6	95.0
Cocke County	77.3	82.3	6.5	51.4	51.7	0.6	96.5	95.0	-1.5	2.0	2.1	5.4	1.1	2.5	138.3
Coffee County	112.4	129.8	15.5	51.3	51.2	-0.3	94.4	92.3	-2.2	3.6	3.9	7.2	2.2	4.4	103.9
Crockett County	54.8	54.0	-1.5	51.7	52.2	0.9	84.8	82.5	-2.7	14.4	14.3	-0.3	5.4	10.9	101.2
Cumberland County	69.1	87.6	26.9	51.4	51.3	-0.3	98.7	96.9	-1.8	0.1	0.7	426.6	1.2	3.1	155.1
Davidson County	1,131.8	1,374.1	21.4	51.6	51.7	0.3	69.7	65.3	-6.3	26.3	27.7	5.3	4.7	10.4	123.4
Decatur County	35.0	35.1	0.2	51.4	50.9	-1.0	95.3	94.8	-0.6	3.5	3.0	-14.0	2.0	3.3	68.7
DeKalb County	57.3	66.2	15.5	50.5	50.0	-1.0	97.4	94.9	-2.6	1.4	2.0	40.2	3.6	8.6	136.8
Dickson County	88.5	109.1	23.3	51.0	50.9	-0.2	93.8	92.7	-1.1	4.6	4.1	-10.1	1.1	3.7	235.3
Dyer County	72.9	72.8	0.0	52.1	51.8	-0.5	85.8	82.7	-3.6	13.0	14.3	10.4	1.2	3.6	198.9
Fayette County	41.3	57.5	39.3	50.9	50.8	-0.2	62.8	70.2	11.8	36.1	27.7	-23.4	1.0	2.9	181.4
Fentress County	33.4	36.5	9.5	50.9	51.2	0.6	99.3	97.7	-1.6	0.1	0.5	346.3	0.5	1.6	201.3
Franklin County	70.9	75.5	6.6	51.3	51.2	-0.3	92.9	91.4	-1.6	5.5	5.2	-6.6	1.6	3.6	130.8
Gibson County	79.8	81.4	1.9	52.8	52.1	-1.4	79.2	79.6	0.5	19.8	18.1	-8.8	1.1	2.8	151.5
Giles County	48.2	48.3	0.1	51.4	51.5	0.2	86.7	86.4	-0.3	11.9	10.4	-13.0	0.9	2.8	206.3
Grainger County	73.6	82.5	12.1	50.2	49.6	-1.2	98.9	97.1	-1.8	0.3	1.0	202.9	1.1	3.5	215.7
Greene County	101.4	111.0	9.5	51.3	50.8	-0.9	96.9	95.5	-1.4	2.1	2.2	4.8	1.0	3.0	193.7
Grundy County	39.7	37.0	-6.7	50.8	50.5	-0.5	98.7	97.1	-1.6	0.1	0.6	328.8	1.0	1.4	41.4

Hamblen County	361.3	400.6	10.9	50.7	51.2	0.9	94.1	91.4	-2.9	4.2	4.4	4.6	5.7	12.0	110.2
Hamilton County	568.8	671.6	18.1	52.2	51.7	-0.9	77.2	75.9	-1.6	20.3	19.4	-4.1	1.8	5.9	222.4
Hancock County	30.5	29.5	-3.5	51.2	50.7	-1.1	98.4	97.2	-1.2	0.5	0.5	9.9	0.4	0.7	78.2
Hardeman County	42.1	37.8	-10.3	46.1	45.4	-1.6	57.5	55.3	-3.9	41.2	42.2	2.5	1.0	1.8	81.8
Hardin County	44.3	44.6	0.8	50.8	51.2	0.8	95.2	93.9	-1.4	3.8	3.3	-11.3	1.0	2.8	175.0
Hawkins County	110.2	116.1	5.3	51.3	50.9	-0.8	97.5	96.4	-1.2	1.5	1.5	0.2	0.8	1.7	112.4
Haywood County	37.1	32.5	-12.5	53.3	53.4	0.2	48.2	47.3	-1.9	51.2	50.7	-0.9	2.6	4.4	67.6
Henderson County	49.2	53.5	8.8	51.8	51.5	-0.7	90.8	89.4	-1.5	8.1	7.8	-2.7	1.0	2.3	135.5
Henry County	55.4	57.6	3.9	51.7	51.5	-0.3	89.7	89.6	-0.1	9.0	7.6	-15.6	1.0	2.8	183.0
Hickman County	36.7	40.9	11.6	47.1	47.4	0.7	94.0	92.4	-1.6	4.5	5.0	9.9	1.0	2.6	165.3
Houston County	40.0	41.3	3.1	50.5	50.9	0.8	95.3	93.9	-1.5	3.3	3.0	-10.6	1.3	2.5	98.8
Humphreys County	33.7	34.8	3.2	50.8	50.3	-1.1	95.8	94.4	-1.5	3.0	2.8	-6.9	0.8	2.7	224.2
Jackson County	35.8	38.1	6.4	50.5	50.3	-0.5	98.8	97.0	-1.8	0.1	0.6	322.9	0.8	2.2	175.6
Jefferson County	162.6	197.1	21.2	50.6	50.8	0.3	96.3	95.4	-0.9	2.3	2.1	-9.7	1.3	3.9	191.1
Johnson County	58.8	59.6	1.3	46.6	46.2	-0.9	96.7	95.9	-0.9	2.4	2.3	-3.4	0.9	2.2	152.7
Knox County	753.4	915.5	21.5	51.7	51.4	-0.5	88.7	86.0	-3.0	8.7	8.9	2.1	1.3	4.4	242.1
Lake County	47.9	44.7	-6.7	39.9	35.7	-10.4	67.1	68.6	2.3	31.5	28.7	-8.8	1.4	2.4	78.0
Lauderdale County	57.4	54.7	-4.7	48.0	48.5	0.9	64.3	62.2	-3.2	34.2	34.8	1.6	1.2	2.6	118.2
Lawrence County	64.7	70.9	9.5	51.5	50.9	-1.1	97.2	95.5	-1.8	1.5	1.8	20.0	1.0	2.2	123.8
Lewis County	40.4	42.8	6.0	50.8	51.2	0.8	97.4	95.3	-2.2	1.6	2.1	27.9	1.2	2.4	98.4
Lincoln County	55.0	59.8	8.7	51.6	50.9	-1.3	90.7	89.6	-1.3	7.4	7.0	-5.6	1.0	3.8	280.0
Loudon County	171.1	231.5	35.2	51.3	50.8	-0.9	97.4	95.5	-2.0	1.2	1.5	32.6	2.3	9.0	292.7
McMinn County	114.3	123.9	8.4	51.7	51.3	-0.9	93.5	92.7	-0.9	4.5	3.8	-15.2	1.8	4.2	133.3
McNairy County	43.8	45.9	4.7	51.5	50.9	-1.2	92.6	91.5	-1.2	6.2	6.1	-2.4	0.9	2.2	131.0
Macon County	66.7	79.0	18.5	50.7	51.1	0.9	98.6	96.0	-2.7	0.3	1.1	334.6	1.7	5.4	219.5
Madison County	165.2	175.2	6.0	52.1	52.6	1.1	65.8	59.0	-10.3	32.7	37.8	15.6	1.7	4.0	133.0
Marion County	55.7	57.4	3.0	51.0	51.1	0.2	94.7	93.2	-1.5	4.2	4.1	-2.5	0.7	1.8	147.6
Marshall County	71.5	89.7	25.4	51.2	51.0	-0.3	91.0	90.1	-1.0	7.8	6.7	-13.8	2.9	5.4	88.1
Maury County	113.6	153.9	35.4	51.4	51.8	0.7	83.9	84.4	0.5	14.4	11.9	-17.5	3.3	6.1	88.9
Meigs County	56.8	63.1	11.0	50.0	50.4	0.8	97.8	95.7	-2.2	1.2	1.5	24.1	0.6	2.3	309.1
Monroe County	61.6	72.9	18.5	50.7	50.2	-1.0	95.9	94.8	-1.2	2.3	2.2	-1.0	1.8	4.7	166.6
Montgomery County	251.4	382.0	52.0	49.8	50.2	0.9	75.3	70.9	-5.9	19.6	20.8	6.2	5.2	10.3	97.0
Moore County	44.3	49.6	11.9	50.2	50.0	-0.2	96.3	94.6	-1.7	2.8	2.8	0.1	0.8	2.0	158.1
Morgan County	37.9	41.3	9.0	46.7	45.3	-3.1	96.9	94.1	-2.9	2.3	3.7	61.8	0.6	1.4	126.3
Obion County	59.7	55.6	-6.9	51.7	51.6	-0.2	89.0	86.7	-2.7	10.0	10.8	8.6	1.9	4.6	143.5
Overton County	46.6	50.9	9.3	50.9	50.4	-0.9	98.8	97.4	-1.4	0.3	0.6	124.0	0.7	1.6	130.1
Perry County	18.4	19.4	5.9	50.1	49.5	-1.1	96.8	93.8	-3.2	1.8	2.6	43.0	0.8	2.8	248.2

APPENDIX TABLE III, CONTINUED

Pickett County	30.3	31.2	3.0	50.8	50.0	-1.6	99.3	98.4	-0.9	0.1	0.2	113.5	0.8	2.0	136.8
Polk County	37.1	38.9	4.7	50.4	50.7	0.7	98.5	96.5	-2.0	0.1	0.8	481.9	0.7	2.2	205.2
Putnam County	155.8	196.6	26.2	50.4	50.2	-0.3	96.2	93.5	-2.8	1.7	2.4	37.7	3.1	6.5	114.0
Rhea County	90.1	104.8	16.2	51.4	50.4	-2.1	96.3	94.7	-1.7	2.0	2.2	9.4	1.7	5.4	224.0
Roane County	144.0	147.3	2.3	51.5	51.2	-0.6	95.5	94.3	-1.2	2.7	2.7	-1.7	0.7	2.0	184.1
Robertson County	115.0	149.1	29.6	50.3	50.6	0.6	90.0	89.3	-0.7	8.7	7.6	-12.1	2.7	7.3	173.2
Rutherford County	296.4	524.6	77.0	50.2	50.8	1.1	87.2	77.2	-11.4	9.6	15.8	65.2	2.8	8.5	199.3
Scott County	39.8	41.4	4.1	50.7	50.9	0.5	98.7	98.1	-0.7	0.1	0.3	178.6	0.6	1.0	84.9
Sequatchie County	42.6	56.0	31.4	50.3	50.5	0.3	98.8	96.5	-2.4	0.2	0.8	294.2	0.8	3.5	343.7
Sevier County	121.1	165.2	36.4	51.0	51.1	0.0	97.8	95.2	-2.6	0.6	1.3	137.8	1.3	6.3	384.6
Shelby County	1,176.9	1,226.2	4.2	52.2	52.5	0.5	48.5	41.1	-15.2	48.8	54.2	11.1	2.7	6.5	146.1
Smith County	56.6	63.5	12.1	50.7	50.3	-0.9	96.1	95.2	-1.0	2.5	2.3	-8.9	1.1	2.9	159.1
Stewart County	27.1	29.5	9.0	50.1	50.1	-0.1	95.7	94.3	-1.4	1.3	1.8	37.9	1.0	3.1	210.8
Sullivan County	370.1	381.4	3.1	51.7	51.4	-0.7	96.8	94.9	-2.0	1.9	2.3	21.5	0.7	1.9	171.7
Sumner County	247.8	353.5	42.6	51.0	51.2	0.3	92.4	88.2	-4.6	5.8	7.9	35.9	1.8	5.1	186.0
Tipton County	112.5	134.3	19.4	50.8	50.6	-0.3	78.2	78.1	-0.2	20.0	18.5	-7.5	1.2	2.8	136.2
Trousdale County	64.8	96.4	48.9	50.9	40.8	-19.8	87.7	85.7	-2.4	11.3	11.5	1.5	1.5	2.4	64.2
Unicoi County	95.0	95.4	0.4	51.2	50.9	-0.7	99.0	97.4	-1.6	0.1	0.6	447.7	2.0	5.1	161.8
Union County	80.0	88.1	10.0	50.3	50.7	0.9	98.7	97.4	-1.3	0.1	0.5	399.8	0.8	1.7	112.0
Van Buren County	20.1	21.1	4.7	50.0	49.9	-0.2	99.2	97.0	-2.3	0.1	0.8	500.4	0.3	1.6	393.5
Warren County	88.7	94.5	6.5	50.9	50.5	-0.7	95.5	93.1	-2.5	3.2	3.8	19.3	4.9	9.3	88.1
Washington County	329.2	393.9	19.7	51.3	51.1	-0.3	94.3	91.4	-3.1	3.9	4.5	15.2	1.4	3.6	157.9
Wayne County	22.9	22.6	-1.6	45.1	44.8	-0.8	92.2	91.8	-0.4	6.8	6.4	-5.6	0.8	2.1	153.6
Weakley County	60.2	57.6	-4.3	51.5	51.0	-1.0	90.8	89.0	-2.0	7.0	7.7	9.4	1.2	2.7	132.5
White County	61.5	72.0	17.0	50.9	51.1	0.2	97.2	95.5	-1.8	1.6	1.8	11.7	1.0	2.8	174.2
Williamson County	219.9	397.7	80.8	50.8	50.9	0.4	92.7	88.7	-4.3	5.2	4.5	-14.1	2.5	4.9	91.4
Wilson County	156.3	246.4	57.6	50.6	50.8	0.4	92.1	88.6	-3.8	6.3	7.3	15.4	1.3	4.5	256.0
Tennessee	**138.3**	**164.2**	**18.7**	**51.3**	**51.2**	**-0.2**	**81.3**	**78.5**	**-3.4**	**16.5**	**17.1**	**3.4**	**2.2**	**5.6**	**155.5**

Source: Population estimates, including estimates by gender and race, are from the U.S. Census Bureau, Population Estimates Program.

APPENDIX TABLE IV

POVERTY RATES, EDUCATIONAL ATTAINMENT, UNEMPLOYMENT, EDUCATION SPENDING, AND MANUFACTURING EMPLOYMENT FOR ALL COUNTIES

	Poverty Rate			Percent with at least a Bachelor's Degree			Unemployment Rate			Total Elementary-Secondary Current Spending per Student			Manufacturing Employment		
County	2000	2018	Percent change 2000 to 2018	2000	2018	Percent change 2000 to 2018	2000	2018	Percent change 2000 to 2018	2000	2018	Percent change 2000 to 2018	2000	2018	Percent change 2000 to 2018
Anderson County	12.2	16.5	35.2	20.8	23.5	12.8	4.1	3.8	-7.3	8,953	10,653	19.0	10,523	11,656	10.8
Bedford County	12.5	14.4	15.2	11.1	16.3	46.6	4.5	3.8	-15.6	6,667	7,514	12.7	6,035	4,570	-24.3
Benton County	16.3	19.2	17.8	6.3	12.6	99.2	7.3	4.9	-32.9	7,232	10,043	38.9	967	698	-27.8
Bledsoe County	19.2	26.7	39.1	7.1	12.9	81.0	4.0	6.0	50.0	7,340	9,828	33.9	706	85	-88.0
Blount County	10.0	9.9	-1.0	17.9	24.0	34.1	3.5	3.2	-8.6	8,128	9,873	21.5	8,674	6,702	-22.7
Bradley County	11.7	14.7	25.6	15.9	21.9	38.0	3.5	3.6	2.9	7,611	8,760	15.1	12,830	7,733	-39.7
Campbell County	20.4	21.6	5.9	7.0	11.9	70.0	5.9	4.8	-18.6	6,867	8,351	21.6	2,008	1,209	-39.8
Cannon County	13.4	14.2	6.0	8.4	13.8	64.5	3.5	3.2	-8.6	6,629	8,983	35.5	297	286	-3.7
Carroll County	14.1	18.6	31.9	11.1	17.2	54.5	7.7	5.0	-35.1	7,118	9,189	29.1	2,945	644	-78.1
Carter County	15.6	19.1	22.4	12.8	16.8	30.9	4.7	4.2	-10.6	7,761	9,587	23.5	2,426	1,183	-51.2
Cheatham County	8.1	10.3	27.2	15.1	19.6	29.7	2.7	2.8	3.7	7,236	8,925	23.4	2,871	1,611	-43.9
Chester County	14.3	15.9	11.2	11.2	16.4	46.1	4.0	3.8	-5.0	6,389	8,333	30.4	718	550	-23.4
Claiborne County	19.5	23.4	20.0	8.9	15.2	70.7	4.9	4.3	-12.2	7,456	9,412	26.2	3,647	2,392	-34.4
Clay County	19.8	21.0	6.1	6.8	14.6	115.0	6.4	4.9	-23.4	6,054	9,184	51.7	544	307	-43.6
Cocke County	19.4	22.5	16.0	6.2	10.8	73.8	6.3	4.7	-25.4	6,982	9,082	30.1	2,618	1,496	-42.9
Coffee County	12.6	15.9	26.2	17.5	19.6	11.9	3.9	3.6	-7.7	7,520	9,715	29.2	5,918	4,770	-19.4
Crockett County	14.6	19.4	32.9	9.1	13.0	43.0	4.6	3.9	-15.2	6,888	7,979	15.8	1,086	259	-76.2
Cumberland County	14.0	14.4	2.9	13.7	18.3	33.3	4.9	4.4	-10.2	6,687	8,379	25.3	2,710	2,491	-8.1
Davidson County	11.8	15.4	30.5	30.5	40.3	32.0	3.1	2.7	-12.9	9,235	11,950	29.4	31,538	20,170	-36.0
Decatur County	15.4	18.2	18.2	7.3	12.8	74.7	5.3	5.1	-3.8	6,840	8,273	21.0	1,087	535	-50.8
DeKalb County	15.5	17.4	12.3	11.3	15.7	38.7	4.6	4.5	-2.2	6,371	7,770	22.0	2,746	2,268	-17.4
Dickson County	11.0	13.8	25.5	11.3	15.4	36.3	3.5	3.1	-11.4	7,519	8,419	12.0	4,551	3,289	-27.7
Dyer County	14.7	18.4	25.2	12.0	16.9	41.0	5.1	4.6	-9.8	8,003	9,430	17.8	5,879	3,887	-33.9
Fayette County	12.4	13.1	5.6	12.8	21.7	69.3	4.4	3.8	-13.6	7,123	8,474	19.0	1,458	1,712	17.4
Fentress County	21.8	20.6	-5.5	8.3	13.6	63.9	7.3	4.2	-42.5	7,256	8,649	19.2	749	320	-57.3
Franklin County	12.4	16.0	29.0	15.3	20.7	35.4	3.8	3.4	-10.5	8,759	9,264	5.8	2,269	3,424	50.9
Gibson County	13.1	16.5	26.0	10.1	17.8	76.6	5.2	4.4	-15.4	6,977	8,694	24.6	8,104	2,813	-65.3
Giles County	12.1	14.5	19.8	10.6	15.1	42.8	4.3	3.7	-14.0	6,984	9,218	32.0	4,265	4,023	-5.7
Grainger County	16.4	18.4	12.2	7.8	10.6	35.4	4.5	4.0	-11.1	7,559	8,782	16.2	1,547	1,015	-34.4
Greene County	13.9	15.1	8.6	12.8	15.3	19.7	5.7	4.7	-17.5	7,794	9,234	18.5	8,699	6,491	-25.4
Grundy County	22.7	21.2	-6.6	7.1	12.1	70.7	4.9	4.5	-8.2	7,499	9,263	23.5	269	225	-16.4

Hamblen County	12.9	17.1	32.6	13.3	16.1	21.0	3.9	3.8	-2.6	7,517	8,610	14.5	14,911	10,269	-31.1
Hamilton County	11.7	13.0	11.1	23.9	31.2	30.6	3.2	3.4	6.3	8,597	9,664	12.4	34,518	24,079	-30.2
Hancock County	27.0	29.9	10.7	10.2	11.5	12.9	5.0	4.9	-2.0	7,697	10,366	34.7			
Hardeman County	20.2	23.5	16.3	7.8	11.4	45.6	5.0	4.9	-2.0	6,594	9,680	46.8	1,910	2,073	8.5
Hardin County	17.9	20.3	13.4	9.8	13.9	42.2	5.3	4.4	-17.0	7,061	8,838	25.2	2,257	2,941	30.3
Hawkins County	14.2	18.4	29.6	10.0	14.0	40.2	4.1	4.0	-2.4	7,123	9,352	31.3	6,251	4,812	-23.0
Haywood County	17.3	20.5	18.5	11.1	12.6	13.4	5.5	5.4	-1.8	7,344	9,939	35.3	1,822	2,160	18.6
Henderson County	13.0	18.0	38.5	9.3	13.8	48.3	4.9	4.7	-4.1	6,757	8,944	32.4	3,333	1,430	-57.1
Henry County	13.9	18.8	35.3	12.1	17.1	41.1	4.8	4.2	-12.5	7,098	9,125	28.6	3,358	1,837	-45.3
Hickman County	14.5	16.3	12.4	6.7	11.0	63.8	4.0	3.3	-17.5	6,678	9,074	35.9	672	526	-21.7
Houston County	15.1	16.7	10.6	10.3	10.6	2.8	5.8	5.5	-5.2	6,535	8,939	36.8	306	208	-32.0
Humphreys County	11.9	13.6	14.3	9.3	13.3	42.9	4.9	4.3	-12.2	7,032	8,761	24.6	2,017	1,630	-19.2
Jackson County	17.2	19.8	15.1	8.4	9.0	7.2	6.2	4.7	-24.2	6,921	9,594	38.6	905	226	-75.0
Jefferson County	13.7	13.8	0.7	12.8	16.4	28.4	4.2	3.8	-9.5	7,128	8,611	20.8	3,138	1,882	-40.0
Johnson County	21.5	20.7	-3.7	6.9	11.3	64.3	6.6	3.5	-47.0	7,489	9,906	32.3	903	740	-18.1
Knox County	10.8	13.2	22.2	29.0	36.7	26.5	3.0	3.0	0.0	8,269	8,850	7.0	16,912	10,591	-37.4
Lake County	29.0	36.5	25.9	5.4	10.4	93.3	6.1	5.2	-14.8	7,685	9,785	27.3			
Lauderdale County	17.9	24.9	39.1	7.7	8.8	13.7	5.1	5.8	13.7	7,003	9,250	32.1	3,170	1,199	-62.2
Lawrence County	14.2	17.7	24.6	8.7	12.5	43.4	9.1	4.0	-56.0	6,859	8,562	24.8	4,697	1,850	-60.6
Lewis County	15.3	17.5	14.4	8.5	11.5	35.2	5.4	4.5	-16.7	6,085	8,713	43.2	607	441	-27.3
Lincoln County	12.9	14.4	11.6	11.9	18.8	57.6	3.5	3.1	-11.4	6,740	8,809	30.7	2,927	3,630	24.0
Loudon County	9.6	9.1	-5.2	17.0	26.3	54.5	3.5	3.4	-2.9	7,815	9,187	17.6	3,273	3,179	-2.9
McMinn County	13.2	15.9	20.5	10.8	15.8	46.3	4.4	4.1	-6.8	6,986	8,631	23.5	8,136	6,642	-18.4
McNairy County	15.8	17.4	10.1	8.8	12.7	44.6	4.3	5.5	27.9	6,651	8,562	28.7	2,558	1,207	-52.8
Macon County	15.1	18.1	19.9	5.6	10.0	79.0	3.7	3.2	-13.5	6,488	8,196	26.3	1,528	1,009	-34.0
Madison County	12.9	17.8	38.0	21.5	25.9	20.5	3.6	3.8	5.6	8,601	9,237	7.4	13,104	9,203	-29.8
Marion County	13.6	15.3	12.5	9.5	11.6	22.2	4.4	4.7	6.8	6,923	8,771	26.7	1,672	1,799	7.6
Marshall County	10.2	14.1	38.2	10.6	14.3	35.3	3.5	3.5	0.0	7,822	8,497	8.6	7,124	3,674	-48.4
Maury County	11.0	10.8	-1.8	13.6	21.8	60.5	3.5	3.2	-8.6	7,567	8,960	18.4	11,393	5,943	-47.8
Meigs County	16.9	17.8	5.3	7.0	10.5	50.2	5.1	4.6	-9.8	7,059	9,114	29.1	743	1,046	40.8
Monroe County	15.6	15.7	0.6	10.1	12.8	26.7	5.3	3.7	-30.2	6,894	8,982	30.3	6,165	5,784	-6.2
Montgomery County	10.1	12.0	18.8	19.3	27.2	41.1	3.7	3.9	5.4	7,019	8,823	25.7	7,842	6,022	-23.2
Moore County	10.7	9.1	-15.0	11.8	20.7	75.3	3.1	3.1	0.0	7,945	10,739	35.2		637	
Morgan County	17.6	20.4	15.9	6.0	7.3	21.9	5.0	4.5	-10.0	7,175	9,376	30.7	746	194	-74.0
Obion County	12.5	17.7	41.6	10.3	14.9	45.1	4.2	5.0	19.0	7,341	9,289	26.5	6,858	2,523	-63.2
Overton County	16.0	15.0	-6.3	8.3	13.1	58.0	5.3	3.8	-28.3	6,683	8,139	21.8	1,380	834	-39.6
Perry County	15.0	17.6	17.3	7.1	11.5	62.3	5.1	4.3	-15.7	7,765	10,628	36.9	1,912	809	-57.7

Pickett County	17.5	16.0	-8.6	9.1	8.7	-4.5	5.0	3.9	-22.0	8,347	9,325	11.7	607	262	-56.8
Polk County	13.4	15.8	17.9	7.5	11.0	46.9	4.4	4.2	-4.5	7,172	8,932	24.5	508	123	-75.8
Putnam County	13.8	14.5	5.1	20.2	25.4	25.9	4.3	3.6	-16.3	6,953	8,882	27.7	9,008	5,394	-40.1
Rhea County	14.5	18.4	26.9	9.1	15.2	66.9	4.6	5.7	23.9	6,615	8,774	32.6	4,604	3,255	-29.3
Roane County	12.8	14.8	15.6	14.8	19.5	31.5	4.2	4.2	0.0	7,754	9,524	22.8	1,998	1,169	-41.5
Robertson County	9.2	10.6	15.2	11.9	18.6	56.1	3.5	3.2	-8.6	6,990	8,567	22.6	5,223	7,299	39.7
Rutherford County	8.2	10.4	26.8	22.9	32.0	39.7	3.0	2.7	-10.0	7,418	8,930	20.4	19,137	20,177	5.4
Scott County	20.7	21.2	2.4	7.5	9.4	24.7	5.1	4.4	-13.7	7,688	8,671	12.8	2,983	1,166	-60.9
Sequatchie County	14.8	16.0	8.1	10.2	14.6	42.9	3.8	4.3	13.2	6,961	8,088	16.2	969	205	-78.8
Sevier County	12.5	13.9	11.2	13.5	17.1	26.9	4.9	3.5	-28.6	7,872	10,091	28.2	2,402	1,750	-27.1
Shelby County	14.3	21.7	51.7	25.3	31.1	23.0	3.8	4.2	10.5	8,312	10,603	27.6	36,736	26,157	-28.8
Smith County	11.9	13.9	16.8	9.3	12.4	33.0	4.2	3.1	-26.2	6,129	8,055	31.4	1,880	1,406	-25.2
Stewart County	12.6	13.9	10.3	10.2	14.9	45.6	4.8	5.0	4.2	7,174	8,750	22.0	379	569	50.1
Sullivan County	12.0	16.5	37.5	18.1	22.8	25.9	3.6	3.7	2.8	9,493	9,693	2.1	15,906	11,973	-24.7
Sumner County	8.4	8.9	6.0	18.6	26.9	44.9	3.2	2.8	-12.5	7,512	8,794	17.1	10,931	7,911	-27.6
Tipton County	11.8	12.0	1.7	10.8	16.7	54.5	3.6	4.2	16.7	6,770	8,167	20.6	3,094	1,603	-48.2
Trousdale County	13.2	18.6	40.9	8.9	16.8	89.1	3.4	3.3	-2.9	6,932	9,118	31.5	390	188	-51.8
Unicoi County	13.2	16.1	22.0	10.6	14.8	39.8	6.7	4.9	-26.9	7,556	9,320	23.3	1,392	1,538	10.5
Union County	17.5	19.8	13.1	5.8	8.5	47.2	3.8	4.1	7.9	7,317	7,758	6.0	1,089	577	-47.0
Van Buren County	15.2	16.3	7.2	7.8	8.5	9.6	4.6	4.8	4.3	7,431	10,981	47.8		187	
Warren County	14.9	22.5	51.0	9.1	14.0	53.8	4.0	4.0	0.0	7,052	8,627	22.3	6,405	3,563	-44.4
Washington County	12.6	14.9	18.3	22.9	32.4	41.3	3.9	3.6	-7.7	7,710	9,056	17.5	10,109	5,325	-47.3
Wayne County	19.9	21.3	7.0	8.0	11.2	39.7	8.1	4.8	-40.7	7,720	9,380	21.5	1,191	550	-53.8
Weakley County	14.1	19.7	39.7	15.3	21.5	40.8	4.9	4.2	-14.3	6,701	8,568	27.9	3,167	1,722	-45.6
White County	15.0	17.3	15.3	7.9	13.5	71.3	4.5	3.6	-20.0	6,131	8,454	37.9	3,249	2,122	-34.7
Williamson County	4.5	3.8	-15.6	44.4	59.0	32.9	2.5	2.5	0.0	8,977	9,585	6.8	4,749	2,191	-53.9
Wilson County	7.6	7.8	2.6	19.6	30.6	56.3	3.1	2.8	-9.7	7,367	8,435	14.5	6,677	4,302	-35.6
Tennessee	**12.6**	**15.2**	**20.6**	**19.6**	**27.5**	**40.2**	**3.9**	**3.5**	**-10.3**	**7,310**	**9,083**	**24.3**	**475,621**	**334,568**	**-29.7**

Source: Poverty rates are from the U.S. Census Bureau, Small Area Income and Poverty Estimates (SAIPE). Educational attainment was obtained from the U.S. Census (2000) and the American Community Survey 5-year Estimates (2009-2018). Unemployment rates stem from the U.S. Bureau of Labor Statistics. Current spending for all elementary-secondary school systems was obtained from the U.S. Census Bureau, Annual Survey of School System Finances and is aggregated for counties. Manufacturing employment is from the U.S. Census, County Business Patterns, and blanks represent withheld data due to disclosure concerns.

APPENDIX TABLE V

DRIVING AND COMMUTING PATTERNS FOR ALL COUNTIES

County	Percent Drove Alone			Percent Carpooled			Percent Public Transportation			Percent Walked			Percent Other Means for Transportation		
	2000	2018	Percent change 2000 to 2018	2000	2018	Percent change 2000 to 2018	2000	2018	Percent change 2000 to 2018	2000	2018	Percent change 2000 to 2018	2000	2018	Percent change 2000 to 2018
Anderson County	86.4	86.9	0.6	9.5	8.4	-11.6	0.2	0.3	50.0	1.3	0.6	-53.8	0.5	0.8	60.0
Bedford County	78.2	80.2	2.6	15.3	14.6	-4.6	0.6	0.2	-66.7	1.8	0.8	-55.6	0.7	1.3	85.7
Benton County	80.2	87.5	9.1	14.3	9.5	-33.6	0.2	0.6	200.0	1.1	0.2	-81.8	1.2	1.0	-16.7
Bledsoe County	76.2	76.7	0.7	19.3	14.3	-25.9	0.0	0.7	-	1.3	3.1	138.5	0.8	1.2	50.0
Blount County	84.9	86.7	2.1	10.4	7.5	-27.9	0.3	0.2	-33.3	1.3	0.7	-46.2	0.7	1.0	42.9
Bradley County	83.6	82.2	-1.7	12.4	10.3	-16.9	0.1	0.2	100.0	1.3	1.9	46.2	0.4	1.2	200.0
Campbell County	80.9	82.8	2.3	15.0	12.5	-16.7	0.0	0.1	-	0.6	0.9	50.0	1.6	0.2	-87.5
Cannon County	76.3	86.2	13.0	17.3	8.2	-52.6	0.1	0.0	-100.0	1.2	1.0	-16.7	1.6	0.1	-93.8
Carroll County	82.0	86.7	5.7	13.0	5.9	-54.6	0.2	0.1	-50.0	1.8	1.9	5.6	1.2	2.8	133.3
Carter County	82.4	86.2	4.6	13.3	6.5	-51.1	0.4	0.1	-75.0	1.9	1.3	-31.6	0.4	1.8	350.0
Cheatham County	79.1	83.7	5.8	16.7	9.2	-44.9	0.3	0.4	33.3	0.7	0.7	0.0	1.0	1.5	50.0
Chester County	79.8	84.5	5.9	13.5	7.6	-43.7	0.0	0.2	-	3.9	2.7	-30.8	0.6	1.5	150.0
Claiborne County	80.4	86.9	8.1	14.5	8.1	-44.1	0.3	0.2	-33.3	0.9	0.9	0.0	1.0	0.4	-60.0
Clay County	79.0	86.5	9.5	15.0	9.2	-38.7	0.9	0.0	-100.0	1.9	1.4	-26.3	0.4	1.4	250.0
Cocke County	78.5	84.1	7.1	16.6	11.4	-31.3	0.2	0.0	-100.0	1.4	0.6	-57.1	0.9	1.7	88.9
Coffee County	82.4	85.9	4.2	13.3	8.6	-35.3	0.3	0.0	-100.0	0.8	1.1	37.5	0.9	0.4	-55.6
Crockett County	82.0	90.4	10.2	12.3	6.4	-48.0	0.1	0.0	-100.0	2.1	1.1	-47.6	0.5	0.3	-40.0
Cumberland County	82.5	83.6	1.3	12.6	10.9	-13.5	0.3	0.0	-100.0	1.6	1.0	-37.5	0.8	1.1	37.5
Davidson County	78.6	78.7	0.1	13.3	10.0	-24.8	1.8	2.1	16.7	2.3	2.2	-4.3	0.9	1.2	33.3
Decatur County	79.8	83.8	5.0	15.6	7.1	-54.5	0.1	0.4	300.0	0.9	0.8	-11.1	1.3	0.7	-46.2
DeKalb County	76.3	84.6	10.9	14.5	11.9	-17.9	0.2	0.0	-100.0	3.6	0.7	-80.6	1.8	0.8	-55.6
Dickson County	79.3	82.5	4.0	15.9	11.5	-27.7	0.3	0.1	-66.7	0.9	2.1	133.3	0.7	0.7	0.0
Dyer County	84.0	87.8	4.5	12.4	7.0	-43.5	0.5	0.0	-100.0	0.7	1.2	71.4	0.7	1.3	85.7
Fayette County	80.3	87.9	9.5	14.3	6.2	-56.6	0.6	0.1	-83.3	0.8	0.5	-37.5	1.0	1.1	10.0
Fentress County	78.9	80.5	2.0	15.8	12.4	-21.5	0.2	0.1	-50.0	1.4	1.1	-21.4	0.7	0.6	-14.3
Franklin County	80.0	84.0	5.0	12.6	8.8	-30.2	0.1	0.0	-100.0	3.2	3.9	21.9	1.0	0.8	-20.0
Gibson County	84.6	86.6	2.4	11.7	6.9	-41.0	0.2	0.1	-50.0	0.9	1.6	77.8	1.1	2.7	145.5
Giles County	82.5	84.7	2.7	11.4	9.3	-18.4	0.4	0.0	-100.0	2.0	1.6	-20.0	0.8	2.3	187.5
Grainger County	81.5	76.4	-6.3	13.6	14.7	8.1	0.3	0.5	66.7	1.3	1.3	0.0	0.3	0.8	166.7
Greene County	83.9	86.8	3.5	11.0	7.2	-34.5	0.3	0.0	-100.0	1.2	1.0	-16.7	0.5	1.8	260.0
Grundy County	73.0	82.2	12.6	19.0	8.3	-56.3	0.6	0.0	-100.0	1.6	2.1	31.2	1.3	0.6	-53.8

Hamblen County	84.6	85.0	0.5	12.9	10.5	-18.6	0.2	0.4	100.0	0.9	0.2	-77.8	0.4	1.0	150.0
Hamilton County	82.4	82.3	-0.1	11.9	8.2	-31.1	1.0	1.1	10.0	1.7	2.0	17.6	0.7	1.1	57.1
Hancock County	71.4	82.1	15.0	20.8	10.6	-49.0	0.1	1.1	1,000.0	0.6	0.8	33.3	0.6	1.2	100.0
Hardeman County	78.9	83.7	6.1	16.6	10.2	-38.6	0.2	0.1	-50.0	0.8	0.9	12.5	1.4	0.8	-42.9
Hardin County	80.7	83.1	3.0	14.3	6.5	-54.5	0.2	0.2	0.0	1.9	0.7	-63.2	0.9	1.4	55.6
Hawkins County	85.9	89.9	4.7	10.5	6.5	-38.1	0.4	0.4	0.0	0.4	0.5	25.0	0.7	0.7	0.0
Haywood County	78.5	88.9	13.2	17.6	7.6	-56.8	0.2	0.0	-100.0	1.0	0.5	-50.0	1.8	1.7	-5.6
Henderson County	84.7	86.7	2.4	11.0	7.4	-32.7	0.2	0.1	-50.0	0.8	0.6	-25.0	1.0	1.0	0.0
Henry County	82.5	83.5	1.2	12.8	8.1	-36.7	0.2	0.1	-50.0	1.3	0.8	-38.5	0.8	3.3	312.5
Hickman County	76.5	78.5	2.6	18.5	12.4	-33.0	0.1	0.1	0.0	0.7	2.0	185.7	0.6	3.1	416.7
Houston County	81.1	79.5	-2.0	14.7	10.2	-30.6	0.5	0.5	0.0	1.2	5.1	325.0	0.1	1.7	1,600.0
Humphreys County	80.3	86.2	7.3	15.1	9.9	-34.4	0.2	0.0	-100.0	1.6	0.8	-50.0	0.6	0.8	33.3
Jackson County	79.0	86.4	9.4	16.0	8.6	-46.3	0.3	0.2	-33.3	1.2	1.3	8.3	0.8	1.4	75.0
Jefferson County	82.4	78.1	-5.2	10.8	14.3	32.4	0.2	0.3	50.0	2.6	1.6	-38.5	1.0	0.9	-10.0
Johnson County	76.2	83.3	9.3	19.1	7.4	-61.3	0.1	0.7	600.0	0.8	1.6	100.0	0.8	1.0	25.0
Knox County	84.5	83.3	-1.4	9.2	7.8	-15.2	0.7	0.7	0.0	2.2	1.9	-13.6	0.6	1.1	83.3
Lake County	81.0	86.4	6.7	13.3	5.6	-57.9	0.4	0.0	-100.0	2.4	3.9	62.5	1.3	2.2	69.2
Lauderdale County	83.3	88.2	5.9	13.0	7.4	-43.1	0.3	0.5	66.7	1.2	1.3	8.3	0.6	1.4	133.3
Lawrence County	80.8	84.0	4.0	13.6	8.9	-34.6	0.0	0.2	-	1.4	2.0	42.9	0.8	1.9	137.5
Lewis County	77.1	76.4	-0.9	17.2	14.3	-16.9	0.1	0.7	600.0	2.4	1.2	-50.0	1.0	3.0	200.0
Lincoln County	80.6	85.3	5.8	14.9	10.4	-30.2	0.4	0.4	0.0	0.7	0.7	0.0	0.7	0.7	0.0
Loudon County	83.7	83.5	-0.2	10.6	9.8	-7.5	0.2	0.2	0.0	0.9	0.4	-55.6	1.3	0.9	-30.8
McMinn County	83.0	85.5	3.0	12.4	8.7	-29.8	0.2	0.3	50.0	1.6	1.2	-25.0	0.5	0.5	0.0
McNairy County	81.7	87.8	7.5	12.4	6.0	-51.6	0.3	0.0	-100.0	1.2	0.4	-66.7	1.3	0.8	-38.5
Macon County	73.7	82.1	11.4	21.0	14.2	-32.4	0.4	0.0	-100.0	1.3	0.5	-61.5	0.6	0.5	-16.7
Madison County	84.1	84.5	0.5	10.7	8.3	-22.4	0.8	0.7	-12.5	1.6	1.0	-37.5	0.9	3.1	244.4
Marion County	81.9	86.0	5.0	14.6	6.8	-53.4	0.0	0.1	-	0.7	1.8	157.1	0.6	0.2	-66.7
Marshall County	80.8	88.2	9.2	14.0	7.6	-45.7	0.4	0.2	-50.0	1.2	0.4	-66.7	0.6	0.6	0.0
Maury County	82.9	86.3	4.1	13.2	7.7	-41.7	0.3	0.2	-33.3	1.0	1.0	0.0	0.7	1.0	42.9
Meigs County	79.3	86.1	8.6	16.1	9.8	-39.1	0.8	0.5	-37.5	1.0	0.2	-80.0	0.9	1.2	33.3
Monroe County	82.3	85.4	3.8	13.3	9.2	-30.8	0.2	0.3	50.0	1.0	1.0	0.0	0.7	1.4	100.0
Montgomery County	81.6	86.5	6.0	12.3	7.2	-41.5	0.9	0.9	0.0	2.1	1.4	-33.3	1.2	1.3	8.3
Moore County	88.8	89.5	0.8	6.4	5.5	-14.1	0.0	0.0	-	1.1	0.4	-63.6	0.2	0.4	100.0
Morgan County	79.6	82.3	3.4	16.1	12.1	-24.8	0.2	0.0	-100.0	1.3	1.5	15.4	0.7	1.0	42.9
Obion County	83.5	85.9	2.9	12.4	8.4	-32.3	0.4	0.3	-25.0	0.9	1.8	100.0	0.7	1.0	42.9
Overton County	82.9	87.8	5.9	12.0	7.9	-34.2	0.2	0.2	0.0	1.8	0.7	-61.1	1.3	0.5	-61.5
Perry County	74.5	77.1	3.5	19.2	5.5	-71.4	0.2	0.0	-100.0	0.8	1.8	125.0	0.7	4.8	585.7

Appendix Table V, Continued

Pickett County	80.1	83.2	3.9	14.2	10.0	-29.6	0.3	0.0	-100.0	0.5	1.1	120.0	0.0	0.0	-
Polk County	75.5	85.4	13.1	18.5	9.8	-47.0	0.4	0.0	-100.0	2.0	1.0	-50.0	0.5	1.0	100.0
Putnam County	80.6	86.3	7.1	12.9	8.4	-34.9	0.2	0.0	-100.0	2.4	1.2	-50.0	1.2	0.8	-33.3
Rhea County	77.7	81.5	4.9	17.4	12.3	-29.3	0.2	0.2	0.0	1.6	1.9	18.8	0.5	0.6	20.0
Roane County	86.1	86.5	0.5	10.3	8.8	-14.6	0.2	0.0	-100.0	0.7	0.4	-42.9	0.9	0.5	-44.4
Robertson County	79.9	83.5	4.5	15.1	8.8	-41.7	0.3	0.4	33.3	0.9	0.9	0.0	0.9	1.9	111.1
Rutherford County	83.1	83.6	0.6	12.6	9.7	-23.0	0.2	0.3	50.0	1.0	0.9	-10.0	0.7	1.2	71.4
Scott County	82.6	85.0	2.9	14.1	8.2	-41.8	0.3	0.1	-66.7	1.3	0.7	-46.2	0.7	1.9	171.4
Sequatchie County	83.4	81.5	-2.3	13.9	13.2	-5.0	0.3	0.2	-33.3	1.3	0.8	-38.5	0.3	1.1	266.7
Sevier County	80.6	78.0	-3.2	13.2	14.2	7.6	0.5	0.3	-40.0	1.6	1.3	-18.8	0.8	1.3	62.5
Shelby County	80.2	83.6	4.2	13.1	9.4	-28.2	2.1	1.2	-42.9	1.5	1.2	-20.0	0.9	1.4	55.6
Smith County	82.3	86.4	5.0	12.2	9.4	-23.0	0.4	0.3	-25.0	0.9	0.3	-66.7	0.9	0.4	-55.6
Stewart County	78.3	84.2	7.5	16.7	11.2	-32.9	0.5	0.3	-40.0	0.3	0.8	166.7	2.5	1.6	-36.0
Sullivan County	86.1	86.1	0.0	9.5	7.6	-20.0	0.2	0.2	0.0	1.2	0.8	-33.3	0.6	1.6	166.7
Sumner County	82.9	83.5	0.7	12.1	8.6	-28.9	0.3	0.4	33.3	0.8	0.5	-37.5	0.8	1.6	100.0
Tipton County	82.9	88.1	6.3	13.1	8.3	-36.6	0.3	0.1	-66.7	0.5	0.5	0.0	1.1	1.1	0.0
Trousdale County	76.1	77.3	1.6	18.3	17.5	-4.4	0.3	0.0	-100.0	0.7	0.4	-42.9	1.6	0.0	-100.0
Unicoi County	85.6	80.9	-5.5	11.2	7.6	-32.1	0.0	1.2	-	0.5	2.2	340.0	0.9	3.1	244.4
Union County	81.0	85.6	5.7	15.1	8.6	-43.0	0.0	0.0	-	1.5	0.2	-86.7	0.5	0.7	40.0
Van Buren County	72.2	83.7	15.9	21.0	4.5	-78.6	0.3	0.4	33.3	1.4	0.0	-100.0	1.7	2.1	23.5
Warren County	78.5	85.3	8.7	15.0	8.9	-40.7	0.2	0.0	-100.0	2.4	1.6	-33.3	0.6	0.3	-50.0
Washington County	85.0	85.8	0.9	10.4	6.0	-42.3	0.4	0.6	50.0	1.5	1.3	-13.3	0.6	2.1	250.0
Wayne County	79.3	84.3	6.3	14.7	10.2	-30.6	0.8	0.0	-100.0	2.0	0.1	-95.0	1.6	3.4	112.5
Weakley County	82.2	84.4	2.7	10.4	7.9	-24.0	0.2	0.2	0.0	3.5	3.6	2.9	0.8	2.5	212.5
White County	81.8	86.8	6.1	12.4	7.6	-38.7	0.1	0.0	-100.0	1.2	1.3	8.3	1.5	1.1	-26.7
Williamson County	83.6	80.9	-3.2	9.3	7.2	-22.6	0.2	0.4	100.0	0.7	0.8	14.3	0.9	1.0	11.1
Wilson County	83.3	82.4	-1.1	11.6	9.2	-20.7	0.3	0.8	166.7	0.6	0.7	16.7	0.9	1.0	11.1
Tennessee	**81.7**	**83.4**	**2.1**	**12.5**	**9.0**	**-28.0**	**0.8**	**0.7**	**-12.5**	**1.5**	**1.3**	**-13.3**	**0.8**	**1.2**	**50.0**

Source: Driving and commuting patterns are from the U.S. Census (2000) and the American Community Survey 5-year Estimates (2009-2018).

Appendix Table VI

Commuting Patterns, Mean Travel Time to Work, and Work Location for all Counties

County	Percent Worked at Home			Mean Travel Time to Work (minutes)			Percent Work in County of Residence			Percent Work Outside County of Residence			Percent Work Out of State		
	2000	2018	Percent change 2000 to 2018	2000	2018	Percent change 2000 to 2018	2000	2018	Percent change 2000 to 2018	2000	2018	Percent change 2000 to 2018	2000	2018	Percent change 2000 to 2018
Anderson County	2.0	3.0	50.0	22.9	23.8	3.9	65.3	61.3	-6.1	34.0	37.6	10.4	0.7	1.1	59.2
Bedford County	3.4	3.0	-11.8	24.1	24.0	-0.4	70.3	63.6	-9.6	29.0	35.5	22.5	0.7	0.9	34.6
Benton County	3.1	1.2	-61.3	27.1	23.3	-14.0	60.9	58.1	-4.6	37.4	39.8	6.3	1.6	2.2	33.6
Bledsoe County	2.3	3.9	69.6	33.0	32.3	-2.1	47.5	47.0	-1.1	50.8	48.2	-5.1	1.7	4.8	179.3
Blount County	2.5	4.0	60.0	24.0	24.7	2.9	63.5	62.9	-1.0	35.4	36.1	1.9	1.0	1.0	-2.5
Bradley County	2.2	4.2	90.9	20.7	21.1	1.9	76.7	74.8	-2.5	18.1	21.5	18.8	5.2	3.7	-29.1
Campbell County	1.8	3.5	94.4	30.8	28.7	-6.8	60.5	60.0	-0.9	35.2	34.7	-1.3	4.3	5.2	20.9
Cannon County	3.5	4.5	28.6	32.7	32.2	-1.5	37.1	33.6	-9.5	62.2	66.4	6.8	0.7	0.0	-100.0
Carroll County	1.8	2.6	44.4	24.1	24.7	2.5	55.8	52.5	-6.0	43.0	46.3	7.8	1.2	1.1	-7.9
Carter County	1.6	4.1	156.3	24.1	23.8	-1.2	43.5	42.7	-1.9	49.7	51.7	3.9	6.7	5.6	-16.9
Cheatham County	2.3	4.5	95.7	32.9	32.7	-0.6	27.4	31.0	13.0	71.4	67.8	-5.0	1.2	1.2	1.8
Chester County	2.2	3.5	59.1	26.1	26.0	-0.4	45.8	52.1	13.8	52.4	46.6	-11.0	1.8	1.3	-29.3
Claiborne County	2.9	3.5	20.7	27.7	24.4	-11.9	64.5	66.0	2.3	19.9	18.0	-9.4	15.6	16.0	2.4
Clay County	2.8	1.6	-42.9	29.0	29.1	0.3	59.4	48.6	-18.2	34.8	46.2	32.9	5.9	5.2	-11.2
Cocke County	2.5	2.2	-12.0	28.5	27.8	-2.5	59.7	54.4	-8.9	39.1	43.8	11.9	1.2	1.8	54.7
Coffee County	2.4	3.9	62.5	22.4	23.6	5.4	75.8	66.6	-12.1	22.7	32.9	44.8	1.5	0.5	-67.0
Crockett County	3.0	1.9	-36.7	20.9	24.0	14.8	56.6	42.9	-24.2	43.0	55.6	29.4	0.4	1.5	272.5
Cumberland County	2.2	3.3	50.0	23.0	22.5	-2.2	83.1	83.3	0.3	15.4	15.5	0.8	1.5	1.2	-22.2
Davidson County	3.1	5.8	87.1	23.3	24.6	5.6	87.0	82.2	-5.5	12.0	16.8	40.5	1.0	1.0	-1.7
Decatur County	2.2	7.1	222.7	25.7	25.9	0.8	65.7	61.4	-6.6	32.4	37.3	15.2	1.9	1.3	-32.2
DeKalb County	3.5	1.9	-45.7	24.3	28.5	17.3	66.4	54.1	-18.5	32.7	44.8	36.9	0.9	1.2	39.7
Dickson County	3.0	3.2	6.7	30.5	32.8	7.5	57.8	55.8	-3.5	41.2	42.9	4.1	1.0	1.2	22.3
Dyer County	1.7	2.7	58.8	19.1	19.9	4.2	82.7	79.3	-4.1	15.1	14.5	-3.8	2.2	6.1	178.2
Fayette County	3.0	4.2	40.0	35.4	32.9	-7.1	32.7	30.2	-7.6	65.2	66.9	2.6	2.1	2.9	38.5
Fentress County	3.0	5.2	73.3	29.5	24.6	-16.6	68.6	71.3	4.0	28.5	27.7	-2.8	2.9	1.0	-65.6
Franklin County	3.0	2.6	-13.3	24.1	23.4	-2.9	59.8	60.5	1.1	36.8	36.0	-2.1	3.4	3.4	0.3
Gibson County	1.5	2.0	33.3	22.1	23.2	5.0	66.3	54.0	-18.6	32.9	45.3	37.9	0.8	0.7	-15.5
Giles County	3.0	2.1	-30.0	25.1	26.4	5.2	71.1	64.6	-9.1	20.7	24.6	19.0	8.3	10.8	30.8
Grainger County	3.0	6.3	110.0	29.1	33.1	13.7	34.5	32.4	-6.2	64.3	65.7	2.1	1.1	1.9	66.8
Greene County	2.9	3.2	10.3	22.4	22.4	0.0	85.0	80.4	-5.5	13.3	18.5	39.5	1.7	1.1	-35.1
Grundy County	4.5	6.8	51.1	32.2	29.1	-9.6	49.6	50.1	1.0	49.0	49.1	0.2	1.4	0.7	-49.2

Appendix Table VI, Continued

Hamblen County	1.1	2.9	163.6	19.6	21.5	9.7	81.5	75.6	-7.3	17.4	23.8	36.7	1.1	0.6	-43.5
Hamilton County	2.3	5.4	134.8	22.6	21.7	-4.0	91.0	91.9	1.0	3.3	4.1	22.6	5.6	4.0	-29.0
Hancock County	6.5	4.2	-35.4	32.7	31.6	-3.4	59.3	50.2	-15.3	38.3	43.4	13.4	2.5	6.4	161.1
Hardeman County	2.2	4.4	100.0	29.4	28.8	-2.0	65.3	61.6	-5.6	31.2	33.1	6.1	3.5	5.3	50.1
Hardin County	2.0	8.0	300.0	24.0	24.9	3.7	69.4	74.1	6.8	23.4	18.3	-21.8	7.2	7.7	6.7
Hawkins County	2.0	2.1	5.0	24.7	25.9	4.9	51.6	44.9	-13.0	45.7	51.6	13.0	2.7	3.5	27.4
Haywood County	0.9	1.2	33.3	24.0	23.9	-0.4	60.0	52.2	-13.1	39.7	47.2	18.9	0.3	0.6	126.5
Henderson County	2.3	4.2	82.6	24.6	27.2	10.6	67.6	60.4	-10.7	31.6	38.5	21.9	0.8	1.1	44.4
Henry County	2.4	4.0	66.7	19.9	20.0	0.5	80.6	75.8	-5.9	14.4	12.6	-12.3	5.1	11.6	128.7
Hickman County	3.7	3.9	5.4	36.7	36.2	-1.4	40.4	38.7	-4.1	58.9	59.8	1.4	0.7	1.5	115.6
Houston County	2.5	3.0	20.0	32.0	33.8	5.6	42.0	43.6	3.8	55.6	53.6	-3.5	2.5	2.8	14.0
Humphreys County	2.3	2.3	0.0	29.8	29.5	-1.0	66.4	61.2	-7.8	32.4	38.0	17.4	1.2	0.8	-35.5
Jackson County	2.9	2.2	-24.1	29.7	33.2	11.8	43.5	32.3	-25.8	55.6	67.2	20.8	0.8	0.5	-40.6
Jefferson County	3.0	4.8	60.0	26.4	26.5	0.4	44.6	41.1	-7.8	54.3	57.2	5.3	1.1	1.7	50.0
Johnson County	3.0	6.0	100.0	32.0	24.8	-22.5	63.5	66.4	4.5	7.9	9.4	19.6	28.6	24.2	-15.4
Knox County	2.7	5.2	92.6	22.2	22.1	-0.5	85.6	83.7	-2.3	13.4	15.3	14.2	1.0	1.0	4.6
Lake County	1.7	1.9	11.8	20.4	18.7	-8.3	67.4	64.8	-3.8	31.9	31.8	-0.2	0.8	3.4	337.7
Lauderdale County	1.6	1.2	-25.0	23.6	25.2	6.8	67.9	63.0	-7.2	31.0	36.0	16.3	1.2	1.0	-14.0
Lawrence County	3.2	3.1	-3.1	24.2	27.3	12.8	76.6	65.6	-14.4	18.6	28.1	51.0	4.8	6.3	32.3
Lewis County	2.1	4.6	119.0	28.5	24.5	-14.0	54.5	61.8	13.5	43.9	37.4	-14.8	1.6	0.8	-50.5
Lincoln County	2.7	2.5	-7.4	27.9	28.0	0.4	61.0	59.6	-2.3	16.0	18.4	14.7	23.0	22.0	-4.2
Loudon County	3.3	5.2	57.6	24.8	22.7	-8.5	50.7	47.5	-6.2	47.8	51.2	7.0	1.5	1.3	-14.0
McMinn County	2.4	3.9	62.5	23.1	23.0	-0.4	72.3	67.4	-6.8	25.6	31.0	21.3	2.2	1.6	-25.6
McNairy County	3.1	4.9	58.1	26.0	26.6	2.3	58.2	52.0	-10.7	28.2	30.4	7.7	13.6	17.6	29.8
Macon County	3.0	2.6	-13.3	31.1	33.2	6.8	56.1	49.1	-12.5	40.7	46.8	14.9	3.1	4.1	30.8
Madison County	1.9	2.4	26.3	19.0	18.7	-1.6	88.6	88.0	-0.7	10.6	10.7	1.0	0.8	1.3	67.9
Marion County	2.1	5.1	142.9	29.2	28.7	-1.7	47.6	51.2	7.7	44.1	43.3	-1.9	8.3	5.5	-33.7
Marshall County	3.0	3.0	0.0	25.3	30.9	22.1	67.7	52.4	-22.6	31.5	46.6	47.8	0.7	1.0	34.3
Maury County	1.9	3.8	100.0	26.0	29.2	12.3	70.0	59.4	-15.2	29.1	39.4	35.4	0.9	1.2	35.8
Meigs County	2.0	2.2	10.0	33.7	30.8	-8.6	32.9	30.2	-8.3	64.7	68.9	6.5	2.3	0.8	-65.9
Monroe County	2.5	2.7	8.0	26.0	28.1	8.1	64.6	60.4	-6.4	33.8	37.4	10.6	1.6	2.2	33.9
Montgomery County	1.9	2.6	36.8	25.5	25.3	-0.8	61.8	62.2	0.7	12.2	13.6	11.2	26.0	24.3	-6.6
Moore County	3.4	4.3	26.5	22.3	28.4	27.4	35.5	33.4	-5.9	63.4	63.8	0.6	1.1	2.7	152.0
Morgan County	2.2	3.0	36.4	34.8	30.0	-13.8	39.1	40.9	4.7	60.0	55.5	-7.5	0.9	3.5	291.7
Obion County	2.1	2.6	23.8	18.3	21.7	18.6	75.2	70.4	-6.4	17.7	21.2	19.7	7.1	8.4	18.5
Overton County	1.7	3.0	76.5	26.1	26.6	1.9	53.2	52.2	-1.9	45.8	46.6	1.8	1.0	1.2	14.7
Perry County	4.7	10.9	131.9	27.9	27.5	-1.4	71.6	70.9	-1.0	25.5	25.7	0.9	2.9	3.5	20.5

Pickett County	4.9	5.7	16.3	25.1	25.7	2.4	61.9	60.6	-2.1	27.8	26.3	-5.5	10.3	13.1	27.4
Polk County	3.0	2.8	-6.7	30.1	28.3	-6.0	29.6	35.2	19.1	49.2	48.6	-1.1	21.3	16.3	-23.4
Putnam County	2.6	3.2	23.1	19.6	22.6	15.3	85.2	84.1	-1.3	13.8	15.2	10.3	1.0	0.6	-42.8
Rhea County	2.6	3.5	34.6	24.4	22.7	-7.0	74.5	72.0	-3.3	23.9	26.4	10.3	1.6	1.7	6.9
Roane County	1.7	3.8	123.5	26.0	28.5	9.6	50.3	46.8	-6.9	48.5	51.8	6.9	1.3	1.4	10.1
Robertson County	2.8	4.5	60.7	29.3	29.6	1.0	43.6	44.4	1.9	54.4	52.9	-2.8	2.0	2.8	38.0
Rutherford County	2.5	4.4	76.0	26.8	28.8	7.5	62.5	65.5	4.7	36.6	33.5	-8.4	0.9	0.9	2.5
Scott County	1.0	4.1	310.0	27.2	28.5	4.8	80.0	74.1	-7.4	14.5	20.9	44.2	5.5	5.0	-9.5
Sequatchie County	0.8	3.1	287.5	27.7	32.4	17.0	49.6	44.5	-10.3	46.6	50.8	9.1	3.8	4.7	23.4
Sevier County	3.3	4.9	48.5	25.3	25.5	0.8	73.8	78.2	5.9	25.2	20.9	-17.1	1.0	0.9	-7.9
Shelby County	2.2	3.2	45.5	23.7	22.8	-3.8	95.2	93.7	-1.6	0.8	1.0	26.9	4.0	5.2	29.3
Smith County	3.3	3.2	-3.0	29.9	29.5	-1.3	60.3	52.1	-13.6	38.9	47.5	22.2	0.8	0.4	-52.7
Stewart County	1.7	2.0	17.6	37.2	31.9	-14.2	42.6	46.5	9.1	42.5	41.7	-1.8	14.9	11.8	-20.9
Sullivan County	2.4	3.6	50.0	21.3	21.1	-0.9	71.7	70.2	-2.1	15.7	17.4	10.5	12.6	12.5	-0.6
Sumner County	3.2	5.4	68.8	27.2	28.4	4.4	49.3	52.1	5.7	48.6	45.1	-7.2	2.1	2.8	30.7
Tipton County	2.2	1.9	-13.6	31.7	32.7	3.2	41.4	35.0	-15.5	57.3	63.1	10.2	1.3	1.9	46.4
Trousdale County	3.0	4.8	60.0	32.7	31.3	-4.3	37.0	33.9	-8.3	61.7	62.5	1.3	1.3	3.6	171.9
Unicoi County	1.7	4.9	188.2	21.2	21.3	0.5	54.1	51.5	-4.8	41.5	45.0	8.4	4.4	3.5	-20.3
Union County	1.9	4.9	157.9	31.5	33.2	5.4	35.2	36.0	2.2	63.5	62.6	-1.4	1.3	1.4	11.1
Van Buren County	3.4	9.3	173.5	29.9	28.5	-4.7	42.3	38.6	-8.7	57.3	60.1	4.9	0.4	1.3	221.2
Warren County	3.3	3.9	18.2	23.4	24.2	3.4	82.3	75.5	-8.2	17.1	23.9	39.9	0.7	0.6	-8.7
Washington County	2.2	4.2	90.9	20.6	20.4	-1.0	73.8	71.8	-2.7	23.8	25.8	8.3	2.4	2.4	-0.9
Wayne County	1.7	2.0	17.6	31.3	30.3	-3.2	63.7	66.0	3.7	23.4	19.8	-15.6	12.9	14.2	10.1
Weakley County	2.9	1.4	-51.7	20.2	20.3	0.5	70.2	68.4	-2.6	26.9	27.9	3.9	2.9	3.7	25.8
White County	3.1	3.1	0.0	22.4	24.0	7.1	67.0	56.5	-15.6	32.3	43.2	33.6	0.7	0.3	-58.0
Williamson County	5.4	9.7	79.6	26.3	27.7	5.3	50.8	61.7	21.6	47.7	36.3	-23.9	1.5	2.0	29.3
Wilson County	3.2	5.9	84.4	29.2	30.9	5.8	43.9	46.7	6.4	55.0	52.1	-5.2	1.1	1.3	14.8
Tennessee	**2.6**	**4.4**	**69.2**	**24.5**	**25.0**	**2.0**	**73.4**	**71.5**	**-2.6**	**23.0**	**24.9**	**8.4**	**3.6**	**3.7**	**2.6**

Source: Driving and commuting patterns are from the U.S. Census (2000) and the American Community Survey 5-year Estimates (2009-2018).

APPENDIX TABLE VII

BOTTOM AND TOP 20 PROJECTS FOR RETURNS TO EMPLOYMENT

Project Pin	Route ID	Counties	County	Award (Nominal $)	Route Type	Establishments ROI	Metropolitan County	Adjacent to Metropolitan County	Population Density (per Square Mile)	Poverty Rate
Bottom 20:										
100249.05	33I0075001	Hamilton	Hamilton	259,600	I	-0.001791	1	1	628.8	19.2
103560.00	79SR057001	Shelby	Shelby	494,940	SR	-0.000691	1	1	1,206.4	18.0
100245.01	45I0081001	Jefferson	Jefferson	146,388	I	-0.000499	1	1	189.4	19.5
100335.03	79SR385301	Shelby, Fayette	Shelby	1,961,253	SR	-0.000438	1	1	1,216.6	20.4
101260.00	19I0065001	Davidson	Davidson	2,070,594	I	-0.000335	1	1	1,288.4	19.0
100332.00	79I0055001	Shelby	Shelby	4,448,890	I	-0.000333	1	1	1,230.6	21.6
47944.04	47I0040001	Knox	Knox	1,279,037	I	-0.000275	1	1	851.9	12.9
100335.03	79SR385301	Shelby, Fayette	Shelby	3,414,543	SR	-0.000252	1	1	1,216.6	20.4
101889.00	79SR001001	Shelby	Shelby	4,869,918	SR	-0.000234	1	1	1,216.6	20.4
100335.01	79SR385301	Shelby, Fayette	Shelby	6,703,482	I	-0.000212	1	1	1,230.6	21.6
100335.02	79SR385301	Shelby, Fayette	Shelby	6,797,836	I	-0.000209	1	1	1,230.6	21.6
101328.00	79SR057001	Shelby	Shelby	4,567,228	SR	-0.000208	1	1	1,229.0	20.2
102992.01	24SR086001	Fayette, Shelby	Shelby	3,231,895	SR	-0.000162	1	1	1,208.8	20.9
102992.01	79SR086001	Fayette, Shelby	Shelby	3,231,895	SR	-0.000162	1	1	1,208.8	20.9
109526.00	38SR022001	Henderson	Henderson	132,411	SR	-0.000159	0	1	53.9	19.1
109526.00	38SR022001	Henderson	Henderson	132,411	SR	-0.000159	0	1	53.9	19.1
101443.01	75I0024001	Rutherford	Rutherford	671,989	I	-0.000143	1	1	434.3	12.1
106526.01	79I0040001	Shelby	Shelby	10,545,363	I	-0.000132	1	1	1,231.1	21.8
100336.01	79SR385301	Shelby, Fayette	Shelby	6,530,794	SR	-0.000132	1	1	1,216.6	20.4
101260.00	19I0065001	Davidson	Davidson	5,473,765	I	-0.000127	1	1	1,288.4	19.0
Top 20:										
100994.00	29SR061001	Grainger, Union, Knox	Knox	1,827,267	SR	0.000189	1	1	810.2	14.2
100994.00	87SR061001	Grainger, Union, Knox	Knox	1,827,267	SR	0.000189	1	1	810.2	14.2
100994.00	47SR061001	Grainger, Union, Knox	Knox	1,827,267	SR	0.000189	1	1	810.2	14.2
114219.00	24I0040001	Fayette	Fayette	150,000	I	0.000193	1	1	55.7	13.8
100994.00	29SR061001	Grainger, Union, Knox	Knox	1,723,800	SR	0.000200	1	1	810.2	14.2
100994.00	87SR061001	Grainger, Union, Knox	Knox	1,723,800	SR	0.000200	1	1	810.2	14.2
100994.00	47SR061001	Grainger, Union, Knox	Knox	1,723,800	SR	0.000200	1	1	810.2	14.2
109532.00	60SR050001	Maury	Maury	192,422	SR	0.000234	1	1	136.3	13.8
107386.01	06SR311001	Bradley	Bradley	164,215	SR	0.000244	1	1	324.6	14.7
100234.05	47I0075001	Knox	Knox	1,163,946	I	0.000317	1	1	836.8	14.3
112455.00	90I0026001	Washington	Washington	275,183	I	0.000363	1	1	390.9	14.9
106269.01	94I0065001	Williamson	Williamson	2,079,927	I	0.000462	1	1	387.8	3.9
102488.07	19I0065001	Davidson	Davidson	3,545,895	I	0.000584	1	1	1,367.0	14.6
100994.00	47SR061001	Grainger, Union, Knox	Knox	577,475	SR	0.000597	1	1	810.2	14.2
100994.00	29SR061001	Grainger, Union, Knox	Knox	577,475	SR	0.000597	1	1	810.2	14.2
100994.00	87SR061001	Grainger, Union, Knox	Knox	577,475	SR	0.000597	1	1	810.2	14.2
117228.00	83I0065001	Davidson, Robertson, Sumner	Davidson	2,192,596	I	0.000752	1	1	1,374.1	15.4
117228.00	74I0065001	Davidson, Robertson, Sumner	Davidson	2,192,596	I	0.000752	1	1	1,374.1	15.4
117228.00	19I0065001	Davidson, Robertson, Sumner	Davidson	2,192,596	I	0.000752	1	1	1,374.1	15.4
46469.00	78SR448301	Sevier	Sevier	317,425	SR	0.000778	0	1	148.5	13.2

Source: Transportation investment data is from the Tennessee Department of Transportation. Business establishment data is from the U.S. Census Bureau, County Business Patterns. Poverty rates are from the U.S. Census Bureau, Small Area Income and Poverty Estimates (SAIPE).

APPENDIX TABLE VII, CONTINUED

Project Pin	Route ID	County	Manufacturing Employment Share	Percent with at least a Bachelor's Degree	Unemployment Rate	Elementary-Secondary Current Spending per Student (2018 $)	Percent Drove Alone	Percent Worked at Home	Mean Travel Time (minutes)	Percent Work in County	Percent Work Outside County	Percent Work Out of State
Bottom 20:												
100249.05	33I0075001	Hamilton	14.2	27.4	7.8	9,651	83.1	3.0	21.3	91.1	3.7	5.2
100335.03	79SR385301	Shelby	6.2	27.8	9.8	10,274	81.7	2.7	22.4	94.4	1.1	4.5
101260.00	19I0065001	Davidson	4.8	35.0	6.2	10,710	79.6	4.5	23.1	82.7	15.8	1.4
100245.01	45I0081001	Jefferson	18.3	13.4	10.5	7,793	81.9	2.5	24.4	44.5	54.3	1.3
47944.04	47I0040001	Knox	5.6	33.8	7.4	9,074	84.7	3.7	20.9	85.7	13.2	1.1
105899.03	19I0040001	Davidson	5.1	33.6	8.9	11,336	80.9	4.2	23.1	84.0	14.7	1.3
100335.03	79SR385301	Shelby	6.2	27.8	9.8	10,274	81.7	2.7	22.4	94.4	1.1	4.5
101443.01	75I0024001	Rutherford	17.1	27.0	7.9	8,434	85.3	2.6	26.4	63.2	35.8	1.0
101889.00	79SR001001	Shelby	6.2	27.8	9.8	10,274	81.7	2.7	22.4	94.4	1.1	4.5
101260.00	19I0065001	Davidson	4.8	35.0	6.2	10,710	79.6	4.5	23.1	82.7	15.8	1.4
100332.00	79I0055001	Shelby	5.9	29.0	8.8	10,358	82.4	2.8	22.4	94.4	0.9	4.7
100336.01	79SR385301	Shelby	6.2	27.8	9.8	10,274	81.7	2.7	22.4	94.4	1.1	4.5
100335.01	79SR385301	Shelby	5.9	29.0	8.8	10,358	82.4	2.8	22.4	94.4	0.9	4.7
100335.02	79SR385301	Shelby	5.9	29.0	8.8	10,358	82.4	2.8	22.4	94.4	0.9	4.7
102992.01	24SR086001	Shelby	6.4	27.5	10.1	10,193	82.2	2.5	22.3	94.6	1.0	4.4
102992.01	79SR086001	Shelby	6.4	27.5	10.1	10,193	82.2	2.5	22.3	94.6	1.0	4.4
106526.01	79I0040001	Shelby	5.9	28.7	8.6	10,313	81.9	2.9	22.4	94.1	1.0	4.9
82060.01	06I0075001	Hamilton	14.2	26.9	9.0	10,081	82.6	2.6	21.2	90.8	3.8	5.4
100335.02	79SR385301	Shelby	5.9	29.0	8.8	10,358	82.4	2.8	22.4	94.4	0.9	4.7
82060.01	06I0075001	Hamilton	14.2	26.9	9.0	10,081	82.6	2.6	21.2	90.8	3.8	5.4
Top 20:												
113898.01	19I0440001	Davidson	4.5	36.5	5.0	10,922	79.7	4.7	23.3	82.3	16.4	1.3
100234.05	47I0075001	Knox	6.2	32.6	5.0	9,189	84.5	3.4	21.0	85.9	13.0	1.1
109532.00	60SR050001	Maury		17.4	7.1	8,722	82.3	3.6	28.7	59.0	39.6	1.5
100994.00	29SR061001	Knox	7.3	31.7	3.9	8,537	84.5	3.2	21.3	85.8	13.1	1.1
100994.00	87SR061001	Knox	7.3	31.7	3.9	8,537	84.5	3.2	21.3	85.8	13.1	1.1
100994.00	47SR061001	Knox	7.3	31.7	3.9	8,537	84.5	3.2	21.3	85.8	13.1	1.1
105899.02	19I0065001	Davidson	5.5	33.3	5.4	10,730	80.6	4.1	23.1	84.3	14.4	1.3
107386.01	06SR311001	Bradley	19.3	21.9	3.6	8,760	82.2	4.2	21.1	74.8	21.5	3.7
106269.01	94I0065001	Williamson	1.7	58.1	2.7	9,621	80.9	9.0	27.3	61.2	36.9	1.9
100994.00	87SR061001	Knox	7.3	31.7	3.9	8,537	84.5	3.2	21.3	85.8	13.1	1.1
100994.00	47SR061001	Knox	7.3	31.7	3.9	8,537	84.5	3.2	21.3	85.8	13.1	1.1
100994.00	29SR061001	Knox	7.3	31.7	3.9	8,537	84.5	3.2	21.3	85.8	13.1	1.1
102488.07	19I0065001	Davidson	4.4	39.1	2.7	11,262	79.2	5.7	24.5	82.0	16.9	1.1
46469.00	78SR448301	Sevier	3.1	15.0	7.1	9,067	78.7	3.4	24.3	77.2	21.7	1.1
117228.00	19I0065001	Davidson	4.4	40.3	2.7	11,950	78.7	5.8	24.6	82.2	16.8	1.0
117228.00	74I0065001	Davidson	4.4	40.3	2.7	11,950	78.7	5.8	24.6	82.2	16.8	1.0
117228.00	83I0065001	Davidson	4.4	40.3	2.7	11,950	78.7	5.8	24.6	82.2	16.8	1.0
100994.00	87SR061001	Knox	7.3	31.7	3.9	8,537	84.5	3.2	21.3	85.8	13.1	1.1
100994.00	29SR061001	Knox	7.3	31.7	3.9	8,537	84.5	3.2	21.3	85.8	13.1	1.1
100994.00	47SR061001	Knox	7.3	31.7	3.9	8,537	84.5	3.2	21.3	85.8	13.1	1.1

Source: Transportation investment data is from the Tennessee Department of Transportation. Manufacturing employment is from the U.S. Census, County Business Patterns, and blanks represent withheld data due to disclosure concerns. Unemployment rates were obtained from the U.S. Bureau of Labor Statistics. Current spending for all elementary-secondary school systems was obtained from the U.S. Census Bureau, Annual Survey of School System Finances and is aggregated for counties. Educational attainment and commuting patterns are from the U.S. Census (2000) and the American Community Survey 5-year Estimates (2009-2018), and linear interpolation was used to calculate values between 2001 and 2008.

APPENDIX TABLE VIII
BOTTOM AND TOP 20 PROJECTS FOR RETURNS TO BUSINESS ESTABLISHMENTS

Project Pin	Route ID	Counties	County	Award (Nominal $)	Route Type	Establishments ROI	Metropolitan County	Adjacent to Metropolitan County	Population Density (per Square Mile)	Poverty Rate
Bottom 20:										
100249.05	33I0075001	Hamilton	Hamilton	259,600	I	-0.001791	1	1	628.8	19.2
103560.00	79SR057001	Shelby	Shelby	494,940	SR	-0.000691	1	1	1,206.4	18.0
100245.01	45I0081001	Jefferson	Jefferson	146,388	I	-0.000499	1	1	189.4	19.5
100335.03	79SR385301	Shelby, Fayette	Shelby	1,961,253	SR	-0.000438	1	1	1,216.6	20.4
101260.00	19I0065001	Davidson	Davidson	2,070,594	I	-0.000335	1	1	1,288.4	19.0
100332.00	79I0055001	Shelby	Shelby	4,448,890	I	-0.000333	1	1	1,230.6	21.6
47944.04	47I0040001	Knox	Knox	1,279,037	I	-0.000275	1	1	851.9	12.9
100335.03	79SR385301	Shelby, Fayette	Shelby	3,414,543	SR	-0.000252	1	1	1,216.6	20.4
101889.00	79SR001001	Shelby	Shelby	4,869,918	SR	-0.000234	1	1	1,216.6	20.4
100335.01	79SR385301	Shelby, Fayette	Shelby	6,703,482	I	-0.000212	1	1	1,230.6	21.6
100335.02	79SR385301	Shelby, Fayette	Shelby	6,797,836	I	-0.000209	1	1	1,230.6	21.6
101328.00	79SR057001	Shelby	Shelby	4,567,228	SR	-0.000208	1	1	1,229.0	20.2
102992.01	24SR086001	Fayette, Shelby	Shelby	3,231,895	SR	-0.000162	1	1	1,208.8	20.9
102992.01	79SR086001	Fayette, Shelby	Shelby	3,231,895	SR	-0.000162	1	1	1,208.8	20.9
109526.00	38SR022001	Henderson	Henderson	132,411	SR	-0.000159	0	1	53.9	19.1
109526.00	38SR022001	Henderson	Henderson	132,411	SR	-0.000159	0	1	53.9	19.1
101443.01	75I0024001	Rutherford	Rutherford	671,989	I	-0.000143	1	1	434.3	12.1
106526.01	79I0040001	Shelby	Shelby	10,545,363	I	-0.000132	1	1	1,231.1	21.8
100336.01	79SR385301	Shelby, Fayette	Shelby	6,530,794	SR	-0.000132	1	1	1,216.6	20.4
101260.00	19I0065001	Davidson	Davidson	5,473,765	I	-0.000127	1	1	1,288.4	19.0
Top 20:										
100994.00	29SR061001	Grainger, Union, Knox	Knox	1,827,267	SR	0.000189	1	1	810.2	14.2
100994.00	87SR061001	Grainger, Union, Knox	Knox	1,827,267	SR	0.000189	1	1	810.2	14.2
100994.00	47SR061001	Grainger, Union, Knox	Knox	1,827,267	SR	0.000189	1	1	810.2	14.2
114219.00	24I0040001	Fayette	Fayette	150,000	I	0.000193	1	1	55.7	13.8
100994.00	29SR061001	Grainger, Union, Knox	Knox	1,723,800	SR	0.000200	1	1	810.2	14.2
100994.00	87SR061001	Grainger, Union, Knox	Knox	1,723,800	SR	0.000200	1	1	810.2	14.2
100994.00	47SR061001	Grainger, Union, Knox	Knox	1,723,800	SR	0.000200	1	1	810.2	14.2
109532.00	60SR050001	Maury	Maury	192,422	SR	0.000234	1	1	136.3	13.8
107386.01	06SR311001	Bradley	Bradley	164,215	SR	0.000244	1	1	324.6	14.7
100234.05	47I0075001	Knox	Knox	1,163,946	I	0.000317	1	1	836.8	14.3
112455.00	90I0026001	Washington	Washington	275,183	I	0.000363	1	1	390.9	14.9
106269.01	94I0065001	Williamson	Williamson	2,079,927	I	0.000462	1	1	387.8	3.9
102488.07	19I0065001	Davidson	Davidson	3,545,895	I	0.000584	1	1	1,367.0	14.6
100994.00	47SR061001	Grainger, Union, Knox	Knox	577,475	SR	0.000597	1	1	810.2	14.2
100994.00	29SR061001	Grainger, Union, Knox	Knox	577,475	SR	0.000597	1	1	810.2	14.2
100994.00	87SR061001	Grainger, Union, Knox	Knox	577,475	SR	0.000597	1	1	810.2	14.2
117228.00	83I0065001	Davidson, Robertson, Sumner	Davidson	2,192,596	I	0.000752	1	1	1,374.1	15.4
117228.00	74I0065001	Davidson, Robertson, Sumner	Davidson	2,192,596	I	0.000752	1	1	1,374.1	15.4
117228.00	19I0065001	Davidson, Robertson, Sumner	Davidson	2,192,596	I	0.000752	1	1	1,374.1	15.4
46469.00	78SR448301	Sevier	Sevier	317,425	SR	0.000778	0	1	148.5	13.2

Source: Transportation investment data is from the Tennessee Department of Transportation. Business establishment data is from the U.S. Census Bureau, County Business Patterns. Poverty rates are from the U.S. Census Bureau, Small Area Income and Poverty Estimates (SAIPE).

Project Pin	Route ID	County	Manufacturing Employment Share	Percent with at least a Bachelor's Degree	Unemployment Rate	Elementary-Secondary Current Spending per Student (2018 $)	Percent Drove Alone	Percent Worked at Home	Mean Travel Time (minutes)	Percent Work in County	Percent Work Outside County	Percent Work Out of State
Bottom 20:												
100249.05	33I0075001	Hamilton	14.2	27.4	7.8	9,651	83.1	3.0	21.3	91.1	3.7	5.2
103560.00	79SR057001	Shelby	6.7	27.3	6.9	9,848	82.0	2.5	22.5	94.7	1.0	4.4
100245.01	45I0081001	Jefferson	18.3	13.4	10.5	7,793	81.9	2.5	24.4	44.5	54.3	1.3
100335.03	79SR385301	Shelby	6.2	27.8	9.8	10,274	81.7	2.7	22.4	94.4	1.1	4.5
101260.00	19I0065001	Davidson	4.8	35.0	6.2	10,710	79.6	4.5	23.1	82.7	15.8	1.4
100332.00	79I0055001	Shelby	5.9	29.0	8.8	10,358	82.4	2.8	22.4	94.4	0.9	4.7
47944.04	47I0040001	Knox	5.6	33.8	7.4	9,074	84.7	3.7	20.9	85.7	13.2	1.1
100335.03	79SR385301	Shelby	6.2	27.8	9.8	10,274	81.7	2.7	22.4	94.4	1.1	4.5
101889.00	79SR001001	Shelby	6.2	27.8	9.8	10,274	81.7	2.7	22.4	94.4	1.1	4.5
100335.01	79SR385301	Shelby	5.9	29.0	8.8	10,358	82.4	2.8	22.4	94.4	0.9	4.7
100335.02	79SR385301	Shelby	5.9	29.0	8.8	10,358	82.4	2.8	22.4	94.4	0.9	4.7
101328.00	79SR057001	Shelby	6.5	30.2	6.4	10,179	82.9	2.8	22.6	94.2	1.0	4.8
102992.01	24SR086001	Shelby	6.4	27.5	10.1	10,193	82.2	2.5	22.3	94.6	1.0	4.4
102992.01	79SR086001	Shelby	6.4	27.5	10.1	10,193	82.2	2.5	22.3	94.6	1.0	4.4
109526.00	38SR022001	Henderson	22.3	11.9	9.7	8,858	87.6	3.0	24.0	62.2	36.3	1.5
109526.00	38SR022001	Henderson	22.3	11.9	9.7	8,858	87.6	3.0	24.0	62.2	36.3	1.5
101443.01	75I0024001	Rutherford	17.1	27.0	7.9	8,434	85.3	2.6	26.4	63.2	35.8	1.0
106526.01	79I0040001	Shelby	5.9	28.7	8.6	10,313	81.9	2.9	22.4	94.1	1.0	4.9
100336.01	79SR385301	Shelby	6.2	27.8	9.8	10,274	81.7	2.7	22.4	94.4	1.1	4.5
101260.00	19I0065001	Davidson	4.8	35.0	6.2	10,710	79.6	4.5	23.1	82.7	15.8	1.4
Top 20:												
100994.00	29SR061001	Knox	7.3	31.7	3.9	8,537	84.5	3.2	21.3	85.8	13.1	1.1
100994.00	87SR061001	Knox	7.3	31.7	3.9	8,537	84.5	3.2	21.3	85.8	13.1	1.1
100994.00	47SR061001	Knox	7.3	31.7	3.9	8,537	84.5	3.2	21.3	85.8	13.1	1.1
114219.00	24I0040001	Fayette	26.2	22.9	6.2	8,418	86.8	3.6	32.9	30.3	67.5	2.2
100994.00	29SR061001	Knox	7.3	31.7	3.9	8,537	84.5	3.2	21.3	85.8	13.1	1.1
100994.00	87SR061001	Knox	7.3	31.7	3.9	8,537	84.5	3.2	21.3	85.8	13.1	1.1
100994.00	47SR061001	Knox	7.3	31.7	3.9	8,537	84.5	3.2	21.3	85.8	13.1	1.1
109532.00	60SR050001	Maury		17.4	7.1	8,722	82.3	3.6	28.7	59.0	39.6	1.5
107386.01	06SR311001	Bradley	19.3	21.9	3.6	8,760	82.2	4.2	21.1	74.8	21.5	3.7
100234.05	47I0075001	Knox	6.2	32.6	5.0	9,189	84.5	3.4	21.0	85.9	13.0	1.1
112455.00	90I0026001	Washington	8.7	31.9	3.8	9,096	85.7	3.8	20.8	72.2	25.2	2.5
106269.01	94I0065001	Williamson	1.7	58.1	2.7	9,621	80.9	9.0	27.3	61.2	36.9	1.9
102488.07	19I0065001	Davidson	4.4	39.1	2.7	11,262	79.2	5.7	24.5	82.0	16.9	1.1
100994.00	47SR061001	Knox	7.3	31.7	3.9	8,537	84.5	3.2	21.3	85.8	13.1	1.1
100994.00	29SR061001	Knox	7.3	31.7	3.9	8,537	84.5	3.2	21.3	85.8	13.1	1.1
100994.00	87SR061001	Knox	7.3	31.7	3.9	8,537	84.5	3.2	21.3	85.8	13.1	1.1
117228.00	83I0065001	Davidson	4.4	40.3	2.7	11,950	78.7	5.8	24.6	82.2	16.8	1.0
117228.00	74I0065001	Davidson	4.4	40.3	2.7	11,950	78.7	5.8	24.6	82.2	16.8	1.0
117228.00	19I0065001	Davidson	4.4	40.3	2.7	11,950	78.7	5.8	24.6	82.2	16.8	1.0
46469.00	78SR448301	Sevier	3.1	15.0	7.1	9,067	78.7	3.4	24.3	77.2	21.7	1.1

Source: Transportation investment data is from the Tennessee Department of Transportation. Manufacturing employment is from the U.S. Census, County Business Patterns, and blanks represent withheld data due to disclosure concerns. Unemployment rates were obtained from the U.S. Bureau of Labor Statistics. Current spending for all elementary-secondary school systems was obtained from the U.S. Census Bureau, Annual Survey of School System Finances and is aggregated for counties. Educational attainment and commuting patterns are from the U.S. Census (2000) and the American Community Survey 5-year Estimates (2009-2018), and linear interpolation was used to calculate values between 2001 and 2008.

APPENDIX TABLE IX

BOTTOM AND TOP 20 PROJECTS FOR RETURNS TO PERSONAL INCOME

Project Pin	Route ID	Counties	County	Award (Nominal $)	Route Type	Personal Income (thousands of 2018 $) ROI	Metropolitan County	Adjacent to Metropolitan County	Population Density (per Square Mile)	Poverty Rate
Bottom 20:										
103560.00	79SR057001	Shelby	Shelby	494,940	SR	-3696.05	1	1	1,206.4	18.0
100335.03	79SR385301	Shelby, Fayette	Shelby	1,961,253	SR	-1234.19	1	1	1,216.6	20.4
102992.01	24SR086001	Fayette, Shelby	Shelby	3,231,895	SR	-749.672	1	1	1,208.8	20.9
102992.01	79SR086001	Fayette, Shelby	Shelby	3,231,895	SR	-749.672	1	1	1,208.8	20.9
100335.03	79SR385301	Shelby, Fayette	Shelby	3,414,543	SR	-708.895	1	1	1,216.6	20.4
101889.00	79SR001001	Shelby	Shelby	4,869,918	SR	-460.122	1	1	1,216.6	20.4
100336.01	79SR385301	Shelby, Fayette	Shelby	6,530,794	SR	-370.637	1	1	1,216.6	20.4
102992.01	24SR086001	Fayette, Shelby	Shelby	7,145,226	SR	-339.088	1	1	1,208.8	20.9
102992.01	79SR086001	Fayette, Shelby	Shelby	7,145,226	SR	-339.088	1	1	1,208.8	20.9
100332.00	79I0055001	Shelby	Shelby	4,448,890	I	-328.165	1	1	1,230.6	21.6
100334.01	79SR385001	Shelby, Fayette	Shelby	3,446,953	SR	-185.195	1	1	1,206.4	18.0
100334.01	24SR385001	Shelby, Fayette	Shelby	3,446,953	SR	-185.195	1	1	1,206.4	18.0
100334.01	79SR385001	Shelby, Fayette	Shelby	4,275,680	SR	-149.300	1	1	1,206.4	18.0
100334.01	24SR385001	Shelby, Fayette	Shelby	4,275,680	SR	-149.300	1	1	1,206.4	18.0
113426.00	73SR001001	Roane	Roane	267,231	SR	-130.141	1	1	146.4	18.0
112540.00	82SR109001	Sullivan	Sullivan	677,319	I	-95.6334	1	1	378.6	18.5
100337.01	79SR385301	Shelby	Shelby	10,192,070	SR	-62.6329	1	1	1,206.4	18.0
109167.01	82SR001001	Sullivan	Sullivan	1,284,668	SR	-38.9519	1	1	378.1	18.0
100332.00	79I0055001	Shelby	Shelby	39,011,021	I	-37.4245	1	1	1,230.6	21.6
112525.00	38I0040001	Haywood	Haywood	2,280,965	I	-14.6554	0	1	33.4	20.0
Top 20:										
100994.00	47SR061001	Grainger, Union, Knox	Knox	1,827,267	SR	1162.57	1	1	810.2	14.2
100994.00	87SR061001	Grainger, Union, Knox	Knox	1,827,267	SR	1162.57	1	1	810.2	14.2
100994.00	29SR061001	Grainger, Union, Knox	Knox	1,827,267	SR	1162.57	1	1	810.2	14.2
112455.00	90I0026001	Washington	Washington	275,183	I	1177.03	1	1	390.9	14.9
100994.00	87SR061001	Grainger, Union, Knox	Knox	1,723,800	SR	1232.35	1	1	810.2	14.2
100994.00	29SR061001	Grainger, Union, Knox	Knox	1,723,800	SR	1232.35	1	1	810.2	14.2
100994.00	47SR061001	Grainger, Union, Knox	Knox	1,723,800	SR	1232.35	1	1	810.2	14.2
114219.00	24I0040001	Fayette	Fayette	150,000	I	1483.38	1	1	55.7	13.8
46469.00	78SR448301	Sevier	Sevier	317,425	SR	1606.19	0	1	148.5	13.2
101260.00	19I0065001	Davidson	Davidson	2,070,594	I	1949.15	1	1	1,288.4	19
107386.01	06SR311001	Bradley	Bradley	164,215	SR	2042.24	1	1	324.6	14.7
106269.01	94I0065001	Williamson	Williamson	2,079,927	I	2163.93	1	1	387.8	3.9
102488.07	19I0065001	Davidson	Davidson	3,545,895	I	2709.73	1	1	1,367.0	14.6
100994.00	29SR061001	Grainger, Union, Knox	Knox	577,475	SR	3678.64	1	1	810.2	14.2
100994.00	87SR061001	Grainger, Union, Knox	Knox	577,475	SR	3678.64	1	1	810.2	14.2
100994.00	47SR061001	Grainger, Union, Knox	Knox	577,475	SR	3678.64	1	1	810.2	14.2
100249.05	33I0075001	Hamilton	Hamilton	259,600	I	4244.33	1	1	628.8	19.2
117228.00	74I0065001	Davidson, Robertson, Sumner	Davidson	2,192,596	I	4730.00	1	1	1,374.1	15.4
117228.00	83I0065001	Davidson, Robertson, Sumner	Davidson	2,192,596	I	4730.00	1	1	1,374.1	15.4
117228.00	19I0065001	Davidson, Robertson, Sumner	Davidson	2,192,596	I	4730.00	1	1	1,374.1	15.4

Source: Transportation investment data is from the Tennessee Department of Transportation. Personal income is from the U.S. Department of Commerce, Bureau of Economic Analysis. Poverty rates are from the U.S. Census Bureau, Small Area Income and Poverty Estimates (SAIPE).

APPENDIX TABLE IX, CONTINUED

Project Pin	Route ID	County	Manufacturing Employment Share	Percent with at least a Bachelor's Degree	Unemployment Rate	Elementary-Secondary Current Spending per Student (2018 $)	Percent Drove Alone	Percent Worked at Home	Mean Travel Time (minutes)	Percent Work in County	Percent Work Outside County	Percent Work Out of State
Bottom 20:												
103560.00	79SR057001	Shelby	6.7	27.3	6.9	9,848	82.0	2.5	22.5	94.7	1.0	4.4
100335.03	79SR385301	Shelby	6.2	27.8	9.8	10,274	81.7	2.7	22.4	94.4	1.1	4.5
102992.01	24SR086001	Shelby	6.4	27.5	10.1	10,193	82.2	2.5	22.3	94.6	1.0	4.4
102992.01	79SR086001	Shelby	6.4	27.5	10.1	10,193	82.2	2.5	22.3	94.6	1.0	4.4
100335.03	79SR385301	Shelby	6.2	27.8	9.8	10,274	81.7	2.7	22.4	94.4	1.1	4.5
101889.00	79SR001001	Shelby	6.2	27.8	9.8	10,274	81.7	2.7	22.4	94.4	1.1	4.5
100336.01	79SR385301	Shelby	6.2	27.8	9.8	10,274	81.7	2.7	22.4	94.4	1.1	4.5
102992.01	24SR086001	Shelby	6.4	27.5	10.1	10,193	82.2	2.5	22.3	94.6	1.0	4.4
102992.01	79SR086001	Shelby	6.4	27.5	10.1	10,193	82.2	2.5	22.3	94.6	1.0	4.4
100332.00	79I0055001	Shelby	5.9	29.0	8.8	10,358	82.4	2.8	22.4	94.4	0.9	4.7
100334.01	79SR385001	Shelby	6.7	27.3	6.9	9,848	82.0	2.5	22.5	94.7	1.0	4.4
100334.01	24SR385001	Shelby	6.7	27.3	6.9	9,848	82.0	2.5	22.5	94.7	1.0	4.4
100334.01	79SR385001	Shelby	6.7	27.3	6.9	9,848	82.0	2.5	22.5	94.7	1.0	4.4
100334.01	24SR385001	Shelby	6.7	27.3	6.9	9,848	82.0	2.5	22.5	94.7	1.0	4.4
113426.00	73SR001001	Roane	11.8	17.7	7.7	9,212	85.1	2.8	26.6	52.8	45.6	1.6
112540.00	82SR109001	Sullivan		21.2	6.6	9,453	86.9	3.0	21.9	69.8	16.6	13.5
100337.01	79SR385301	Shelby	6.7	27.3	6.9	9,848	82.0	2.5	22.5	94.7	1.0	4.4
109167.01	82SR001001	Sullivan		20.5	7.6	9,665	86.8	2.8	21.7	70.0	16.5	13.5
100332.00	79I0055001	Shelby	5.9	29.0	8.8	10,358	82.4	2.8	22.4	94.4	0.9	4.7
112525.00	38I0040001	Haywood	43.7	11.9	6.5	9,404	86.8	2.2	23.3	53.9	45.7	0.4
Top 20:												
100994.00	47SR061001	Knox	7.3	31.7	3.9	8,537	84.5	3.2	21.3	85.8	13.1	1.1
100994.00	87SR061001	Knox	7.3	31.7	3.9	8,537	84.5	3.2	21.3	85.8	13.1	1.1
100994.00	29SR061001	Knox	7.3	31.7	3.9	8,537	84.5	3.2	21.3	85.8	13.1	1.1
112455.00	90I0026001	Washington	8.7	31.9	3.8	9,096	85.7	3.8	20.8	72.2	25.2	2.5
100994.00	87SR061001	Knox	7.3	31.7	3.9	8,537	84.5	3.2	21.3	85.8	13.1	1.1
100994.00	29SR061001	Knox	7.3	31.7	3.9	8,537	84.5	3.2	21.3	85.8	13.1	1.1
100994.00	47SR061001	Knox	7.3	31.7	3.9	8,537	84.5	3.2	21.3	85.8	13.1	1.1
114219.00	24I0040001	Fayette	26.2	22.9	6.2	8,418	86.8	3.6	32.9	30.3	67.5	2.2
46469.00	78SR448301	Sevier	3.1	15.0	7.1	9,067	78.7	3.4	24.3	77.2	21.7	1.1
101260.00	19I0065001	Davidson	4.8	35.0	6.2	10,710	79.6	4.5	23.1	82.7	15.8	1.4
107386.01	06SR311001	Bradley	19.3	21.9	3.6	8,760	82.2	4.2	21.1	74.8	21.5	3.7
106269.01	94I0065001	Williamson	1.7	58.1	2.7	9,621	80.9	9.0	27.3	61.2	36.9	1.9
102488.07	19I0065001	Davidson	4.4	39.1	2.7	11,262	79.2	5.7	24.5	82.0	16.9	1.1
100994.00	29SR061001	Knox	7.3	31.7	3.9	8,537	84.5	3.2	21.3	85.8	13.1	1.1
100994.00	87SR061001	Knox	7.3	31.7	3.9	8,537	84.5	3.2	21.3	85.8	13.1	1.1
100994.00	47SR061001	Knox	7.3	31.7	3.9	8,537	84.5	3.2	21.3	85.8	13.1	1.1
100249.05	33I0075001	Hamilton	14.2	27.4	7.8	9,651	83.1	3.0	21.3	91.1	3.7	5.2
117228.00	74I0065001	Davidson	4.4	40.3	2.7	11,950	78.7	5.8	24.6	82.2	16.8	1.0
117228.00	83I0065001	Davidson	4.4	40.3	2.7	11,950	78.7	5.8	24.6	82.2	16.8	1.0
117228.00	19I0065001	Davidson	4.4	40.3	2.7	11,950	78.7	5.8	24.6	82.2	16.8	1.0

Source: Transportation investment data is from the Tennessee Department of Transportation. Manufacturing employment is from the U.S. Census, County Business Patterns, and blanks represent withheld data due to disclosure concerns. Unemployment rates were obtained from the U.S. Bureau of Labor Statistics. Current spending for all elementary-secondary school systems was obtained from the U.S. Census Bureau, Annual Survey of School System Finances and is aggregated for counties. Educational attainment and driving and commuting patterns are from the U.S. Census (2000) and the American Community Survey 5-year Estimates (2009-2018), and linear interpolation was used to calculate values between 2001 and 2008.

Appendix Table X

Bottom and Top 20 Projects for Returns to Personal Income per Capita

Project Pin	Route ID	Counties	County	Award (Nominal $)	Route Type	Personal Income per Capita (2018 $) ROI	Metropolitan County	Adjacent to Metropolitan County	Population Density (per Square Mile)	Poverty Rate
Bottom 20:										
103560.00	79SR057001	Shelby	Shelby	494,940	SR	-0.004076	1	1	1,206.4	18.0
40813.02	42SR147001	Houston	Houston	327,200	SR	-0.002048	0	1	41.5	19.6
100335.03	79SR385301	Shelby, Fayette	Shelby	1,961,253	SR	-0.001524	1	1	1,216.6	20.4
101443.01	75I0024001	Rutherford	Rutherford	671,989	I	-0.001518	1	1	434.3	12.1
102992.01	79SR086001	Fayette, Shelby	Shelby	3,231,895	SR	-0.001019	1	1	1,208.8	20.9
102992.01	24SR086001	Fayette, Shelby	Shelby	3,231,895	SR	-0.001019	1	1	1,208.8	20.9
100335.03	79SR385301	Shelby, Fayette	Shelby	3,414,543	SR	-0.000875	1	1	1,216.6	20.4
47944.04	47I0040001	Knox	Knox	1,279,037	I	-0.000623	1	1	851.9	12.9
101889.00	79SR001001	Shelby	Shelby	4,869,918	SR	-0.000585	1	1	1,216.6	20.4
100332.00	79I0055001	Shelby	Shelby	4,448,890	I	-0.000558	1	1	1,230.6	21.6
112525.00	38I0040001	Haywood	Haywood	2,280,965	I	-0.000465	0	1	33.4	20.0
112540.00	82SR109001	Sullivan	Sullivan	677,319	I	-0.000464	1	1	378.6	18.5
102992.01	24SR086001	Fayette, Shelby	Shelby	7,145,226	SR	-0.000461	1	1	1,208.8	20.9
102992.01	79SR086001	Fayette, Shelby	Shelby	7,145,226	SR	-0.000461	1	1	1,208.8	20.9
100336.01	79SR385301	Shelby, Fayette	Shelby	6,530,794	SR	-0.000458	1	1	1,216.6	20.4
117402.00	38SR222001	Fayette, Haywood	Haywood	13,796,636	SR	-0.000381	0	1	33.0	20.6
117402.00	24SR222001	Fayette, Haywood	Haywood	13,796,636	SR	-0.000381	0	1	33.0	20.6
101108.00	75SR840001	Rutherford	Rutherford	11,116,220	SR	-0.000329	1	1	418.3	12.4
101293.01	85SR141001	Trousdale	Trousdale	11,010,676	SR	-0.000326	1	1	87.2	15.3
100334.01	24SR385001	Shelby, Fayette	Shelby	3,446,953	SR	-0.000313	1	1	1,206.4	18.0
Top 20:										
102488.07	19I0065001	Davidson	Davidson	3,545,895	I	0.002742	1	1	1,367.0	14.6
102256.00	14SR052001	Clay	Clay	445,563	SR	0.003205	0	1	33.6	22.4
100301.03	51SR099001	Lewis	Lewis	703,684	SR	0.003555	0	1	42.6	17.5
106269.01	94I0065001	Williamson	Williamson	2,079,927	I	0.003592	1	1	387.8	3.9
100994.00	47SR061001	Grainger, Union, Knox	Knox	577,475	SR	0.004436	1	1	810.2	14.2
100994.00	29SR061001	Grainger, Union, Knox	Knox	577,475	SR	0.004436	1	1	810.2	14.2
100994.00	87SR061001	Grainger, Union, Knox	Knox	577,475	SR	0.004436	1	1	810.2	14.2
117228.00	74I0065001	Davidson, Robertson, Sumner	Davidson	2,192,596	I	0.005696	1	1	1,374.1	15.4
117228.00	19I0065001	Davidson, Robertson, Sumner	Davidson	2,192,596	I	0.005696	1	1	1,374.1	15.4
117228.00	83I0065001	Davidson, Robertson, Sumner	Davidson	2,192,596	I	0.005696	1	1	1,374.1	15.4
112455.00	90I0026001	Washington	Washington	275,183	I	0.005918	1	1	390.9	14.9
100249.05	33I0075001	Hamilton	Hamilton	259,600	I	0.006053	1	1	628.8	19.2
112550.00	68SR013001	Perry	Perry	439,500	SR	0.006264	0	0	18.9	23.1
109526.00	38SR022001	Henderson	Henderson	132,411	SR	0.008137	0	1	53.9	19.1
109526.00	38SR022001	Henderson	Henderson	132,411	SR	0.008137	0	1	53.9	19.1
117452.00	22SR046001	Dickson	Dickson	567,350	SR	0.008327	1	1	109.1	13.8
107386.01	06SR311001	Bradley	Bradley	164,215	SR	0.008507	1	1	324.6	14.7
109532.00	60SR050001	Maury	Maury	192,422	SR	0.008772	1	1	136.3	13.8
114219.00	24I0040001	Fayette	Fayette	500,000	I	0.009726	1	1	55.7	13.8
114219.00	24I0040001	Fayette	Fayette	150,000	I	0.032421	1	1	55.7	13.8

Source: Transportation investment data is from the Tennessee Department of Transportation. Personal income per capita was obtained from the U.S. Department of Commerce, Bureau of Economic Analysis. Poverty rates are from the U.S. Census Bureau, Small Area Income and Poverty Estimates (SAIPE).

Project Pin	Route ID	County	Manufacturing Employment Share	Percent with at least a Bachelor's Degree	Unemployment Rate	Elementary-Secondary Current Spending per Student (2018 $)	Percent Drove Alone	Percent Worked at Home	Mean Travel Time (minutes)	Percent Work in County	Percent Work Outside County	Percent Work Out of State
Bottom 20:												
103560.00	79SR057001	Shelby	6.7	27.3	6.9	9,848	82.0	2.5	22.5	94.7	1.0	4.4
40813.02	42SR147001	Houston	24.0	7.5	8.1	7,858	80.7	2.4	27.3	53.4	44.7	1.9
100335.03	79SR385301	Shelby	6.2	27.8	9.8	10,274	81.7	2.7	22.4	94.4	1.1	4.5
101443.01	75I0024001	Rutherford	17.1	27.0	7.9	8,434	85.3	2.6	26.4	63.2	35.8	1.0
102992.01	79SR086001	Shelby	6.4	27.5	10.1	10,193	82.2	2.5	22.3	94.6	1.0	4.4
102992.01	24SR086001	Shelby	6.4	27.5	10.1	10,193	82.2	2.5	22.3	94.6	1.0	4.4
100335.03	79SR385301	Shelby	6.2	27.8	9.8	10,274	81.7	2.7	22.4	94.4	1.1	4.5
47944.04	47I0040001	Knox	5.6	33.8	7.4	9,074	84.7	3.7	20.9	85.7	13.2	1.1
101889.00	79SR001001	Shelby	6.2	27.8	9.8	10,274	81.7	2.7	22.4	94.4	1.1	4.5
100332.00	79I0055001	Shelby	5.9	29.0	8.8	10,358	82.4	2.8	22.4	94.4	0.9	4.7
112525.00	38I0040001	Haywood	43.7	11.9	6.5	9,404	86.8	2.2	23.3	53.9	45.7	0.4
112540.00	82SR109001	Sullivan		21.2	6.6	9,453	86.9	3.0	21.9	69.8	16.6	13.5
102992.01	24SR086001	Shelby	6.4	27.5	10.1	10,193	82.2	2.5	22.3	94.6	1.0	4.4
102992.01	79SR086001	Shelby	6.4	27.5	10.1	10,193	82.2	2.5	22.3	94.6	1.0	4.4
100336.01	79SR385301	Shelby	6.2	27.8	9.8	10,274	81.7	2.7	22.4	94.4	1.1	4.5
117402.00	38SR222001	Haywood	47.2	12.4	5.2	9,732	88.7	1.4	22.8	55.8	43.7	0.5
117402.00	24SR222001	Haywood	47.2	12.4	5.2	9,732	88.7	1.4	22.8	55.8	43.7	0.5
101108.00	75SR840001	Rutherford	15.7	26.4	9.7	8,488	85.2	2.6	26.1	63.8	35.2	0.9
101293.01	85SR141001	Trousdale	15.0	14.8	4.8	8,216	82.8	4.6	28.4	36.8	61.9	1.3
100334.01	24SR385001	Shelby	6.7	27.3	6.9	9,848	82.0	2.5	22.5	94.7	1.0	4.4
Top 20:												
102488.07	19I0065001	Davidson	4.4	39.1	2.7	11,262	79.2	5.7	24.5	82.0	16.9	1.1
102256.00	14SR052001	Clay	39.2	9.4	11.5	9,916	81.1	4.2	28.2	57.7	34.2	8.1
100301.03	51SR099001	Lewis	21.4	12.0	4.5	8,652	72.6	4.5	26.2	58.4	39.3	2.3
106269.01	94I0065001	Williamson	1.7	58.1	2.7	9,621	80.9	9.0	27.3	61.2	36.9	1.9
100994.00	47SR061001	Knox	7.3	31.7	3.9	8,537	84.5	3.2	21.3	85.8	13.1	1.1
100994.00	29SR061001	Knox	7.3	31.7	3.9	8,537	84.5	3.2	21.3	85.8	13.1	1.1
100994.00	87SR061001	Knox	7.3	31.7	3.9	8,537	84.5	3.2	21.3	85.8	13.1	1.1
117228.00	74I0065001	Davidson	4.4	40.3	2.7	11,950	78.7	5.8	24.6	82.2	16.8	1.0
117228.00	19I0065001	Davidson	4.4	40.3	2.7	11,950	78.7	5.8	24.6	82.2	16.8	1.0
117228.00	83I0065001	Davidson	4.4	40.3	2.7	11,950	78.7	5.8	24.6	82.2	16.8	1.0
112455.00	90I0026001	Washington	8.7	31.9	3.8	9,096	85.7	3.8	20.8	72.2	25.2	2.5
100249.05	33I0075001	Hamilton	14.2	27.4	7.8	9,651	83.1	3.0	21.3	91.1	3.7	5.2
112550.00	68SR013001	Perry	39.1	12.3	9.8	9,216	78.4	4.0	26.1	68.9	30.2	1.0
109526.00	38SR022001	Henderson	22.3	11.9	9.7	8,858	87.6	3.0	24.0	62.2	36.3	1.5
109526.00	38SR022001	Henderson	22.3	11.9	9.7	8,858	87.6	3.0	24.0	62.2	36.3	1.5
117452.00	22SR046001	Dickson	23.2	15.4	3.1	8,419	82.5	3.2	32.8	55.8	42.9	1.2
107386.01	06SR311001	Bradley	19.3	21.9	3.6	8,760	82.2	4.2	21.1	74.8	21.5	3.7
109532.00	60SR050001	Maury		17.4	7.1	8,722	82.3	3.6	28.7	59.0	39.6	1.5
114219.00	24I0040001	Fayette	26.2	22.9	6.2	8,418	86.8	3.6	32.9	30.3	67.5	2.2
114219.00	24I0040001	Fayette	26.2	22.9	6.2	8,418	86.8	3.6	32.9	30.3	67.5	2.2

Source: Transportation investment data is from the Tennessee Department of Transportation. Manufacturing employment is from the U.S. Census, County Business Patterns, and blanks represent withheld data due to disclosure concerns. Unemployment rates were obtained from the U.S. Bureau of Labor Statistics. Current spending for all elementary-secondary school systems was obtained from the U.S. Census Bureau, Annual Survey of School System Finances and is aggregated for counties. Educational attainment and driving and commuting patterns are from the U.S. Census (2000) and the American Community Survey 5-year Estimates (2009-2018), and linear interpolation was used to calculate values between 2001 and 2008.

APPENDIX TABLE XI

BOTTOM AND TOP 20 PROJECTS FOR RETURNS TO POPULATION

Project Pin	Route ID	Counties	County	Award (Nominal $)	Route Type	Population ROI	Metropolitan County	Adjacent to Metropolitan County	Population Density (per Square Mile)	Poverty Rate
Bottom 20:										
113426.00	73SR001001	Roane	Roane	267,231	SR	-0.004128	1	1	146.4	18.0
101610.00	79SR177001	Shelby	Shelby	3,955,924	SR	-0.000701	1	1	1,227.5	20.8
112540.00	82SR109001	Sullivan	Sullivan	677,319	I	-0.000564	1	1	378.6	18.5
108916.00	79SR175001	Shelby	Shelby	6,414,785	SR	-0.000555	1	1	1,226.4	18.9
109167.01	82SR001001	Sullivan	Sullivan	1,284,668	SR	-0.000465	1	1	378.1	18.0
102990.00	41SR048001	Hickman	Hickman	843,382	SR	-0.000464	0	1	39.5	23.2
43975.03	10SR400001	Carter	Carter	2,788,020	SR	-0.000225	1	1	167.8	23.0
112525.00	38I0040001	Haywood	Haywood	2,280,965	I	-0.000193	0	1	33.4	20.0
105627.01	15I0040001	Cocke	Cocke	1,399,622	I	-0.000188	0	1	81.5	26.9
101211.00	49SR208001	Lauderdale	Lauderdale	13,798,190		-0.000173	0	1	53.6	24.9
101211.00	49SR209001	Lauderdale	Lauderdale	13,798,190		-0.000173	0	1	53.6	24.9
101244.01	73SR001001	Roane	Roane	7,235,018	SR	-0.000173	1	1	147.3	18.1
100296.01	28SR015001	Lawrence, Giles	Giles	2,412,401	SR	-0.000159	0	1	48.0	18.0
100296.01	50SR015001	Lawrence, Giles	Giles	2,412,401	SR	-0.000159	0	1	48.0	18.0
112526.00	38I0040001	Haywood	Haywood	3,611,906	I	-0.000122	0	1	33.4	20.0
101604.00	79I0040001	Shelby	Shelby	28,282,840	I	-0.000121	1	1	1,226.2	21.7
112519.00	13SR033001	Union, Claiborne	Claiborne	1,995,409	SR	-0.000107	0	1	72.6	21.6
112519.00	87SR033001	Union, Claiborne	Claiborne	1,995,409	SR	-0.000107	0	1	72.6	21.6
101596.00	35SR015001	Hardeman, McNairy	Hardeman	9,152,099	SR	-0.000106	0	1	40.2	27.9
101596.00	55SR015001	Hardeman, McNairy	Hardeman	9,152,099	SR	-0.000106	0	1	40.2	27.9
Top 20:										
100994.00	29SR061001	Grainger, Union, Knox	Knox	1,827,267	SR	0.014208	1	1	810.2	14.2
100994.00	47SR061001	Grainger, Union, Knox	Knox	1,827,267	SR	0.014208	1	1	810.2	14.2
117228.00	19I0065001	Davidson, Robertson, Sumner	Davidson	2,192,596	I	0.014654	1	1	1,374.1	15.4
117228.00	83I0065001	Davidson, Robertson, Sumner	Davidson	2,192,596	I	0.014654	1	1	1,374.1	15.4
117228.00	74I0065001	Davidson, Robertson, Sumner	Davidson	2,192,596	I	0.014654	1	1	1,374.1	15.4
102488.07	19I0065001	Davidson	Davidson	3,545,895	I	0.014997	1	1	1,367.0	14.6
100994.00	87SR061001	Grainger, Union, Knox	Knox	1,723,800	SR	0.015061	1	1	810.2	14.2
100994.00	29SR061001	Grainger, Union, Knox	Knox	1,723,800	SR	0.015061	1	1	810.2	14.2
100994.00	47SR061001	Grainger, Union, Knox	Knox	1,723,800	SR	0.015061	1	1	810.2	14.2
106269.01	94I0065001	Williamson	Williamson	2,079,927	I	0.015771	1	1	387.8	3.9
47944.04	47I0040001	Knox	Knox	1,279,037	I	0.016545	1	1	851.9	12.9
101260.00	19I0065001	Davidson	Davidson	2,070,594	I	0.017750	1	1	1,288.4	19
100234.05	47I0075001	Knox	Knox	1,163,946	I	0.018078	1	1	836.8	14.3
101443.01	75I0024001	Rutherford	Rutherford	671,989	I	0.024481	1	1	434.3	12.1
107386.01	06SR311001	Bradley	Bradley	164,215	SR	0.030089	1	1	324.6	14.7
100994.00	87SR061001	Grainger, Union, Knox	Knox	577,475	SR	0.044958	1	1	810.2	14.2
100994.00	29SR061001	Grainger, Union, Knox	Knox	577,475	SR	0.044958	1	1	810.2	14.2
100994.00	47SR061001	Grainger, Union, Knox	Knox	577,475	SR	0.044958	1	1	810.2	14.2
46469.00	78SR448301	Sevier	Sevier	317,425	SR	0.045428	0	1	148.5	13.2
100249.05	33I0075001	Hamilton	Hamilton	259,600	I	0.047716	1	1	628.8	19.2

Source: Transportation investment data is from the Tennessee Department of Transportation. Population estimates are from the U.S. Census Bureau, Population Estimates Program. Poverty rates are from the U.S. Census Bureau, Small Area Income and Poverty Estimates (SAIPE).

Appendix Table XI, Continued

Project Pin	Route ID	County	Manufacturing Employment Share	Percent with at least a Bachelor's Degree	Unemployment Rate	Elementary-Secondary Current Spending per Student (2018 $)	Percent Drove Alone	Percent Worked at Home	Mean Travel Time (minutes)	Percent Work in County	Percent Work Outside County	Percent Work Out of State
Bottom 20:												
113426.00	73SR001001	Roane	11.8	17.7	7.7	9,212	85.1	2.8	26.6	52.8	45.6	1.6
101610.00	79SR177001	Shelby	6.1	30.2	5.3	9,908	82.7	2.9	22.8	94.1	1.0	4.9
112540.00	82SR109001	Sullivan		21.2	6.6	9,453	86.9	3.0	21.9	69.8	16.6	13.5
108916.00	79SR175001	Shelby	5.7	30.6	4.3	10,460	83.3	3.2	22.9	94.1	1.0	4.9
109167.01	82SR001001	Sullivan		20.5	7.6	9,665	86.8	2.8	21.7	70.0	16.5	13.5
102990.00	41SR048001	Hickman		12.0	8.3	8,635	78.8	3.2	38.7	37.8	60.7	1.5
43975.03	10SR400001	Carter	11.5	15.5	8.9	9,148	83.3	4.4	22.8	46.4	48.7	4.9
112525.00	38I0040001	Haywood	43.7	11.9	6.5	9,404	86.8	2.2	23.3	53.9	45.7	0.4
105627.01	15I0040001	Cocke	25.9	8.1	13.2	8,791	84.1	1.0	27.6	59.5	38.8	1.7
101211.00	49SR208001	Lauderdale	22.3	8.6	7.7	8,900	90.8	0.9	23.2	66.3	32.6	1.1
101211.00	49SR209001	Lauderdale	22.3	8.6	7.7	8,900	90.8	0.9	23.2	66.3	32.6	1.1
101244.01	73SR001001	Roane	12.6	17.3	9.0	9,272	83.4	2.9	25.8	51.5	47.0	1.5
100296.01	28SR015001	Giles	32.1	13.2	10.0	9,509	89.1	1.9	25.2	65.4	22.8	11.9
100296.01	50SR015001	Giles	32.1	13.2	10.0	9,509	89.1	1.9	25.2	65.4	22.8	11.9
112526.00	38I0040001	Haywood	43.7	11.9	6.5	9,404	86.8	2.2	23.3	53.9	45.7	0.4
101604.00	79I0040001	Shelby	6.0	31.1	4.2	10,603	83.6	3.2	22.8	93.7	1.0	5.2
112519.00	13SR033001	Claiborne	26.9	14.2	7.2	9,032	84.9	4.0	24.3	62.9	19.6	17.5
112519.00	87SR033001	Claiborne	26.9	14.2	7.2	9,032	84.9	4.0	24.3	62.9	19.6	17.5
101596.00	35SR015001	Hardeman		10.6	12.1	9,177	84.3	2.4	29.5	60.1	34.3	5.6
101596.00	55SR015001	Hardeman		10.6	12.1	9,177	84.3	2.4	29.5	60.1	34.3	5.6
Top 20:												
100994.00	29SR061001	Knox	7.3	31.7	3.9	8,537	84.5	3.2	21.3	85.8	13.1	1.1
100994.00	47SR061001	Knox	7.3	31.7	3.9	8,537	84.5	3.2	21.3	85.8	13.1	1.1
117228.00	19I0065001	Davidson	4.4	40.3	2.7	11,950	78.7	5.8	24.6	82.2	16.8	1.0
117228.00	83I0065001	Davidson	4.4	40.3	2.7	11,950	78.7	5.8	24.6	82.2	16.8	1.0
117228.00	74I0065001	Davidson	4.4	40.3	2.7	11,950	78.7	5.8	24.6	82.2	16.8	1.0
102488.07	19I0065001	Davidson	4.4	39.1	2.7	11,262	79.2	5.7	24.5	82.0	16.9	1.1
100994.00	87SR061001	Knox	7.3	31.7	3.9	8,537	84.5	3.2	21.3	85.8	13.1	1.1
100994.00	29SR061001	Knox	7.3	31.7	3.9	8,537	84.5	3.2	21.3	85.8	13.1	1.1
100994.00	47SR061001	Knox	7.3	31.7	3.9	8,537	84.5	3.2	21.3	85.8	13.1	1.1
106269.01	94I0065001	Williamson	1.7	58.1	2.7	9,621	80.9	9.0	27.3	61.2	36.9	1.9
47944.04	47I0040001	Knox	5.6	33.8	7.4	9,074	84.7	3.7	20.9	85.7	13.2	1.1
101260.00	19I0065001	Davidson	4.8	35.0	6.2	10,710	79.6	4.5	23.1	82.7	15.8	1.4
100234.05	47I0075001	Knox	6.2	32.6	5.0	9,189	84.5	3.4	21.0	85.9	13.0	1.1
101443.01	75I0024001	Rutherford	17.1	27.0	7.9	8,434	85.3	2.6	26.4	63.2	35.8	1.0
107386.01	06SR311001	Bradley	19.3	21.9	3.6	8,760	82.2	4.2	21.1	74.8	21.5	3.7
100994.00	87SR061001	Knox	7.3	31.7	3.9	8,537	84.5	3.2	21.3	85.8	13.1	1.1
100994.00	29SR061001	Knox	7.3	31.7	3.9	8,537	84.5	3.2	21.3	85.8	13.1	1.1
100994.00	47SR061001	Knox	7.3	31.7	3.9	8,537	84.5	3.2	21.3	85.8	13.1	1.1
46469.00	78SR448301	Sevier	3.1	15.0	7.1	9,067	78.7	3.4	24.3	77.2	21.7	1.1
100249.05	33I0075001	Hamilton	14.2	27.4	7.8	9,651	83.1	3.0	21.3	91.1	3.7	5.2

Source: Transportation investment data is from the Tennessee Department of Transportation. Manufacturing employment is from the U.S. Census, County Business Patterns, and blanks represent withheld data due to disclosure concerns. Unemployment rates were obtained from the U.S. Bureau of Labor Statistics. Current spending for all elementary-secondary school systems was obtained from the U.S. Census Bureau, Annual Survey of School System Finances and is aggregated for counties. Educational attainment and driving and commuting patterns are from the U.S. Census (2000) and the American Community Survey 5-year Estimates (2009-2018), and linear interpolation was used to calculate values between 2001 and 2008.