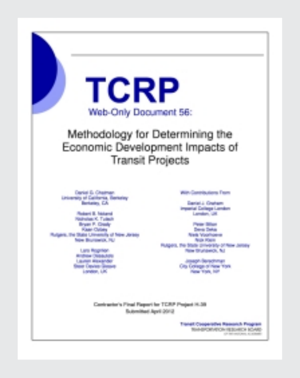

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Methodology for Determining the Economic Development Impacts of Transit Projects

Methodology for Determining the Economic Development Impacts of Transit Projects

DETAILS

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Contents

TABLES

FIGURES

EXECUTIVE SUMMARY

Transit Cooperative Research Program (TCRP) project H-39, “Methodology for Determining the Economic Development Impacts of Transit Projects,” was aimed at developing a method for transit agencies to assess whether and under what circumstances transit investments have economic benefits that are *in addition* to land development stimulated by travel time savings. The method was intended for possible use by transit agencies proposing new transit systems as well as major capital investments in existing transit systems.

Current evaluation procedures include estimates of travel time savings, costs of construction, environmental impacts, and effects on land development. This TCRP study addresses an additional type of impact: the productivity increases associated with agglomeration economies—economies of scale in density—that may be caused by transit improvements. We reviewed existing evaluation practices and academic research, and then carried out a wide-ranging empirical study on metropolitan-level data from cities across the US, firm-level data from two metropolitan areas, and case studies of three recent transit projects. A study of this question had never been carried out in the US to our knowledge. Recent research in the UK has been the basis for the formal evaluation of such impacts there and has suggested that agglomeration-related benefits are substantial.

The measures of agglomeration used for the empirical estimates in this report are at the metropolitan area level: employment density in the urbanized area and the principal cities of the metropolitan area, and the size of the metropolitan area as measured by its population. While we investigate local level measures of density in our firm-level analysis, we are unable with the available data to investigate how clustering of activities in certain economic sectors in close proximity to one another or to other businesses such as business services or suppliers, within a defined radius of transit stations, might affect productivity. However, we find evidence that there is little such activity occurring in the two regions for which we have firm-level data, or for the three case study regions.

This report does not address the development impacts of opening new transit lines or transit stations. Although such transit-induced development may have local benefits, this type of impact is already addressed in current guidance. From a regional or national perspective such development impacts may be primarily redistributive rather than a net addition to economic growth, and therefore there is reason to discount them as additive effects.

Review of literature and practice

We reviewed academic literature, conducted interviews with professional practitioners, and studied practice reports from the US as well as the written guidance adopted by the United Kingdom to evaluate wider economic impacts of transit investments.

It has long been argued in the academic literature that improvements to transportation could lead to easier interactions between firms, more centralized and higher-density employment clusters, and larger cities. These changes could increase the productivity of firms and workers by making labor markets more accessible, increasing information exchanges between firms, enabling more specialization, and in other ways. Despite this well-established theory, empirical research on the link between transportation investments, agglomeration, and productivity increases is limited. This is particularly true for transit projects, which are likely to have markedly different effects on agglomeration than roads or highways. Those few estimates available suggest that the wider economic benefits of transportation projects can add as much as a 25 percent increment to the benefits calculated in a conventional benefit-cost analysis.

Our interviews of US practitioners revealed little awareness of or interest in the possibility of these additional economic impacts. In discussing the possible addition of a "wider economic benefits" criterion in evaluating transit project proposals, there were significant concerns, including worry that the additional complexity and reporting requirements would be burdensome; that any requirement might not be consistently applied or evaluated; and that the new criterion could put some agency applications at a disadvantage. We also interviewed practitioners in the United Kingdom and Australia, where wider economic impacts are routinely calculated. With some effort, agencies there have been able to provide the inputs needed for analysis, but the process and outputs are complex and not well understood.

We also reviewed agency reports that addressed the economic impacts of prospective rail investments. None of these estimated agglomeration impacts or other wider economic impacts. The most relevant reports described analysis using input-output models or integrated land use and transportation models. Most of these focused on multiplier effects of cost savings in firm production processes, which double-count travel time savings in some cases, and in others would distinguish transit projects from each other only insofar as different regions have different intrinsic economic multipliers.

Finally, we reviewed the approach used in the United Kingdom and promulgated by the Department for Transport there, which avoids the problems of US practitioner approaches. The UK approach is based on estimates of how productivity varies intra-regionally as a function of employment accessibility (or "effective density"), which in turn is increased by transit investments that reduce travel time. Though innovative, this method ignores the potential impacts of transit investments on employment densification and urban growth, and it also relies on firm-level revenue and capital data that are generally unavailable in the US.

Empirical study

We developed a three-part study approach suitable for evaluating how transit investments affect agglomeration economies in the US. Our goals were: first, to explore the relationship between transit and agglomeration from different perspectives; and second, to estimate how increases in transit capacity affect agglomeration-related productivity, with the most accuracy possible given data constraints and funding limitations. We sought to ensure that our estimates did not include economic benefits of capitalizing travel time savings so as to avoid "double-counting."

In the first part of the empirical study, we compiled productivity, agglomeration, and transit capacity data for all of the metropolitan areas in the United States, and analyzed the data exhaustively using a variety of methods, measures, and model specifications, producing MSA-specific estimates of how wages and GDP are correlated with transit capacity due to agglomeration. In the second part, we conducted a spatially fine analysis of firm clustering near transit stops in two metro areas. In the third part, we conducted case studies of transit projects in three metro areas. Each part is described below.

Nationwide analysis

For our analysis of all metropolitan areas in the US, we gathered a time-series of data from the National Transit Database, the American Public Transportation Association, the

National Transportation Atlas Database, the Bureau of Economic Analysis, the American Community Survey, and the Longitudinal Employer-Household Dynamics (LEHD) database. We carried out metropolitan area-level estimates in two stages: first, estimating how transit capacity is associated with agglomeration; and second, how agglomeration is associated with wages and GDP. We tested a variety of measures of transit capacity and agglomeration.

There are strong statistical associations between transit capacity and two measures of agglomeration: the employment density of the principal cities within the metropolitan area, and the total population of the metropolitan area. Our second-stage models linked these agglomeration measures to metropolitan area productivity, measured with wages and GDP. We applied both model stages in estimating the changes in productivity associated with adding additional transit capacity.

There was substantial variation in agglomeration-related economic benefits, depending on levels of transit, population, and employment density in the metropolitan area. Larger metropolitan areas with larger transit systems are associated with stronger relationships between additional transit investments and productivity. The estimates ranged between \$1 and \$50 per capita per year, depending on the metropolitan area. Among metropolitan areas with existing rail systems, the net agglomeration benefit of one additional track mile ranges from \$10 million to \$500 million per year.

We view these estimates with caution. Our study is both the first US study and the first transit-specific empirical study of the link between transportation investment, agglomeration, and productivity. There is a need for continued research with more complete data enabling methodological improvements. The benefits likely take quite some time to be realized, lagging full ridership levels by several years or more. The estimates are best suited for categorical comparisons between rail projects, rather than figures to be compared directly with the value of travel time savings.

Firm-level analysis

In the second stage of empirical analysis, we investigated firm-level spatial data in two regions, Dallas-Fort Worth and Portland, Oregon, to look for evidence of growth or relocation near rail stations. We chose these two metropolitan areas based on initial analysis of worker-by-industry data at the census block level for a number of metropolitan areas with recent transit investments. We had initially intended to include New Jersey's recent transit investments with firm-level productivity data (i.e., payroll and revenue) from the state, but this proved impossible due to confidentiality issues and budget cuts in the state department of labor. Instead, we purchased data from the National Establishment Time-Series database from a private vendor, Walls & Associates, consisting of a twenty-year time-series of geo-coded firm establishment locations with number of workers, industry classification, and retail sales. Unfortunately, this database includes no payroll or revenue information.

We focused on how the location of newly opened light rail stations influenced the location and growth of firms, as well as their retail sales. These spatial effects are of interest because they address the nature of the transit-to-firm-agglomeration link, which is the precursor to some of the expected productivity effects of transit capacity investments.

There were substantial differences between the two regions when analyzing block-level data about employment changes over time. Unexpectedly, proximity to CBD-based transit stations in the Dallas region was associated with employment density *reductions*. In the case of Dallas, perhaps residential development near CBD-based stations could account for lower employment density growth there in comparison to elsewhere in the metropolitan area. Meanwhile, in Portland there was no statistically significant association between station proximity and employment growth, although an alternative model with cross-sectional data found substantial employment density increases near transit stations, along with a reduction in firm size. This combined pattern in Portland—more clustering of smaller firms near transit stations, resulting in higher density there—is in line with agglomeration theory.

Case studies

For the third and final stage in our empirical analysis, we carried out case studies of the Dallas Area Rapid Transit (DART) light rail system in Dallas-Fort Worth; the TRAX light rail line in Salt Lake City; and the Los Angeles Metro's Orange Line, a 14-mile fixed-guideway bus rapid transit (BRT) line that began serving passengers in 2005. The case studies included a review of all relevant public documents and reports, a spatial analysis of industry growth data, a description of regulatory constraints, and interviews with more than a dozen knowledgeable local officials and developers in the regions.

The spatial analysis revealed some densification effects along the transit corridors in all three study regions, but these changes did not appear to be largely or even partly attributable to the transit lines. Our mapping of zoning and other regulatory constraints did not suggest a strong causal role in shaping or hindering non-residential development responses to rail station access, although Dallas-Fort Worth and Salt Lake City appear to have relatively weak regulatory environments in comparison to Los Angeles. The strongest emergent theme from interviews with key stakeholders in economic development, planning, and real estate was the lack of emphasis on transit's potential role in fostering or attracting industry or affecting industrial clustering, though access to transit was marketed by residential and mixed-use developers. Developers of all types, including commercial and industrial developers, were seen as generally indifferent about transit access, believing it plays at best a minor role in development. Interviewees reported that the regulatory environment was relatively flexible in adjusting to the demands of developers, and was not usually seen as posing substantial hurdles to development, particularly in Salt Lake City and Dallas-Ft. Worth. While height and bulk restrictions were not viewed as impediments, parking requirements and procedural hurdles were sometimes seen as problematic.

The Orange Line Bus Rapid Transit service in the San Fernando Valley of Los Angeles is the only recently-opened fixed-guideway bus rapid transit system in the US. Fairly significant densification has occurred along the Orange Line corridor during the last decade, although it is difficult to attribute this to the presence of the BRT line in particular. While zoning regulations along the corridor do not differ substantially from those outside the corridor, zoning plans and economic development initiatives elsewhere in the Metro system—particularly those focused on entertainment industries—could encourage increases in population and employment densities near transit stations that enable the Orange Line to increase agglomeration across the metropolitan area. The denseness of the network to which the Orange Line connects increases the potential for it to contribute to agglomeration economies.

In Salt Lake City, a much smaller metropolitan region, we found little empirical evidence that recent transit investment has resulted in agglomeration. Professional planners and developers reported that non-residential development near rail stations is still in the early stages, and that there are signs of nascent agglomeration in the downtown area. Finance and technology companies were cited as recent examples of firms interested in transit access as a part of their location strategy.

In Dallas, an emerging world city and center for finance, energy, and insurance, a rise in road congestion increases the potential for transit investment to increase agglomeration by improving access to labor markets. But there is limited evidence of this potential being realized. Even in the relatively permissive regulatory environment in Dallas, increasing density around transit is difficult. Infrastructure (including parking) and lengthy procedural hurdles are viewed as the most significant challenges faced by developers in the region.

Spreadsheet tool

We produced a spreadsheet tool that could be used by transit agencies and others to estimate the agglomeration-related economic benefits of rail investments in the forms of new systems or additions to existing systems. With information about any of five possible measures of the proposed investment—track miles, total seating capacity, rail-specific seating capacity, rail revenue miles, or total revenue miles—the spreadsheet provides a range of possible wage or GDP impacts. The tool is best used to compare the agglomeration impacts of transit investments in different metropolitan areas to each other. It is less well suited to within-region comparisons of systems because it cannot take into account variations in alignment or other factors beyond the five inputs listed above.

Conclusions

Our metropolitan area-level estimates provide a reasonable starting point for assessing how the GDP and wage benefits of agglomeration caused by transit investments can be expected to vary depending on characteristics of the existing network, the population of the metropolitan area which it serves, and the employment density of its principal cities. City size, employment density, and transit network size at the time of the proposal are all highly predictive of the size of the agglomeration benefit. The case studies reinforce the idea that city size and transit network maturity are important.

Our calculations, summarized in the spreadsheet tool, are expressed in terms of increases to average wage and per capita GDP. In practice, these increases could take the form of more jobs, higher wages for existing jobs, shorter unemployment spells, and greater firm profits—likely some combination of all four.

At the same time, both the firm-level analysis and the case studies suggest that there are large differences from city to city in how benefits arise, due to differences between cities in development patterns, regulatory environments, and institutional support. Agglomeration benefits likely take a substantial amount of time to be realized. Our US metro-level data did not allow us to directly quantify the time dimension.

Further research is certainly needed on this topic. The obvious next research steps are to collect and analyze historical data on transit, agglomeration, and productivity over several decades, and to use more advanced statistical methods to better understand mutual causality. Other research requires testing other measures of transit capacity, such as examining how firm formation may occur in response to transit investments, and investigating whether the residential focus of TOD efforts may dampen employment-related agglomeration impacts of transit.

1. INTRODUCTION

TCRP project H-39, “Methodology for Determining the Economic Development Impacts of Transit Projects,” was intended to arrive at a recommended methodology for US transit agencies to follow when estimating the likely economic benefits of proposed transit capital investment projects.

Transit projects, such as the extension of a rail system or the creation of a new bus rapid transit corridor, have economic benefits mainly when they make faster travel possible. Estimates of the direct value of faster travel times are already included in current evaluation procedures. Those benefits are economic impacts, and they potentially affect productivity, property values, and land development, but they are only part of the possible economic impacts. Both the reduction in travel times and the higher occupancy and denser development made possible by faster travel can in turn, at least in some cases, make firms and workers more productive in places with access to the new or improved transit services.

It is important to note what we do not address in this study. First, there are significant direct expenditure impacts of transportation construction projects, in the form of direct jobs and indirect multiplier effects. These are important economic impacts. However, they do not necessarily distinguish transit projects from alternative uses of public funds like constructing roads, building schools, or funding food stamp programs.

Second, we do not explore whether there may be benefits directly associated with the redistribution of economic activity, or more compact or clustered development that may follow transit investments. Most planners and transit agency professionals would say that a transit extension or new line leading to residential and non-residential development near stations would represent real success. They would argue that such an outcome demonstrates the role of transit to support compact community development patterns and population growth. However, from the perspective of this study, these spatial patterns are only of interest in terms of how they may increase the productivity or size of the regional or national economy. Densification near stations, or higher land values, are of less interest because they do not, by themselves, necessarily represent economic growth; they may instead represent local benefits at the expense of forgone growth elsewhere. The distinction is subtle and bears repeating: alteration of development patterns is partly a process of redistribution of economic activity, which does not by itself represent an increase in productivity when considered at the regional or national level.

Third, and related to the above, our focus on agglomeration avoids double-counting user benefits. Under current procedures, travel time savings are already counted as user benefits. These travel time savings are capitalized into what most people refer to as land development benefits; and land development benefits have their own category.

Fourth, this report does not address whether and under what circumstances transit investments may decrease poverty or unemployment within an area. Such impacts would be in addition to current evaluation criteria, and potentially worth serious consideration. A transit investment in an economically depressed area might have equivalent productivity impacts as one in a thriving area, but its actual benefits would likely be greater in the depressed area.

In Chapter 2, we explore existing knowledge on how to estimate the economic benefits of transit projects, based on the academic literature, interviews and practice reports, and other practice-related reports and legislative/administrative guidance. In Chapter 3, we describe how to improve these methods, and explain the scope of work for the empirical phase of the project. Chapter 4 contains our primary research results. It describes an extensive analysis of a nationwide dataset of metropolitan statistical areas that includes economic data and measures of transit capacity, and which is used for the basis of the spreadsheet tool described later. In Chapter 5 we describe supplementary analysis of geo-coded firm-level data for two metropolitan areas with relatively new rail transit systems: Dallas-Fort Worth, and Portland, Oregon. Chapter 6 describes three case studies of regions with recent transit investments: Los Angeles, Salt Lake City, and Dallas-Fort Worth. The case studies provide supplementary information on agglomeration effects and the barriers to achieving them, not easily incorporated into the quantitative analysis. Chapter 7 is a concluding chapter that also contains a description of the spreadsheet tool that could be used by transit agencies and others to estimate the GDP and wage impacts of proposed transit investments, given five input measures about those investments.

Volume 2 of this report includes an additional set of appendixes, including a complete review of the academic literature, a detailed description of the agency interviews, a review of practice in the US and the UK, detailed tables of results from our US metropolitan area-level statistical analysis, and a glossary of terms used within the report.

2. SYNTHESIS: THE STATE OF THE ART AND THE STATE OF THE PRACTICE

In this section of the report we describe existing academic theory and research methods to estimate the economic impacts of transit investments, focusing on agglomeration impacts. This is followed by a description of how public agencies estimate and understand the potential economic impacts of project proposals and evaluations, based on our interviews with staff as well as our review of reports and other documents. Our focus was on three main questions:

- How are transit infrastructure investments thought to affect the economy?
- How have those possible impacts been investigated and estimated?
- What are the practical challenges in carrying out such estimates?

We begin with an overview of existing federal planning and evaluation processes for fixed-guideway transit systems. We then summarize our extensive review of academic literature on transportation and agglomeration (the full review can be found in Appendix C). We next turn to a description of our interviews with practitioners familiar with New Starts and Small Starts funding applications to the Federal Transit Administration (the full description of interviews is Appendix D). Finally, we describe documentary sources and guidance that explain how economic impacts are estimated in practice (the full review of these practice documents is in Appendix E).

Existing Federal planning and evaluation processes

The Federal Transit Administration's (FTA) New Starts and Small Starts programs are the primary federal funding resource for capital investments in fixed-guideway transit systems. SAFETEA-LU identifies specific criteria that the FTA must consider in order to advance a New Starts project through the project development process and to enter into a funding agreement. SAFETEA-LU requires that FTA consider the economic development effects of New Starts projects, however this criterion was not required for the FY 2008 and FY 2009 evaluation cycles because FTA "desires through the rulemaking process to work with the industry on the development of appropriate factors for measuring the economic development effects of candidate projects."

Economic development impact is currently included as an optional measure under the "Other Factors" project justification criterion. This criterion is documented by project sponsors in a "Making the Case" report that is submitted to FTA. Specific reporting requirements are not provided.

FTA published the *Proposed New Starts Economic Development Criterion - October 2008*, which lays out a method and reporting requirements for a new, stand-alone economic development criterion first applicable to FY 2011 projects. This criterion is based on the developability of land near stations, the presence of transit-supportive plans and policies, and the economic climate.

Land development impacts of proposed fixed-guideway projects are documented through population and employment forecasts, tax assessment data, a build-out analysis of the total additional development that could be accommodated under existing or proposed zoning, and a subjective market assessment by a local analyst.

Transit-supportive plans and policies are defined by FTA as those that support pedestrian mobility and accessibility, and include pedestrian network connectivity, building setbacks, parking design, requirements, and regulations, the land use mix, and residential and commercial densities. These are documented through an inventory of relevant plans, policies, and ordinances, as well as a narrative description of potential barriers such as environmental contamination.

Economic climate is documented through long-term metropolitan growth forecasts, recent growth in station area and project corridor property values, commercial and residential rents, and commercial vacancy rates.

Academic literature review

A rich theoretical literature can be applied to the question of how a transit project might increase economic activity. The empirical literature is less detailed but also useful. Our research focuses on "additional economic benefits"—benefits of transit investments beyond travel time and/or cost savings, the capitalization in land prices of those savings, or the higher development density that may ensue. Travel time and cost savings, and their immediate effects, can be more readily calculated; such estimates are already required in FTA guidelines for funding applications.

Transit projects are hypothesized to have several types of additional economic impacts, closely related to each other. These impacts are called "wider economic impacts" by the UK Department for Transport. They are related to the "induced" impacts of transportation investments—the economic and population growth that have been shown to follow some transportation investments—but they are entirely distinct from those changes. In fact, in the UK, only the interactions between firms enabled by lower travel times are included when calculating agglomeration economies. It is those interactions that matter in increasing productivity.

What is agglomeration?

Agglomeration is perhaps the most widely observed feature of the spatial organization of economic activity, evident in the existence and growth of cities, in the formation of industrial regions and districts, and in the clustering of like activities within a neighborhood. Agglomeration is a term also used to refer to interactions between firms and households that may be made easier by transportation improvements *without* any such physical changes in the built environment. There are multiple kinds of agglomeration mechanisms that may result in economic benefits. These mechanisms include greater innovation due to more frequent contacts among a specialized labor force, reduced costs of producing goods when production equipment and knowledge are shared, and better matching of workers to firms. Which of these mechanisms might arise from transit projects is an understudied question, but an important one.

Most additional economic impacts of transit investments can be characterized as higher industrial productivity due to greater *agglomeration economies* enabled both by faster travel, and by densification of development near transit stops and across the metropolitan area. While "agglomeration" perhaps most commonly refers to the size or density of a city, or of an industrial cluster, it also refers to industrial concentration within an urban economy, or the percentage of total employment in a particular industrial sector, or even increases in "effective density," which is essentially equivalent to decreases in travel time.

There are various causes of such economic returns to firm concentration, including access to large and specialized labor markets, better sharing of a variety of inputs to production, and the rapid dissemination of specialized production knowledge. The relative importance of each of these agglomeration mechanisms is not well understood empirically, though there is a well-developed set of theories. Theory has it that concentration of economic activity, such as a city or a business park, takes place because of economic returns to doing so. The existence of returns to scale of concentration is demonstrated by the fact that settlement is organized in cities, rather than scattered across the landscape.

Agglomeration economies are to a large extent *external* to firms; that is, firms do not capture all of the benefits of their decision to locate near other firms. Those benefits instead accrue to all members of the agglomeration. When choosing a location, a firm will take account of the benefits of concentration on its own activities and profitability, but not the impact of its own decisions on the activities of other firms. Because of this, firm clusters, CBDs, and cities themselves may be less concentrated than is optimal.

There are two main ways that transportation improvements may affect economies of agglomeration:

- If a transportation improvement causes the relocation of activity (i.e. densification), there may be positive agglomeration impacts where the activity relocated to (and negative impacts where it relocates from)
- The lower cost of movement will increase accessibility to economic activity, especially by increasing the pool of accessible labor; this may lead to further positive agglomeration impacts.

These various agglomeration effects can be evaluated as they might relate to transit (see Table 1, below). Each implies a different possible set of empirical measures and estimation methods to determine whether these economic impacts are in fact large enough to help distinguish proposed projects, and if so, how best to estimate the impacts.

TABLE **1 Transit projects and hypothesized agglomeration mechanisms**

Agglomeration mechanism	Likely facilitated by transit projects?
Input sharing (enabling horizontal vertical disaggregation, that is, small, nimble firms instead of large ones; and supplier specialization)	No, unless transit projects reduce freight congestion
Knowledge spillovers (skilled labor learning from each other; quick dissemination of innovative practices)	Indirectly, (a) by facilitating local and walk-accessible firm concentrations, and possibly (b) by increasing speed of business travel (but only where transit is used for business travel and/or where transit reduces road congestion)
Labor market pooling (enabling better matching of workers to jobs; less turnover)	Yes, by increasing the size of the labor pool within commuting distance
Reduced cost of negotiations (enabling vertical disaggregation and supplier specialization)	Indirectly, by facilitating local and walk-accessible firm concentrations
Infrastructure sharing (closely related to economies of scale in transportation provision)	Yes—there is shared access to transit infrastructure, but this particular mechanism of agglomeration is already included in FTA guidelines by counting travel times along with anticipated densification near stops.
Amenity sharing (specialized public and private goods)	Yes—but this is a consumer-side benefit, and is hard to measure except very indirectly, via land prices

Empirical studies of the effects of transportation investments on agglomeration are diverse and incomplete. Depending on the causal theory being tested, the studies use different dependent variables: changes in productivity, firm revenues, wages, and land values are all examples. Studies also use different independent measures: accessibility changes, and changes in density, are the most common examples. The unit of analysis also ranges widely, from the metropolitan region to small areas. There is little or no direct study of how transit investments might have economic impacts beyond travel time savings.

The uncertainty on the empirical side is illustrated by Table 2 below, which gives an example of how in the case of different levels of pent-up demand the theory fails to shed much light on the specific effects of any particular transportation investment. The response of travelers and development to projects will vary; in some cases costs will exceed benefits and in other cases the reverse will be true. Additional economic benefits may be a substantial fraction of project benefits in some cases, such as a project that helps relieve a major bottleneck or that occurs in a region with industries that benefit from agglomeration. Local context and conditions can make a difference and any single study will not be able to disentangle all the possible associations.

TABLE **2 Possible variation in additional economic benefits**

	Cost	Time savings	"Other" economic benefits	Notes
Example 1	$1.5bn	$0.80bn	$0.10bn	Low demand for project
Example 2	$0.50bn	$0.75bn	$0.50bn	Relieve transportation bottleneck
Example 3	$0.50bn	$0.10bn	$0.20bn	Post-project travel/congestion
Example 4	$2.50bn	$0.90bn	$1.80bn	Ability to attract agglomeration of firms

There may also be other additional economic benefits of transit investments that are related to but distinct from agglomeration effects, including:

- Transit network effects
- Economic multiplier effects
- Reduced income-tax-related deadweight loss
- Greater price competition

The first of these is the increasing returns to scale in waiting, walking, and transfer times that come with higher-density transit networks. Some transit investments may reduce waiting, walking, and transfer times, but these depend on specific details of the transit network and also of the corresponding pedestrian network. The benefits associated with network effects will likely be enhanced by having a large existing transit network that is well integrated with a pedestrian network.

The second is economic multiplier effects. These are typically estimated by regional economic models, such as the REMI (Regional Economic Models, Inc.) model, which addresses the connection between transport costs and productivity via the ability of firms to access labor markets, and the potential variety and concentration of those labor markets. Calculating such effects is beyond the scope of this study, but economic multipliers may be intimately related to agglomeration economies. We describe such models below and in Appendix E.

The third of these is the additional value of labor market participation that goes beyond increased wages. Agglomeration can lead to higher employment rates or more work hours in several ways, such as improved transit access to jobs encouraging more unemployed residents to join the labor market. If a proportion of the time saved traveling is spent working more hours; or if local labor supply increases at highly productive (and agglomerated) locations, deadweight losses associated with taxation of income may decrease, which would be another economic benefit.

The fourth of these additional economic benefits is related to but distinct from agglomeration effects. Lack of accessibility and high transportation costs can be a barrier to competition between firms. These effects are likely to be minimal given that transportation networks (particularly the road network) are mature in the US, so transit investments would likely have a trivial impact on increasing competition between firms. Lower prices and more competitive markets effects may occur only if the transit project reduces major congestion of roads that are used by freight, leading to the possibility of effectively larger market areas for some industries.

Interviews

We conducted eighteen practitioner interviews with transit agencies, metropolitan planning organizations (MPOs), and their technical consultants in the US, UK, and Australia from January 2009 to April 2009. The purpose was to obtain their assessment of how the economic impacts of proposed transit projects are assessed in practice, including what works well and what does not, how methods might be improved and made consistent among different locales, and what types of products from this effort would be useful. We sought to understand current techniques, expertise levels, and needs of various agencies. We asked questions about the methods currently used to forecast economic and non-economic benefits of proposed projects; data quality and availability; and transferability across different regions and transit modes. The US interviews also addressed how the assessment of economic impacts relates to the New Starts/Small Starts federal funding process.

An interview guide was developed to ensure all interviews followed the same structure and collected similar information. A copy of the interview guide is included at the end of Appendix D. The guide covered the following topics:

- Benefits measures used in the transit project development process;
- Methods for both forecasting and ex-post monitoring of economic impacts;
- Data availability and ease/cost of acquisition, including any systematic delays or difficulties;
- Any local, customized modeling tools for forecasting impacts and their relative success;
- Examples and evidence of good practice and problems encountered previously relevant to the research objectives;
- Transferability of methods between regions and project types; and
- Any other views on what a practical evaluation methodology should consist of.

Interview subjects in the US included transit agency staff, their consultants, staff of MPOs, and a representative of APTA. Outreach to identify interview subjects was conducted at the January 2009 Annual Meeting of the Transportation Research Board in Washington, DC, through presentations at select committee meetings. Subjects were also selected from recommendations made by the TRB Review Panel, through direct outreach to transit agencies, and through personal contacts of the researchers. Interview subjects in the UK and Australia included transit and other government agency staff and their consultants. Members of the research team interviewed a diverse set of transit professionals with experience in rail, light rail, and streetcar projects in mature, developing, and planned systems in a variety of metropolitan areas. Subjects included technical staff and consultants with broad experience in project planning and economics, as well as agency leadership with knowledge of the political complexities of transit development. In total, 18 interviews were conducted, primarily via telephone (thirteen in the US, four in the UK and one in Australia). More detailed accounts of the interviews are presented in Appendix D. Here we summarize the most salient results.

The interviews suggest there is no standard practice in the US transit industry for conducting economic benefits analysis. Respondents cited a variety of methods, including cost–

benefit analysis, proprietary models such as REMI and TREDIS, input-output models, and real estate investment studies (these are discussed in the next section). A large share, or in some cases all, of the calculated economic benefits in these studies amount to monetized travel time benefits—a form of double-counting, since travel time reductions are already reported to the FTA as part of the application process.

These methods lack an explicit attention to productivity-increasing responses to transit investments. Respondents were generally unfamiliar with agglomeration or labor search, and how they might lead to economic benefits from transit investments.

Interviewees also commonly wanted to discuss the New Starts/Small Starts application process. The process was generally reported to be cumbersome and there was reluctance to increase the complexity of evaluation, which is what is implied by an additional "economic benefits" criterion. Respondents generally expressed the interests of their agencies. They preferred finding a process that would reflect positively on their agency's local circumstances. Many felt the existing process was biased against their agencies. A common theme among respondents was that the unique economic and land development contexts of different regions, as well as the relative maturity of systems, should all be taken into consideration. Respondents also expressed a strong interest in having explicit environmental benefits considered as part of the calculation of economic benefits.

In the United Kingdom, the Department for Transport (DfT) publishes standard guidance for overall assessment of transportation investments, which was frequently cited by UK respondents as a key resource. The guidance is standardized across different types of transportation projects and only contains mode-specific advice where there are technical modeling issues, and in parameters such as the value of time. It covers a range of areas including environmental impacts, safety impacts, economic impacts, and accessibility; it utilizes both quantitative and qualitative measures, which are compared to national standards. The guidance includes a methodology for assessing additional economic impacts such as agglomeration economies.

In contrast with the UK, most practitioners in the United States are unaware of the ways in which transit is thought to have the potential to increase economic productivity. To the extent that they are, there is little consensus about how impacts should be measured.

Practice reports and guidance

To supplement our review of the academic literature and our practitioner interviews, we conducted a review of current practice in the US and the UK for assessing the economic impacts of transit projects, focusing on reports and practice guidelines. In the US, these consist largely of the results of input-output models and integrated land use and transportation models. Such models do not explicitly attempt to estimate transit-caused increases in economic productivity. The economic multiplier effects due to travel time reductions may vary from region to region. As we note below, however, it is difficult to conceive of a clean way to make estimates distinguishing regional economic impacts on this basis. Models used to calculate these impacts are region-specific and can be tweaked to yield desired answers.

Table 3 summarizes the methods used by the sample of studies that we were able to gain access to and found most relevant. Appendix E provides details on each of these studies.

TABLE **3 Summary of methods used by sample studies**

Study	Cost–benefit Analysis	Input-Output/CGE	Real Estate	Ad Hoc
Chicago Metropolis	X	TREDIS		
Access to the Region's Core (ARC)	X	REMI	X	
Metrolinx	X	Proprietary	X	
MAROps	X	REMI		X
New York Cross Harbor	X	REMI		
Chicago Region Freight (CREATE)	X	REMI	X	
Howland Hook Marine Terminal	X			
NJ Transit Consumer Spending	X			X
Portland Streetcar			X	
DART Fiscal Impact			X	X
Phoenix Metro Light Rail			X	
DART TOD Guidelines			X	X

Based on the information from the interviews, we conducted a detailed examination of REMI and the UK method, and discuss the latter in some detail in Appendix E. Many of the other methods used by agencies are relatively ad hoc, or are studies aimed at gaining local support for specific projects. Based on our review, none of the US studies tackled the productivity-increasing effects that are the focus of this study. Most studies used input-output analysis to track the local employment impacts of construction spending. Others relied on traditional travel demand modeling, mainly to assess direct travel time benefits.

The REMI model is one of the more widely used models for evaluating economic benefits, not only of transportation projects, but of other regional investment strategies. We studied publicly available information on this model to determine whether it evaluates agglomeration benefits, as this was unclear in the studies we reviewed. We concluded that it was not possible to tell from available documentation. More details on this issue are provided in Appendix E.

The UK guidance has the benefit of being clearly written, non-proprietary, and more explicitly linked to economic theory. While this guidance is still in draft form, it is being applied by consultants and local authorities to projects within the UK. The first and most obvious disadvantage of this guidance for analyzing transit projects in the United States is that the agglomeration elasticity estimates are based on UK data. There are other issues, as we note in the framework below.

Agglomeration benefits in the UK approach are calculated based on estimates relating employment accessibility (rather than development density) to economic output measures. The accessibility measure accounts for the concentration of employment within a zone and interactions with every other zone, discounting by an exponential function of travel time, or more accurately, by the generalized cost of travel. This generalized cost estimate is taken from a travel demand model, with and without the specified project. The change in accessibility is converted to productivity gains using empirical evidence on the relationship between effective density and productivity, or agglomeration elasticities.

The UK method also estimates labor market impacts separately, although these effects are possibly more clearly understood as another particular kind of agglomeration economy (as defined in the academic literature; see Appendix C). The two most relevant for transit projects are increased employment due to increased access and increased productivity due to a larger number of jobs in more productive firms and industries. The increase in labor supply (that is, more people choosing to work) is spurred by the effective reduction in the costs of working by reducing transport costs. This is an important point, especially when considering the distributional impacts of investment and how transport costs disproportionately affect lower income employees. In order to estimate this properly, one must derive an elasticity of employment with respect to wages. Estimates are likely available in the literature and could be used, although these would not be locally specific.

In the UK approach, the increase in accessibility is also considered to have the potential to increase local labor supply to dense and highly productive locations. In the presence of income taxation, any resulting productivity increase will carry a component (i.e. the tax element) that is not counted elsewhere. This element may simply consist of a transfer between workers and the government, so it is not clear whether it should be included as an economic benefit.

3. FRAMEWORK FOR ANALYSIS, AND SCOPE OF WORK

Much research still needs to be conducted to fully understand the wider economic impacts of transit investments. Two important questions about agglomeration and transit are not well understood. The first is under what conditions transit projects might significantly increase accessibility and/or concentrate residential development or firm clusters. The second question is how those changes might lead to increases in economic productivity. Addressing these questions is essential to understanding the likely economic impacts of transit investments given the varied economies, infrastructure, and development conditions of particular cities.

Existing empirical studies, for the most part, are unable to provide insight into the why and how—they are only able to demonstrate that with certain data sets and in certain places, there is a correlation between (for example) economic productivity and employment density or accessibility. The role of transit investments in increasing residential or employment density (either physical density, or "effective density"—i.e., employment accessibility) is essentially assumed in such studies.

The UK guidance offers a useful roadmap for assessing some of the additional economic benefits of transit, in that the additional economic benefits of transit investments are only one small piece of a much more comprehensive multi-attribute assessment approach in the UK. The approach is explicitly designed to match national objectives with specific assessment criteria, including objectives of environment, accessibility, safety, economic, and transport integration with other policy sectors. Within the overall evaluation process, this type of framework could provide a useful means of integrating regional goals with other objectives; however, there are limitations to the UK approach. It assumes that physical densification is purely redistributive, it relies on firm-level data to which US analysts typically do not have access, and it treats modes as equivalents when they may not function similarly in particular agglomeration mechanisms. We discuss these issues in more detail below.

Assessment: Improvements to research and practice

In this section we discuss and critique existing research and practice in several topical areas, as follows: understanding agglomeration mechanisms; treating transit separately from other transportation modes; improving measurement and estimation methods; controlling for endogeneity; distinguishing net effects from redistribution; and considering development context, particularly regulatory constraints on development impacts. In the end, our analysis method addresses some, but not all, of these issues.

Understanding agglomeration mechanisms

There is much to explore about the agglomeration-related mechanisms of economic growth with respect to transit infrastructure, and reasons to be cautious about extrapolating estimates. Although there is plentiful empirical evidence that industrial productivity is higher in denser or more accessible areas, the specific reasons for such relationships are not well understood. We have instead several hypotheses that have, for the most part, not been adequately tested. For example, transit investments may increase the accessibility of workers to employment clusters, resulting in higher productivity from better job matching and quicker filling of vacancies. Transit investments may also enable metropolitan growth by allowing higher occupancy of existing development without requiring additional construction of auto parking spaces. Distinguishing such different possible agglomeration economies is important, particularly if future development will not have the same characteristics as current development, or if a study area economy is significantly different from that to which estimates are to be applied.

Treating transit separately

Transit investments may enable agglomerations of firms and households, which may in turn increase productivity and economic output. But there is a need for research to explicitly examine the economic impacts of transit projects, as opposed to those of transportation generally, or highways specifically. Previous research has not explicitly investigated how transit leads to agglomeration and hence increases economic productivity. Current practice in the United States also does little to analyze these linkages. The best practical example of estimating impacts, the UK guidance, relies on a composite generalized cost measure which gives weights to the different modes according to current trip patterns. In places where auto trips dominate (as in most cities in the United States) this measure does not represent transit's potential impacts on accessibility via agglomeration, and elasticity estimates applied based on such travel time estimates would be incorrect. Also, the UK method does not take into account how changes in development densification may increase agglomeration economies. The method measures only those effects of agglomeration economies depending on interactions that occur between existing firms and households over transit and roads.

Higher employment accessibility may enable economies of scale in serving markets that require freight shipment, without increasing agglomeration externalities. That is, they may enable higher productivity not due to more interaction with firms, but higher productivity because reduced transportation cost enables a larger scale of production. Since "serving markets" in this case means sending trucks on roads, this kind of economy is less applicable to transit.

Some of the agglomeration benefits of transit may be very localized—limited by walking distances, and dependent on intensification of development around transit corridors and/or near stations. Other potential economic benefits of transit investments are regional in scope, and are not as dependent on development intensification.

Improving data and measures of dependent and independent variables

Continued improvements in measures of key dependent and independent variables are needed to better understand and estimate the relationship between transit and agglomeration. There might be significant threshold effects of agglomeration on productivity; agglomerations (transit-induced or otherwise) might increase productivity only at sufficiently high density. This requires explicit threshold measures or other nonlinear measures.

Most economic productivity measures implicitly include the value of reduced travel time. For example, net revenues are exclusive of wages which could be lower due to reduced travel time. The value of finished goods per worker might provide a measure avoiding the double-counting problem. Output per worker may also be the best measure from the national perspective, because it implies genuine additional economic growth (not just economic growth that would have occurred anyway, being transferred from one region or locality to another) and improved global economic competitiveness.

Accounting for endogeneity (the chicken-or-egg problem)

The research needs to explore further the endogeneity of firm location with respect to agglomeration, and so far has done little on endogeneity of firm location with respect to transit infrastructure. Do more productive firms move to denser or more accessible places? Does greater accessibility or density lead to higher productivity? How does transit infrastructure influence these location and expansion decisions? How might transit infrastructure increase productivity and innovation? There have been few attempts at longitudinal analysis; almost all empirical work is cross-sectional.

Distinguishing effects at different scales and for different groups

The impacts of transit projects on the economy flow from accessibility changes—reductions in travel time—as well as reductions in the cost of travel. These changes are unevenly distributed within a region, leading to localized and possibly regional changes in demand for space, and hence increased demand for land development in some places with possibly decreased demand in other places. Redistribution of employment may occur in response to a transit investment, reducing employment accessibility in some areas, and perhaps also resulting in reduced productivity in those places.

Thus there is a need to distinguish net regional or national economic benefits from local redistribution of economic activity. "Economic growth" is a tricky concept. Does it refer to more local capture of regional growth, to more regional capture of national growth, or to more national capture of global economic growth? These possibilities should be distinguished with study at different geographic scales. From the national perspective, it may be national growth that matters most.

Considering development context

There is a need in practice to understand the role of development regulations in enabling some kinds of agglomeration economies. Development regulations constrain supply development responses to demands, to a varying extent from jurisdiction to jurisdiction. Estimates of the land use impacts of transit projects are already addressed under FTA guidelines for the New Starts and Small Starts programs, and could be used as an input to estimates of agglomeration economies. But they are important inputs to additional economic impacts and may need to be included in the procedures for calculating those impacts.

Empirical study approach

Agglomeration impact estimates are readily carried out at the metropolitan level for the United States because data on GDP and wages are available for metropolitan areas. Agglomeration elasticities have been estimated for the United Kingdom, for a variety of industrial sectors, but similar estimates do not exist for the US. Thus, the first task we identified was to conduct a national study of metropolitan areas examining how changes in transit infrastructure affect productive output in urbanized areas, providing estimates of metropolitan-wide agglomeration economies caused by transit investments. The second part of the study approach was to investigate firm-level data, which are more precise than data aggregated to counties or higher spatial levels, and which enable an investigation of how transit affects the distribution of economic activity. There is reason to believe that the economic impacts of transit investment may be the greatest for firms with walking access to stations, while possibly leading to reductions in economic output for firms farther away from transit. Finally, we selected and carried out three project-level case studies, to investigate the qualitative and context-driven aspects of the transit-agglomeration-productivity relationship, and better understand the local political, economic, and institutional factors that may play an important role.

We focused on agglomeration economies and not the four other possible sources of additional economic impacts of transit, for several reasons. First, the literature suggests that agglomeration benefits are the largest of the additional economic benefits associated with transportation, and we expect that for transit they are even more important. Estimates of network effects and economic multiplier effects would double-count some of the impacts of travel time changes (such as higher ridership), while economic adjustments from relocation should be captured by agglomeration estimates. There is reason to believe that the tax-related labor participation benefits and the price-competition benefits used in the UK guidance are actually transfers, rather than additional economic benefits in a broader sense. Also, there are very few studies of either, and estimates rely heavily on intuition. Finally, improving competition between firms on price is not an impact that we expect to see for most transit investments in the United States, because the ability of consumers and firms to search for better-priced products may not be significantly expanded by transit.

4. MSA-LEVEL TRANSIT-AGGLOMERATION-PRODUCTIVITY ANALYSIS

In the first empirical part of our study, we used data from all of the metropolitan areas in the United States to estimate how transit capacity is correlated with agglomeration, and how in turn agglomeration is correlated with productivity. In this section we describe that effort in detail, starting with the theory that is the basis for the study, describing data and analysis methods, and presenting our findings in summary form and then in greater detail.

Theory

Transit improvements reduce travel time, and this may lead to increased access to central city areas, physical densification of employment, and population growth. In turn, those agglomeration changes may increase productivity. We conceptualized this relationship as a two-stage model, including the theoretical relationship between transit capacity and agglomeration, and the production relationship between agglomeration and productivity.

In the first stage, changes in transit and road capacity may alter travel times and consequently affect both agglomeration interactions over space, by making them easier, as well as affecting physical agglomeration as measured spatially. But roads and transit infrastructure can also be expected to directly affect production, independent of agglomeration effects (Berechman et al., 2006). We distinguish them to avoid double-counting effects that are not included in our elasticity estimates. One of the first-stage models takes the form:

$$D_i = \theta T_i + \tau H_i + \sigma P_i + XC_i, \qquad (1)$$

where D is employment density (one measure of agglomeration), T a measure of transit capacity, H the highway network supply, P population for each metro area i, and C a vector of other controls that might also affect employment density, including population and industry characteristics, and the employment density level from some previous period. This model is meant to measure the effect of transit capacity on central city employment density while controlling for other factors. Employment density may enable information spillovers and the potential knowledge networks that can form when firms and their employees are in close proximity.

Another agglomeration mechanism is the increase in labor force size that can result in more efficient workers due to better matching of skills to needs, quicker filling of vacancies, and shorter unemployment spells. This is represented in our other first-stage model in which the population of the metropolitan area is specified as a function of transit and road capacity measures as well as a similar set of controls as for the employment density model:

$$P_i = \rho T_i + \varphi H_i + XC_i \qquad (2)$$

Estimation of these equations results in elasticities that are dependent on the size of the transit (or road) network, the existing levels of employment density and of population, and other factors. The parameter θ provides an estimate of how employment density and population vary with transit supply. Elasticities of agglomeration with respect to transit supply are, for employment density,

$$\epsilon_{T,E} = \frac{\theta T}{D}, \qquad (3)$$

and for population,

$$\epsilon_{T,P} = \frac{\rho T}{P}. \qquad (4)$$

Next, we define a production function that includes a multiplier to account for any additional productivity effects from agglomeration. Similar to Graham (2007) we define our model as:

$$Y = g(z)f(X) \qquad (5)$$

Where $g(z)$ is the Hicks multiplier, which incorporates any agglomeration effect, and $f(X)$ is the production function. Graham (2007) goes on to specify this via a translog function, using effective density (ED) as the agglomeration term, where ED is based on travel times. Our approach differs in that we use in our empirical formulation more traditional measures of agglomeration to distinguish different possible agglomeration mechanisms: urbanized area employment density, central city employment density, and metropolitan area population.

Most research uses a Cobb-Douglas production function, e.g. Abel *et al.* (2010) specify

$$Y_{ij} = A_{ij}K_{ij}^{\alpha}H_{ij}^{\beta}L_{ij}^{1-\alpha-\beta}, \qquad (6)$$

where A_{ij} is the Hicks neutral parameter, K_{ij} is physical capital, H_{ij} is human capital and L_{ij} is labor supply. Subscript *i* denotes metropolitan area, and *j* represents the larger region within which the metropolitan area is found (e.g. the state). Constant returns to scale are assumed in all inputs. Abel *et al.* assume that the rate of return on physical capital is constant and use this to redefine their model to factor out the physical capital input (which is generally not available at this scale of analysis, although Graham (2007), who used UK data, had a physical capital measure based on self reported firm-level capital depreciation). Thus Abel *et al.* reduce their model to the following:

$$\frac{Y_{ij}}{L_{ij}} = \phi_j A_{ij}^{\frac{\gamma_1}{1-\alpha}} \left(\frac{H_{ij}}{L_{ij}}\right)^{\frac{\beta}{1-\alpha}}, \qquad (7)$$

where $\o_j$ is the rental price of capital for the larger region, *j*, is a constant and may vary across regions (or states). A_{ij} is the measure of density (agglomeration). They take the log of the above to empirically estimate the model as,

$$log\frac{Y_{ij}}{L_{ij}} = log\phi_j + \frac{\gamma_1}{1-\alpha}logA_{ij} + \frac{\beta}{1-\alpha}log\left(\frac{H_{ij}}{L_{ij}}\right) \qquad (8)$$

We use this basic framework to estimate agglomeration elasticities using the three different agglomeration measures: principal city employment density, urbanized area employment density and MSA population.

With the two models combined, we can estimate transit-agglomeration-productivity elasticities. Our models use both per capita wage rates and GDP as dependent variables for the productivity models. Thus we can calculate two estimates of the elasticity of productivity with respect to transit capacity, as follows:

$$\varepsilon_D = \frac{\theta T}{D}\frac{\gamma_1}{1-\alpha}, \qquad (9)$$

representing the effect through densification of employment, and,

$$\varepsilon_P = \frac{\rho T}{P}\frac{\gamma_1}{1-\alpha}, \qquad (10)$$

representing the agglomeration impact of increased city population. The overall elasticity of productivity with respect to transit capacity is then the sum of these two elasticities:

$$\varepsilon = \varepsilon_D + \varepsilon_P. \qquad (11)$$

Our empirical analysis thus allows us to decompose the impact of transit capacity changes through both agglomeration mechanisms and on both wages and GDP per capita. We also explore equations restricted to particular industrial sectors to explore possible differences in transit-agglomeration-productivity relationships across sectors.

Data

We compiled data for the 366 US metropolitan statistical areas (MSAs) as defined by the US Census for an eleven year period from 1998 to 2008, although we were not able to use all observations for our analysis, as we describe below. The dataset included transit capacity, as measured in several different ways; road network information; firm productivity measures, including GDP, average wages, and number of firms and workers; population; and measures of employment density for the MSA as a whole, the urbanized area portion of the MSA, and the urbanized area portion of the principal cities within the MSA.

Transit capacity data were derived from two sources. First, we spent considerable effort to process a time-series of data from the National Transit Database (NTD). This is a rich data source of information for every transit agency in the country, but frequently suffers from lack of agency reporting for various years and for some variables. Data for both rail and bus revenue seat-miles, total revenue miles, and seat capacity were relatively complete. We obtained track mileage data by rail type from the American Public Transportation Association, supplemented by checking information on agency websites to compile a time-series of track mileage for commuter, heavy, and light rail modes.

Aggregating transit agency data to the metropolitan area level was a non-trivial exercise. The NTD reports the location of transit service as the transit agency headquarters, but in some cases this did not match the primary metropolitan area that the agency served. For example, the Altamont Commuter Express rail service between Stockton and San Jose (California) is operated by the San Joaquin Regional Rail Commission, is headquartered in Stockton, but the primary flow of commuters is toward San Jose. In this case we allocated the system to the San Jose metropolitan area. We made similar corrections for a dozen other systems. There were 34 metropolitan areas with some form of rail transit in 2008, including 17 with commuter rail, 11 with heavy rail, and 27 with light rail (including a few relatively small trolley systems). Additional reallocations were made as noted in Appendix K.

While the NTD contains a code identifying the primary MSA served, additional matching was done by manual inspection of the data files. This provided data for 333 MSAs, so our analyses using revenue seat-miles and total revenue miles had this as the maximum number of observations per year. Most MSAs had no transit service or incomplete data, and in some cases were served by transit agencies located in another MSA (e.g. Trenton, New Jersey MSA).

Road network data were drawn from National Highway Planning Network (NHPN) files within the annually published National Transportation Atlas Database. NHPN provides a GIS record of virtually every road of federal significance, including those not within the National Highway System. From this we derived freeway and arterial road mileage for all 366 MSAs. One shortcoming of these data is that they are not updated every year (i.e., 2001 and post-2004) so it was problematic to use the data in time-series analysis, but based on our diagnostic tests with a time-series of road data for 88 MSAs taken from the Texas Transportation Institute dataset, we determined that it was not necessary to include road measures except in cross-sectional analysis.

County Business Patterns data from the Census Bureau were used for our measures of worker productivity: average and total payroll. We aggregated county data to the MSA level to maintain consistent MSA boundaries, because many MSAs were created, expanded, or altered after definitional changes by the Census Bureau. These data between 1998 and 2007 were processed at the two-digit NAICS sector level. Data from the Bureau of Economic Analysis for GDP by two-digit NAICS sector was also processed at the MSA level between 2001 and 2007. We found there was incomplete data for most industrial categories, and so were only able to evaluate total GDP data across the economy. Annual population and land area estimates by county were also obtained from the Census Bureau.

One quirk in the data was the treatment of MSAs in Virginia. The Bureau of Economic Analysis (BEA) uses non-standard FIPS codes to deal with independent cities in Virginia, which are separate from their surrounding counties. We adjusted our data accordingly to aggregate to the relevant MSA level.

We calculated two kinds of employment density-based measures of agglomeration: urbanized area employment density and central city employment density. We used primary-worker-at-place-of-work data from the Census Bureau's Longitudinal Employer-Household Dynamics (LEHD) dataset, available at the census block level for the years 2002 to 2008, along with block-level land and water area from the 2009 Census TIGER shapefiles. The LEHD data (short for Longitudinal Employer-Household Dynamics) were developed by the Census Bureau in conjunction with state governments from a variety of federal and state data sources to estimate the number and characteristics of individuals employed within a given geographic area in areas as small as a census block. LEHD data were the basis for computing employment density of metropolitan areas and principal cities from 2002 on. Urbanized area employment density was calculated by dividing LEHD-estimated employment in census blocks within the Census-defined "urbanized area" boundary of the MSA by the land area of those blocks. Central city employment density was calculated by dividing LEHD-estimated employment in the urbanized blocks within Census-defined "principal cities" of the MSAs by the land area of those blocks. (For example, there are nine principal cities in the Dallas-Fort Worth MSA: Dallas, Fort Worth, Arlington, Plano, Irving, Carrollton, Denton, McKinney, and Richardson, accounting for 60 percent of employment and 9.5 percent of the urbanized area of the MSA.[1]) Central city employment density is of particular interest here because we expect the clustering of economic activity around rail stops to be primarily in the main cities within the urbanized portions of metropolitan regions.

Data from the LEHD for Massachusetts, New Hampshire, Connecticut and the District of Columbia are not available for all years; some other states also have one-year gaps in the data. Two MSAs with rail transit—Boston, MA and New Haven, CT—were omitted from most of our analysis due to this limitation. Because the entire populated area of the District of Columbia is urbanized and within a principal city, we were able to include it by replacing the missing LEHD data with county-level data from the County Business Patterns database.

The distribution of the employment density variables across all MSAs for the year 2008 are shown in FIGURE 1 and Figure 2. Central city employment density varies more than urbanized area employment density. The mean density of employees per square mile within central cities is 1,969, while for urbanized areas it is 932 employees per square mile. Central city employment density also has larger densities at the extreme of the distribution.

Jaison Abel also kindly provided a measure of human capital used in Abel et al (2010): the fraction of people in each MSA of working age with a college degree, which we used as a control variable in the productivity models.

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[1] http://www.census.gov/population/www/metroareas/lists/2008/List2.txt.

FIGURE **1 Distribution of central city employment density (workers per square mile)**

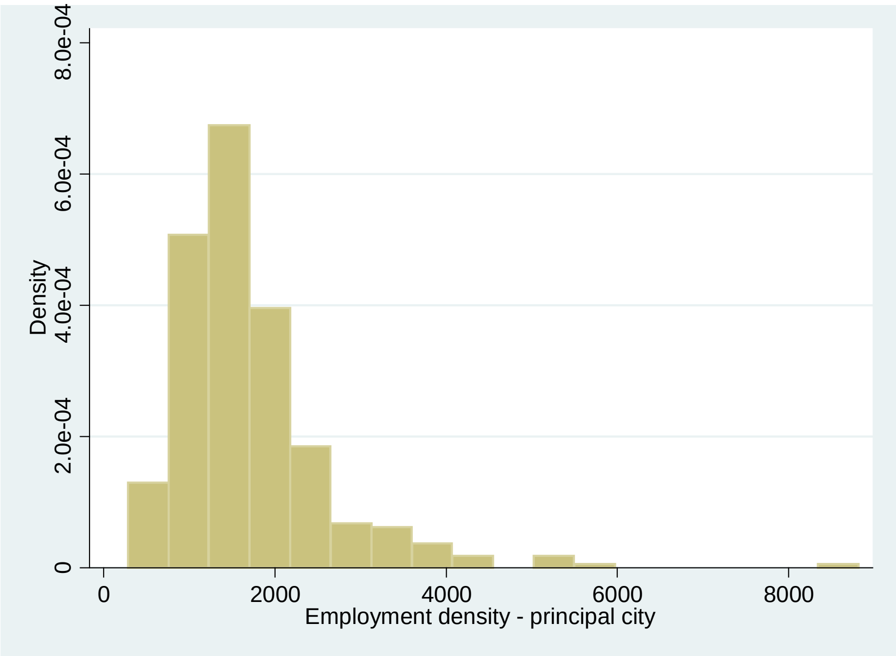
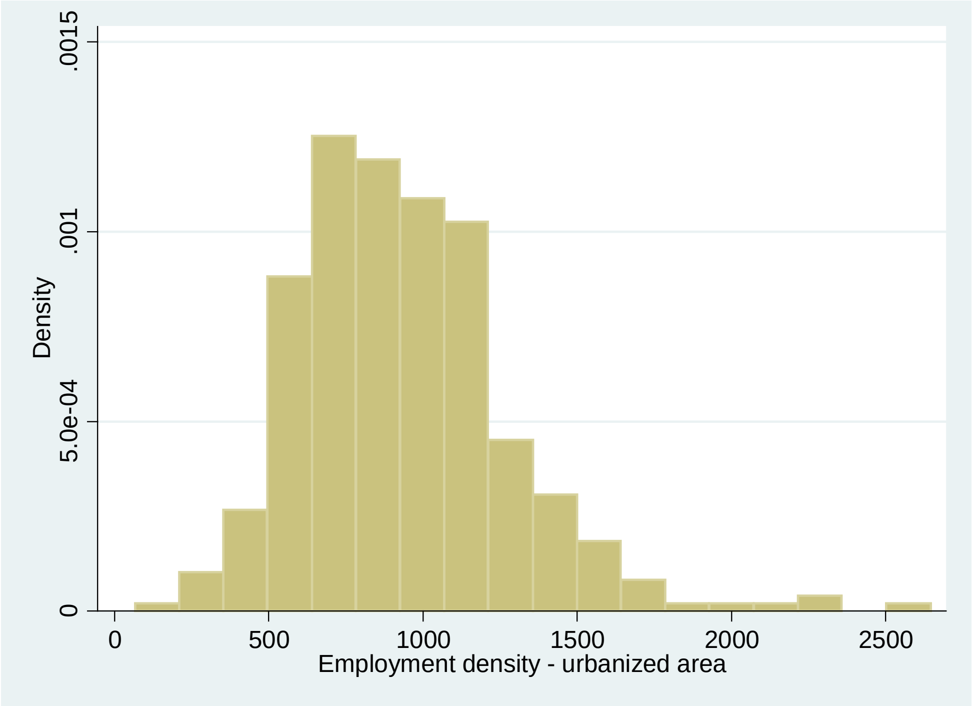


FIGURE **2 Distribution of urbanized area employment density (workers per square mile)**



For a large majority of US metropolitan areas, their central cities make up less than 5 percent of their land area (Figure 3). Those whose central cities make up the largest share of their total metropolitan area —in the 10 to 20 percent range—include Los Angeles; El Paso, TX; Virginia Beach, VA; Carson City, NV; and Honolulu. The share of the metro area occupied by Census-defined urbanized blocks also varies widely (Figure 4). The most highly urbanized

MSAs include Honolulu; New York City; Trenton, NJ; Philadelphia; Providence, RI; and Los Angeles.

FIGURE **3 Number of metropolitan areas by share of area occupied by central cities**

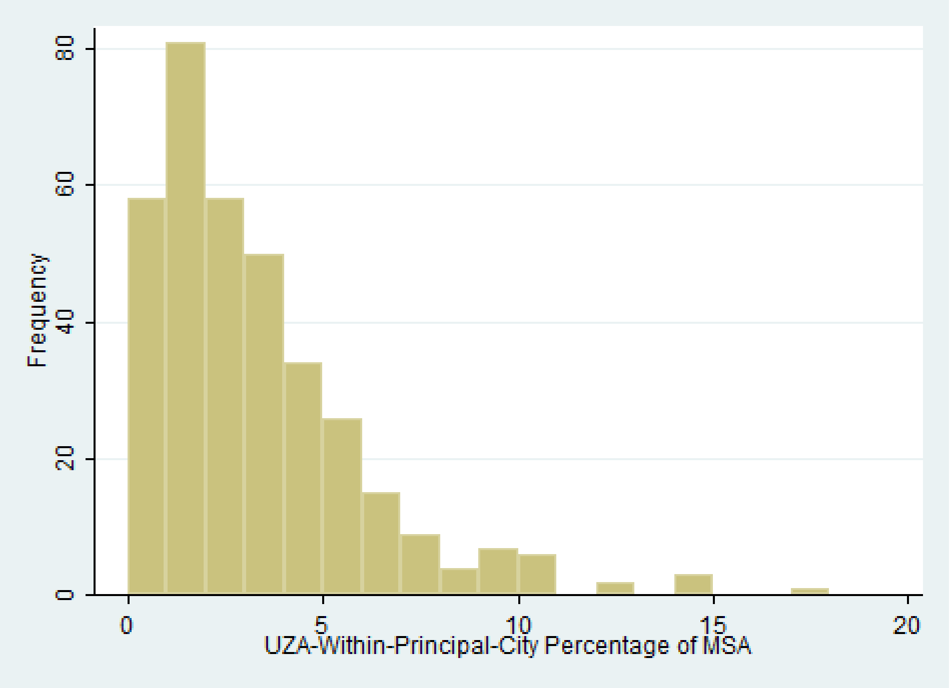
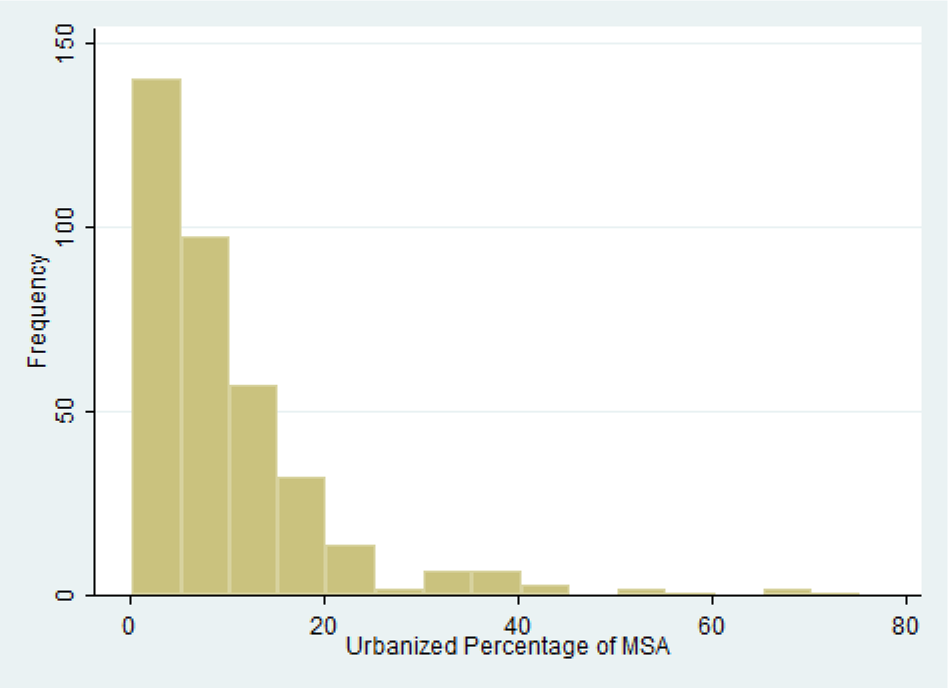


FIGURE **4 Urbanized share of MSAs**



We also obtained some variables ("instruments") that were needed to control for mutual causality, as described below. The first set of instruments included the population of the MSA in the year 1900 and a climate index (both kindly provided by Jaison Abel at the Federal Reserve Bank of New York, see Abel et al. 2010). The climate index is based on the average heating degree days and precipitation between 1970 and 2000, for each MSA (measured at the central city of each MSA). Two additional instruments were used. First, whether the state allows a township form of governance was included as an instrument for employment density in our productivity estimates. Township governance data were from the Census of Governments;[2] we defined a dummy variable with a value of 1 for MSAs wholly within or primarily within in a state allowing town or township forms of governance, and a value of 0 otherwise. Twenty states enable this form of governance.[3] For the transit regressions we used three instruments: the climate index; the population in 1900 (described above); as well as another instrument, the percent water area in the MSA, from Census geographic files for 2009. We detail our use of these instruments in our discussion of statistical methods below.

In addition, we obtained MSA-level census data for nine variables that were included as control variables in the econometric analysis. These were: percent of residents aged under 18, aged 65 or over, aged 25+ holding a high school diploma, aged 25+ holding a Bachelor's degree, identified as white, identified as Black/African-American, and identified as Hispanic/Latino, plus median household income, and the median value of owner-occupied housing units. These variables were only available for a cross-section and were included when we opted to examine cross-sectional instead of panel models.

Methods

There are several empirical issues associated with estimating our model. The choice of agglomeration measure is of particular interest, as discussed in the synthesis above. Abel et al. (2010) used population density. We explored three measures: total MSA population (rather than population density) and employment density measured both at the central city level and at the urbanized area level. Increasing public transit capacity may facilitate better labor pool matching by making larger populations possible; may cause densification of city centers by enabling more efficient use of space by transportation users accessing those centers; and may also affect the density of the larger urbanized portions of the metropolitan area. The clustering of employment and populations can also result in improved knowledge sharing and can allow for economies of scale in the production of urban amenities that attract high-quality labor (e.g. cultural activities and recreational facilities). State dummy variables ("fixed effects") are one way to control for

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[2] The Census of Governments defines Township governments as follows: "Organized local governments authorized in state constitutions and statutes and established to provide general government for areas defined without regard to population concentration; includes those governments designated as towns in Connecticut, Maine (including organized plantations), Massachusetts, Minnesota, New Hampshire (including organized locations), New York, Rhode Island, Vermont, and Wisconsin, and townships in other states". The definition varies between states, for example in some states townships are fully incorporated municipalities (e.g. New Jersey), whereas in others they are a junior partner of the county government with limited authority (e.g. Ohio), or are a layer of governance that overlaps with cities and provides a limited set of services (e.g. Indiana).

[3] Data available at: https://www.census.gov/govs/cog/GovOrgTab03ss.html

physical capital as $\emptyset_j$ is assumed constant for each state. However, these dummy variables were highly correlated with MSA population so they were omitted (see below); instead we used highway and transit capacity measures to proxy for physical capital.

Our methodological strategy was to first model measures of agglomeration as a function of transit capacity; then to separately estimate productivity as a function of the agglomeration measures; and finally to trace the net effects of transit capacity on agglomeration-related productivity. We distinguished agglomeration-related productivity increases from the capitalization of transit travel time savings in wages or GDP by including transit capacity as an independent variable in our productivity models. Our method was to use the two separate sets of models to construct net transit-agglomeration-productivity elasticities via an implicit path analysis. We did not correct for error propagation between the two separate sets of models.

A particularly important statistical modeling issue is the problem of controlling for possible mutual causality. In addition to transit causing changes in levels of agglomeration, change in agglomeration could increase the likelihood that transit agencies improve capacity. And in addition to agglomeration causing changes in productivity, it could be that highly productive clusters of firms result in larger or denser agglomerations. The potential mutual causality requires statistical methods to avoid incorrect estimates of the effects of transit on agglomeration. Our initially preferred method was to use a statistical estimation routine called generalized method of moments (GMM) that specifies a dynamic model using multiple observations over time of the same MSAs. We spent a great deal of time constructing a ten-year panel dataset for this purpose. After substantial analysis of the panel data we abandoned this approach due to very poor diagnostics when using GMM that could not be solved with different model forms. The diagnostic tests indicated significant over-identification, and we were unable to draw any conclusions from these models.

We switched to a series of cross-sectional regressions, relying on two methods to control for mutual causality: two-stage least squares and lagged independent variables. The two-stage least squares (or “instrumental variables”) approach was particularly important. To carry out this approach we predicted levels of transit service as a function of other variables that might be correlated with historical transit investment decisions, but not caused by recent levels of agglomeration. As previously mentioned, the transit capacity variables were instrumented using the population in 1900, a climate index (from Abel et al., 2010), and the percent of the metro area that is covered by water. In some models we omitted the climate index due to over-identification. We predicted levels of agglomeration using the population in 1900 and the climate index, as well as a dummy variable indicating whether the MSA is in a state that allows for township forms of government. We tested for weak instruments using the Cragg-Donald F test and the Stock-Yogo (2005) critical values. We tested for over-identification using either the Sargan test (for the first-stage transit-agglomeration models and for some of the second-stage agglomeration-productivity models), or the Hansen test (for the productivity models that corrected for robust standard errors, necessary when the state-varying township government instrumental variable was used).

We treated track mileage as a regular normally distributed variable when carrying out two-stage least squares with instrumental variables. As Roodman (2009: 17-18) notes, “[two-stage least squares] and related linear methods are consistent in the presence of heteroskedasticity...whereas [maximum likelihood] estimation that explicitly models the censoring may not be.” Instrumenting track mileage is thus consistent, even though the variable is heteroskedastic (because it is equal to zero for 91 percent of US metropolitan areas). We also tested a variation of this model in which we set predictions of track mileage that are less than zero to be equal to zero. This had differing but less statistically reliable results, and we do report those estimates.

Analysis overview

We carried out analysis of the MSA-level dataset in two stages. In the first stage, we investigated how agglomeration is correlated with transit capacity. In the second stage, we investigated how productivity is correlated with agglomeration. We modeled agglomeration in 2006 as a function of transit capacity two and four years prior; and we modeled 2008 productivity as a function of agglomeration in both 2006 and 2004. Our lag results for the two- and four-year periods were fairly similar, probably because there is not much variance in either transit capacity or in agglomeration in most cities in the US over a two- or four-year period.

The strength of the MSA scale of analysis is that any redistribution of economic activity within a region that is occasioned by transit investments will be controlled for, to the extent that MSA boundaries correspond to economically self-contained regions. Looking at smaller measures of productivity (e.g., firm-level revenues) entails the problem of having to account for spatial shifts of economic productivity within economic regions. Regardless, we were unable to acquire firm-level revenue or wage data. Later in this report, we describe firm-level employment data for Portland and Dallas-Fort Worth that enable us to describe shifts of employment density at a small scale, but do not allow us to directly measure whether these shifts cause productivity changes.

We tested a variety of measures of transit capacity: rail revenue miles; total revenue miles; rail and bus seat capacity per capita; and track mileage, specified in four ways (in absolute terms, per capita, per total CBSA area, and per urbanized portion of CBSA area). We also tested these four specifications of rail track mileage for three different types of rail: commuter rail, light rail, and heavy rail, specified in the same four ways.

We tested three main measures of agglomeration: employment density in the urbanized portion of the metropolitan area; central-city employment density of the metropolitan area (defined as employment density within the urbanized portions of the metropolitan area's census-designated "principal cities"); and the total population of the metropolitan area. Urbanized area employment density and central city employment density are used to test whether scale matters in agglomeration effects, while total population is used as a proxy for labor force size.

These models also include a measure of road capacity (lane miles of arterials and freeways, normalized similar to the corresponding transit capacity variable) and a variety of control variables derived from census data. Models were tested with and without the control variables and we found the results on our transit and road capacity variables to be very robust. For productivity, our measures were gross domestic product and payroll, measured both per capita and in aggregate, measured at the MSA level (4 variables).

Transit-agglomeration model results

In this first stage of the MSA analysis, we examined whether transit capacity was correlated with agglomeration, as measured by both employment density and total MSA population. We regressed three measures of agglomeration—central city employment density, urbanized area employment density, and MSA population, measured in 2006—on measures of transit capacity in 2004 and 2002, along with control variables including road capacity (lagged similarly) and population (observed contemporaneously).

We examined several measures of transit capacity, including track mileage (as a total, per capita based on MSA population, per total area of the MSA, and per urbanized area of the MSA); track mileage for different rail modes (commuter rail, heavy rail and light rail); seat capacity totals and per capita (for rail and motorbuses); and revenue miles of service (both rail and total). All models included a measure of road capacity (the sum of freeway and arterial lane miles), in most cases normalized similar to the rail capacity measure. We also estimated models that omitted the New York metropolitan region because it is an outlier, accounting for a very high percentage of all transit use in the country, and by far the highest average central city density in our dataset at 8,813 employees per square mile. We also tested the inclusion of a dummy variable indicating whether the metro area had any kind of rail transit and we estimated difference regressions for changes in all variables between 2002 and 2007, the widest range possible given the availability of the employment density measures. The models with rail dummies did not show any major difference in results, while the difference models did not provide good statistical diagnostics; we omit both for brevity.

A summary of our transit-agglomeration model estimates is presented here. The subsections give more technical details. First, transit capacity is associated with dispersion of employment at the urbanized area level, with a consistently negative and statistically significant coefficient. Second, we find an opposite effect when we analyze the impact of transit capacity on central city employment density; this is consistent with our expectation that transit will have a greater effect on spatial clustering of employment density in the vicinity of rail stations that are concentrated in central cities. Third, when we analyze the impact of transit capacity on total metropolitan population, we find a consistent and strong relationship with some transit variables. For example, each additional mile of track is associated with an additional 6,680 increase in population, and the effect is larger when the New York MSA is omitted.

These results come with some caveats. First, heavy rail seems to be most influential, although light rail has some influences on central city employment density. Second, it appears that there is a nonlinear effect: an additional mile of track in an already-dense set of central cities or an already-populous metropolitan area has a bigger absolute impact. Third, there does not seem to be much difference in the two-year or the four-year impact, which suggests some caution since we would expect larger effects over time of a transit capacity investment; in fact our dataset has little variance over time, which is what probably gives rise to the need to use a cross-sectional approach rather than a dynamic panel approach.

In the following subsections we provide more technical details on the effects of each of the transit capacity measures that we tested: total rail track mileage, rail track by type, seat capacity, and revenue-miles. Tables with model results are in Appendix B, and we refer to some of these tables in our discussion (all tables prefixed with ‘B’ are in Appendix B). In most cases we present both instrumental variable and ordinary least squares estimates.

Total rail track mileage

Track mileage is used as an unlogged dependent variable because models using logged track mileage were consistently over-identified. The per capita track mileage models were all consistently over-identified; thus, we cannot interpret the coefficient estimates and we do not show these results.

Track mileage is associated with dispersion of employment at the urbanized area level, with a consistently negative and statistically significant coefficient (Table B-1). However, when the New York City region is omitted (Table B-2) the coefficient is no longer statistically significant, suggesting that this outlier has a disproportionate impact on the analysis. The instrumental variable results, however, are over-identified as shown by the Sargan test, so we cannot claim a causal effect of track mileage on urbanized employment dispersion. In general this holds for the models in Table B-3 and B-4 for track miles normalized by CBSA square miles. Track mileage is associated with higher central city employment density, with good diagnostic tests on the instrumental variable models. One exception is the models that omit New York City (in Table 4) that have a weak instrument (as shown by the Cragg-Donald test). There are no major differences in the two- or four-year lags.

Our second set of first-stage models estimated the effect of transit capacity on MSA population (Table B5 and Table B6). These models have somewhat different results. We used transit capacity per capita and per square mile, as total track miles gave weak diagnostic results. While the OLS models showed a strong association between population and track mileage in all cases, the instrumental variable models suffered from over-identification. Models with total track miles and track miles per area of the CBSA were both over-identified and could not be relied upon.

Each model also includes a measure for road capacity, as this is likely to exert some additional influence on the spatial location of employment activity and on population growth. The variable is defined as the sum of freeway and arterial lane miles in the CBSA. Since we do not instrument road capacity there may be mutual causality at work. For our urbanized area models the coefficient is either statistically insignificant or negative (keeping in mind that the instrumental variable models have bad diagnostics). For the central city density models the coefficient is positive and significant, suggesting that road capacity could also have an agglomerative effect on central city employment density (in fact it is generally more significant in the instrumental variable models than in the OLS models). The road capacity variable was also lagged by two and four years, and no major differences were found. Finally, in the transit-population models we find that the total road capacity measure is negatively associated with population and most are statistically significant. There is a positive association in the OLS model in Table B-6 when normalized by MSA area. The negative effect could represent population dispersion to neighboring MSAs. It would require the development of additional spatial econometric models to examine this hypothesis more fully.

The population of the metro area was also included as an independent variable in the transit-employment density models, and the coefficient was positive and statistically significant for the urbanized area employment density models, but in some cases not statistically significant in the central city employment density models. Principal cities account for just 2.4 percent of the metropolitan land area on average, ranging from less than one tenth of a percent to a high of 18 percent, so this difference is expected.

We also ran some models that included a binary variable indicating the presence of rail transit (not shown here). The variable was statistically significant in both the central city and urbanized area employment density models, with a positive sign. This variable represents an additional shift of the intercept term for those areas with rail transit. We expected this variable to reduce the size of the rail capacity coefficient, but in fact the coefficient is slightly larger. We do not, however, display or use these models in elasticity estimates later, in order to err on the conservative side of effect sizes.

We omitted the New York metropolitan region from the final set of models to test their sensitivity to the inclusion of the MSA with the most pervasive rail transit and the highest central city employment density, exceeding the next highest MSA by 50 percent. We expected omission of the New York region to result in a reduced agglomeration effect. In the case of the transit-employment density models, our rail capacity coefficients are actually larger, but we did not test whether this difference was statistically significant. At a minimum, this clearly shows that New York City is not having a positive bias on the employment density results, and it may suggest a declining effect of transit capacity on central density densification. The effect in our transit-population models is the opposite: when New York City is omitted, the coefficients on rail capacity are slightly smaller.

Table 4 summarizes overall results for the track mile density models. Track mile density is not correlated with urbanized area employment density, but it is with central city employment density. Table 5 summarizes results for the population models; track miles were found to be strongly positively correlated with metropolitan population, regardless of how that statistic was normalized (i.e. per capita or per urbanized square mile), while results regarding freeway and arterial lane-mile totals were more inconsistent.

TABLE **4 Summary of track mile regression results**

	Urbanized area employment density	Central city employment density	Urbanized area employment density, omitting NYC	Central city employment density, omitting NYC	Regression diagnostics
Total track miles	Negative	Positive	Not statistically significant	Positive, larger value	Good instruments, some over-identification
Track miles per CBSA area	Negative	Positive	Not statistically significant	Positive, larger value	Urbanized area over-identified
Freeway and arterial capacity	Not statistically significant	Positive	Not statistically significant (except 1 case is negative)	Positive	
Population	Positive	Not statistically significant, positive for OLS	Positive	Not statistically significant, positive for OLS	

TABLE **5 Track mile, population models**

	Population (with and without NYC)	Regression diagnostics
Track miles per capita	Positive	Over-identified
Track miles per UZA area	Positive	Over-identified
Freeway and arterial capacity	Per capita, negative; per square mile, positive in OLS	NA

Rail track mileage by type

We also separately analyzed the impact of commuter rail (CR), heavy or metro rail (HR), and light rail (LR), using the standard APTA/NTD-defined categories. Each rail type has various different characteristics: speed, frequencies, number of stations, and network length. In each of these models we included all three rail types and instrumented each type in turn. Only the model with heavy rail instrumented did not suffer from a weak instrument problem, so we focus our discussion on those models (Table B7 and Table B8), both for total track miles and track miles per square mile of CBSA. We also analyzed track miles per square mile of urbanized area (UZA), but this model suffered from weak instruments for all three modes of operation. Omission of the New York region also resulted in weak instruments and we do not present those results either. We only include a reduced set of independent variables in these models as they were over-identified when the full set was included.

Heavy rail is associated with dispersion of urbanized area employment, and concentration of central city employment (Table B7). Light rail and commuter rail have no statistically significant association with urbanized area employment density, but light rail is associated with concentration of central city employment, and commuter rail is associated with dispersion of central city employment. In these models, the road capacity variable is not statistically significant and population remains significant and positive only when urbanized area employment density is the dependent variable. Table B8 shows similar analysis, but with each mode normalized by square miles of land area for the CBSA. Only the results with heavy rail instrumented are presented. Other models were over-identified or had weak instruments. Heavy rail per square mile is associated with lower urbanized area employment density and higher central city employment density. Commuter rail per square mile has no statistically significant effects, while light rail per square mile is associated with higher urbanized area employment density.

Both Table B7 and Table B8 also display population models. The model with total heavy track mileage (Table B7) is over-identified and thus the results are not reliable. Table B8, with heavy rail track miles per CBSA area, is well identified. In this model we see that increased density of heavy rail leads to greater population. Both light rail and commuter rail density, however, have no statistically significant effect.

Overall results tend to be fairly consistent and similar to the total track mileage models. These are summarized in Table 6. Commuter rail is associated with higher urbanized area employment density, and lower central city employment density. In contrast, heavy rail is positively associated with central city employment density and total population and negatively associated with urbanized area employment density. Finally, light rail is positively associated with both scales of employment density. Note again that in these models only heavy rail was successfully instrumented.

TABLE 6 Summary of rail track associations by rail type

	Urbanized area employment density	Central city employment density	Population
Commuter rail	Small positive effect	Negative effect	No effect
Heavy rail	Negative effect	Positive effect	Positive effect
Light rail	Positive effect (NS for track miles)	Positive (except for CBSA density)	No effect

Seat capacity

An alternative measure of transit capacity for which we have data is the seat capacity of both rail and buses. We specified these variables in the same model (with only the rail seat capacity variable instrumented) to calculate the effects of each in the same model. The bus seat capacity variable has the benefit of providing us with much more variability across our 351 metro areas (with full data), as virtually all have some amount of bus capacity, though in some cases the systems are very small. We estimated models that include measures of rail and bus capacity (both total and normalized by CBSA population), both with two-year and four-year lags, we also included an additional dummy variable if they have a rail system, and also tested models omitting the New York region (omitted here for brevity).

One issue we encountered is that using total seat capacity as a measure, especially motor bus seat capacity, leads to large degree of multicollinearity with population. This made it difficult to determine whether it is population that is associated with the employment density or the seat capacity measure. For this reason we normalized the seat capacity measures by population and discuss those models. These also allowed us to estimate models where our agglomeration measure was population as the dependent variable.

We estimated a set of models with seat capacity per capita, which are shown in Table B9. We used two instruments (population in 1900 and percent water area) as inclusion of the climate index led to over-identification. The models are well specified with only two instruments. There is a positive association of both rail seat capacity per capita and motor bus seat capacity per capita with central city employment density. Rail seat capacity is also positive and significant in the population model, but bus seat capacity is not. Note that only the rail seat measure is instrumented. We did not estimate urbanized area models, given the poor results in the track mile models.

Revenue miles

We estimated models using revenue miles of both rail service and total revenue miles for all transit service, as a measure of the quantity of transit service. This variable is more highly endogenous than the other rail capacity variables, which are capital based. Given some level of capacity, more service may be provided in denser areas. The models for rail revenue miles were in line with the results from our other models: revenue miles were associated with lower urbanized area employment density and higher central city employment density. This held for the model omitting the New York region, although for the OLS model it is no longer significant. Test statistics indicated a good set of instruments and no over-identification for the principal city models, but not for the urbanized area models, which are over-identified. Results are in Table

B10 and Table B11. Population models show a high level of statistical significance and are shown in Table B12, although the instrumental variable model is over-identified.

Models for total revenue miles (rail revenue miles plus bus revenue miles) were more problematic because the total revenue miles variable is very highly correlated with population. However, results are consistent with previous results. Our models without New York, however, suffer from weak instruments, and we can make no conclusions based on them. The population model is over-identified, but the coefficient values are similar to the OLS results. All results are in Table B13, Table B14, and Table B15.

Agglomeration-productivity model results

In the second stage of our MSA-level analysis we modeled productivity as a function of our two significant measures of agglomeration: principal city employment density and total MSA population. For productivity measures, we used 2008 MSA-level data on payroll and GDP, in both total and per capita form. For agglomeration, we used the same measures as in the first step of the analysis: total MSA population, central city employment density, and urbanized area employment density, as measured in 2004 and 2006.

Our control variables were human capital (share of population of working age with a college degree), transit and road capacity, demographic variables such as share of the population over the age of 65 and share Hispanic, and, in the employment density model, population. Good measures of physical capital are not available, but following other studies we proxied for physical capital with transportation capital measures: total freeway and arterial lane mileage per capita and transit track mileage per capita. We also included total track mileage as a measure of the quality of rail service, to minimize any double-counting of capitalization of transit time savings benefits.

We present only those models with productivity and employment density measures specified in logarithmic form. Models specified without logging these variables did not provide satisfactory estimates and uniformly resulted in no statistical significance on the employment density variables. We tested state fixed effects but these models failed the over-identification test, and so were omitted. We corrected for robust standard errors on the first stage of the two-stage-least-squares procedure in order to account for clustering caused by the state-level "township form of government" instrument.

Per capita wage and productivity models

We found that both central city employment density and total MSA population were highly significant predictors of average wages, but urbanized area employment density had no correlation. The agglomeration measures appear to have an initially large effect that attenuates over time, since coefficients on the two-year lagged agglomeration measures are larger than those on the four-year measures.

Our initial estimates with GDP per capita models showed weak significance of central city employment density, but when we corrected for robust standard errors in the first stage of the 2SLS procedure (due to the need to correct for clustering by state on the "township form of government" variable) we found more highly significant results, so that GDP per capita was now significantly related to central city employment density and to MSA population. It is unsurprising that the results are more robust for average payroll than for GDP, since most agglomeration mechanisms are related to labor productivity.

Results of our first estimates are shown in Table B16. The instruments (which are drawn from those in Abel et al. 2010) were weak in all these models, as shown by the Cragg-Donald F-statistic which do not exceed the 10 percent critical value derived by Stock and Yogo (2005). The latter estimates are much improved and provide a stronger instrument, although just below the 10% Stock-Yogo maximal value in some cases. None of the estimates are over-identified as indicated by the Sargan test. We focus our discussion on the results of Table B17 because these are better estimates.

There is a strong association between central city employment density and productivity as measured by wages. This is an important distinction from previous research, which has typically examined the entire metro area. Central cities are important to consider for this work; these contain the concentrations of employment within a city that are most likely to be affected by transit service, and where we expect to see accessibility changes from transit improvements.

As mentioned previously, the two-year central city employment density lag has a stronger association with productivity than the four-year lag. This suggests a relatively fast productivity effect that is not critically linked to the timing of when densification occurs, but an effect that is attenuated over time, perhaps due to delayed firm competition between metropolitan areas or a delay in interurban labor migration that leads to more competition and a driving down of wages over time.

Our measure of human capital (share of population of working age with a college degree) is statistically significant across all models. The population of the metro area also is positive and significant in our wage models, representing the benefits of a large labor market on productivity.

As proxies for physical capital we also included measures for transit rail capacity (track mileage per capita) and road capacity (freeway and arterial lane mileage per capita). Our road mileage variables have a small effect on the GDP models but none on wages. The opposite is true of the transit capacity variable, although we note that these may not represent the investment in physical capital within the region.

Industrial sub-sectors

The literature on productivity suggests that agglomeration benefits are more pronounced in some industries than in others. For example, the service sector is seen as benefiting from agglomeration and much research in the past has examined manufacturing. For this reason we estimated models for 20 sub-sectors of the economy, specifying agglomeration as own-sector employment density (Table B18). These models replicate the economy-wide wage and GDP models described above, using the same three instrumental variables and robust standard errors. We focus our discussion on those sectors where the models are well identified. These are shown in Table B19. We did not have sufficient detail on industry-specific GDP in our data and therefore could only estimate wage models. We regressed industry-specific wage levels on industry-specific employment density variables as well as population. For example, retail wages were regressed on central city retail density. Most models either had weak instruments or were over-identified. Three exceptions were the models for manufacturing (NAICS code 31-33), finance and insurance (code 52), and health and social assistance (code 62). We found a positive association and statistically significant association between manufacturing central city employment density and manufacturing productivity. The health and social assistance sector actually shows a negative and statistically significant association between own-sector employment density and productivity. Finance and insurance was positive, but not statistically significant. Our tests of the other industry categories, including those we would most expect to have positive agglomeration-productivity effects—industries such as information (publishing and media); professional, scientific, and technical services; and retail trade—had poor test diagnostics and we cannot address whether there are any statistically significant associations in these industries.

Total wage and productivity models

We also estimated models that use total GDP and total payrolls as the dependent variable. Many of these models were over-identified when our employment density measures were instrumented. However, in both OLS and IV estimates, the coefficients were similar in magnitude to our per capita models (described below). This serves as a good check on whether the per capita models (below) are biased by the failure to interactively control for MSA size. Central city employment density was positive and statistically significant in the wage model while urbanized area population density was not (in the IV model). In the GDP model effects were a bit smaller for central city employment density, at an 85-90% level of confidence (in the IV model), while urbanized area employment density was statistically insignificant. Population coefficients were near unity; we cannot separate a distinct agglomeration effect from population in these models.

Nonlinearity

We also sought to determine whether there are marked differences in agglomeration-productivity effects depending on threshold levels. For example, there might be greater effects for changes in population from small to medium sized cities, or for changes from moderate to intense levels of employment density in central cities. To investigate this, we carried out spline regressions with density thresholds based on median or interquartile range of population and central city employment density (table not shown). The coefficients on different ranges were within 10 percent of each other and the differences were not statistically significant. This is a notable finding: it implies that the log-log model form, in which the model predicts percentage increases in productivity per percentage increases in agglomeration, is accurate. This implies metropolitan areas with higher per capita GDP or wages experience greater *total* agglomeration benefits from transit capacity increases than metropolitan areas with lower per capita productivity, when population or employment density increase in the same range. At the same time, this result implies that the largest *per capita* increases in productivity, all else equal, are for small cities.

Demographic control variables

As mentioned previously we include various demographic control variables in most of the models. Models were tested with and without these controls and overall results on our key variables of interest were very robust. The behavior of the control variables showed some variation, depending on which term is tracked across specifications. Age variables were consistent: youth population share was found to be negatively correlated with principal city density, while elderly population share was found to be negatively correlated with urbanized area density. Also, race was largely not a factor in the results, except that black population share was negatively correlated with urbanized area employment density. Education and income variables, however, showed no consistent pattern. The inclusion of these variables did, in general, improve the overall fit of the models.

Linking transit capacity with productivity

Based on the above two stages of analysis, we estimated how transit capacity is associated with wages and GDP via the agglomeration-productivity pathway. The correlation between productivity and transit capacity is separate from any direct correlation between transit capacity and GDP or wages, due to (for example) reducing travel times. We avoid double-counting by including track mileage as an independent variable in the productivity equations.

We calculated the net agglomeration-related productivity impacts of transit capacities by multiplying the calculated elasticities together. Our results do not account for eventual decreasing returns to productivity in central city employment density and in MSA population, which we believe exist but are difficult to explore with the limited data available on the just 29 MSAs which have rail capacity and for which employment density data are available. There may also be complex nonlinearity involved, including threshold effects of density levels and interactions (for example, between population and employment density, or between employment density and levels of transit service) but the small dataset precludes robust statistical tests of these hypotheses.

Different effects for different metropolitan areas

We calculated correlations between transit and productivity for two agglomeration pathways: via MSA population increases and via central city employment densification. We found that these correlations—our best estimates of the effects of adding additional capacity—were dependent on current transit capacity, central city employment density, and MSA population. That is, they are not linear relationships, but depend on the starting point prior to the transit investment. The most reliable population models were those with per capita track mileage, while the most reliable central city employment density models used total track mileage. The largest correlations between transit and agglomeration were for increases to already large systems in already large cities (see Appendix G). There were relatively small yearly correlations per worker (ranging from $3 to over $100 per additional rail mile, for example) that often added up to larger figures when aggregated across all workers in the entire metropolitan area economy (ranging from $5 million to over $500 million per additional rail mile, see Appendix H). The average agglomeration "effect" of rail mileage is generally in the range of a 0.0009 to 0.04 percent net increase in productivity region-wide for every 1 percent increase in track mileage, with higher percentages in larger cities with more existing rail mileage. These are large figures in comparison to the total benefits associated with fixed-guideway transit investments.

We calculated elasticities using mean values from our sample. These can be found in Table 7, Table 8, and Table 9 for the first stage, the second stage, and the combined effect, respectively. Similar elasticities are also calculated for each MSA, based on the value of each variable for that MSA, and are displayed in Appendix B.

Elasticity estimates give the effect of a one percent change in different measures of transit capacity upon average wages and GDP per capita. These are shown for the sample mean values in **TABLE** 10 (below). Appendix F lists these measures for each MSA. We likewise show the total effect on total wages and GDP multiplying per-person values by total workforce and total population, respectively. The results for each MSA in the US are shown in Appendix G.

Summary of results

We found that in most of our tests, the transit capacity measures were significantly associated with three effects: increases in central city employment density, decreases in urbanized area employment density, and increases in total population. This is consistent with the hypothesis that increasing rail capacity causes both job dispersal (at the UZA level) and job density (at the central city level).

In the second stage, we found that central city employment density was significantly correlated with higher productivity, both in wages and GDP per capita. We found even larger correlations between MSA population and productivity. The urbanized area employment dispersal caused by transit capacity is not correlated with any statistically significant differences in GDP or payroll.

These results are consistent with a world in which increases in transit capacity simultaneously allow more far-flung non-residential development, outside of the core principal cities of the metropolitan area; greater densification in urban cores by enabling firms in those cores to draw from a wider labor pool; and metropolitan population growth, perhaps as a complement to the higher productivity from firms in densifying urban cores. Transit-related agglomeration mechanisms may work via the clustering of principal city (typically, polycentric) employment density and via the labor market increase, while there is no effect on productivity from urbanized area employment density.

We analyzed a large number of regression models conducted in the first and second stages of analysis to make estimates of the relationship between transit capacity, population growth, central city employment density, and productivity. Because of the wide variety of models with different measures of transit capacity and of productivity, our results varied. In general, we found small per-worker relationships (ranging from $3 to over $100 per additional rail mile per year, for example), which translated into large effects when aggregated across all workers in the metropolitan economy (ranging from $5 million to more than $500 million per additional rail mile per year). If averaged over only those workers likely to have benefited from agglomeration economies, the per capita figures could be substantially higher.

The average agglomeration effect of rail mileage is generally in the range of a 0.0009 to 0.04 percent net increase in productivity region-wide for every 1 percent increase in track mileage, with higher percentages in larger cities with more existing rail mileage. These are large effects in comparison to the total benefits associated with fixed-guideway transit investments. In general, larger cities have greater productivity impacts from an additional rail mile, and cities with larger amounts of existing transit capacity also have larger effects from additions to that capacity.

Appendix F and G list elasticity results, and estimated effects at both the per-person level and aggregated across the population for each MSA for a variety of different transit measures, and for both OLS and instrumental variable results. There is a large range in these estimates, given both the different measures used and the analytical method used for estimation. However, the relative impacts between metropolitan areas are as expected. For example, the effect of an additional mile of rail is larger in the Chicago region, which has a large population with an extensive rail network, than it is in Tampa-St. Petersburg, with less population and a minor streetcar system. In general, larger regions with more population and those regions with more extensive transit systems tend to have greater agglomeration-related productivity increases for an increase in transit investment.

There are several caveats to mention, because the analysis, though groundbreaking, is not perfect. Our goal was to develop a causal model given the mutual causality among transit investment, density, and productivity benefits. Further analysis can likely refine the methods to increase our confidence in the magnitude of these results. The productivity models may not completely account for physical capital. Additional data (for example, on real estate rents) may be one way to control for this. Lack of this control is not uncommon within the literature on agglomeration economies, but examining it in more detail would increase the accuracy of the estimates. Finally, there may be other factors that influence central city employment density and population of MSAs in addition to transit capacity, highway capacity, and MSA demographics.

TABLE **7 Density elasticities w.r.t. transit capacity measures, calculated at the sample mean**

Total track mile coefficient elasticity (4 year lag)	**Employment density (principal city)**	**Population**
Mean total track mile elasticity	0.01411 - 0.04827	
Mean track mile per sqm CBSA area elasticity	0.01788 - 0.08705	
Mean track mile per capita elasticity		0.30057 -0.66029
Mean track mile per sqm UZA elasticity		0.3451 -0.6454
Mean rail revenue miles	0.0296 - 0.04491	0.3656 - 0.4055
Mean total revenue miles	0.1004 - 0.1960	0.7083 - 0.7106
Mean rail seat capacity per capita	0.0200 - 0.0514	0.3049 - 0.4195
Mean bus seat capacity per capita	0.1372 - 0.1286	0.3165 - 0.1496

Note: range is based on OLS and IV estimates

TABLE **8 Productivity elasticities w.r.t. agglomeration, calculated at the sample mean**

	Average payroll (wages) elasticity	**GDP per capita elasticity**
Employment density of urbanized portion of principal city (2 year lag)	0.0554 – 0.114	0.152 - 0.135
Total population	0.0420 - 0.0344	0.0610 - 0.0633

Note: range is based on OLS and IV estimates

TABLE **9 Productivity elasticities w.r.t. transit capacity measures, calculated at the sample mean**

	Average payroll (wages) elasticity	**GDP per capita elasticity**	**Average payroll (wages) elasticity**	**GDP per capita elasticity**
Agglomeration mechanism	Employment density (principal city)		Population	
Total track miles	0.00078 - 0.00550	0.00214 - 0.00652		
Track mile per sqm CBSA area	0.0010 - 0.0099	0.0027 - 0.0118		
Track mile per capita			0.01262 -0.02271	0.01833 -0.04180
Track mile per sqm UZA			0.0145 -0.0222	0.0211 -0.0409
Rail revenue miles	0.0016 - 0.0056	0.0045 - 0.0066	0.0202 - 0.0462	0.0554 - 0.0547
Total revenue miles	0.0056 - 0.0223	0.0153 - 0.0265	0.0392 - 0.0810	0.1077 - 0.0959
Rail seat capacity per capita	0.0011 - 0.0059	0.0030 - 0.0069	0.0169 - 0.0478	0.0463 - 0.0566
Bus seat capacity per capita	0.0076 - 0.0147	0.0209 - 0.0174	0.0175 - 0.0171	0.0481 - 0.0202

Note: range is based on OLS and IV estimates from previous tables

TABLE **10 Estimated changes per unit based on mean elasticity estimates w.r.t transit capacity measures**

	Change in average annual wage						**Change in GDP per capita**					
Agglomeration mechanism	Emp. Density (principal city)		Population		Total		Emp. Density (principal city)		Population		Total	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Total track miles	$0.34	$2.42					$0.94	$2.87				
Track mile per sqm MSA	$0.43	$4.36					$1.20	$5.18				
Track mile per capita			$5.54	$9.97					$8.08	$18.41		
Track mile per sqm UZA			$6.36	$9.75					$9.27	$18.00		
Total track mi (per capita)					$5.88	$12.39					$9.02	$21.28
Rail revenue mile	$0.72	$2.46	$8.87	$20.29	$9.59	$22.75	$1.98	$2.46	$24.41	$24.11	$26.39	$27.03
Total revenue miles	$2.44	$9.81	$17.23	$35.57	$19.67	$45.38	$6.72	$11.66	$47.43	$42.26	$54.15	$53.92
Rail seat capacity per capita	$0.49	$2.57	$7.42	$21.00	$7.90	$23.57	$1.33	$3.05	$20.35	$24.86	$21.68	$27.91
Bus seat capacity per capita	$3.34	$6.44	$7.70	$7.49	$11.04	$13.93	$9.16	$7.62	$21.12	$8.87	$30.28	$16.49

Note: range is based on OLS and IV estimates from previous tables.

Several features of our elasticity estimates are worth noting. First, we show a range of estimates based on different model types (ordinary least squares [OLS] and instrumental variables [IV]). In most cases, the IV estimated elasticity is much larger than that estimated with OLS, which is an unexpected result because the IV models are meant to control for overestimation. In a few cases, the OLS estimate is slightly larger. The correlation between transit capacity and agglomeration, for all of our transit capacity measures, is much larger for population than for central city employment density.

Because of the large correlation with population, we ran a series of robustness tests using control variables drawn from the initial (2005-07) three-year American Community Survey (ACS): percent of residents aged under 18, aged 65 or over, aged 25+ holding a high school diploma, aged 25+ holding a Bachelor's degree, identified as white, identified as Black/African-American, and identified as Hispanic/Latino, median household income, and the median value of owner-occupied housing units. In some specifications, only the second, fifth, and eighth of these variables were included to avoid potential collinearity. Inclusion of all nine terms did not generate variance inflation factors high enough to indicate inefficient estimates, and for most of our models we include all these additional controls, which significantly improved model fit. The coefficient estimates for the transit variables were remarkably stable.

The other key policy variable, miles of freeway and arterial roadway (sometimes divided by MSA square mileage or population, depending on the nature of the specification), was positively correlated with principal city density, but was found to not be statistically significant when estimating urbanized area density. Conversely, MSA population was found to be positively correlated with urbanized area density, but was not significant in principal city regressions. Again, these findings are all consistent with and without demographic controls.

5. FIRM-LEVEL SPATIAL ANALYSIS

We conducted analysis of firm-level data for two regions with rail, Dallas-Fort Worth and Portland, Oregon. We chose these two regions based on initial diagnostic regression analysis of block-level worker-by-industry data from the LEHD database. We aimed at understanding how relatively new transit systems have affected the pattern of spatial development in a region over time. We had initially intended to obtain firm-level data from the State of New Jersey, which we had used in the past. However, due to budget cuts in the Department of Labor, we were unable to obtain these data. Instead, we purchased a large database for two regions: Portland, OR, and Dallas, TX, consisting of a twenty-year time-series of geo-coded firm-level data on workers and retail sales.

These data do not include information on average wages or firm revenues, which are required for an explicit productivity analysis. Instead, our analysis focused on how the location of stations and the introduction of light rail transit influenced the location of firms, as well as both the number of employees in each firm and their total sales. Although we were unable to make an explicit linkage to any changes in productivity associated with the transit systems, the spatial effects are of interest to that question because they address the nature of the transit-to-agglomeration link, which is the precursor to most of the expected productivity effects of transit capacity investments. The firm-level analysis gives support to some of our case study results and provides additional evidence as to how different regions have leveraged or failed to leverage the potential of their transit systems.

The dataset used here is a complete set of Dun & Bradstreet (D&B) reports for every firm that is or was located within the metropolitan areas between 1990 and 2009. These areas are the three counties in each region served by light or commuter rail. Specifically, these are Collin, Dallas, and Tarrant Counties in Texas and Clackamas, Multnomah, and Washington Counties in Oregon. D&B time-series used herein are the estimates of each firm’s annual number of employees and the dollar value of its sales. These data may be directly reported by the firm or estimated based on economic census data, proprietary modeling by Dun & Bradstreet, or imputation by the data vendor, Walls & Associates. They are available for every year that the company is in business in the metropolitan area. Along with these data are included a geocode (latitude and longitude) and a six-digit industrial classification (NAICS) code, again updated annually. After data cleaning, the dataset included 1,025,441 firms in the Dallas-Fort Worth area and 336,158 in the Portland area.

From there, geocodes were mapped using ArcGIS and spatially joined to the appropriate block, as defined by Census 2000. These data were then aggregated at the block level while being disaggregated by two-digit NAICS sector. The result was industry-specific employment and sales counts for each census block by year. From there, the distances from the centroid of each block to the central business district of the respective metropolitan area and the nearest rail station that was open in the corresponding year were calculated for all blocks, of which there were 60,923 in the Dallas-Fort Worth area (meaning that, as the data is a 20-year panel in long form, there are 1,218,460 observations) and 28,270 (565,400 observations) in the Portland area. Using block-level data, four ratios were computed: employees per acre, employees per firm, sales per firm, and sales per employee. The first of these was computed for each NAICS sector as well as across all sectors, while the other three were only computed for all firms.

These ratios became the dependent variables in panel regressions. Fixed-effects and random-effects models were specified with independent variables consisting of dummy variables representing each year of the data (except 1990, the reference year) and rail station distance.

With regard to the latter, six variables were specified identifying [1] blocks whose centroid is located within ¼ mile of a station situated in the central business district, [2] within ½ mile of a CBD station, [3] within one mile of a CBD station, [4] within ¼ mile of a non-CBD station, [5] within ½ mile of a non-CBD station, and [6] within one mile of a non-CBD station. (Naturally, the reference category is all blocks not within one mile of a rail station.) These terms are mutually exclusive, in that blocks are assigned to the "closest" range that applies to it and that only the station closest to the centroid is included in the analysis. Central business districts are defined according to the transit agencies themselves; Dallas Area Rapid Transit (DART) identifies a "Downtown Dallas" area on its route map, while Tri-Met designates a city center "Free Ride Zone" in Portland's urban core. Straight-line distance to the central business district in miles was also included in random-effects models only. A summary of findings is provided on the next page, followed by statistical outputs in the appendices.

Results

In the first set of analyses using the variables above, we specified a panel model that uses time-series econometric techniques to better compute correlations over the course of the study period. This was done first using what is known as a *fixed-effects model*, which imposes statistical constraints on the model by assuming the independent variables are non-random, and a *generalized least squares* or *random-effects model* that does not have this constraint. Using a *Hausman test*, it was determined that the data are in fact non-random in all cases and, therefore, that the fixed-effects model is more appropriate.

Results for Dallas and Portland contrast substantially. In Dallas, the presence of transit stations was largely negatively correlated with three of the four dependent variables: employees per acre, employees per firm, and sales per firm. For instance, being located within a quarter-mile of a CBD transit station in Dallas was associated with a reduction of 20 employees per acre and the $900,000 in retail sales per firm. However, there was a $11,768 increase in sales per employee for businesses located within a quarter-mile of a non-CBD rail station. In Portland, results were far more ambiguous. Most coefficients were not statistically significant, though as in Dallas there was again a positive correlation with rail proximity and sales per worker. Detailed output is available in Appendix J.

From here, it was decided that sector-specific analysis would be appropriate, specifically as it pertained to employees per acre. Hence, the ratio was computed for workers employed in the 20 two-digit NAICS categories, again in both Dallas and Portland. There was indeed substantial variation across industries, as detailed in Table 11 below and in the regression outputs in Appendix J. Clearly, there is no single decisive trend; overall, a majority of coefficients reported an absence of a statistically significant relationship. This was especially true in Portland, where none of the sectors indicated a strong correlation in either direction. (A correlation is considered to be "strong" if a majority of dummy variables indicate the same directional relationship.) The only finding consistent for the two metropolitan areas is that rail access has no correlation with manufacturing employees per acre.

TABLE **11 Impacts of rail stations on employees per acre by two-digit NAICS sector, 1990-2009**

NAICS Sector	Dallas	Portland	NAICS Sector	Dallas	Portland
Agriculture	Ambiguous	Slightly Neg.	Real Estate	Positive	Slightly Neg.
Mining	Positive	None	Prof. Services	Positive	Slightly Neg.
Utilities	Negative	None	Management	Ambiguous	None
Construction	Positive	Slightly Neg.	Administration	Ambiguous	None
Manufacturing	None	None	Education	Ambiguous	None
Wh. Trade	Slightly Neg.	Slightly Pos.	Health Care	Positive	Ambiguous
Retail Trade	Slightly Neg.	Ambiguous	Arts & Ent.	Positive	None
Transportation	Slightly Neg.	None	Hotels/Dining	Positive	None
Information	Slightly Neg.	None	Other Services	Positive	None
Fin. & Ins.	Ambiguous	None	Public Admin.	Slightly Neg.	None

Finally, we carried out some regressions cross-sectionally, rather than as a panel, to measure change over time as a single phenomenon rather than a year-to-year one. The dependent variables of the ordinary least squares regressions were the change in each of the original measurements between 1996, the year Dallas inaugurated its rail system, and 2009, the most recent year in the dataset. Independent variables were the six rail dummies plus the straight-line distance to the central business district (in miles). Findings indicated that, in Dallas, presence of rail stations depressed (in increasing order of magnitude) employees per acre, employees per firm, and sales per firm. Across all three, however, being located within ¼ mile of a CBD rail station had strong negative impacts. There appeared to be no impact on sales per employee in Dallas. Meanwhile, in Portland, the effect on employees per acre was positive within ½ mile of CBD stations, while the effect on employees per firm was consistently negative (implying decreasing firm size near rail stations, but more firms), and no impact was found with regard to sales.

6. CASE STUDIES

The purpose of the case study phase was to seek on-the-ground evidence of agglomeration economies caused by recent rail investments, and to explore factors not easily quantified in the other empirical work. A number of additional factors may influence whether rail investments increase firm productivity, such as governance and institutional issues, land use policies, and agency ownership of station area property. We selected the transit systems and regions listed in Table 12 on our "short list" of possible case studies. All of these had opened a new fixed-guideway transit line or extended an existing line between 1990 and 1999, although the selection criteria were relaxed to include BRT lines opened in the 2000s. Systems we initially considered to be strong candidates are marked with an asterisk in the "S" column. These included BART (San Francisco Bay Area), Santa Clara Valley Transit, Sacramento Light Rail, San Diego Trolley, and recent rail systems in Dallas, Chicago, Portland, Washington DC, Los Angeles, Salt Lake City, Buffalo, Baltimore, Miami, and Cleveland.

TABLE **12 Initial list of metropolitan-level case study candidates**

S	City	Agency	Mode	Year original line opened	Years new service/ extensions opened
*	Atlanta, GA	Metropolitan Atlanta Rapid Transit Authority	Heavy Rail	1979	1992, 1996
*	Baltimore, MD	Maryland Transit Administration	Heavy Rail	1983	1995
*	Baltimore, MD	Maryland Transit Administration	Light Rail	1992	1992, 1997
*	Chicago, IL	Chicago Transit Authority	Heavy Rail	1892	1993
*	Chicago, IL	Metra Northeast Illinois Commuter Railroad Corporation	Commuter Rail	1856	1996
*	Cleveland, OH	Greater Cleveland Regional Transit Authority	Light Rail	1920	1996
*	Dallas, TX	Dallas Area Rapid Transit Authority	Light Rail	1996	1996, 1997
*	Dallas, TX	Trinity Railway Express	Commuter Rail	1996	1996
	Denver, CO	Regional Transportation District	Light Rail	1994	1994
	Galveston, TX	Island Transit	Light Rail	1988	1995
*	Los Angeles, CA	Los Angeles County Metropolitan Transportation Authority	Heavy Rail	1993	1993, 1996, 1999
*	Los Angeles, CA	Los Angeles County Metropolitan Transportation Authority	Light Rail	1990	1990, 1991, 1995

*	Los Angeles, CA	Southern California Regional Rail Authority	Commuter Rail	1992	1992
	Memphis, TN	Memphis Area Transit Authority	Light Rail	1993	1993, 1997
*	Miami, FL	Miami-Dade Transit Agency	Busway	1997	1997
	New Haven, CT	Connecticut Department of Transportation	Commuter Rail	1990	1990
	New Orleans, LA	New Orleans Regional Transit Authority	Light Rail	1835	1990, 1999
	Pittsburgh, PA	Port Authority of Allegheny County	Light Rail	1964	1993
*	Portland, OR	Tri-County Metropolitan Transportation District of Oregon	Light Rail	1986	1997, 1998
*	Sacramento, CA	Sacramento Regional Transit District	Light Rail	1987	1998
	Saint Louis, MO	Bi-State Development Agency	Light Rail	1993	1993, 1994
*	Salt Lake City, UT	Utah Transit Authority	Light Rail	1999	1999
	San Diego, CA	North San Diego County Transit District	Commuter Rail	1995	1995
*	San Diego, CA	San Diego Trolley	Light Rail	1981	1990, 1995, 1996, 1997
	San Francisco, CA	Peninsula Corridor Joint Powers Board	Commuter Rail	1992	1992
*	San Francisco, CA	San Francisco Bay Area Rapid Transit District	Heavy Rail	1972	1995, 1996, 1997
	San Francisco, CA	San Francisco Municipal Railway	Light Rail	1892	1991, 1998
*	San Jose, CA	Santa Clara Valley Transportation Authority	Light Rail	1987	1990, 1991, 1999
	Stockton, CA	Altamont Commuter Express	Commuter Rail	1998	1998
	Washington, DC	Virginia Railway Express	Commuter Rail	1992	1992
*	Washington, DC	Washington Metropolitan Area Transit Authority	Heavy Rail	1976	1990, 1991, 1993, 1997, 1998, 1999

Our three case studies were selected from this list according to review panel input, economic and travel data availability, interest by regional agencies, and diversity in geographic location, metropolitan area size, transit system maturity, and mode. We also took into account the employment, transportation, land use, and geographical characteristics of the metropolitan areas.

The first was Los Angeles Metro's Orange Line, a 14-mile fixed-guideway bus rapid transit (BRT) line that began serving passengers in 2005, joining a fairly extensive existing light and heavy rail system. The second was the Dallas Area Rapid Transit (DART) light rail system, which started operating in 1996 with 11 miles of right-of-way and has since expanded to about 48 miles, with further expansions planned. The third was Salt Lake City's TRAX light rail system, installed in phases in 1999, 2001 and 2003, with just 19 miles of right-of-way but relatively high ridership.

Los Angeles and Dallas are large metropolitan regions with global and regional industries; they are centers for commerce that attract capital from around the world. It is in such large metropolitan areas that transit-induced agglomeration economies may be most likely to occur. Salt Lake City is a much smaller regional and state economic center, in a relatively isolated region of the United States Mountain West, with a successful light rail system (installed in preparation for the Winter Olympics in 2002) that has had higher ridership than forecasted. The similarities and differences among these three help illustrate how transit-related industry agglomeration effects might not be accounted for in our quantitative modeling methodology. These factors may include the influences of long-range regional transportation planning, land use regulations, public-private partnerships for economic development, and other political associations among transportation, business, and metropolitan governance entities.

The policy environment within which economic development is allowed to take place will affect the type and timing of activities that are developed. This is important because if planning policies constrain or encourage particular types of development in the vicinity of new transit lines, this will confound any underlying market forces that may lead firms to take advantage of agglomeration economies from densification. While we would expect to observe patterns of densification in the type of activities we believe enjoy such agglomeration economies, planning policies may have designated land and floor space to other purposes, such as retail and housing. We therefore investigate in some degree of detail the planning and land use policies that have guided development along the transit lines in each case study.

As shown in Table 13 below, Los Angeles has the highest mode share for transit, at about 7 percent; Dallas has the most solo drivers, with about 79 percent, significantly more than Salt Lake City or Los Angeles. The share of trips by public transportation plus solo car is nearly equal in all three cases: 81% for Dallas, 80% for Salt Lake City, and 79% for Los Angeles. For the purpose of this table, the Dallas area is defined as Dallas and Collin Counties, the Salt Lake City area is defined as Salt Lake County, and the Los Angeles area is defined as Los Angeles County.

TABLE **13 Mode shares by region *(1)*** (Please see Appendix A for numbered references in all case studies)**.**

Mode	Dallas	Salt Lake City	Los Angeles
Drove alone	78.5%	75.9%	72.1%
Carpooled	11.9%	12.4%	11.5%
Public transportation	2.7%	3.6%	7.2%
Walked	1.4%	2.1%	2.9%
Other means	1.5%	1.7%	2.1%
Worked at home	4.0%	4.3%	4.3%

Summary of findings

The evidence we collected for the case studies showed a variety of influences over the development process in the three selected cities. Common among them was the general lack of strong evidence of transit-influenced densification or firm location. This was attributed at least in part to a lack of physical infrastructure to support the intensity of use that would be desired by the market in certain locations. The cities included in the case studies each had unique characteristics and circumstances, but their development paths more or less coincide with an emergent theme: lack of investment in infrastructure other than transit (water and sewer especially) are more significant barriers toward densification than other policy limitations we initially believed to be relevant, such as zoning, land use regulation, and form-based codes. Region-specific results are summarized in the sections that follow.

Los Angeles

Our Los Angeles case focuses on the Orange Line Bus Rapid Transit service in the San Fernando Valley. It is the only recently-opened fixed-guideway bus rapid transit system in the US, and early signs indicate that it may be bringing agglomeration benefits to the San Fernando Valley.

Our evidence suggests transit-driven densification has occurred along the Orange Line corridor, although it is difficult to attribute to the presence of the BRT line in particular. Visual examination of time-series employment data, from 2002 to 2008, shows increases in resident worker population densities along most of the corridor, and pockets of increased employment density, most notably near the western terminus of the Orange Line. These data also indicate a significant increase in the presence of jobs in industries prone to agglomeration (such as finance and insurance, professional services, health care, and public administration) near the corridor over the time period.

Zoning regulations along the LA Metro Orange Line corridor do not differ substantially from those outside the corridor. However, elsewhere in the LA Metro system, zoning plans specific to individual transit-oriented development projects could encourage increases in population and employment densities near transit stations.

The Red and Blue lines, which both converge on downtown Los Angeles, have existed longer than the Orange Line and have been the focus of more intense development programs over the past decade. Economic development initiatives have targeted the downtown area around transit stations as an entertainment hub for the region, with the recent development of the Staples

Center and LA Live. Planning tools for transit-oriented development such as form-based zoning and changes to parking standards have been seen as helpful in certain segments of the real estate market, but not others (particularly not in the high-end market) according to professionals we have talked with.

Salt Lake City

Salt Lake City provides a contrasting study area to Los Angeles. It is, for one, a much smaller metropolitan region. Our case study results do not show much, if any, empirical evidence that recent transit investment has resulted in significant agglomeration. Prior to the implementation of the two TRAX light rail lines, UTA operated frequent, successful bus service along both current light rail corridors, limiting the potential improvements in accessibility of businesses to labor markets that could result from the transition from bus to light rail service.

There is also limited empirical evidence of transit-driven densification along the corridor. Examination of time-series employment data from 2002 to 2008 shows increases in employment and resident worker population densities near the corridor, however, it is not clear if this is a direct result of transit investment, or part of a broader trend. At the same time, these data do not indicate an increased presence of jobs near the corridor in industries that tend to agglomerate. Additionally, since the opening of the TRAX lines, there have been no corresponding changes in zoning laws to encourage or allow increased densification along the corridor. With the exception of a few small areas zoned specifically for transit-oriented development, zoning regulations along the TRAX light rail corridors do not differ substantially from those outside the corridors. This lack of special zoning would appear to reflect a minimal focus on potential economic development impacts during the planning of the initial TRAX lines.

In our discussions with professional planners and developers in the Salt Lake City region, we came across a slightly different story with respect to transit-driven densification. Though many acknowledged the slow pace of change with respect to transit development, some participants pointed out what they felt were significant changes in the downtown area, where the two TRAX lines converge and the FrontRunner rail terminates. Densification of employment has been occurring in this area in recent years, some of which may be attributable to the presence of high-quality transit service. The University of Utah was also cited as having specifically targeted policies, such as limited parking supply, while increasing employment density on campus. Intermountain Medical Center selected a site for regional expansion in part because of its high accessibility both via transit and highways. They have a stated policy of acquiring property for future expansion with transit access as one of many criteria in mind. Other station areas have been slower to develop, and we see no evidence of this in industries that we expect to agglomerate. According to our discussions, one reason may be the historical nature of the rail areas as former industrial corridors, which has limited the redevelopment potential for a variety of reasons including land cleanup, assembly, and lack of infrastructure.

Dallas

Finally, Dallas-Fort Worth is a case that is situated somewhere between the two previous cases. Dallas is an emerging world city and center for finance, energy, and insurance. Like Salt Lake City and Los Angeles, Dallas has only recently begun to develop fixed-guideway transit systems. The continually increasing congestion in the Dallas area make it a prime candidate to experience agglomeration benefits from transit investment, due to large gains in accessibility to labor markets that could result from improved transit service. However, empirical evidence that this has resulted from the 1990s investment in the DART light rail system is limited.

Examination of time-series employment data from 2002 to 2008 shows increases in employment and resident worker population densities near the northern portion of each corridor, and decreases in employment and resident worker population densities in the downtown area. Again, it is not clear if these increases on the northern portions of the corridors are direct results of transit investment, or part of a broader trend. The data also do not indicate an increased presence of jobs in industries prone to agglomeration near the corridor over the period. Our analysis of firm-level data (discussed previously) supports this conclusion.

Additionally, since the 1996 opening of the DART light rail system, there do not appear to have been any corresponding changes in zoning laws to encourage or allow increased densification along the corridor. As seen in Salt Lake City, zoning regulations along the DART light rail corridors do not differ substantially from those outside the corridors.

The Dallas case, as described by our discussions with planners and professional developers, is somewhat similar to the Salt Lake City case in a number of ways. Developers have been slow to embrace transit-oriented development principles in the outlying areas, though there are notable exceptions, such as Mockingbird Station and downtown Plano. Parking and infrastructure constraints have led to a slower pace of agglomeration in the downtown area than many participants would like to see. Unlike the Salt Lake City case, however, Dallas does not have typical planning regulatory barriers to address in the downtown area. Instead they rely heavily on flexible negotiations for each project in a process of creating Planned Development Districts. These overlay districts allow developers to set the parameters of development. Yet, like the Salt Lake City case, downtown Dallas is constrained by parking and infrastructure limitations. Addressing these is much trickier than typical planning regulations such as zoning, or those on building height or bulk.

Methods and data sources

Our methodological approach toward the case studies is to supplement and enrich the quantitative work, which uses nationwide data on metropolitan areas and firm-level data from two metropolitan regions to study how transit is correlated with population and employment densification and hence with average wages and firm revenues. There are potentially significant limitations of a quantitative modeling approach to estimating the additional economic impacts of transit investments—particularly when geographic and political factors heavily influence transit and economic development decisions on local, state, regional and national levels. It is expressly these types of limitations we are trying to capture in our three case studies.

Several of the questions we identified and addressed in the sections that follow are:

- Which industries seem to be locating in, or moving away from, transit station areas, and why?
- How have regulatory environments affected the development in and around transit stations? Have they been a significant factor in constraining or otherwise shaping the agglomeration patterns in metropolitan regions?
- What are some of the historical patterns that have influenced transit development? Have these been key conditions in determining the types of investments made in or near transit stations?

- What impact has the financial crisis of 2008 had on the trajectory of transit investment and the potential benefits of agglomeration?
- Do property prices reflect the additional value provided by transit access?
- Do transit investments free employers to pursue other location strategies by increasing the flexibility of travel options for workers?

We do use some quantitative data for the case studies, largely from the Longitudinal Employer-Household Dynamics (LEHD) database from the US Census Bureau. These data are based primarily on employer-reported worker characteristics, including place of residence, place of work, and industry type, and are available from 2002 to 2008 for the block, block group, and census tract levels to explore the changes in employment patterns in our three case study regions. The maps and figures in this case study report are based primarily on that data source, and so are limited to the period 2002 to 2008. Corridor to metro area comparisons are based on selecting census block groups within a quarter-mile of stations; we defined “within” as “having any part within a quarter-mile radius.”

The LEHD data includes some imputed characteristics of worker-employer relationships, such as the work location for firms that have multiple work sites, but they are the most accurate and comprehensive data on employer-worker location currently available to show changes over time at a corridor or small-area level. Other quantitative data sources include the Texas Transportation Institute congestion index, and the 2008 American Community Survey county- and place-level reporting on commute mode. When available, we also mapped land use and zoning GIS data for Los Angeles, Dallas, and Salt Lake City. The land use and zoning characteristics along each of the transit corridors give insight into the regulatory environment that may impact development around transit stations.

Our secondary data sources include agency reports, plans, newspaper articles, and websites that provide details about the historical development and current performance of the transit systems and metropolitan area economies in the three case study areas. These data are limited given their subjective nature, but they provide valuable evidence of the types of important qualities developers and firms are interested in when they make decisions to locate or expand operations locally, regionally, or nationally.

Finally, each of the case studies relies heavily on key-informant interviews identified during the data collection process. The informants were selected through contacts made with the responsible transit agencies and their industry partner organizations. A summary of the interview topics and questions is included at the end of this report. The purpose of the interviews was to triangulate the data collected in the case studies, and to verify that the stories presented here accurately depicted the events as understood by those involved in the process or with intimate knowledge of the transit development process. Where conflicts emerged in the stories we gathered from multiple sources, we made notes in the text below.

The three case studies follow and each is organized in three sections. First, we briefly summarize the current state of transit within each region, focusing on areas of recent transit investment where agglomeration benefits would most likely be observed. Second, we discuss in greater detail the specific economic development strategies undertaken by regional governance entities to promote job growth, transit ridership, transit-oriented development, and particular industrial development. This second section of each case study includes a discussion of constraining development policies and other factors that could limit agglomeration. Finally, we discuss the current context, particularly the potential role of road congestion in spurring transit-led densification, recent changes in employment and residential densification near transit development, zoning regulations, and existing land use.

Los Angeles – Metro Orange Line

Our first case study is the Los Angeles Metro Orange Line Bus Rapid Transit (BRT) corridor. We selected the Orange Line because it is the only fixed-guideway BRT system built recently in the US, and because Los Angeles is a high-growth, global city with a progressive transit development agenda.

Los Angeles County has the largest population of any county in the United States, and the larger five-county metropolitan region is the second largest, behind only New York City *(2)*. Yet, until recently, Los Angeles lagged behind in rail transit service. Like many other metropolitan areas, much of the city's extensive rail and streetcar network was dismantled in the 1950s in favor of rubber-tired bus service. But in the last two decades, the Los Angeles region has become one of the largest investors in rail transit, and their system includes several innovative approaches to transit development.

Currently the most congested metro area in the US, Los Angeles has made significant efforts to improve its transportation system by investing heavily in rail transit in recent years. Since 2005, the Orange Line has shown some promise in providing agglomeration benefits to the San Fernando Valley.

Evidence exists that suggests transit-driven densification has occurred along the Orange Line corridor, although it is difficult to attribute to the presence of the BRT line in particular. Examination of time-series employment data from 2002 to 2008 shows increases in resident worker population densities along most of the corridor, and pockets of increased employment density, most notably near the western terminus of the Orange Line. These data also indicate a significant increase in the presence of jobs in industries prone to agglomeration (such as finance and insurance, professional services, health care, and public administration) near the corridor over the period.

The Orange Line has not been targeted by the City of Los Angeles for specific zoning regulation changes to encourage particular types of development. The regulations remain the same as the rest of the region. This contrasts with regulatory changes around other transit lines, in particular the Blue and Red Lines near Hollywood and downtown Los Angeles, where more direct efforts have been made to increase density in housing and certain industries.

The Red and Blue lines, which both converge on downtown Los Angeles, have existed longer than the Orange Line and have been the focus of more intense development programs over the past decade. Economic development initiatives have targeted the downtown area around transit stations as an entertainment hub for the region, with the recent development of the Staples Center and LA Live. Planning tools for transit-oriented development such as form-based zoning and changes to parking standards have been seen as helpful in certain segments of the real estate market, but not others (particularly not in the high-end market) according to professionals we have talked with.

Current state of the transit system

The current LA Metro rail system is made up of five different lines, distinguished by color designation. The Blue Line—connecting Long Beach to downtown Los Angeles—opened in 1990 and has an average weekday ridership of over 82,000 boardings. The Green Line, opened in 1995, runs from Redondo Beach east to Norfolk with significant stops at Los Angeles International Airport and the Imperial/Wilmington transfer station. The Green Line has an average daily ridership of over 42,000 boardings. The Red Line subway, opened in 1993, is entirely underground and cost significantly more than the other rail lines to construct ($4.5 billion compared to a combined $3.7 billion for the four other lines). It initially included just five stations as a starter project, but was rapidly expanded to serve the dense urban Hollywood corridor by 1999 and North Hollywood in 2000. In terms of ridership, the Red Line nearly equals the other three fixed-guideway rail lines, with average weekday boardings of nearly 150,000. The newest fixed-guideway rail line to open is the Gold Line, connecting the eastern suburb of Pasadena to Union Station in downtown Los Angeles and portions of East Los Angeles through an extension just opened in 2009. The Gold Line was the second most expensive line to construct at a cost of $1.8 billion, but with over 35,000 weekday boardings, it has not yet seen the ridership figures of the other fixed-guideway lines *(3)*.

The fifth fixed-guideway transit line is called the Orange Line, but unlike the other four, it is a rubber-tired bus rapid transit line, on a fixed guideway with few at-grade crossings. The Metro Orange Line runs from the Warner Center (a major mixed-use retail and office park) in Canoga Park, California, to North Hollywood, where it connects to the Metro Red Line with service to downtown Los Angeles. The Orange Line was constructed for a fraction of the cost of the other lines, at a total of $330 million on old rail right-of-way *(3)*. The Orange Line ridership had surpassed ridership projections for 2020 after only seven months of operation, topping over 20,000 average weekday boardings *(4)*.

Service is provided with articulated buses specially designed for the Orange Line. The buses include three doors for faster boarding, and no fareboxes. Fares are prepaid only. Peak weekday operating headways (time between buses) are about 4-5 minutes; off-peak headways average about 12-14 minutes *(5)*. Travel time savings are substantial, though not as high as predicted, due to safety and signaling issues. Average speeds along the dedicated busway were just 17 miles per hour westbound and 21 miles per hour eastbound, comparable to the Ventura Metro Rapid bus, which does not operate on a dedicated busway. Despite this slow operating speed, eighty-five percent of respondents reported a reduction in travel time for the same trip by switching to the Orange Line *(4)*.

The route’s fourteen miles of busway include fourteen stations along the primarily east-west corridor. Seven of these fourteen stations have free parking available, and two of the seven offer additional reserved spaces for a fee. The number of spaces varies depending on the station, ranging from about 300 to 1,200 *(6)*.

Economic development and related policies

Much of the motivation for transit improvement in the Los Angeles region came from federal requirements to meet air quality standards under the Clean Air Act. Planners, however, recognized the potential economic development opportunities that coincided with the shift to transit and other transportation technology solutions to the congestion-related air quality issues in Southern California. The Regional Mobility Element (RME) of 1994, prepared by SCAG, presented a vision of industrial clustering of advanced transportation technology as an economic development strategy for the region. According to the Plan Performance section of the RME, by 2014, $56 billion in capital investments would yield a projected 58,000 to 134,000 jobs per year with annual aggregate salaries totaling between $1.2 billion and $2.6 billion. Advanced transportation technology investments were estimated to yield another 350,000 jobs in the regional industry cluster over the same period *(7)*.

In the next decade, SCAG launched the COMPASS Blueprint initiative, with goals that differ substantially from the 1994 RME. COMPASS recognizes the challenges of widespread change and instead focuses on a strategy targeting two percent of the region's land area with investments. The goals are to promote mobility, livability, prosperity, and sustainability through targeted "opportunity areas." The primary focus shifted away from a broad, regional approach toward improving transit throughout the region to a specific set of policies aiming to invest around existing transit and employment centers *(8)*. These four measures—mobility, livability, prosperity, and sustainability—incorporate a vision with transit-oriented development and urban design at the center. The opportunity areas focus on half-mile buffers around existing transit systems and stations, and are further broken into a number of other categories, summarized below. Two types of development forecasting in the COMPASS Blueprint stand out from the rest. First, COMPASS planners projected the impact of new development occurring through infill development and redevelopment in terms of new households and new jobs. The percentage of new jobs created through infill practices varied based on regional location, from a high of 67 percent in the Los Angeles Basin to zero percent in Imperial. Other areas with high percentages of new jobs through redevelopment included: Orange County (26%), Ventura (27%), and Riverside (16%). The overall region was projected to gain one third of new jobs through redevelopment practices. The following are identified as potential opportunity areas for the Joint Development Program *(9)*.

- Metro Centers
- City Centers
- Rail Transit Stops
- Bus Rapid Transit Corridors
- Airports, Ports, and Industrial Centers
- Priority Residential Infill Areas
- COMPASS Principles Priority Areas

The other important piece of the job creation forecast by COMPASS was related to projections of the employment mix. The report focused on retail and service employment, classifying everything else as “other”. The main assumption of this projection related to this report was the expected growth in service employment with a subsequent decline in “other” employment.

Los Angeles Metro has another program to invest in existing transit centers, which they call the Joint Development Program. When Metro built the Blue and Red Lines, they acquired several parcels of land surrounding the station locations. Since the stations are underground, these parcels were allocated to the Joint Development Program to pursue mixed-use, infill development opportunities. The goals were to reduce auto use, increase density around transit stations, and provide an additional return on investment for the transit system. Though the process of negotiating and completing these projects has been slow, Metro has finished eleven projects by 2010, with one in construction and over 30 in negotiation or under consideration *(10)*. Most of the projects to date have added retail or high-density residential space, though notable exceptions include the Wilshire/Vermont middle school and the 7th and Flower Metro Red Line station (550,000 square feet of office space) *(11)*. Some of the proposed projects are also targeting office space development, though most include some form of residential component.

Another Metro program aiming for economic development goals is the Metro 30/10 Initiative. This plan is to accelerate the investment in transit projects to meet employment and emissions goals. Los Angeles County Measure R of 2008 approved a local tax to fund transportation projects, and the 30/10 Initiative is aggressively leveraging the new revenue source to begin work on twelve key Metro expansion projects immediately *(12)*. These projects include several Joint Development Projects for real estate development at the new station locations.

Overall, it does not appear that development and land use policies have significantly constrained or encouraged particular types of developments along the Orange Line. Rather, developments have been allowed to be guided by market forces. Office development has been slow due to oversaturation in the previous ten years (LA Interviewee B, personal communication, 01-07-2011). In contrast, the Red and Blue Lines have seen more development than other areas, despite limitations in the marketplace. The MTA has taken a central role in developing areas around stations with its Joint Development Project. This project is generating $16 million in annual revenue for the transit system and grows every year (LA Interviewee A, personal communication, 01-18-2011). Mixed-use retail and residential developments have been far more common around transit stations on the Red and Blue Lines. Two notable exceptions cited by interview participants were the Staples Center/LA Live development and the Hollywood/Western station. Both of these were large, complex projects focused on creating regional entertainment destinations (LA Interviewee A, personal communication, 01-18-2011).

Current context – employment, transportation, and land use

Accessibility/Congestion

More congested urban areas are more likely to experience a densification effect from transit services, because in such urban areas there is pent-up demand for travel into and out of congested areas, and because separate right-of-way transit systems can provide that access.

In 2007, annual delay per peak traveler in the Los Angeles metro area was 70 hours, which is 71% higher than the average for all 90 urban areas in the Texas Transportation Institute's 2009 Urban Mobility Report, and the highest of any metro area in the US by a significant margin. Comparing with peer cities, annual delay in Los Angeles is 37% higher than the average for very large urban areas. Between 1997 and 2007, congestion in the Los Angeles area has remained relatively constant, remaining between 67 and 72 hours of annual delay per peak traveler for all years. Over this same period, the average congestion in very large urban areas and all urban areas contained in the TTI report increased by 19 and 14 percent, respectively *(13)*.

Los Angeles is well known as one of the nation's most congested urban areas, and fixed-guideway transit may allow for increased industry densification in congested urban areas. The extent to which this is possible for BRT systems like the Orange Line is more difficult to assess, but given the qualities of the Orange Line's infrastructure—most notably the reserved right-of-way—the probability of equal benefits with more traditional fixed-guideway systems is high. However, the right-of-way is interrupted by multiple grade crossings. Congestion at traffic intersections was reported in one study of the Orange Line as a major limiting factor in the improvement of speed along the corridor *(4)*, so this may be mitigating the benefits of reserved right-of-way in this instance.

Employment and industry characteristics

Los Angeles County is the largest county in the Los Angeles metropolitan area, and was home to 3.6 million jobs in 2008. More than 40 percent of those jobs were in consumer services sectors, such as retail trade, education, health and other services. Additional key industries in the area include tourism and hospitality, international trade, entertainment, and logistics. Los Angeles is also the second largest manufacturing center in the US *(14)*.

FIGURE 5 2002 to 2008 LA Metro Orange Line corridor change in workers at place of work by Census block group. (Source: US Census Bureau Longitudinal Employment Data)

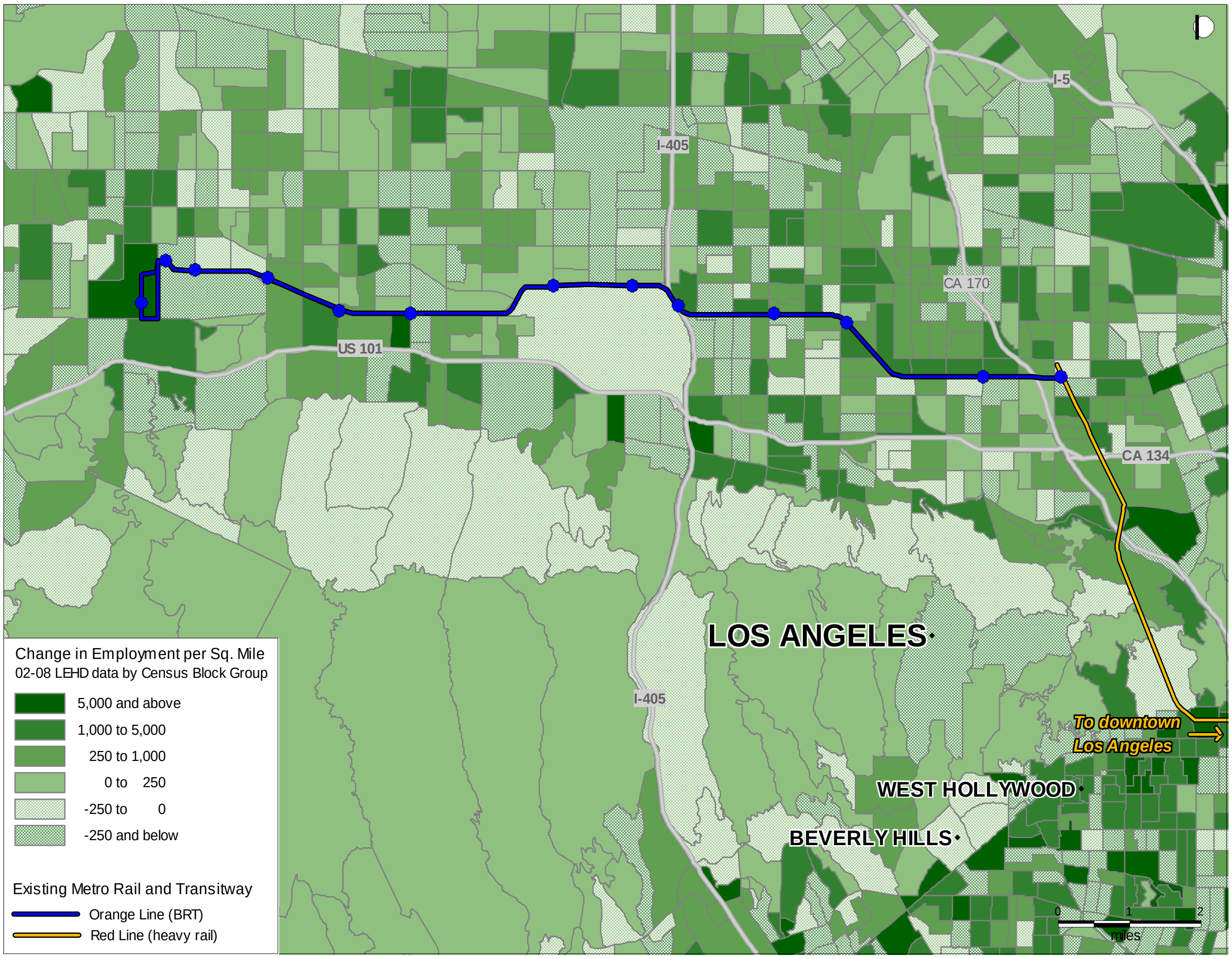

FIGURE 6 2002 to 2008 LA Metro Orange Line corridor change in workers at place of home by Census block group. (Source: US Census Bureau Longitudinal Employment Data)

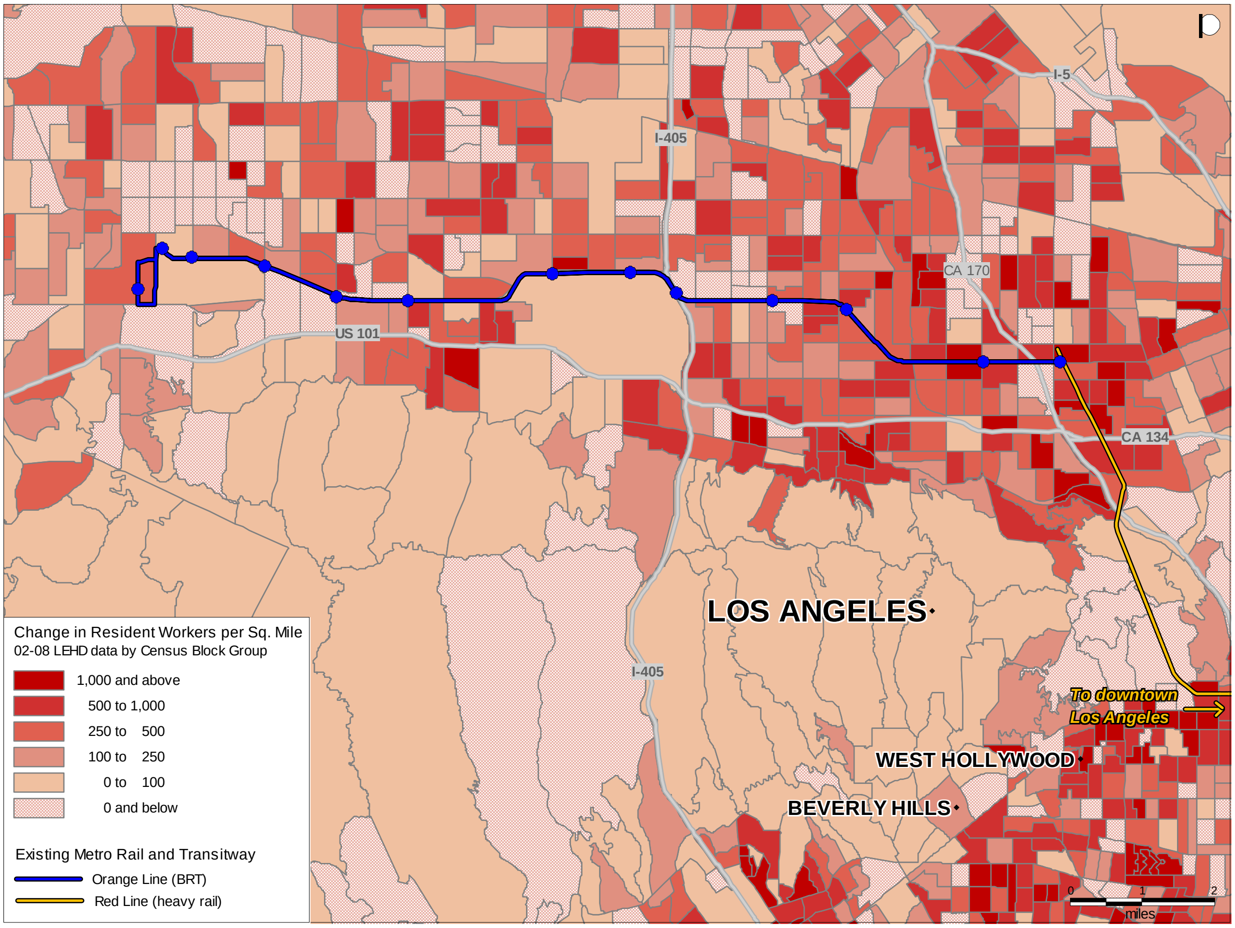

Figure 5 and Figure 6 show the change in workers by employment and residence locations between 2002 and 2008 for the area surrounding the Metro Orange Line. It is evident that resident worker density generally increased between 2002 and 2008 along the Orange Line, especially east of Interstate 405. While there were some declines in employment density along the corridor, the area near the west terminus of the Orange Line gained more than 5,000 jobs per square mile between 2002 and 2008. The area north of the east terminus also saw increased employment density.

In 2008, there were 54,000 jobs, roughly 1.5% of total jobs in the county, located along the Orange Line corridor.[4] Figure 7 below shows a comparison of employment by industry for the corridor and Los Angeles County as a whole. Employment along the Orange Line corridor is more concentrated in business services, particularly finance and insurance and management, than the county, with 60 percent of corridor jobs within the business service sector.

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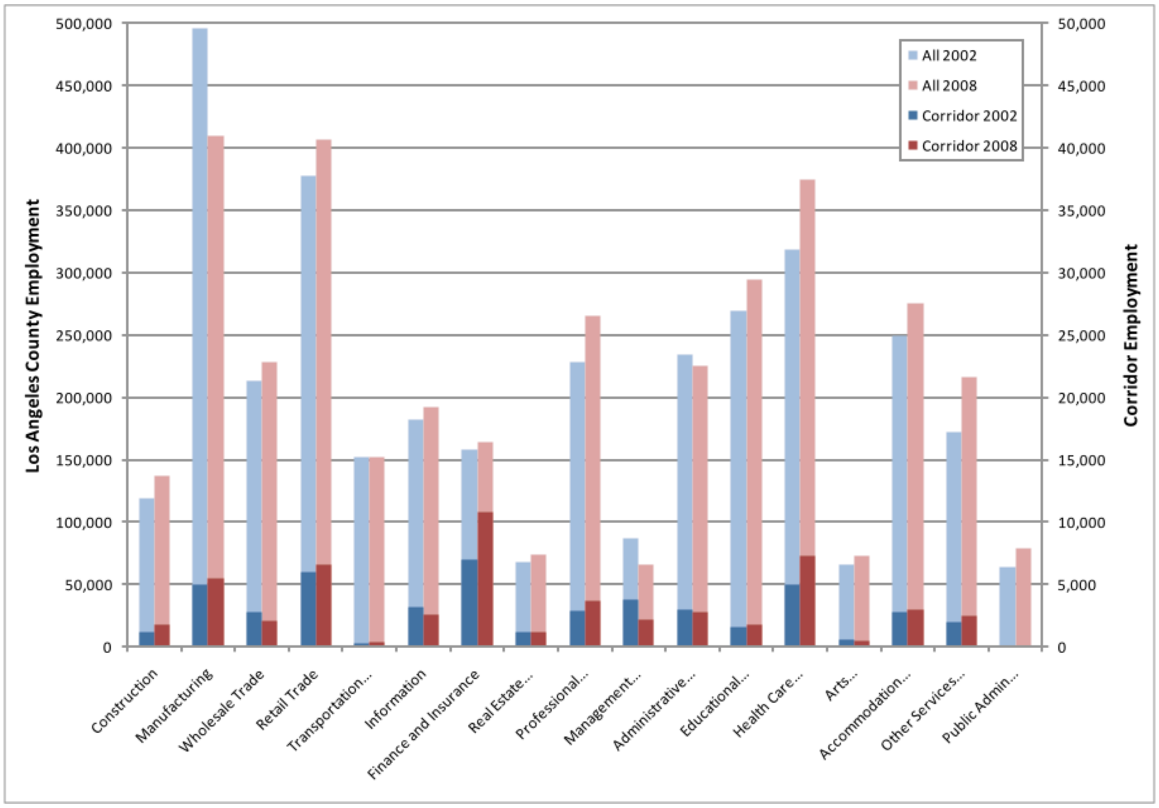
[4] The ‘corridor’ is defined as all Block Groups that fall within ¼ mile of a transit stop.

FIGURE **7 Los Angeles County and corridor employment by sector. (Source: US Census Bureau Longitudinal Employment Data)**



Between 2002 and 2008, employment along the Orange Line corridor grew by about 13 percent. Figure 8 (below) shows the distribution of this growth across industries. There appears to be a quite significant structural change in the type of activities located along the corridor, as illustrated by significant increases in employment within finance and insurance, professional services, and health care. Construction, manufacturing, and transportation employment have also grown more in the corridor than for Los Angeles County as a whole.

FIGURE **8 Change in Los Angeles County and corridor employment by sector, 2002 to 2008. (Source: US Census Bureau Longitudinal Employment Data)**

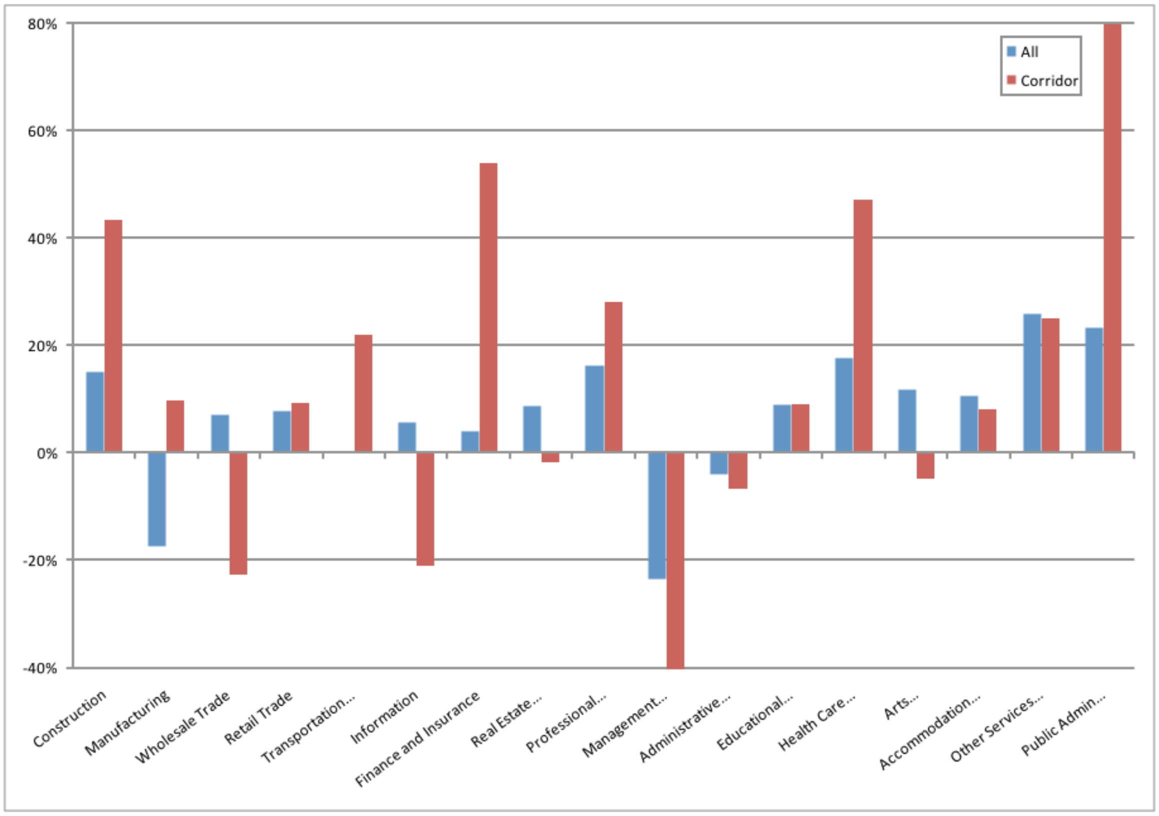
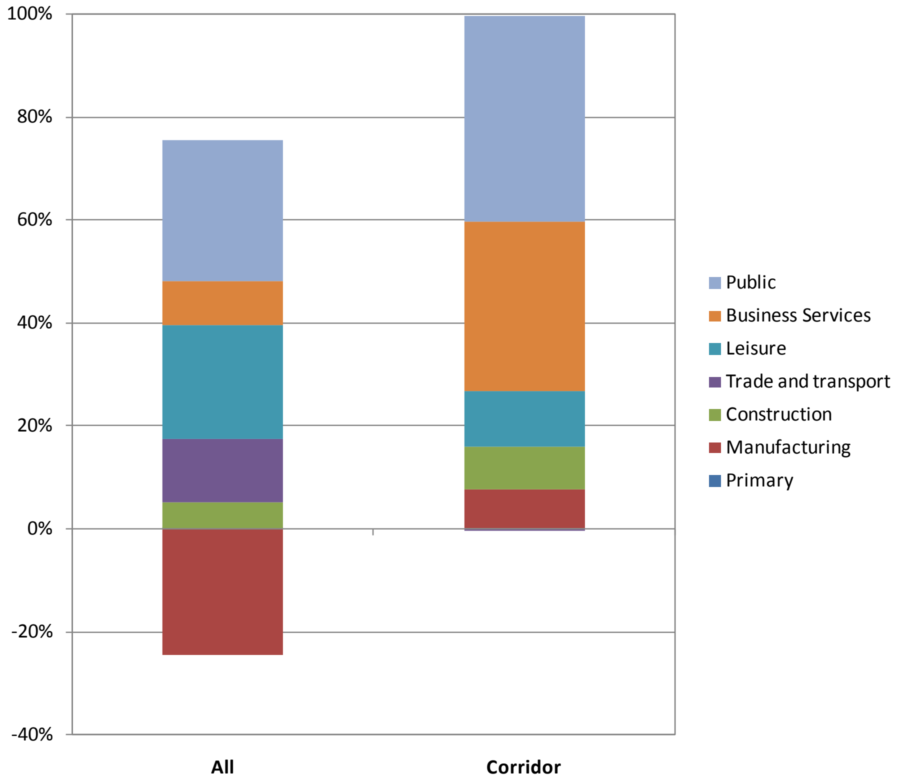


Figure 9 (below) shows the composition of the change in jobs by sector between 2002 and 2008. Nearly a third of all new jobs in the corridor were in the business services sector. In Los Angeles County, the same sector contributed less than 10 percent to overall job growth.

FIGURE **9 Los Angeles County and near corridor job growth by sector, 2002 to 2008 (Source: US Census Bureau Longitudinal Employment Data)**



In contrast to the other two case studies (see below), we do find evidence of increased concentration of activities likely to enjoy agglomeration economies being attracted to locations along the MTA transit lines, although there are also losses in manufacturing employment near the corridors.

Zoning regulations

Los Angeles's zoning regulations break land use into eight primary categories: Agricultural, Residential Estate, One-family Residential, Multiple Residential, Commercial, Manufacturing, Parking, and Open Space/Public Facilities/Submerged Lands. Within these categories, specific uses are allowed, and where uses are common between zones within a category, zoning restrictions are effectively hierarchical, as additional restrictions are based on allowable values of building height, distances between buildings, and lot dimensions. In addition to the eight primary categories of zones, a set of Supplemental Use Districts exists to regulate specific uses, such as surface mining and oil drilling, that are not already adequately covered. Additionally, there exist a number of area-specific zoning designations. Los Angeles's zoning regulations do not explicitly include zoning designations for mixed-use development *(15)*.

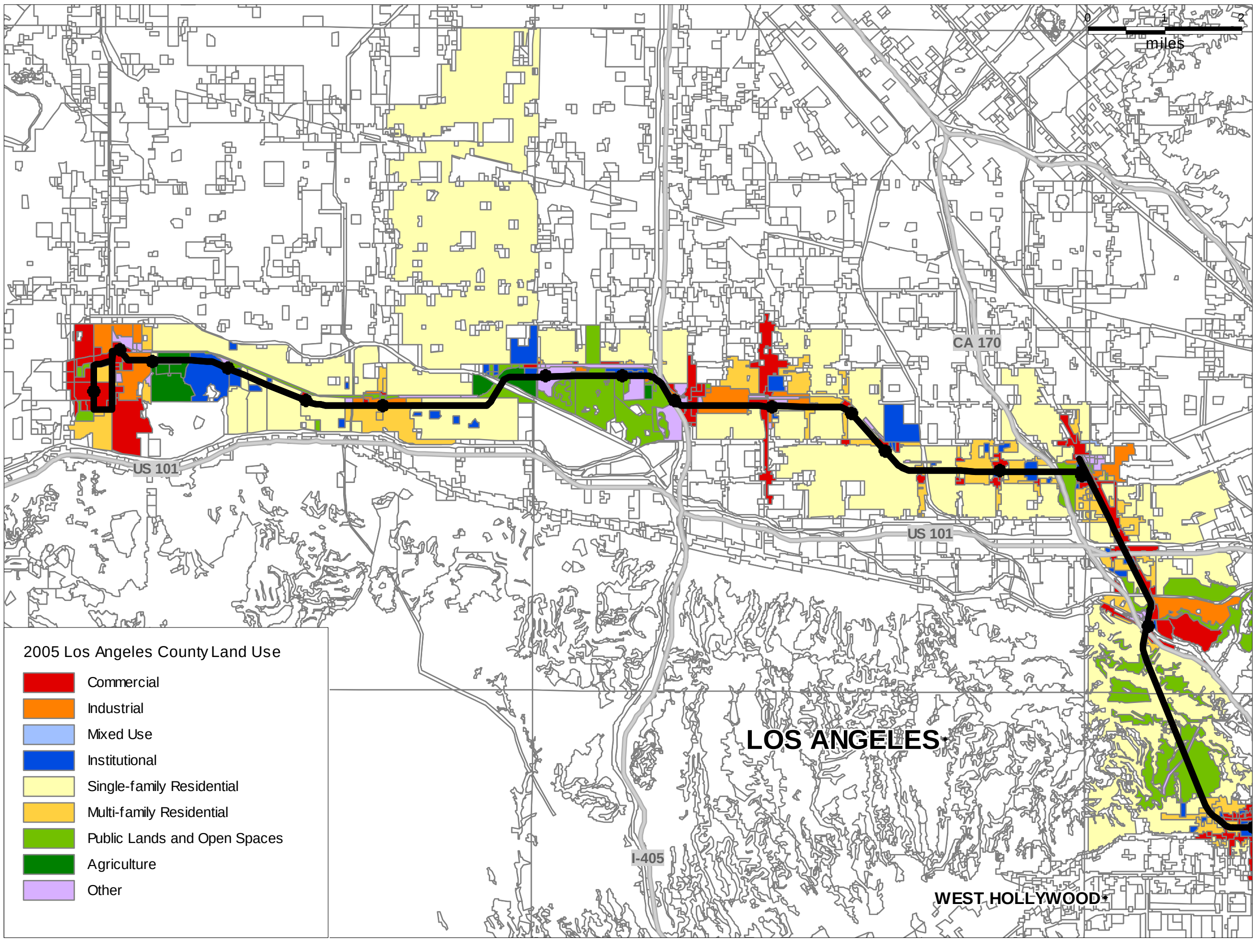
Of the three case study regions, Los Angeles has been most proactive in pursuing zoning and other regulatory changes to guide development near their transit stations. Form-based codes and changes to parking regulations (from minimums to maximums) have not yet yielded the types of results planners would like to see. According to one industry professional, this is due to unfamiliarity among the developers, who do not yet know how to take full advantage of the new regulations in their projects. Developers are also resistant to parking regulation changes in certain markets because they find limited parking to be difficult to market to high-end residents and businesses, even near transit (LA Interviewee B, personal communication, 01-07-2011). This is known as the "density dilemma": as you go more dense, you have to add more parking, which adds more cost to the development.

The LA Metro Orange and Red lines, as well as part of the Gold Line, are contained within the city limits of Los Angeles and fall within its zoning ordinance. The Gold Line also passes through the City of Pasadena and the City of South Pasadena, as well as East Los Angeles, which is an unincorporated portion of Los Angeles County. Interactive zoning maps for the City of Los Angeles and Los Angeles County were used in conjunction with existing zoning maps available for Pasadena and South Pasadena to describe zoning along the transit corridors. Land use GIS files from SCAG were then used to create the corridor-level maps below.

SCAG has 33 land use categories, which we aggregated into the nine broader categories seen along the Orange Line in Figure 10 below. These categories, defined below, are grouped around land use characteristics that are important to development along the transit corridor.

- **Commercial**: includes General Office Use, Regional Shopping Centers, Retail Stores and Commercial Services, Hotels and Motels, and Other Commercial
- **Industrial**: includes Light Manufacturing, Assembly, and Industrial Services, Light Industrial, Heavy Manufacturing, Heavy Industrial, and Wholesaling and Warehousing
- **Mixed Use**: Mixed Commercial and Industrial and Mixed Urban
- **Institutional**: includes Public Facilities, Special Use Facilities, Education K-12, Education – College, and Military Installations
- **Single-family Residential**: includes Single Family Residential, Mobile Homes and Trailer Parks, Mixed Residential, and Rural Residential
- **Multi-family Residential**: includes Multi-Family Residential
- **Public Lands & Open Spaces**: includes Open Spaces and Recreation, Vacant, and Water
- **Agriculture**: includes Agriculture
- **Other**: includes Transportation, Communications, and Utilities and Under Construction

FIGURE 10 2005 LA Metro corridor land use, San Fernando Valley Area. (Source: SCAG Land Use GIS Data)



As the LA Metro Orange Line travels west from North Hollywood Station, where it connects with the Metro Red Line, it travels primarily through areas of single-family residential, multi-family residential, commercial, and industrial use. Generally, between major cross-streets, the area immediately along the corridor is primarily single-family or multi-family residential, and areas on the corridor near major cross-streets are commercial. There are, however, several significant concentrations of industrial and commercial development along the corridor, specifically from Hazeltine Avenue to the eastern edge of the Sepulveda Basin (Industrial), from Etiwanda Avenue to Wilbur Avenue (primarily Industrial), and from DeSoto Avenue to the western terminus of the line (Commercial).

Zoning GIS data was not available for Los Angeles, and as a result we were also unable to map properties that relate to regulatory constraints along the corridor, such as maximum building height. Online interactive maps and existing maps of zoning within the City of Los Angeles and neighboring municipalities were used to examine zoning along the transit corridors.

Salt Lake City – TRAX light rail

The Salt Lake City TRAX light rail system is included as a case study because, in addition to its recent investment in rail transit, Salt Lake City is a smaller, regional economic center unlike Los Angeles and Dallas. Though the particulars of this case are not generalizable to the broader population of mid-sized metropolitan regions, we believe that Salt Lake City provides some insights to how smaller metropolitan regions approach transit investment as an economic development strategy. As shown below, Salt Lake City took a transportation-oriented approach to rail transit investment. While planners in Salt Lake City did identify the potential for economic development and transit-oriented growth, they did not implement strong measures to ensure its success, at least initially. Instead, they relied primarily on engineering-driven measures of performance to evaluate system alternatives. While increased transit investment in the Salt Lake City area—including that in the UTA TRAX light rail system—has played a key role in congestion relief, there does not seem to be much, if any, empirical evidence that it has resulted in significant agglomeration. Prior to the implementation of the two TRAX lines, UTA operated frequent, successful bus service along both current light rail corridors, limiting the potential improvements in accessibility of businesses to labor markets that could result from the transition from bus to light rail service.

There is also limited empirical evidence of transit-driven densification along the corridor. Examination of time-series employment data from 2002 to 2008 shows increases in employment and resident worker population densities near the corridor, however, it is not clear if this is a direct result of transit investment, or part of a broader trend. At the same time, these data do not indicate an increased presence of jobs in industries typical to agglomeration near the corridor over the period. Additionally, since the opening of the TRAX lines, there have been no corresponding changes in zoning laws to encourage or allow increased densification along the corridor. With the exception of a few small areas zoned specifically for transit-oriented development, zoning regulations along the TRAX light rail corridors do not differ substantially from those outside the corridors. This lack of special zoning would appear to reflect a minimal focus on potential economic development impacts during the planning of the initial TRAX lines.

In our discussions with professional planners and developers in the Salt Lake City region, we came across a slightly different story with respect to transit-driven densification. Though many acknowledged the slow pace of change with respect to transit development, some participants pointed out what they felt were significant changes in the downtown area, where the two TRAX lines converge and the FrontRunner rail terminates. Densification of employment has been occurring in this area in recent years, some of which may be attributable to the presence of high-quality transit service. The University of Utah was also cited as a firm that has specifically targeted policies like limited parking supply while increasing employment density on campus. Intermountain Medical Center selected a site for regional expansion in part because of its high accessibility both via transit and highways. It has a stated policy of acquiring property for future expansion, with transit access as one of many criteria in mind. Other station areas have been slower to develop, in particular in agglomeration-type industries. According to our discussions, one reason may be the historical nature of the rail areas as former industrial corridors, which has limited the redevelopment potential for a variety of reasons, including land cleanup, assembly, and lack of infrastructure.

Current state of the transit system

The Utah Transit Authority (UTA) serves the metropolitan region of Salt Lake City, and consists of fixed-route and express buses, three light rail lines, and one commuter rail line extending north to Ogden, Utah. The 18-mile light rail service, called TRAX, which was developed in part for the 2002 Winter Olympic Games, connects the southern suburbs to downtown Salt Lake City and the University of Utah with daily ridership of about 42,000 trips. The 44-mile FrontRunner system, a commuter rail service, opened in April 2008. It serves a modest 4,500 daily trips. The UTA also opened a bus rapid transit service, called MAX, in July of 2008. UTA bus service carries 74,000 daily trips *(16)*.

The Sandy/Salt Lake City Line, which opened in 1999, operates along the I-15 corridor from Salt Lake City approximately 15 miles south to Sandy. The University Line, which opened in 2001, operates between the University of Utah and downtown Salt Lake City, approximately five miles to the west. At Salt Lake Central Station, where the two lines meet, transfers are also available to FrontRunner commuter rail service. On weekdays, trains run each direction every 15 minutes on both lines. On weekends, service on each line operates every 20 minutes. In addition, there are 4-6 trains running in each direction during peak hours between Sandy and the University Medical Center. Standard TRAX fares are $2.00, and a fare free zone is maintained within the central downtown area *(17)*.

Parking is available at all stops south of 900 South on the Sandy/Salt Lake Line, with the exception of Sandy Expo-9400 S; there is no parking available along the University Line. Parking is free at all stations. The majority of the stations have 100 to 400 parking spaces, however the Murray Central and Sandy Civic Center stations have higher availability with 750 and 1185 spaces, respectively *(17)*.

Since the Sandy/Salt Lake City Line opened in 1999, TRAX consistently gained riders until 2007, near a peak in fuel prices. Between 2007 and 2009, annual ridership dropped approximately 18% from its peak at over 16 million annual unlinked trips *(18)*. It is also worth noting that during the period of rapid growth in TRAX ridership, the Salt Lake City area experienced a significant decrease in congestion, according to the Texas Transportation Institute *(13)*.

Prior to the opening of the TRAX light rail lines, both of the corridors were served by multiple UTA bus routes. The State Street corridor (along the Sandy/Salt Lake City Line) was the most successful bus corridor in the region, featuring numerous routes combining to provide an effective frequency of ten minutes all day. This service was mostly replaced by the light rail line, although some bus service was maintained. Bus service on the North Temple portion of the University Line corridor was also very frequent, and mostly replaced by light rail, with some bus service preserved. The eastern portion of the University Line, along 400 South also featured bus service, which was mostly replaced by light rail. Bus service also existed between downtown and the Salt Lake City International Airport, but on a much less frequent basis. The grid structure of the bus system in the downtown area was strengthened significantly to facilitate better connectivity between light rail and bus.

Economic development and related policies

Land use impacts were not considered much, if at all, during the planning of the original TRAX lines. The planning process was focused instead on catering to the area's growing travel demand and in particular growing demand for non-auto travel options. Work conducted during the planning phases of the initial light rail lines generally addressed the potential changes in development patterns that could result from the opening of the service, but did not attempt to quantify any associated benefits *(19, 20)*. This work also made reference to how well the light rail lines—down to the individual station level—would likely support the existing development plans, but again did not attempt to quantify impacts. Since the planning of the original TRAX lines, UTA has continued to focus on meeting transportation demand rather than influencing development patterns (UTA Planner, personal communication, 10-8-2010). Interviews with UTA officials revealed that early planning for TRAX projects was not sophisticated in terms of treating land use in connection to transit proposals. This was seen as a major early barrier to adoption by several interviewees.

Overall there have been some attempts by planning authorities in Salt Lake City to encourage development of retail and leisure activities around transit stations. The fact that the UTA owns undeveloped land along the corridor may also have constrained the growth of the type of activities that would be expected to benefit from densification. It is unclear, however, how much this has affected the development patterns observed after the introduction of the transit lines. According to development professionals we talked to, UTA’s control over large areas of land has placed limits on development around certain stations, in particular those north and west of downtown. Two interviewees cited problems with lease arrangements as a particularly troublesome burden on development projects, while more than one interviewee noted the lack of adequate infrastructure investment in the area as a problem. Though these limits have been frustrating for both private developers and UTA, SLC Interviewee F points out UTA's position on development: "We're very patient capital." This limitation has been addressed recently through state legislation, opening up five projects to move forward with development. This legislative change has created a groundswell of support for TOD in the region, as many of the cities with stations have requested projects. SLC Interviewee F expresses the desire to seek more development, even in areas where UTA does not currently hold land: "If there was a way to target stations that are underdeveloped where we don't have land, then we'd do it", especially in places were current uses are obsolete or "blighted" (SLC Interviewee F, personal communication, 12-12-2010).

Although reaction by businesses to economic development around stations has been somewhat mixed, the Gateway shopping center near the end of the TRAX line in downtown Salt Lake City has became an attractive destination for shoppers using public transit. The Gateway is viewed by developers and transit officials as a good model of transit-oriented development. They noted the ability to build off initial success to create an even more attractive transit-business partnership when transit was extended through the Gateway shopping corridor to serve the entire area.

Current context – employment, transportation, and land use

While this case study focuses on the original two TRAX lines, current transportation plans provide insight into UTA’s consideration of development and land use in the evaluation of transit projects. Five new light rail and commuter rail lines, which will double UTA’s current rail network, are scheduled to open by 2015 *(17)*. Corridor evaluation reports for UTA’s planned extensions to the TRAX system make it clear that the corridors were planned primarily with transportation service and engineering considerations in mind. UTA’s FrontLine 2015 Plan includes a few general references to particular alignments increasing TOD potential, but there is no mention of why or how this is expected to take place.

Similarly, in the 2007-2030 Regional Transportation Plan of the regional metropolitan planning organization, the Wasatch Front Regional Council (WFRC), transportation system alternatives are evaluated based on performance measures including transit shares, transit speeds, and transit access to major activity and mixed-use centers, but the plan does not include any measures intended to evaluate the land-use impacts of new transit projects. The WFRC also utilizes cost/revenue forecasting to assess the viability of every transit project in its 2010-2015 Transportation Improvement Plan, but does not refer to any evaluation measures concerning the impact of a project on future economic development. One transportation engineer at WFRC described the regional challenges associated with growth around transit as attributed primarily to a lack of familiarity by financiers and developers, rather than any specific regulatory constraint (SLC Interviewee G, personal communication, 12-21-2010).

Despite UTA's historical limited focus on land use impacts, it has recently created a TOD group, which is looking at development issues as they relate to transit, and has conducted workshops and produced publications on the topic of land use and transit-oriented development.

Accessibility/congestion

Constraints on accessing downtown Salt Lake City have implications on economic development. The total annual delay for drivers in Salt Lake City steadily rose until 2003, when levels began to decrease; by 2006 the annual delay was below that of 2000. Similarly, travel time index and congestion cost also began to decrease after 2003, despite the fact that population and daily vehicle-miles of travel were still increasing *(13)*. These trends may suggest that at a large scale, Salt Lake City's transit initiatives may be able to take advantage of congestion conditions to provide greater access to dense areas or even allow for increased density otherwise impossible to achieve with just mixed traffic, congested highways, and arterials.

In 2007, annual delay per peak traveler in the Salt Lake City metro area was 27 hours, which is 34% less than the average for all 90 Urban Areas in TTI's 2009 Urban Mobility Report. Comparing with peer cities, Salt Lake City's annual delay is 17% higher than the average for medium urban areas. However it is important to note that Salt Lake City is one of the largest urban areas in this category. Between 2003 and 2006, the Salt Lake City area experienced a significant decrease in congestion—on the order of 30%. Over this same period, the average congestion in medium urban areas and all urban areas contained in the TTI report increased steadily *(13)*.

Congestion isn't viewed as a major problem in Salt Lake City, despite its geographic constraints, according to our interviews. Salt Lake City has a good supply of high-capacity, high-quality roads. There are a couple of problem areas on the I-15 linear corridor during commute times. Transit at a minimum keeps up with the congestion during peak periods, but generally traffic is not a problem.

Congestion factors are different in Utah than in the other two cases. Salt Lake City gets significant snowfall in the winters, making the roads difficult to travel. In these cases, and cases of accident-induced congestion, transit service offers more reliability on daily commutes, but it is not competitive in terms of time with free-flowing traffic. Recent highway expansions along the FrontRunner commuter rail line have eroded some of the congestion-related advantage, as have decreases in gasoline prices from their peak in 2008.

Employment and industry characteristics

The Salt Lake City metro area is home to a fast growing economy that relies heavily on the service sector, particularly information technology, health care, and tourism. As in much of the US, retail and manufacturing are still the largest sectors by total employment. However, these sectors have been steadily contracting while the professional, technical, and scientific services sectors have been rapidly increasing. The Salt Lake City area is also home to many call centers spanning a variety of industries, and the area has become a regional center for banking and finance. As the capital of Utah, and the home of the University of Utah, government jobs comprise a significant portion of employment in Salt Lake City *(21, 22)*.

When asked about industry development strategies, interviewees gave mixed responses. SLC Interviewee G believes that most of the transit-oriented development is residential-focused, and very little is targeting firms or industries (SLC Interviewee G, personal communication, 12-21-2010). The University of Utah may be a notable exception, but it was in place before the transit line was created. To what extent the University’s plans could have been possible without transit is unknown. Some of their plans, however, have been thwarted by the development and finance community's unwillingness to assume the risk of untraditional development plans (particularly with respect to lower parking standards).

Firm expansion was cited by SLC Interviewee F as an important part of the transit development strategy undertaken by UTA. He gave the examples of the IRS facility expansion in Ogden along the FrontRunner commuter rail and the Daybreak development in the western part of the valley. The latter is a very significant expansion of both firm and residential development by the land-owning mining company, which sounds a lot like a "new town"-type project. Adobe Software has also sought expansion near transit facilities as one of their key location factors, and UTA has worked with the Economic Development Corporation of Utah to assist them and other firms in identifying real estate. In Murray, Intermountain Healthcare has recently opened a new hospital, which may explain some of the employment density increase we have seen on our maps.

Away from transit, in West Jordan, some of the employment density increase may be due to typical suburban firm relocations, but it also may be an anticipated reaction to the expansion of transit in that direction.

Murray has pursued development around stations, particularly medical firms, through national marketing efforts led by private development firms. They view Intermountain as a strategically important asset for economic development and feel like they have been successful in their efforts to attract this industry specifically.

SLC Interviewee E confirmed that tech companies are interested in developing in the region, and are looking for transit access as one of many factors when searching for locations (SLC Interviewee E, personal communication, 01-05-2011). He said one in particular was seeking a location in the southern part of the region, where rail plans to expand in the future.

Analysis of employment and population data gives further insight into economic development around TRAX stations. Figure 11 and Figure 12 show the percent change in employment (workers at place of work) and resident (workers at place of home) density between 2002 and 2008, respectively.

FIGURE 11 2002 to 2008 UTA TRAX corridor change in workers at place of work by Census block group. (Source: US Census Bureau Longitudinal Employment Data)

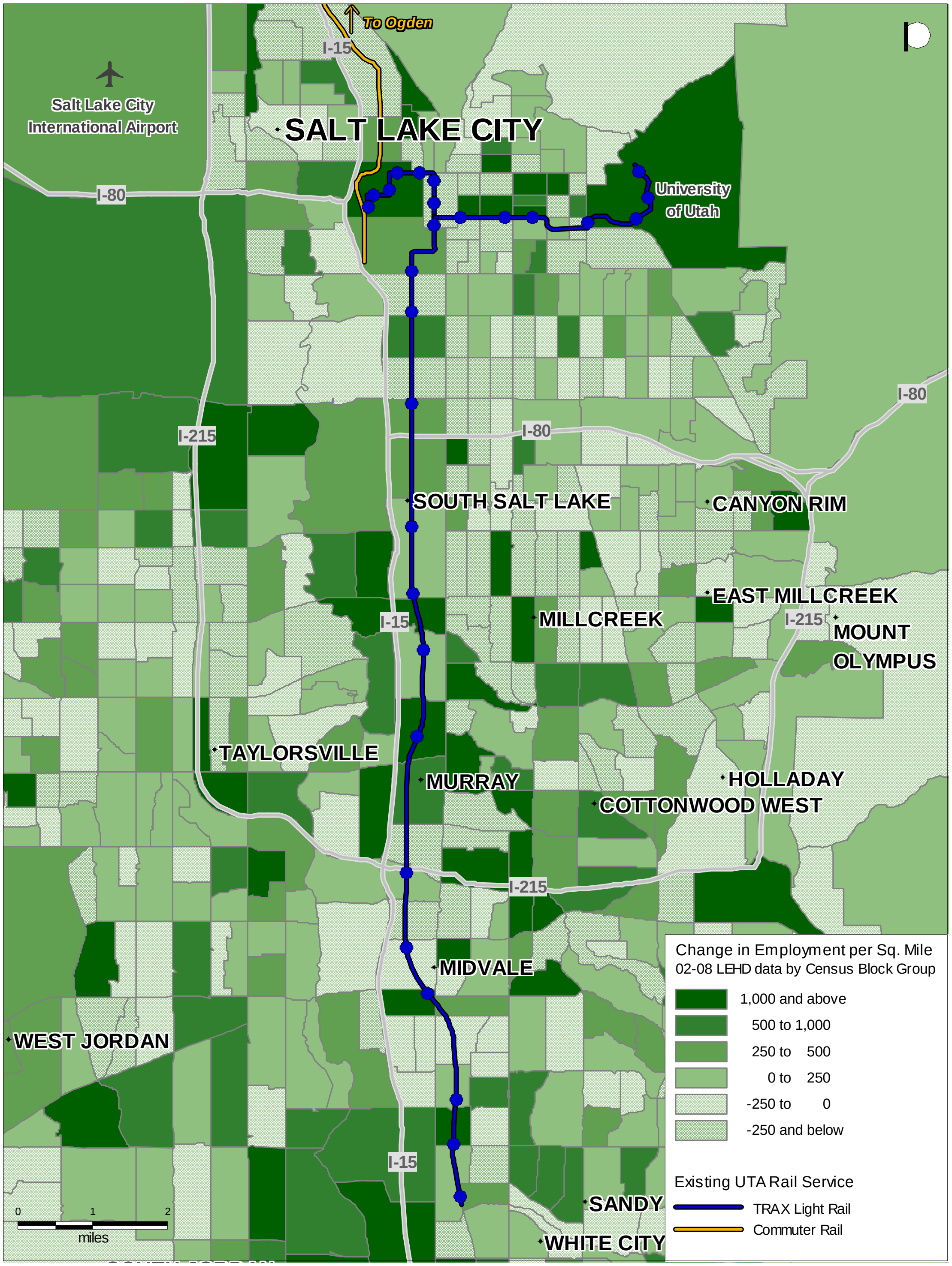
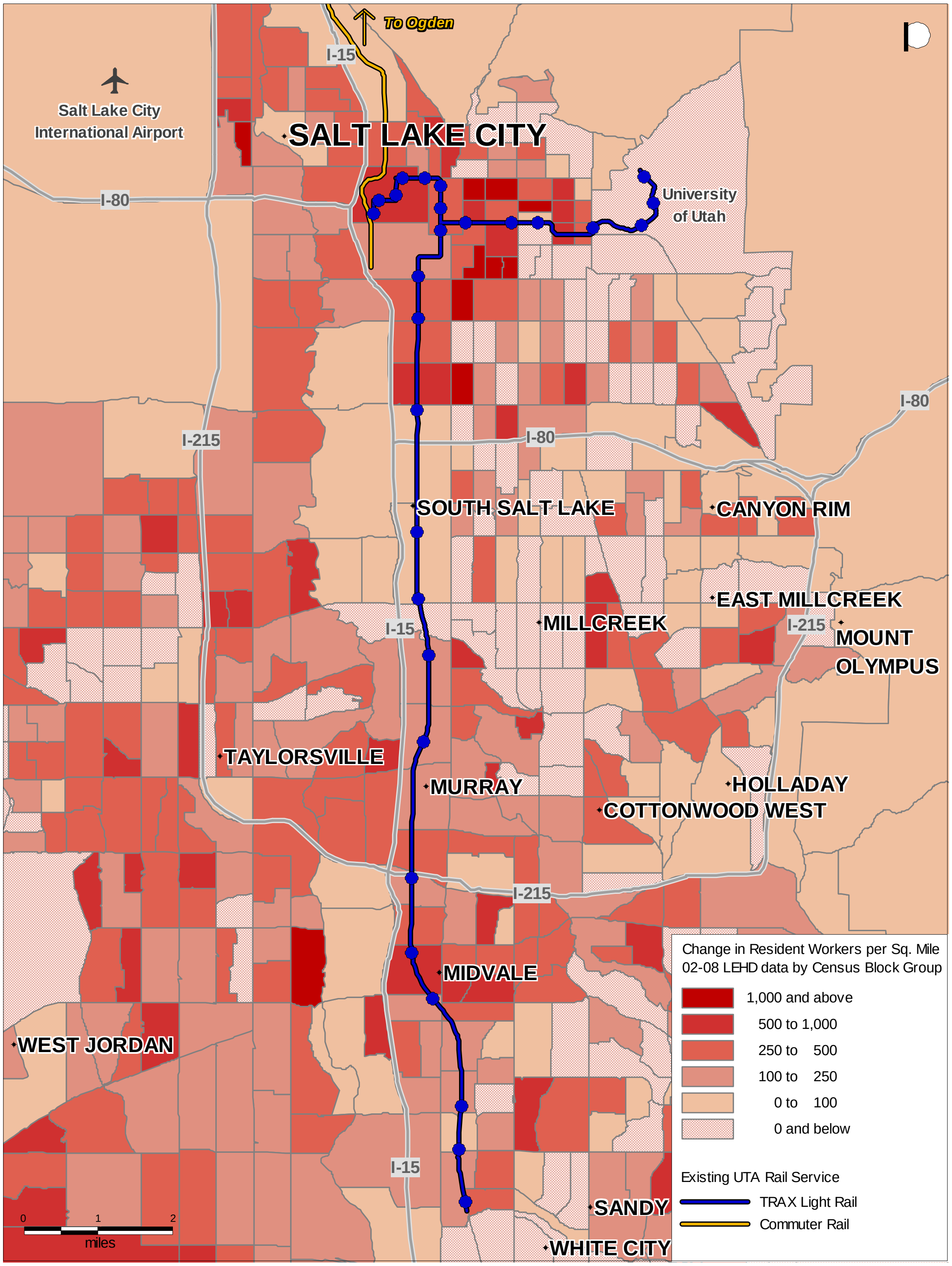


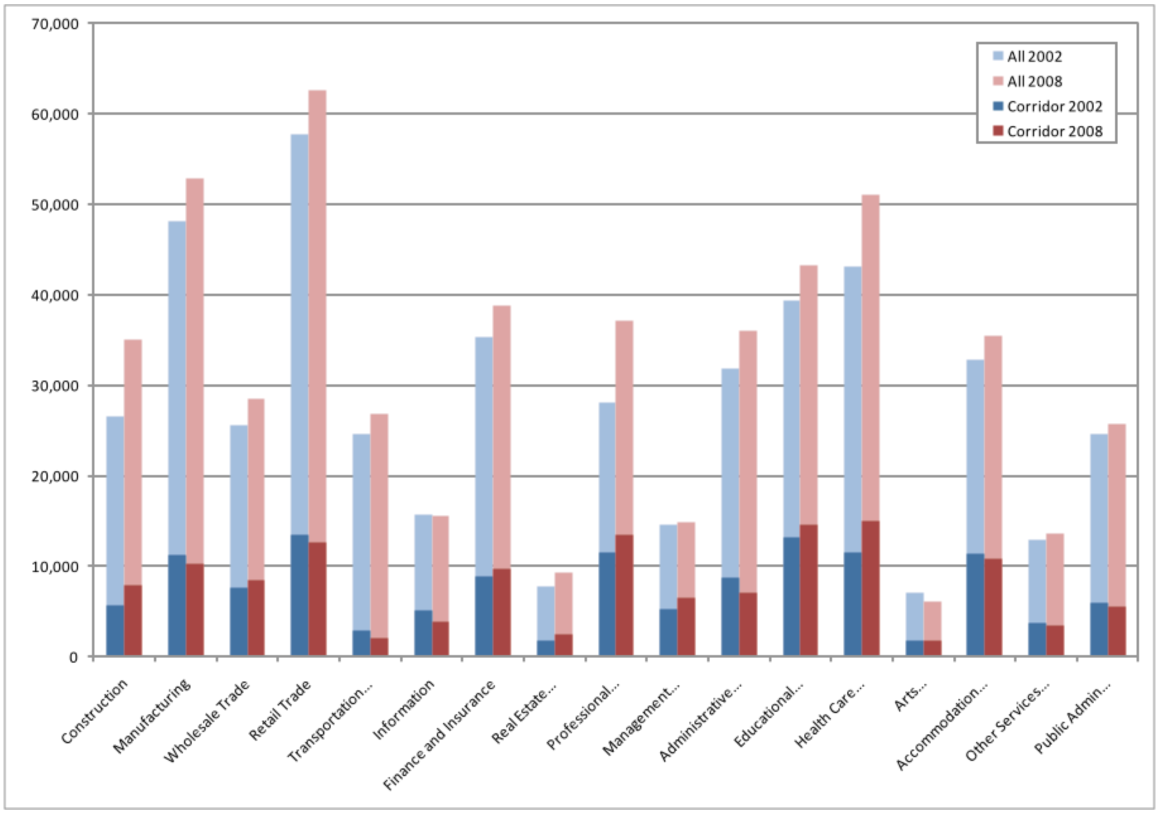
FIGURE 12 2002 to 2008 UTA TRAX corridor change in workers at place of home by Census block group. (Source: US Census Bureau Longitudinal Employment Data)



As illustrated in Figure 11 and Figure 12, both employment and resident worker population have generally become more dense along the original two TRAX lines in recent years, though it is unclear whether the new transit lines have been a major catalyst for this change, or whether this is part of a broader trend of densification along major corridors in the area. Areas with particularly large increases in density include the downtown area, the area just north of the University TRAX line between downtown and the University of Utah, and the area along the North/South TRAX line near Murray. Each of these areas has seen a significant increase in both employment and resident worker density. Additionally, the areas along the North/South TRAX line in the southern portion of Salt Lake City proper and near Midvale have seen increases in resident worker density, but no corresponding increases in employment density. At a regional level, the southwestern suburbs have been an area that has seen a substantial increase in resident worker density, and a more moderate increase in employment density, while the area southeast of Salt Lake City has experienced decreasing employment and resident worker density.

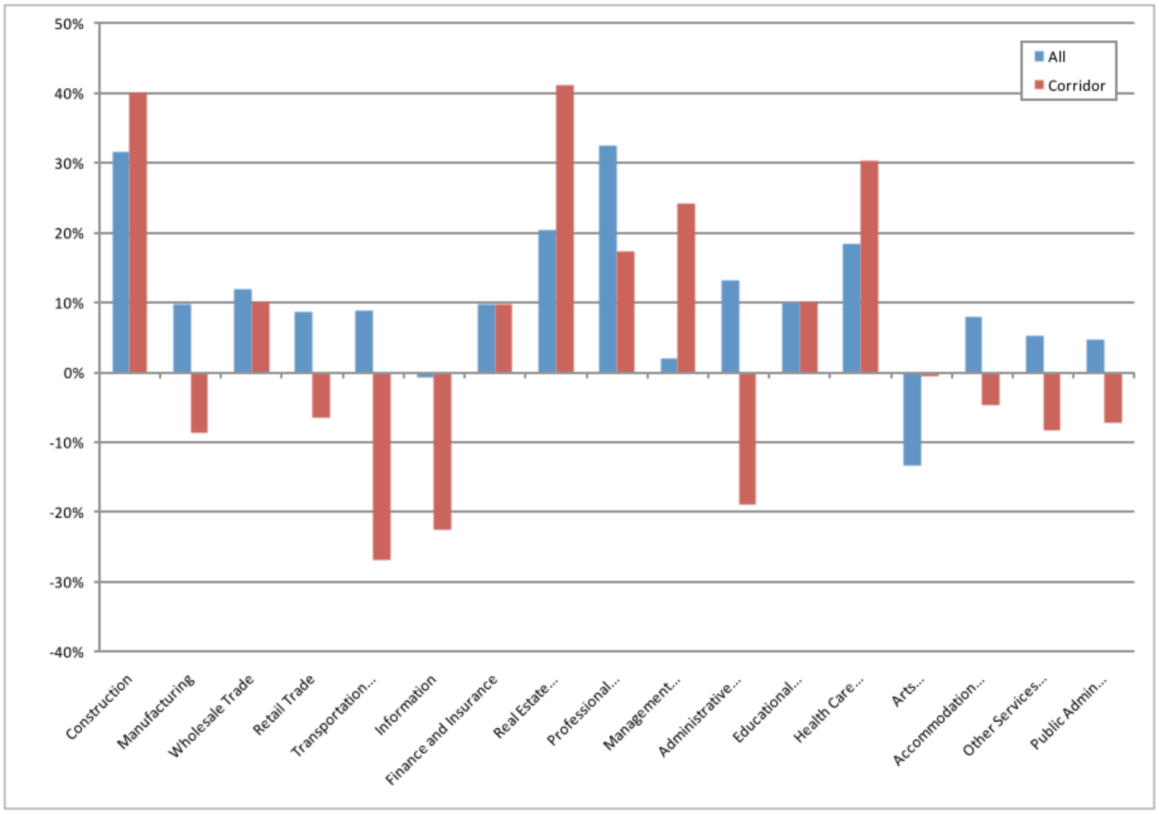
Of about 540,000 jobs in Salt Lake County, nearly 140,000 are located along the light rail corridor. More than 50% of jobs are in consumer service sectors, such as retail trade, accommodation, and public services. Business services comprise just under 30%. As shown in Figure 13, the distribution of jobs by sector in Salt Lake County and along the corridor is quite similar. The proportion of jobs in business service sectors and public service sectors is higher along the corridor, while in Salt Lake County, the concentration is higher in secondary industries and in trade sectors.

FIGURE **13 Salt Lake County and corridor employment by sector. (Source: US Census Bureau Longitudinal Employment Data)**



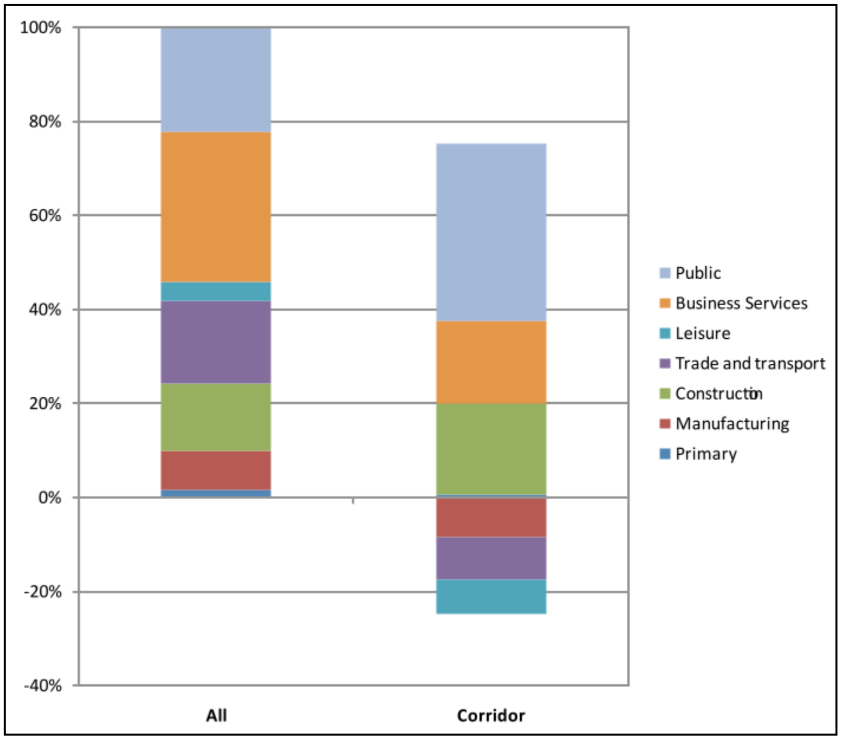
In terms of changes in jobs between 2002 and 2008, growth along the corridor has been higher than for Salt Lake County in construction and real estate, as well as management services (see Figure 14). This may be seen as an indication of higher levels of development along the corridor over the time period. However, other sectors that we would expect to benefit from agglomeration economies, such as information services, finance and insurance, and professional and administrative services, have experienced similar or lower levels of growth compared with those seen in Salt Lake County.

FIGURE **14 Change in Salt Lake County and corridor employment by sector, 2002 to 2008. (Source: US Census Bureau Longitudinal Employment Data)**



In Figure 15 (below), we see that a large share of the new jobs generated along the corridor between 2002 and 2008 has been in the public service sector (we include education, health care, and public administration in these categories), while in Salt Lake County, business services have seen the largest increase. Some of this increase along the corridor is likely due to expansion of the University of Utah. Anecdotal evidence suggests that the University draws a large share of TRAX ridership on the line, primarily students.

FIGURE **15 Salt Lake County and near corridor job growth by sector, 2002 to 2008. (Source: US Census Bureau Longitudinal Employment Data)**



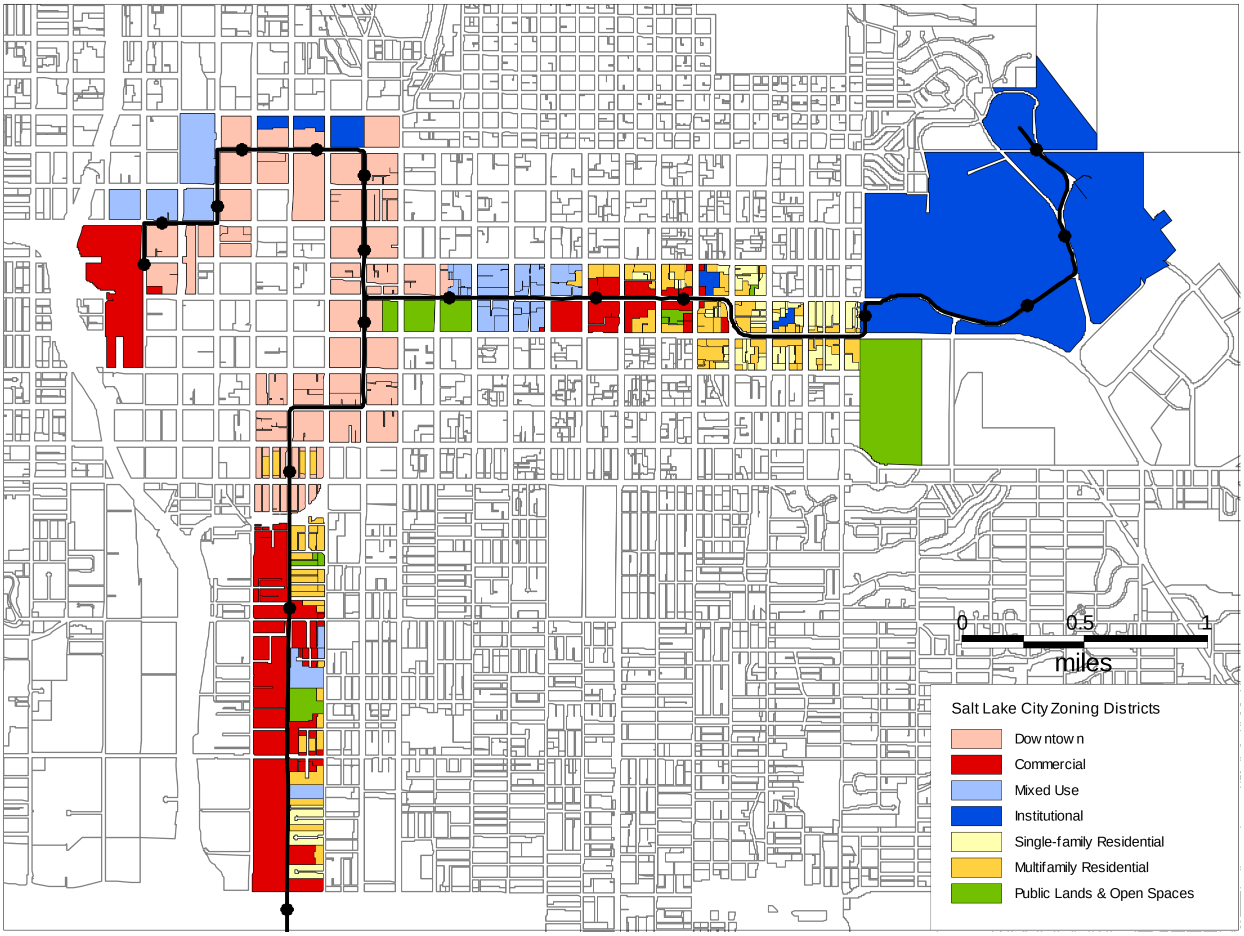
Zoning regulations

Salt Lake City zoning code divides land use into five primary categories: Residential, Commercial, Manufacturing, Downtown/Gateway, and Special Purpose. In addition, twelve types of overlay districts are specified, which can be effective concurrently with any zoning designation from the primary five categories. Within each zoning designation, permissible uses and qualifying provisions are listed, and common limitations on characteristics such as building height and landscaping are presented. Where multiple land uses are acceptable in a given zoning designation, each acceptable use has its own requirements for lot dimensions *(23)*. Along the Salt Lake City portion of the TRAX corridor, we identified 26 individual zoning designations, which we then aggregated into the 7 broader categories seen in Figure 16. These categories, defined below, are grouped based on land use characteristics that are important to development along the transit corridor and parallel those mapped for Los Angeles.

- **Commercial**: includes Community Business, Corridor Commercial, General Commercial, Neighborhood Commercial, and Community Shopping
- **Downtown**: includes Central Business District, Downtown Support District, Downtown Warehouse/Residential, and Downtown Secondary Central Business District
- **Mixed Use**: includes Residential/Business, Residential/Mixed Use, Residential/Office, Transit Corridor, and Gateway Mixed Use
- **Single-family Residential**: includes Single Family Residential, Single and Two-Family Residential, and Special Development Pattern Residential

- **Multi-family Residential**: includes Low Density Multi-family Residential, Moderate Density Multi-family Residential, Moderate/High-Density Multi-family Residential, and High-Density Multi-family Residential
- **Institutional**: includes Institutional and Urban Institutional
- **Public Lands & Open Spaces**: includes Public Lands and Open Space

FIGURE 16 2009 Salt Lake City TRAX corridor zoning. (Source: Salt Lake City Zoning GIS Data)



From the southern limits of Salt Lake City to approximately 900 South, the area to the west of the Sandy/Salt Lake City Line is zoned General Commercial, while the area to the east of the line consists of a mix of residential zoning designations. As the line travels north into the downtown area, the surrounding area is zoned Downtown Support District between 900 South and 600 South, and Central Business District, beginning at 600 South *(24)*.

From the University of Utah, the University Line travels through areas zoned Institutional (the University), and a variety of residential zoning designations, before reaching a three-block corridor zoned Corridor Commercial and Community Shopping between 900 East and 600 East. Between 600 East and 200 East, the University Line travels through an area zoned Transit Corridor, before entering the Central Business District at 200 East and connecting with the Sandy/Salt Lake City Line *(24)*.

Heading away from downtown, toward their shared western terminus, the two lines travel through areas zoned Secondary Central Business District, Gateway Mixed Use, Downtown Warehouse/Residential, and General Commercial before terminating at Central Station *(24)*.

In addition to permitted uses, Salt Lake City zoning regulates a number of characteristics that affect densification, including lot size, parking requirements, and maximum building height. As an indicator of density restrictions along the corridor and how they compare to the rest of Salt Lake City, Figure 17 and Figure 18 below show maximum building height by zoning parcel for non-residential and residential uses, respectively. Mixed-use zones are designated by hatched patterns on both maps.

FIGURE **17 2009 Salt Lake City maximum building height, non-residential zones. (Source: Salt Lake City Zoning GIS Data)**

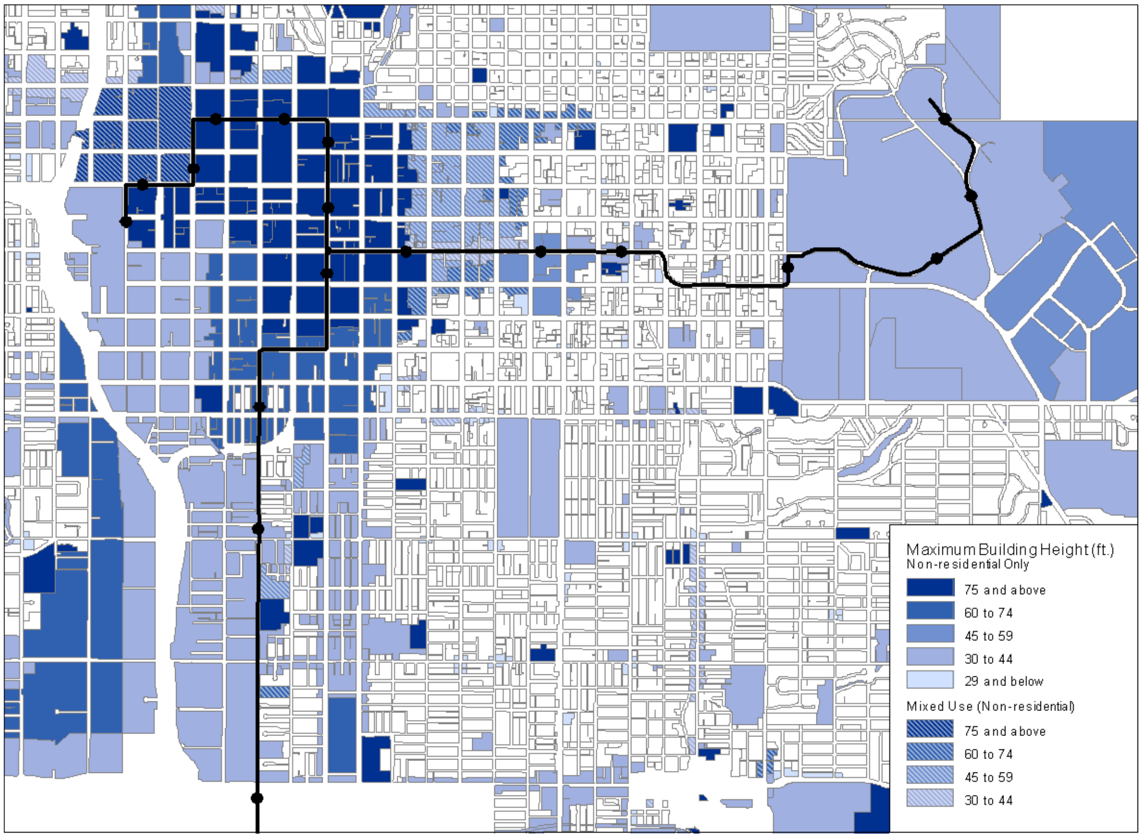
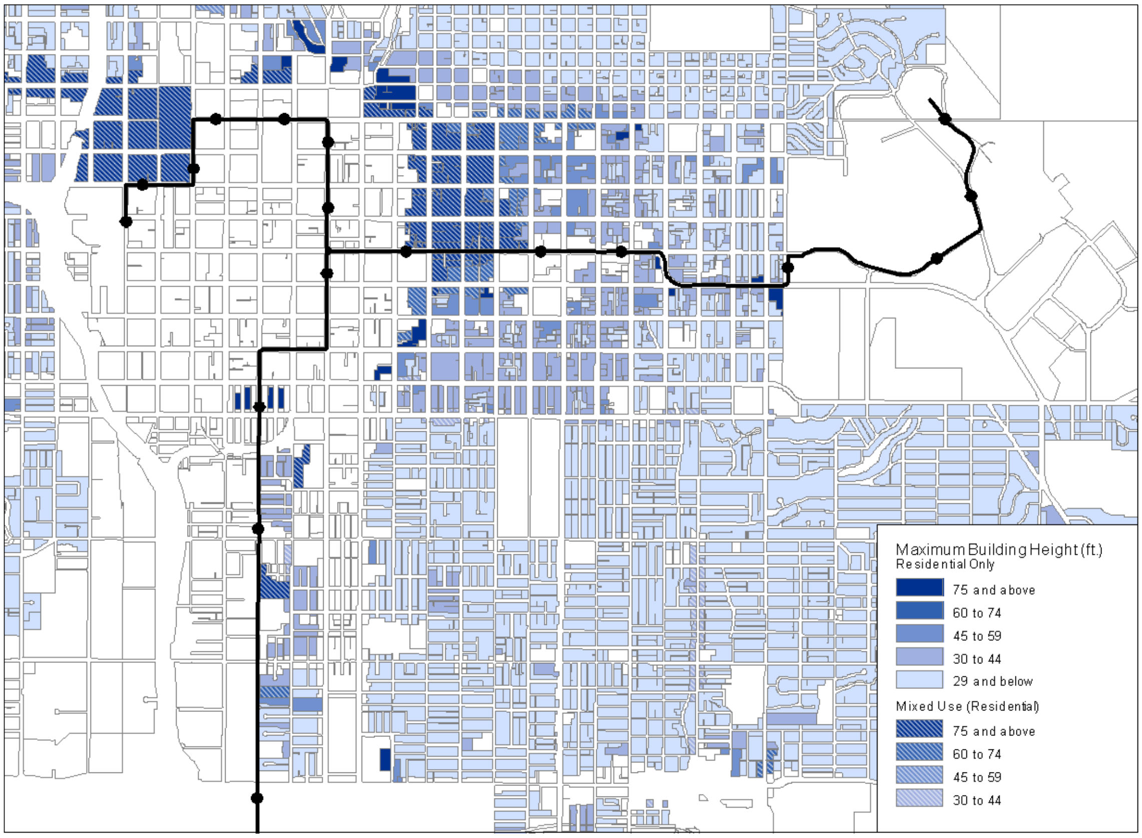


FIGURE **18 2009 Salt Lake City maximum building height, residential zones. (Source: Salt Lake City Zoning GIS Data)**



As expected, zones in downtown Salt Lake City have the largest allowable building heights, zones along the I-15 corridor and near the University of Utah allow for mid-range building heights, and zones in the primarily residential area southeast of downtown have the lowest allowable building heights seen in the area. Zoning along the TRAX lines follows these general trends, indicating that zoning regulations do not reflect efforts to encourage higher-density development along the transit corridor.

Although the University TRAX line lies fully within Salt Lake City, the Sandy/Salt Lake City Line also passes through South Salt Lake, Murray, and Midvale before terminating in Sandy. As in Salt Lake City, each municipality is responsible for zoning within its jurisdiction. While designations differ slightly across the different cities, the zoning categories and structure are similar to that of Salt Lake City and to each other. Zoning maps are not presented for the portion of the TRAX corridor passing through these four cities due to the unavailability of GIS zoning files, however, the discussion below is based on existing zoning maps for each city.

The City of South Salt Lake is responsible for zoning near the three TRAX stations just south of Salt Lake City. Zoning is designated as Light Industrial to the west of the TRAX line stations and General Commercial, Corridor Commercial, and Mixed to the east of 2100 South, 3300 South, and 3900 South, respectively *(25)*. Along the entire TRAX corridor through South

Salt Lake, there is also a TOD Overlay. The next three stations to the south are located within the City of Murray. The 4500 South station is located in a district designated Transit-Oriented Development, the 5300 South station is surrounded by zones designated Mixed Use Development District and Commercial Development Conditional, and the 6400 South station is located in an area zoned as Manufacturing General Conditional *(26)*. The two stations in Midvale, 7200 South and 7800 South, are located in areas designated as Transit-Oriented Development with Single Family zoning districts nearby. In Sandy, the 9000 South Station is in an area zoned primarily as Single Family, with an Industrial, Research Park district very nearby *(27)*. The 9400 South station has zoning designated as Commercial to the west and Single Family to the east. Open Space and Mixed Use zones surround the 10000 South station, the southern terminus of the TRAX line, with Commercial and Single Family districts in close proximity *(28)*.

Unlike for Los Angeles, GIS land use data were not available for Salt Lake City or the nearby municipalities. As a result, we relied on zoning GIS data to gain insight into the regulatory environment and land use characteristics around TRAX stations.

Regulatory constraints like zoning play important roles in shaping regional economic development in Salt Lake City, as in the other case study regions. Some of the firm expansions in downtown and at the university have been constrained by parking supply. At the University of Utah, parking does not compete favorably with research facilities for land rent, and therefore they have embraced transit; the result has been a 30% mode share of transit for students, faculty and staff, much higher than the regional average. In downtown, firms are wary about parking costs and are seeking alternatives, but workers place a high value on their automobiles and are reluctant to give up parking, at least in the short term.

SLC Interviewee F cited the environmental concerns that are somewhat unique to the Salt Lake City region as a major motivator for transit investment in the region. The annual "inversions" that create thick smog have serious respiratory health effects for a lot of people, and UTA has been able to use this highly visible condition as a selling point for transit (SLC Interviewee F, personal communication, 12-12-2010).

According to SLC Interviewee D, the primary constraints on development in Murray have mostly been environmental. The stations in Murray are all located along older industrial areas served by freight rail lines, and as a result many of the available development areas have significant contamination that needs to be dealt with prior to redeveloping. To deal with these issues, the city has used tax incremental financing as the primary tool for funding cleanup. Another constraint has been parcel assemblage, but this is not unique to the transit areas; it is an issue anywhere where redevelopment is happening. A third constraint has been infrastructure for pedestrians and transit. Since the redevelopment areas are older industrial zones, they are not configured to support pedestrian and transit movement patterns, and need to be reconfigured as part of the street fabric of the rest of the city to make them more accessible. This has been another use for TIF (SLC Interviewee D, personal communication, 01-21-2011; DFW Interviewee A, personal communication, 02-03-2011).

Parking has not been a major constraint in Murray, according to SLC Interviewee D. The city has relaxed minimum parking requirements, but still sees many developers seeking "suburban" style developments with parking supplies greater than the minimum. They do have parking maximums in place in their downtown area. Because of the industrial history of the redevelopment areas, Murray has not seen the kinds of resistance to densification that other communities have faced. These areas have been identified by many community stakeholders as in need of redevelopment, and this has been a great benefit to the process. The real issue or constraint facing potential developers right now is financing. Deals are not happening because no one can raise money for development (SLC Interviewee D, personal communication, 01-21-2011; SLC Interviewee E, personal communication, 01-05-2011).

Dallas – DART light rail

This case study focuses on the Dallas Area Rapid Transit (DART) light rail system, the first phase of which opened in 1996. Specifically, we examine DART's first two light rail lines, the Red and Blue lines, which roughly parallel Texas State Highway 75 and Interstate Highway 35E, respectively.

The Dallas-Fort Worth region is a rapidly growing regional economic center on the verge of becoming a global city. The region already serves as a center for energy and financial accounting industries. Like Los Angeles, Dallas has rapidly expanded its transit facilities through investment in its rail transit network. Unlike Los Angeles, however, Dallas did not have a strong history of transit service. Yet it has been successful in continuing to expand its initial investment in rail transit despite uneven geographical support for these expansions. A broad coalition of interests has stuck with the project despite some struggles to advance projects quickly. The Dallas area transit agencies have been proactive in seeking evidence of the economic benefits of transit investment, primarily through a partnership with the University of North Texas. Of our three case studies, Dallas has most directly pursued strategies to maximize the job growth impacts of transit.

The continually increasing congestion in the Dallas area makes it a prime candidate to experience agglomeration benefits from transit investment, due to large gains in accessibility to labor markets that could result from improved transit service. However, empirical evidence that this has resulted from the 1990s investment in the DART light rail system is limited.

Examination of time-series employment data from 2002 to 2008 shows increases in employment and resident worker population densities near the northern portion of each corridor, and decreases in employment and resident worker population densities in the downtown area. Again, it is not clear if these increases on the northern portions of the corridors are direct results of transit investment, or part of a broader trend. The data also do not indicate an increased presence of jobs in industries prone to agglomeration near the corridor over the period. Additionally, since the 1996 opening of the DART light rail system, there do not appear to have been any corresponding changes in zoning laws to encourage or allow increased densification along the corridor. As seen in Salt Lake City, zoning regulations along the DART light rail corridors do not differ substantially from those outside the corridors.

The Dallas case, as described by our discussions with planners and professional developers, is somewhat similar to the Salt Lake City case in a number of ways. Developers have been slow to embrace transit-oriented development principles in the outlying areas, though there are notable exceptions, such as Mockingbird Station and downtown Plano. Parking and infrastructure constraints have led to a slower pace of agglomeration in the downtown area than many participants would like to see. Unlike the Salt Lake City case, Dallas does not have typical planning regulatory barriers to address in the downtown area. Instead they rely heavily on flexible negotiations for each project in a process of creating Planned Development Districts. These overlay districts allow developers to set the parameters of development. Yet, like the Salt Lake City case, downtown Dallas is constrained by parking and infrastructure limitations. Addressing these is much trickier than typical planning regulations like zoning or building height/bulk.

Current state of the transit system

The Dallas-Fort Worth region is served by two rail transit systems and a variety of bus and other transit services. DART operates the light rail system, and jointly (with the Fort Worth Transportation Authority) runs the area's commuter rail service, the Trinity Railway Express (TRE). The DART light rail system consists of three color-coded lines totaling 55 stations and about 48 miles of track. The TRE system adds another 10 stations and 34 miles. DART light rail serves over 64,000 passengers each weekday, while TRE serves nearly 10,000 *(29)*. The DART system also includes bus service of 674 vehicles serving 146,000 weekday boardings.

DART light rail is operated with modern light rail vehicles called Super Light Rail Vehicles, featuring level boarding and increased passenger capacity *(30)*. DART light rail headways average about 15 minutes, systemwide, but the Red Line and Blue Line have supplemental Orange Line service that increases frequency during peak hours to about 7 minutes.

Twenty of the 35 stations along DART's Red and Blue lines have free parking available. Most of these spaces are at stations towards the ends of the lines, rather than in central Dallas. The eight stations between the northern split of the Red and Blue lines at Mockingbird Station and the southern split at the 8th and Corinth Station offer no free parking. The northern terminus of the Red Line in Plano has the most spaces, with just over 2000, and several of the other stations along the Red Line north of Mockingbird Station have among the highest number of free parking spaces *(31)*.

Economic development and related policies

The North Central Texas Council of Governments (NCTCOG) is the regional body that oversees economic development and transportation infrastructure planning for the Dallas-Fort Worth region. A representative of NCTCOG stated that the organization does not focus on specific industrial clusters, but rather regional growth as a whole. Furthermore, there is no region-wide effort to direct development of clusters to distinct parts of the region in an effort to maximize the productivity gains of clustering (DFW Interviewee F, personal communication,12-16-2010).

DART and Dallas-area lawmakers have been interested in the development impacts of DART rail projects from the early stages, though real estate developers have embraced the potential for transit to help their business in the last decade or so *(32)*. One recent study estimated the "value of projects attributable to the presence of a DART rail station since 1999" at $4.26 billion. These properties generate considerable revenues for the member cities and states, both in property taxes (estimated at about $78 million annually) and sales taxes ($42 million annually) *(33)*. The fact that these studies were commissioned by DART indicates that economic development and transit-oriented development are two key goals of their overall transit policy.

A more recent transit environmental impact study conducted by DART planners assessed different build alternatives in the downtown Dallas area. Though the study focused on the largest employment center in the metropolitan region, little mention was made of the potential employment impacts of transit investment. Instead, the focus was on transit-oriented development impacts and attracting ridership to the system *(34)*.

Current context – employment, transportation, and land use

Accessibility/congestion

In 2007, annual delay per peak traveler in the Dallas-Fort Worth-Arlington metro area was 53 hours, which is 29% higher than the average for all 90 urban areas in TTI's 2009 Urban Mobility Report. Compared with peer metro areas, Dallas-Fort Worth's annual delay is 4% higher than the average for very large urban areas. Between 1997 and 2007, congestion in the Dallas-Fort Worth area has increased approximately 56%. Over this same period, the average congestion in very large urban areas and all urban areas contained in the TTI report increased by 19% and 14%, respectively *(13)*. With increased congestion, the benefits of fixed-guideway transit are enhanced with respect to mobility and accessibility improvements to dense urban centers. Transit, in this case, may allow increased densification and industry agglomeration in highly congested urban centers.

FIGURE 19 2002 to 2008 DART light rail corridor change in workers at place of work by Census block group. (Source: US Census Bureau Longitudinal Employment Data).

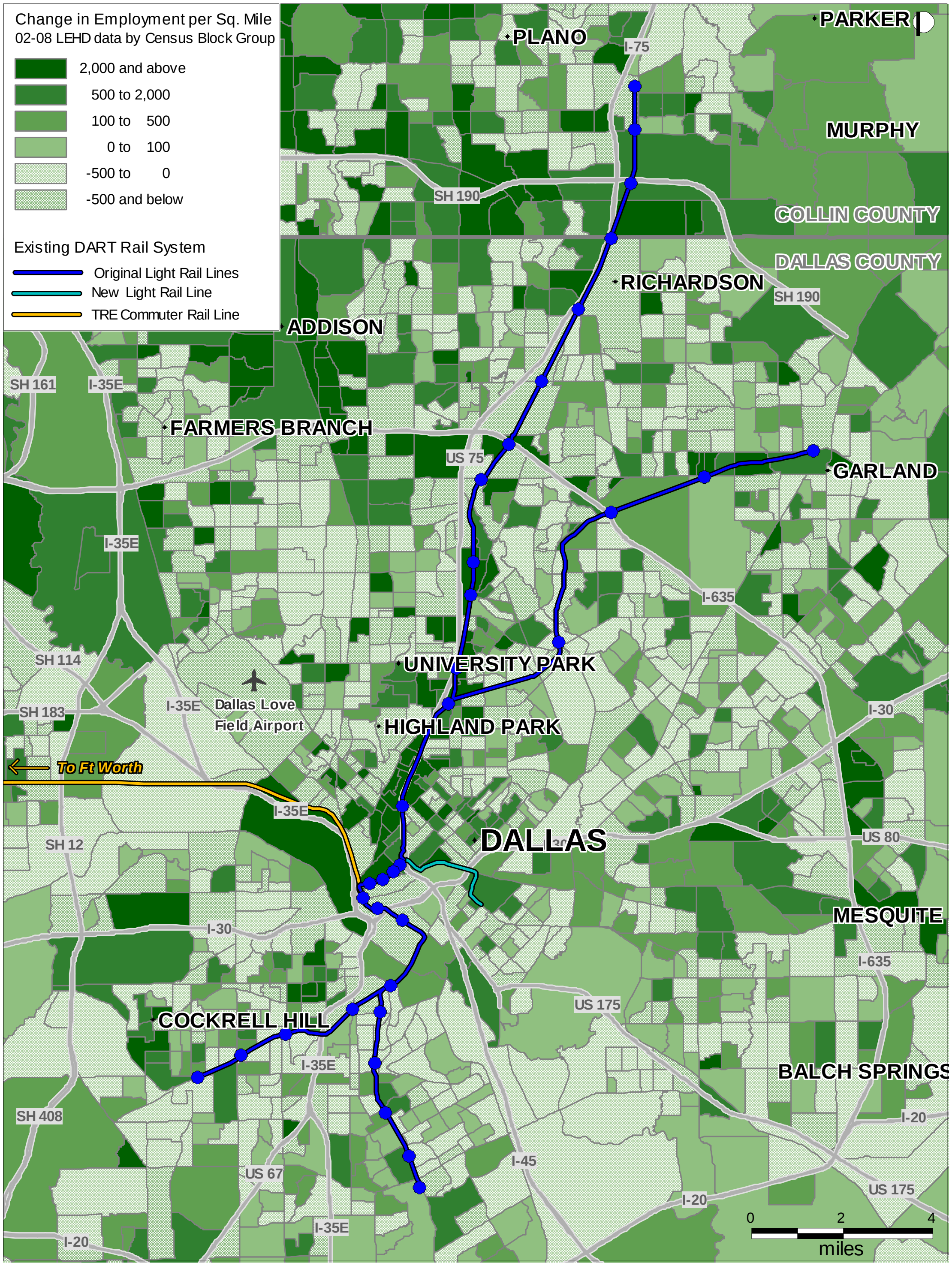
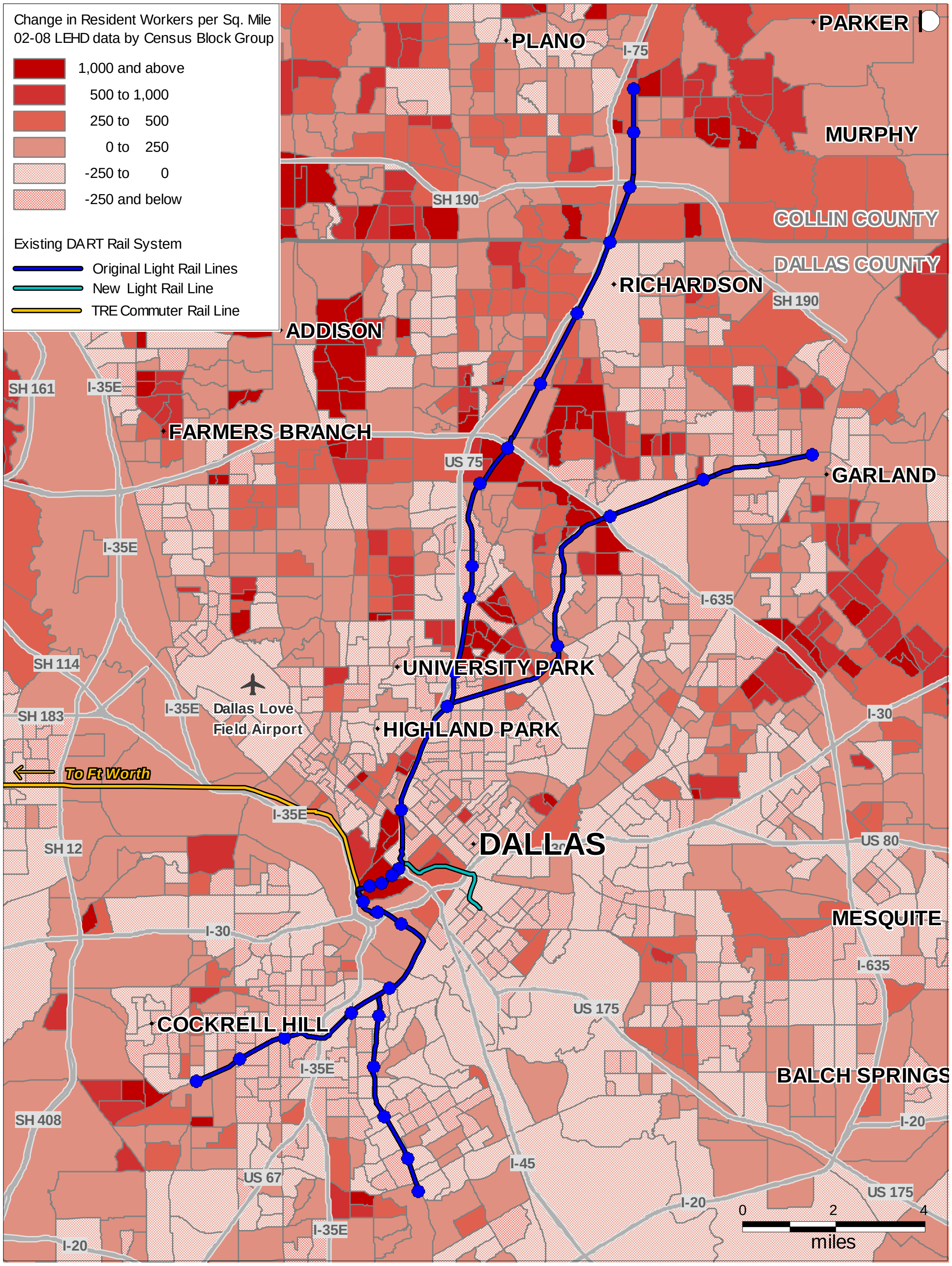


FIGURE 20 2002 to 2008 DART light rail corridor change in workers at place of home by Census block group. (Source: US Census Bureau Longitudinal Employment Data).

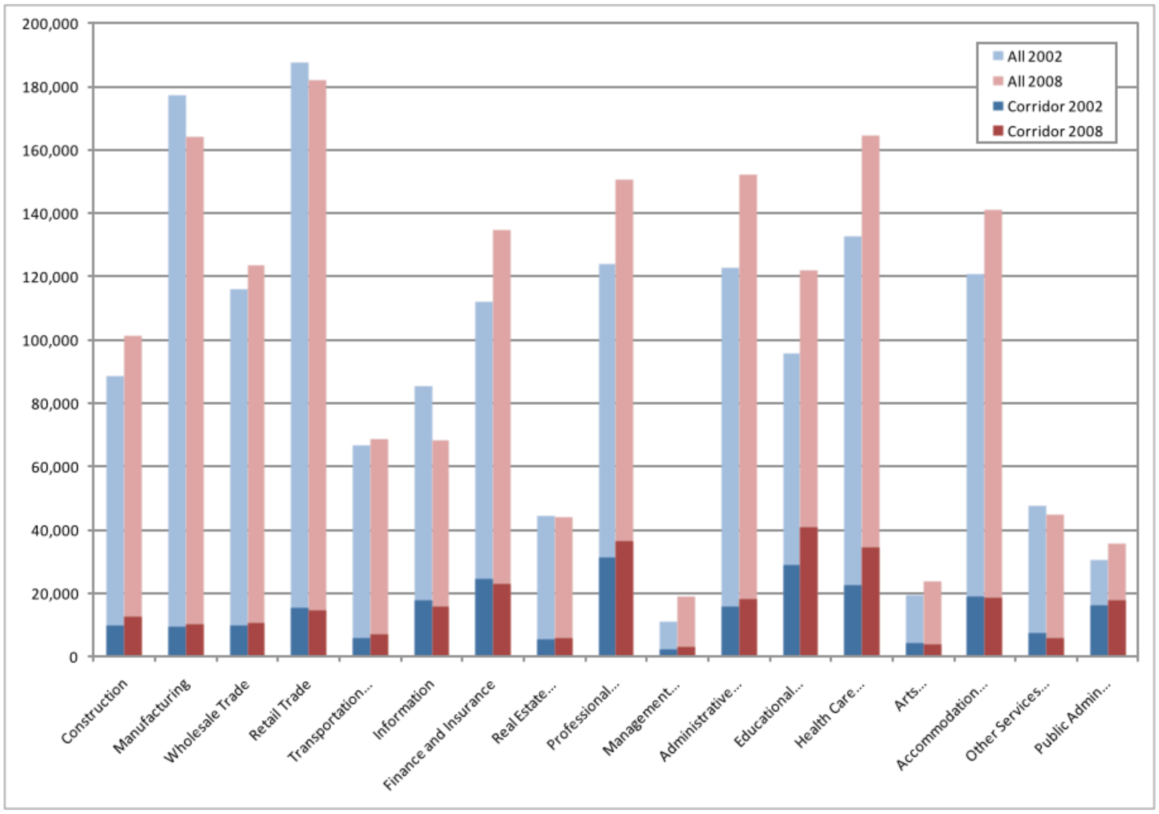


Employment and industry characteristics

As illustrated by Figure 19 and Figure 20 above, both employment and resident worker population became denser between 2002 and 2008 along the light rail corridor in downtown Dallas. Employment density continues to increase north from downtown Dallas along US 75 until just south of I-635. Resident worker densification is seen along the light rail corridor along US 75 north of I-635 to Plano. The area surrounding the north terminus of each line also experienced employment and resident worker densification. Despite these signs of densification, much of the central Dallas area experienced decreases in employment and resident worker density. At the regional level, Addison and the areas east and west of Plano and along SH 190 near Plano experienced the highest increases in employment, which is likely independent of light rail. In terms of resident workers, Dallas County north of the University Park area and the southern portion of Collin County had significant overall increases in resident worker density.

Figure 21 shows the distribution of employment (by workplace) in 2002 and 2008 for Dallas County and Collin County and for areas surrounding transit stops along the study corridor.

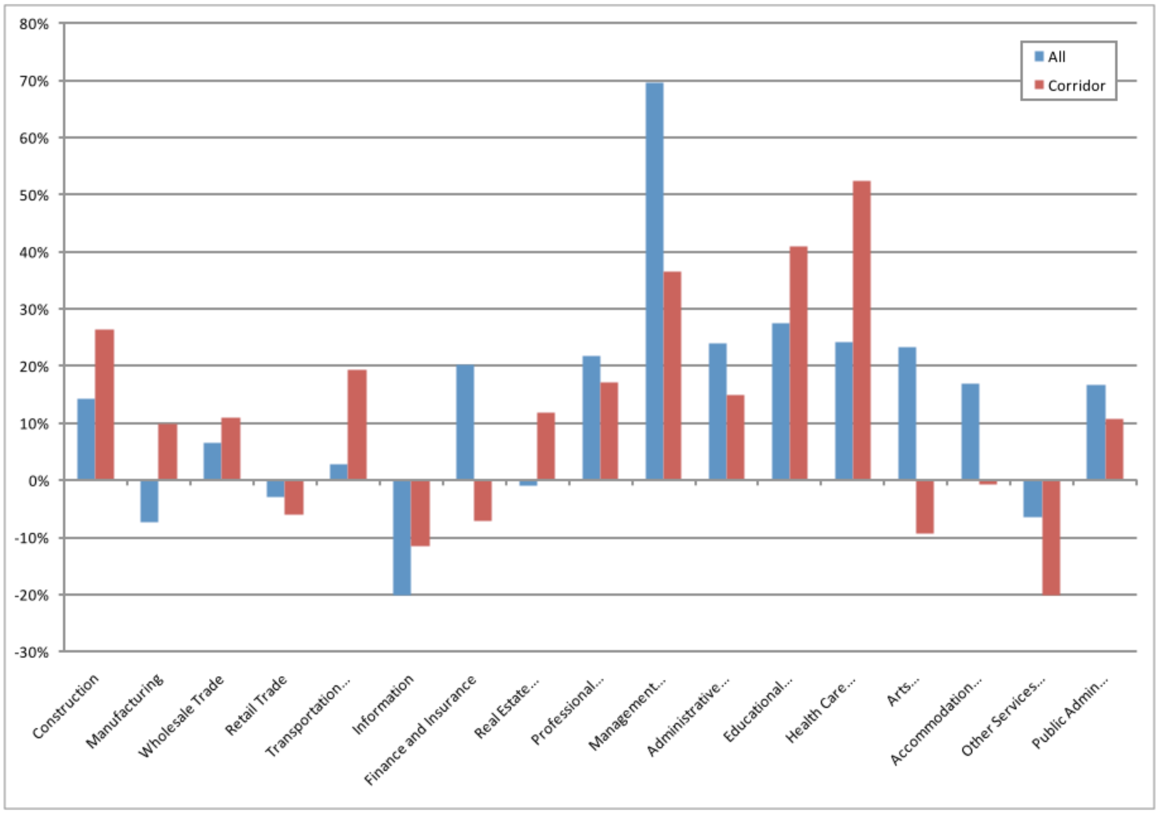
FIGURE **21 Dallas area and corridor employment by sector. (Source: US Census Bureau Longitudinal Employment Data)**



Out of 1.8 million total employees in Dallas and Collin Counties in 2008, around 290,000 were located along the corridor. Employment in the two counties is largely service-based, with the business and consumer service sectors each comprising more than 30% of the total. The manufacturing and construction sectors are also sizable, together comprising about 15% of jobs. Additional key sectors in the Dallas area include high-technology industries, such as information technology, defense, life sciences, and semiconductors, as well as logistics and healthcare *(35)*. Employment along the corridor is concentrated in business services and public administration to a larger extent than total area employment.

Figure 22 shows the percentage change in employment in Dallas County and Collin County and along the corridor between 2002 and 2008.

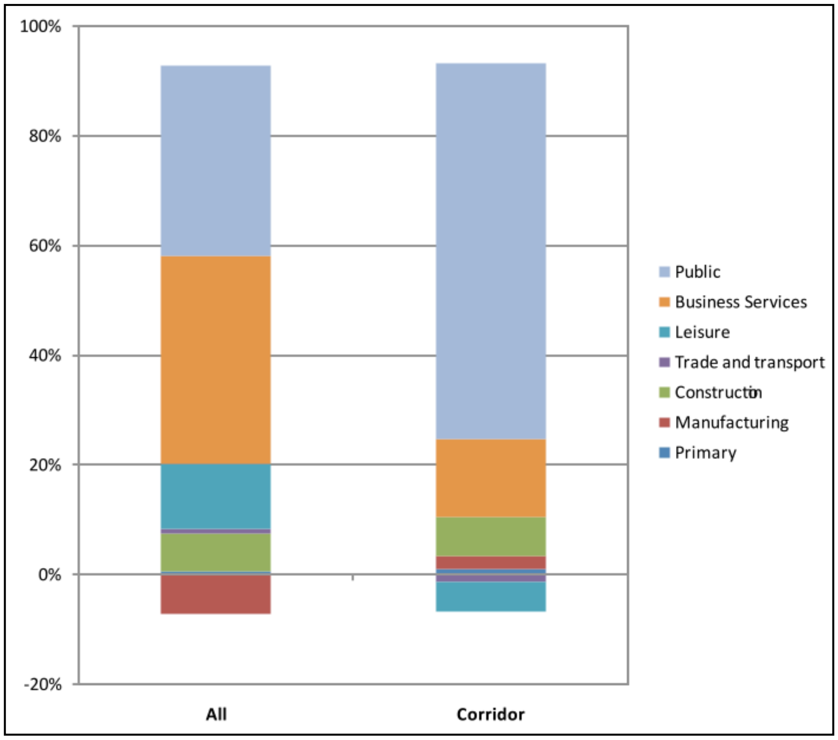
FIGURE **22 Change in Dallas area and corridor employment by sector, 2002 to 2008. (Source: US Census Bureau Longitudinal Employment Data)**



Growth in the corridor is higher than average for agriculture, construction, transportation, wholesale trade, real estate, and some public/social services. There has also been growth in manufacturing along the corridor, but a decrease in manufacturing jobs in Dallas County and Collin County overall. The loss of jobs in information services has been smaller in the corridor than for the two counties overall. Some of this is consistent with increased development (construction, transportation, and real estate), but are not exactly the typical sectors we think would benefit from urban agglomeration economies, with the possible exception of information services.

Figure 23 shows the composition of new jobs between 2002 and 2008, along the corridor and for Dallas County and Collin County.

FIGURE **23 Dallas area and near corridor job growth by sector, 2002 to 2008. (Source: US Census Bureau Longitudinal Employment Data)**



More than 70% of the additional jobs in the corridor are in the public services sector (public administration, health, and education services). Slightly more than 15% of job growth occurred in business services (financial, information, management, etc.). Over the same period, overall job growth for Dallas County and Collin County was driven by growth in business services.

These patterns do not seem to indicate agglomeration-driven densification as a result of the two original DART light rail lines, as the type of activities we would normally think would benefit from access to transit stations would be sectors that require access to a highly-skilled and specialized work force.

Two planners we spoke with pointed out that Dallas has been a leader in attracting new and existing financial, insurance and real estate firms to open or expand in the region (DFW Interviewee D, personal communication, 02-17-2011; DFW Interviewee B, personal communication, 02-28-2011). Corporate relocations are one common project type, whether its headquarters or back office facilities. These types of projects are typically focused on existing office inventory, and either moving into the city or moving from one office building to another. In some cases, perhaps as many as 30-40% of the office related projects that the city works on in the downtown area, access to transit is one factor among many in the decision to locate. Rail access to labor force is often a primary consideration for these types of projects. Companies use detailed quantitative modeling to determine labor market access, which includes accessibility measures like journey to work.

Most of the development changes in downtown Dallas around transit stations have been conversions from Class B and C office space into residential uses, according to interview sources. These haven't been new developments, but changes in the use of existing buildings. Dallas has an oversupply of large office towers, and one City of Dallas planner sees the primary development objectives as infill, with smaller projects of 3-8 stories with a mix of uses. The City of Dallas is concerned with the creation of an urban fabric, rather than an abstract increase in density. To ensure consistency among the developments, the City of Dallas plans to initiate a design peer review committee to oversee project proposals in the downtown area. It is too difficult to take away the unlimited development potential from landowners in downtown, so design review is the best alternative to ensuring the type of development the city would like to see, according to one expert (DFW Interviewee D, personal communication, 02-17-2011).

Zoning regulations

In order to regulate development, Dallas zoning code specifies setbacks, density, building height, lot coverage, and primary use for each zoning designation. Residential zoning categories include Single Family, Duplex/Townhouse, and Clustered Housing/Multi-family. Non-residential categories include Office, Retail, Commercial/Industrial, Central Area, Mixed Use, Multiple Commercial, and Parking *(15)*. In the downtown area, Dallas's zoning regulations are superseded by Planned Development Districts. These districts allow developers to negotiate the form-based requirements of their projects on a case-by-case basis in partnership with the City of Dallas (DFW Interviewee D, personal communication, 2-17-2011). PDDs provide much more flexibility and effectively eliminate zoning as a regulatory barrier to development. Other barriers, in particular parking and municipal infrastructure, were still cited as significant even in areas where PDDs were in use.

Using GIS zoning files from the City of Dallas and the City of Plano, we aggregated zoning designations into the nine broader categories shown in Figure 29 and Figure 30. These categories, defined below, are grouped around zoning characteristics that are important to development along the transit corridor. GIS zoning data was unavailable for Garland and Richardson, and as a result the figures do not include zoning parcels within those jurisdictions.

- **Downtown**: Central Area
- **Commercial**: includes Commercial Service, Multiple Commercial, General Office, Office District, Limited Office, Mid-Range Office, Neighborhood Office, Neighborhood Service, Community Retail, Regional Retail, and General Retail
- **Industrial**: includes Industrial Manufacturing, Industrial Research, and Light Industrial
- **Planned Development**: Planned Development District
- **Mixed Use**: Mixed Use
- **Single-family Residential**: includes Single-family Residential, Duplex, Townhouse
- **Multi-family Residential**: includes Multi-family, Clustered Housing
- **Other**: Conservation District
- **Parking**: Parking

FIGURE 24 2011 DART corridor zoning, south of Mockingbird Station. (Source: City of Dallas Zoning GIS data)

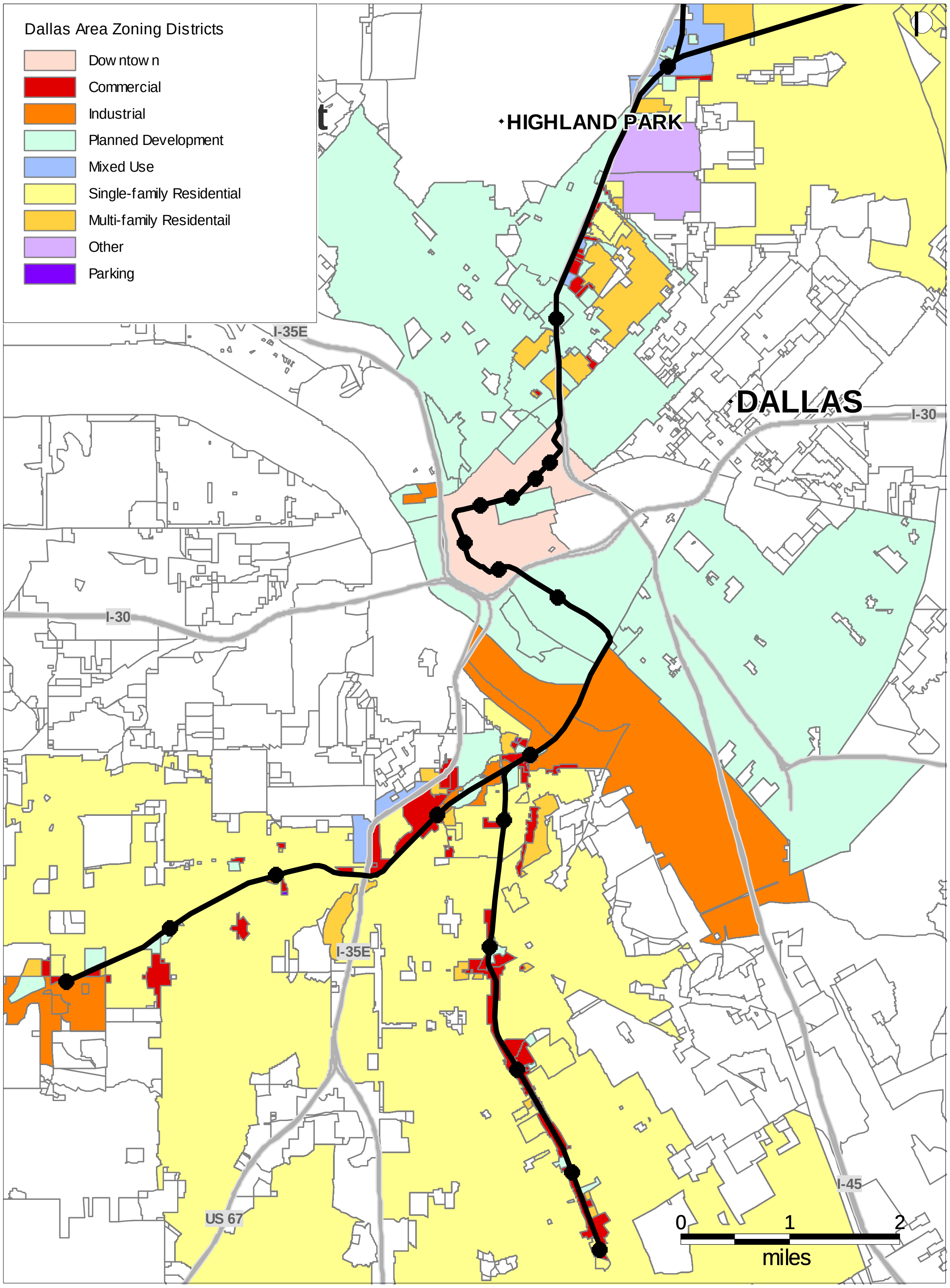
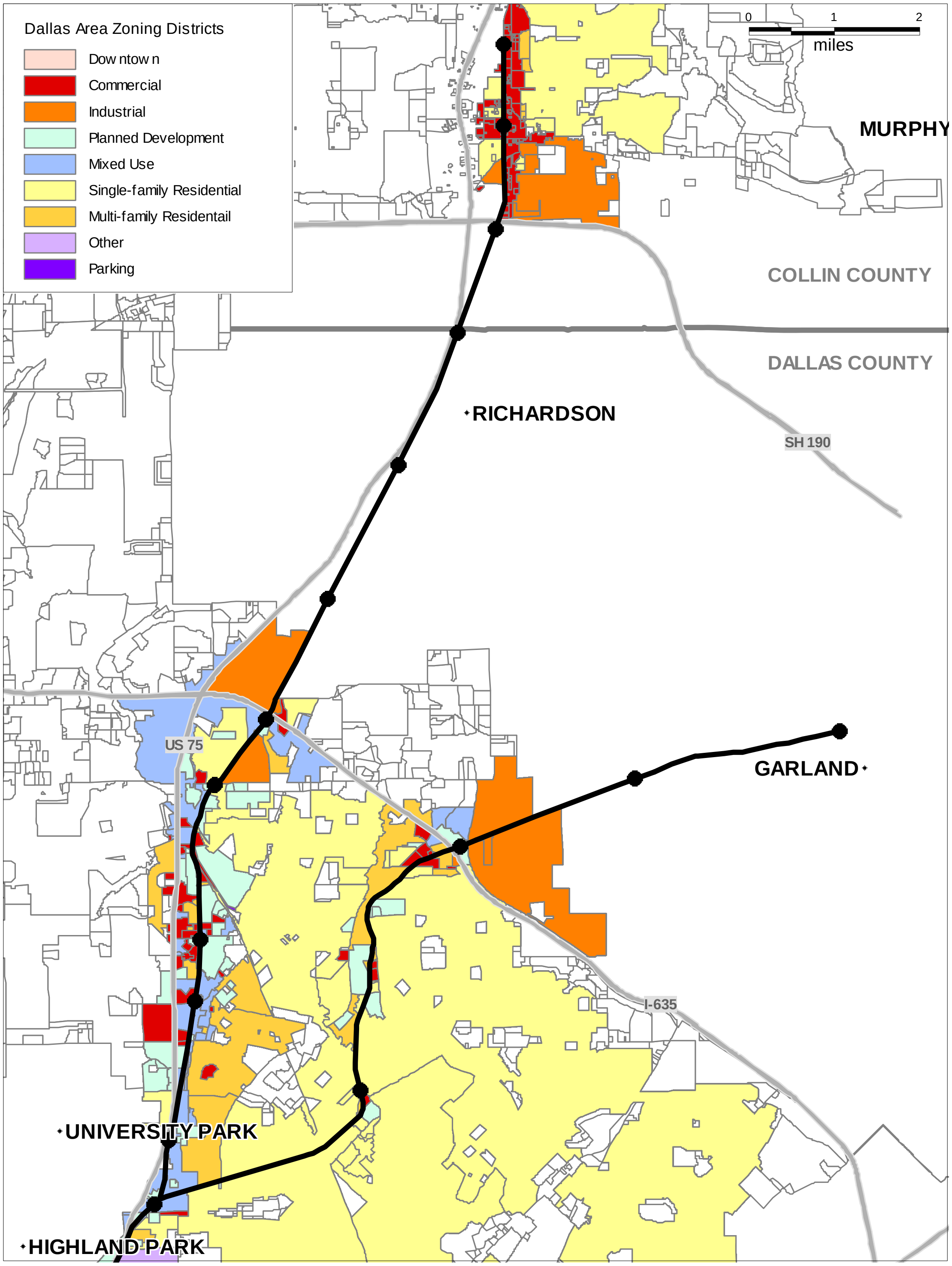


FIGURE 25 2010/2011 DART corridor zoning, north of Mockingbird Station. (Source: City of Dallas and City of Plano Zoning GIS data)



Land use GIS files obtained from NCTCOG were used to create the maps below. NCTCOG has 25 land use designations, which we then aggregated into the 8 broader categories seen in Figure 26, Figure 27, and Figure 28 below. These categories, defined below, are grouped similarly to those mapped for Los Angeles and Salt Lake City.

- **Commercial**: includes Office, Retail, Hotel/Motel, Transportation, and Utilities
- **Single-family Residential**: includes Single Family and Mobile Home
- **Multi-family Residential**: includes Multi-family
- **Institutional**: includes Group Quarters, Institutional, Airport, Runway, and Large Stadium
- **Public Lands & Open Spaces**: includes Parks/Recreation, Landfill, Flood Control, Vacant, and Water
- **Industrial**: includes Industrial
- **Parking**: includes Parking Garage, Parking CBD, and Expanded Parking
- **Other**: includes Roadway and Under Construction

FIGURE 26 2005 DART corridor land use, south of Mockingbird Station. (Source: NCTCOG GIS Land Use Data)

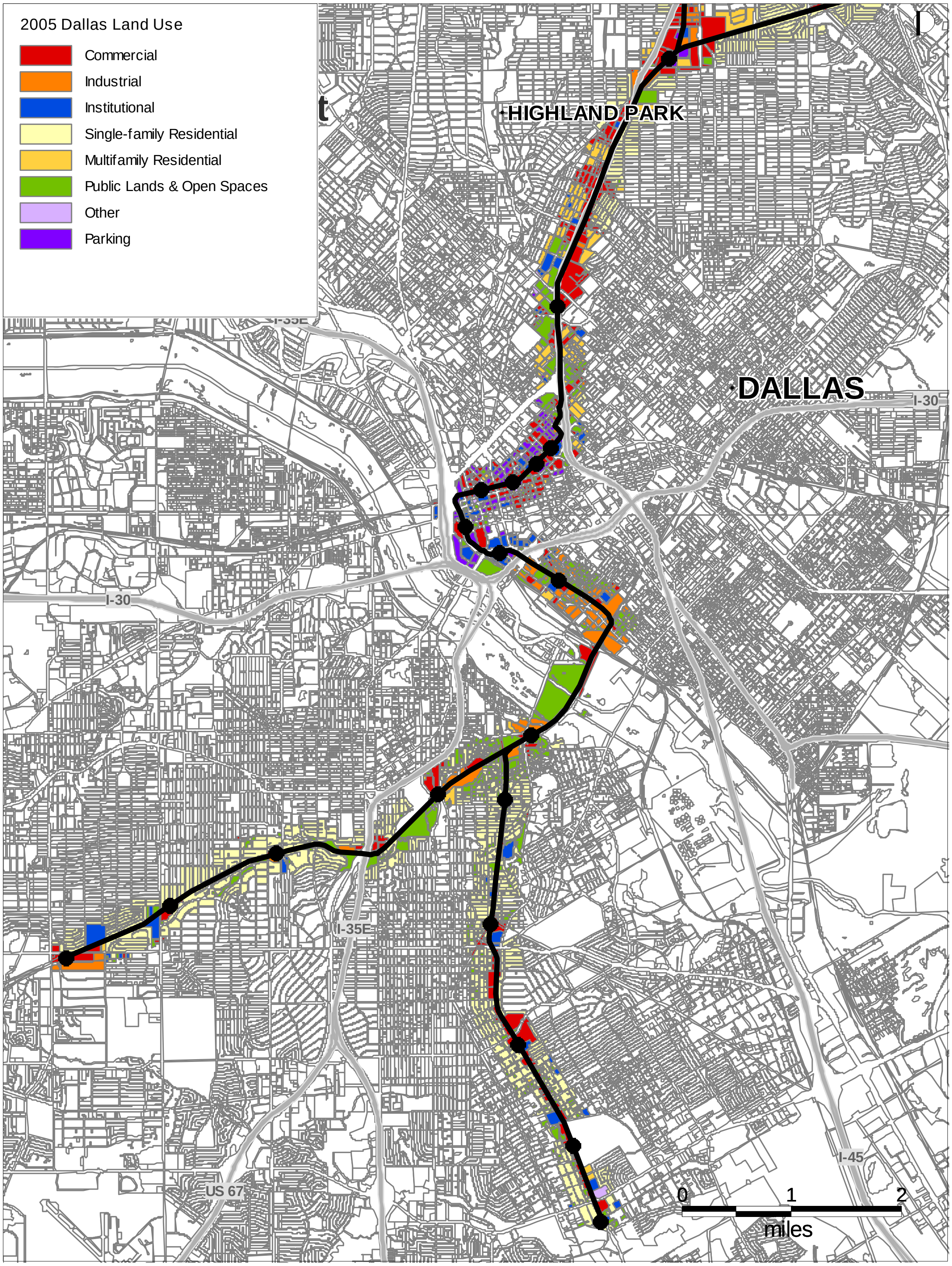


FIGURE 27 2005 DART corridor land use, north of Mockingbird Station. (Source: NCTCOG GIS Land Use Data)

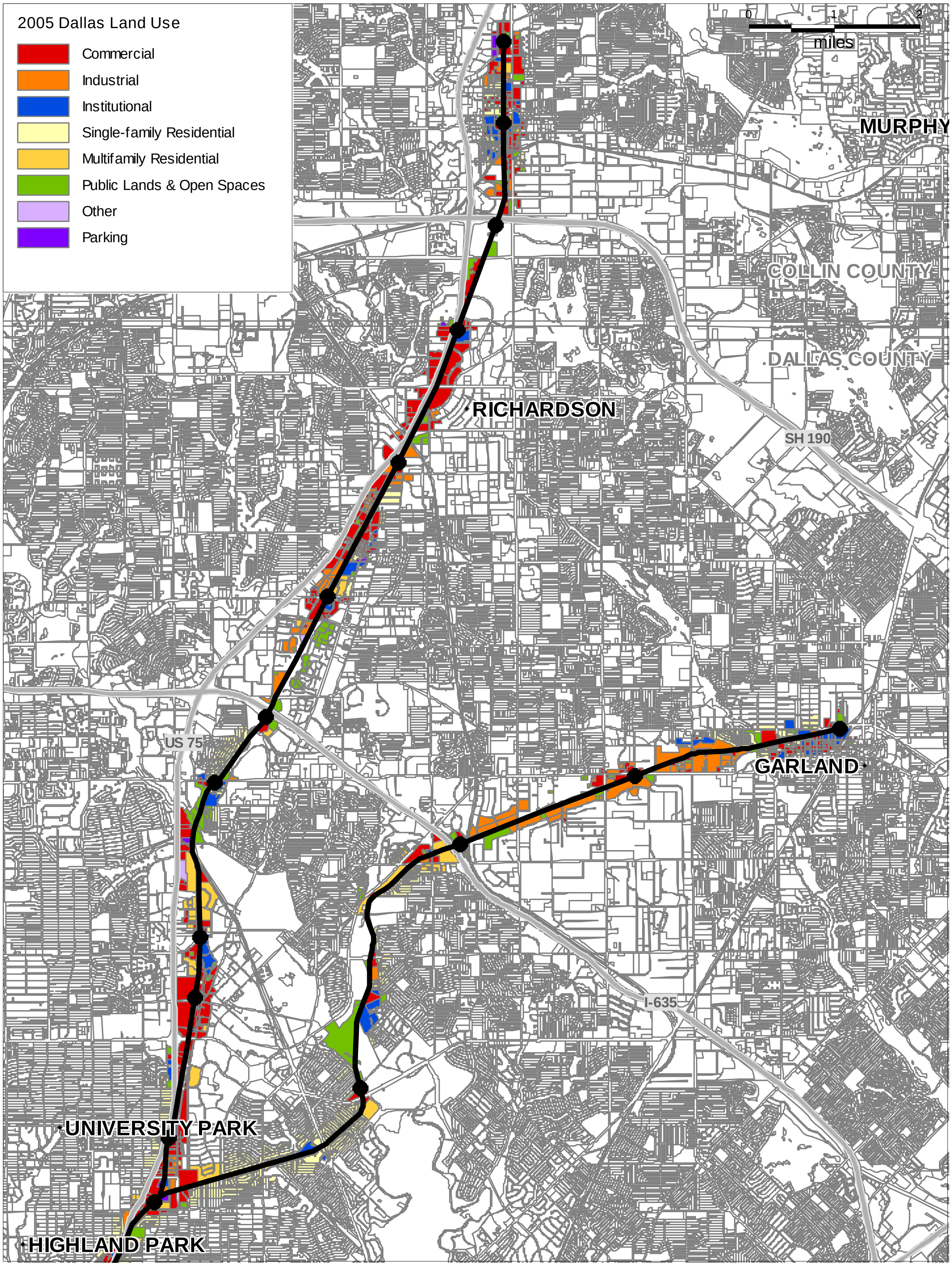
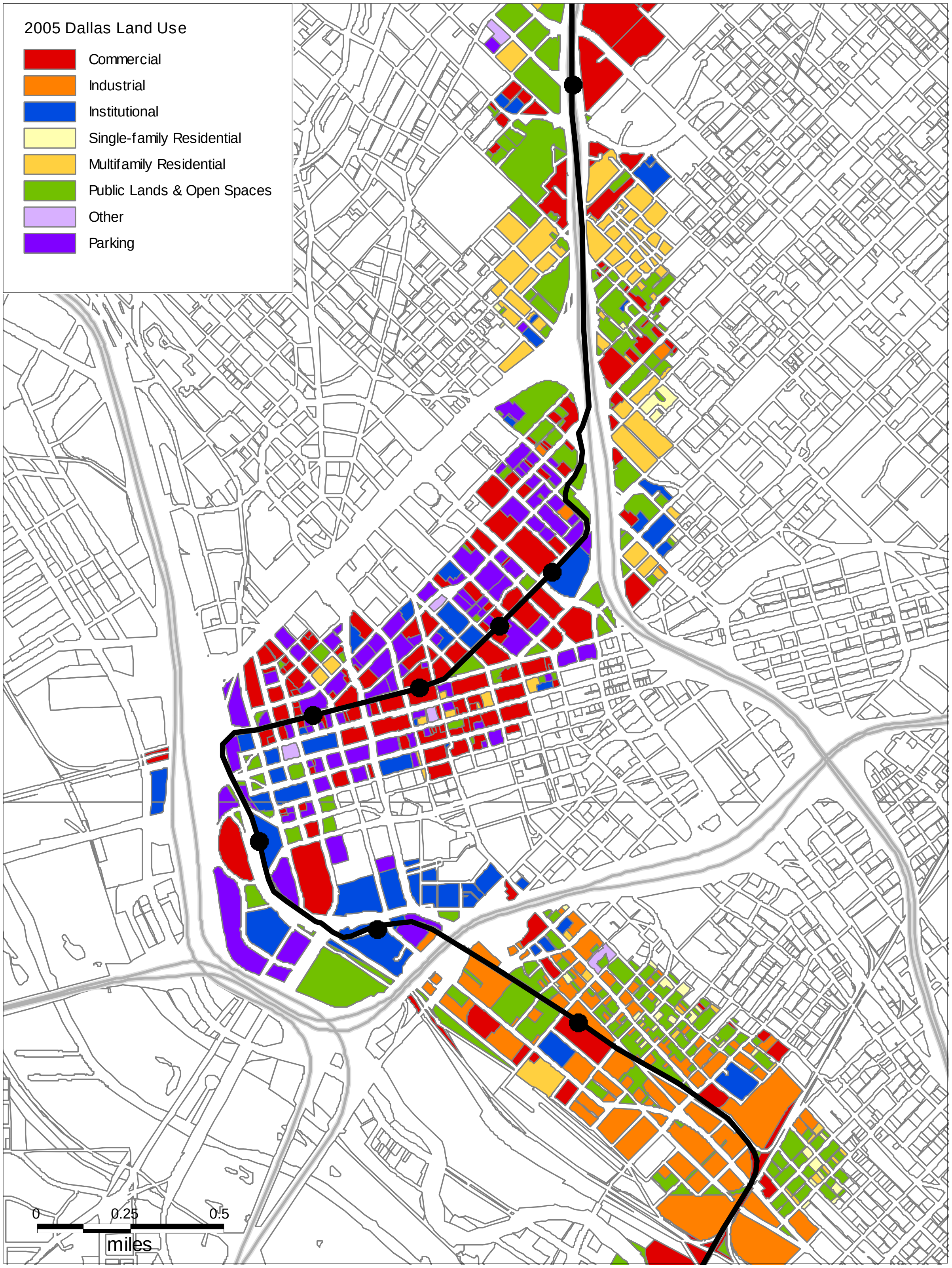


FIGURE 28 2005 DART corridor land use, downtown Dallas. (Source: NCTCOG GIS Land Use Data)



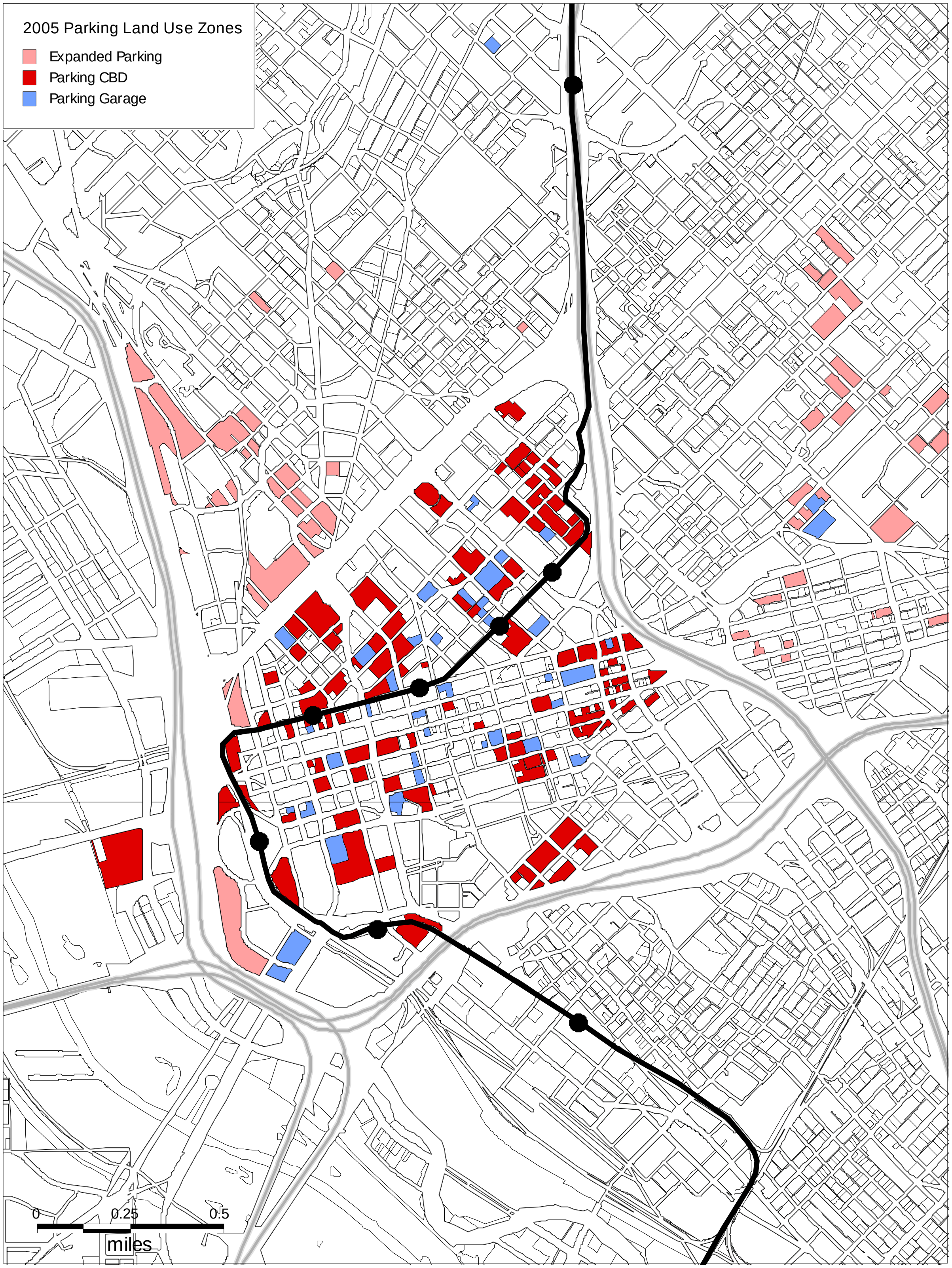
Going south from its northern terminus, the DART rail line is surrounded primarily by retail and institutional development through Plano; and office, industrial, and retail development in Richardson. Continuing further south, the line passes through institutional, office, retail, and multi-family residential areas to the Mockingbird Station in the University Park area. Here, the line that splits off to the northeast; and passes first through single and multi-family residential, then industrial, and finally terminates in Garland near institutional and industrial areas.

Continuing south from the split at Mockingbird Station, the DART rail line passes through office, retail, and institutional areas through downtown. As the line continues southwest, it passes through institutional, then industrial areas, until the split at the 8th and Corinth Station. As seen in Figure 28, downtown Dallas is dominated by commercial land uses, while the area just north of downtown contains a lot of multi-family residential development, and the area just south of downtown contains significant industrial development.

The southeast leg runs primarily through single-family residential areas, however, institutional and retail areas are scattered along the transit corridor near stations. Similarly, the southwest leg passes through single-family residential development with some industrial, retail, and institutional development along the line, and terminates at the W. Illinois Ave Station, surrounded by a large area of industrial use.

The availability of parking may affect densification along the DART corridor. Figure 29 below shows land use zones in downtown Dallas designated solely for parking. Along the rest of the corridor and throughout the Dallas area, there are very few other parking zones, most of which are parking areas adjacent to or near large event venues (Expanded Parking). Downtown Dallas has an overabundance of parking, yet many perceive an undersupply of parking located in high-demand areas. Much of the parking supply is on the periphery of downtown or far from the high intensity uses. The City of Dallas controls only a small fraction of the parking supply, so the City plans to create a parking management collaboration among private and public owners. This is an attempt to address both the perceived lack of parking and the oversupply in underdeveloped areas near downtown. This is part of the overall challenge Dallas faces in a) having a large downtown area and b) creating an attractive 24-hour downtown community. The latter is something Dallas is trying hard to achieve (DFW Interviewee D, personal communication, 02-17-2011).

FIGURE 29 2005 Downtown Dallas parking land use zones. (Source: NCTCOG GIS Land Use Data)



7. CONCLUSIONS

Our empirical analysis found that metropolitan-area-level associations between transit capacity, agglomeration, and productivity are strong. But in the four regions selected for firm analysis and for qualitative case studies, there is mixed evidence on whether and under what conditions improving transit capacity will cause densification of employment near stations, or influence the industry mix along corridors. In Portland, Oregon, we did find some evidence that there was significant densification and firm clustering patterns near transit stations, but in Dallas the opposite result appeared to be occurring. In the qualitative case studies, we did not find strong evidence of strategies to encourage densification near transit stops, or of actual *employment* densification occurring. In fact, there was more evidence of *population* densification occurring near rail corridors. This suggests that any agglomeration-related productivity increases may be more large-scale than what is possible to readily observe with the methods we used for our firm-level analysis, or with the case study approach. This is consistent with the relatively large-scale measures that we found to be significant in our metropolitan area-level analysis: principal city employment density (not limited to employment density near rail stops, but throughout the main cities in the metro area) and metropolitan area population.

We investigated the role of physical metropolitan area-level measures of agglomeration as the mediator between transit investments and productivity impacts. We were not able to analyze the potential effects of “effective density” (i.e., employment accessibility) or other local measures of agglomeration that might also be affected by transit investments. However, as discussed earlier in the report, metropolitan area-level physical measures may be most appropriate in the case of rail investments in the US.

The firm-level analysis results and the case study results are helpful in providing a caveat to the national level estimates. The spreadsheet tool simply employs the national estimates because there is no straightforward way to incorporate additional information, and because the national level estimates provide the only quantitative findings directly related to productivity. We would recommend that these estimates be combined with an evaluation of the likely regulatory barriers to local or regional densification and growth.

Regulatory policy includes parking requirements, building density, maximum building heights, infrastructure provision, and short duration of the approval process. All tend to push against the realization of agglomeration benefits. Local policy should be designed to facilitate agglomerations rather than to prevent them. There could also be policies to proactively encourage agglomeration, including transit inducements like the Transit Hub Tax Credits in New Jersey. Similarly, there have been instances, such as in Arlington, Virginia, where the relative unavailability of developable land elsewhere likely intensified development along transit corridors. Although we have not evaluated the efficacy or value of these particular policies, our case studies suggest such policies could play an important role in agglomeration economies.

Application in practice: Spreadsheet tool

We created a simple companion spreadsheet tool that can be used by transit agencies, MPOs, or others to calculate the wage and GDP benefits of proposed rail projects after entering one or more of five possible measures of new additional transit capacity: new track miles, added total seat capacity, added bus seat capacity, expected total additional revenue miles, and/or expected additional rail revenue miles. As noted above, these terms are defined as follows. Track miles are “route miles” of track, not accounting for direction or number of tracks (therefore only a fraction of the "directional route miles" reported by agencies to the NTD). Rail revenue miles and seating capacity are both reported by agencies to the NTD, so they are familiar with both terms. Rail revenue miles is defined as the miles that vehicles travel while in revenue service, including layover time but excluding deadhead. Seat capacity is the total number of seats in the vehicles owned by the operator. Projecting rail revenue miles is subject to some judgment by the proposing agency, while the other two measures (rail mileage and seat capacity) are less subjective.

Applying our estimates using the spreadsheet tool is very straightforward from the transit agency's perspective, although the population and employment density figures should be updated annually for the greatest accuracy. The spreadsheet contains a row for each metropolitan area in the United States. Note that for users who have access to Excel Version 2010, a drop-down list enables the metropolitan area to be chosen. For those with an earlier version, the MSA names must be copied from the second tab in the spreadsheet. A *range* of possible agglomeration-productivity benefits is provided in the box on the right-hand side of the spreadsheet. These estimates are best used to compare transit agency proposals to each other, rather than as absolute dollar values that can be compared to cost-benefit analysis results.

The spreadsheet tool is user-friendly in the sense that all the metro-level data is built in, and the user only needs to enter two or three summary pieces of data about the proposed transit investment to see a range of estimated agglomeration impacts. From that standpoint, it should be attractive for use by a range of stakeholders, even those less technically inclined. The downside is that one of the three input types, revenue miles, can be tricky to forecast. But all of the measures are required to be provided by transit agencies and reported to the FTA for the National Transit Database, so they are not new to those agencies responsible for those reports.

Updating the spreadsheet tool yearly with current population, employment density, and other metropolitan characteristics would be required in order to have the most current estimates, because these factors affect the net estimates of productivity benefits. However, the accuracy of the estimates will likely not suffer very much for at least five years, since there are not likely to be large shifts in any of the underlying metropolitan area data over that time period. Population estimates, wages, and payroll can be downloaded from the Census and BEA websites and readily entered into the spreadsheet. Updating the central city employment density figures is more complicated because the Census LEHD data have to be aggregated up from the block level to the central city level; this task took our research team a substantial amount of time.

Spreadsheet tool limitations

A minor limitation of the spreadsheet tool is that it cannot easily be used to project values into the future, or allow anticipated values to be input (for example, future expected levels of wages and GDP per worker, population, and number of workers). Making changes of this kind, however, would be relatively straightforward.

A more significant improvement to the tool would be to extend our existing models to incorporate characteristics of projects other than only track mileage, rail revenue miles, and seat capacity. Such measures could include connectivity/accessibility, alignment quality, projected ridership, or other within-MSA information. (Ridership could not be used as an input to these models because it is endogenous: agglomeration also increases ridership.) However, conducting the analysis needed to support such measures would require substantial additional resources.

The most significant limitation of the tool is that we could not construct a dataset that would enable us to distinguish one proposed project from another within the same metropolitan area (e.g., two different corridors for a new rail service). Future work could try more fine-grained analysis, but its success is somewhat uncertain because the data do not support detailed modeling; there are too few total rail investments in the US in the last two decades or so (about 80). Thus the value of the spreadsheet tool, following the value of the metro-level analysis on which it is based, is in distinguishing the agglomeration impacts of transit investments in different metropolitan areas from each other, not in distinguishing different alignments within the same metropolitan area.

Use of spreadsheet tool outputs

The spreadsheet tool would be most productively used for comparative analysis of proposed projects from different regions. This was one of the main goals of the H-39 research effort. The outputs could also be used by agencies to help inform public outreach and information campaigns about the possible benefits of transit investments.

Another use for the tool is to compare different rail service scenarios within a region, without depending on their spatial characteristics—only depending on their total track mileage, seating capacity, and projected revenue miles. For example, there might one scenario in which five or six proposed rail lines are to be constructed in a region, and another where only one or two new lines are built. In this case the agency can sum the new track, revenue miles and seat capacity for all of these, enter them and compare the outputs from the spreadsheet. A better service might, in theory, have more revenue miles but less track; the range of estimates would reflect this and might yield roughly equivalent estimated agglomeration effects for the two scenarios, or might yield a significantly higher upside for the higher-revenue-mile scenario.

The analysis on which the spreadsheet tool is based was carried out in wage and GDP terms, not in terms of jobs. So the outputs cannot be directly discussed in terms of job creation, although the effects on the wage side are all job-related. Metropolitan area-wide wage and GDP increases can take many forms—including more jobs, higher wages for existing jobs, shorter unemployment spells, and greater firm profits—and most likely, a combination of all of these.

Future research

Further research is certainly needed on this topic. The obvious next research steps are to collect and analyze historical data on transit, agglomeration, and productivity over several decades, and to use more advanced statistical methods to better understand the mutual causality between agglomeration, transit and productivity. Other research needs include: testing other measures of transit capacity; examining how firm formation may occur in response to transit investments; and investigating whether the residential focus of TOD efforts may dampen employment-related agglomeration impacts of transit.

Our data are limited in that we are not able to distinguish the effects of rent increases on gross domestic product (GDP) or wages. But the literature is clear, as we note in Appendix A, that wages and rents both reflect some portion of agglomeration benefits and that therefore both should be investigated simultaneously. We do use both wages and GDP as measures of productivity; both capture some different and some similar elements of productivity. Future research should bring rents into the analysis.

Much more could be done to discriminate among different types of cities so as to better understand how metropolitan areas themselves may vary in terms of agglomeration effects. This is readily achievable within the current dataset, although it would benefit highly from a decadal (10 year census) data approach.

It would also be desirable to have a companion highway input-output model to fairly evaluate the total scenario impact, although our estimates do include highway miles as an input.

It is unclear from our analysis over what period of time agglomeration benefits can be expected to accrue after a transit investment. Among other methods, it might be fruitful to qualitatively investigate the perceptions of agglomeration benefits by tenants and other business and residential location decision-makers. As noted in our case studies, market acceptance may play a role in the lag time between the new or improved transit facilities' completion and the visibility of agglomeration benefits.

The metro-level estimates could be tested retroactively in a region where transit investments have been made and compared with a region where a new investment is proposed. This would require overcoming limitations in the current dataset, which has only about eight years of data.

APPENDIX A: REFERENCES

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APPENDIX B: MSA MODEL RESULTS

TABLE B-1: Total track mile models for employment density

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
dependent variable	Emp. Dens., Urban Area	Emp. Dens., Urban Area	Emp. Dens., Urban Area	Emp. Dens., Urban Area	Emp. Dens., Prin. City	Emp. Dens., Prin. City	Emp. Dens., Prin. City	Emp. Dens., Prin. City
	OLS	OLS	IV	IV	OLS	OLS	IV	IV
APTA track miles	-0.774		-1.450		1.879		6.203	
(2 year lag)	(-2.25)		(-3.00)		(1.94)		(4.44)	
APTA track miles		-0.686		-1.480		1.811		6.197
(4 year lag)		(-2.05)		(-3.06)		(1.93)		(4.44)
Freeway/arterial miles	-0.114		-0.167		0.0774		0.423	
(2 year lag)	(-1.82)		(-2.47)		(0.44)		(2.17)	
Freeway/arterial miles		-0.0858		-0.145		0.0518		0.386
(4 year lag)		(-1.31)		(-2.07)		(0.28)		(1.91)
Population, 2006	0.000153	0.000137	0.000202	0.000192	0.000160	0.000174	-0.000157	-0.000131
	(4.76)	(4.52)	(4.98)	(4.95)	(1.77)	(2.05)	(-1.34)	(-1.17)
% of population under 18	-3.377	-3.383	-2.667	-2.609	-73.15	-73.09	-74.42	-74.62
(2005-2007 ACS)	(-0.41)	(-0.41)	(-0.33)	(-0.32)	(-3.13)	(-3.13)	(-3.14)	(-3.14)
% of population over 65	-13.62	-13.55	-13.34	-13.21	-15.49	-15.55	-15.78	-16.14
(2005-2007 ACS)	(-2.11)	(-2.10)	(-2.09)	(-2.06)	(-0.85)	(-0.86)	(-0.86)	(-0.87)
% of population 25+ with	-2.584	-2.478	-2.878	-2.937	-42.47	-42.58	-38.29	-38.19
HS diploma (2005-07 ACS)	(-0.50)	(-0.48)	(-0.56)	(-0.57)	(-2.92)	(-2.93)	(-2.57)	(-2.56)
% of population 25+ with	15.55	15.47	15.77	15.73	25.33	25.42	23.95	23.97
coll. Diploma (2005-07 ACS)	(4.35)	(4.31)	(4.46)	(4.43)	(2.52)	(2.52)	(2.35)	(2.34)
% of population white	-2.922	-2.883	-3.123	-3.098	2.211	2.151	2.924	2.863
(2005-2007 ACS)	(-1.15)	(-1.13)	(-1.24)	(-1.23)	(0.31)	(0.30)	(0.40)	(0.39)
% of population black	-9.042	-9.024	-9.314	-9.349	-10.77	-10.81	-8.878	-8.886
(2005-2007 ACS)	(-3.25)	(-3.24)	(-3.39)	(-3.38)	(-1.37)	(-1.38)	(-1.12)	(-1.12)
% of population Hispanic	-0.738	-0.711	-1.175	-1.264	-2.522	-2.569	0.685	0.832
(2005-2007 ACS)	(-0.39)	(-0.38)	(-0.62)	(-0.67)	(-0.48)	(-0.48)	(0.13)	(0.15)
Median household income	0.00497	0.00465	0.00462	0.00418	0.0524	0.0526	0.0535	0.0543
(2005-2007 ACS)	(1.53)	(1.43)	(1.44)	(1.30)	(5.74)	(5.78)	(5.76)	(5.84)
Median value of own-occ.	-0.000303	-0.000274	-0.000292	-0.000255	-0.00188	-0.00190	-0.00189	-0.00196
housing unit (2005-07 ACS)	(-1.35)	(-1.22)	(-1.32)	(-1.15)	(-2.98)	(-3.02)	(-2.96)	(-3.07)

Constant	1015.5	1008.1	1049.5	1057.0	4132.7	4143.0	3697.3	3691.9
	(2.11)	(2.09)	(2.20)	(2.20)	(3.05)	(3.05)	(2.68)	(2.67)
Number of observations	354	354	351	351	354	354	351	351
Adjusted R-squared	0.465	0.463	0.460	0.456	0.464	0.464	0.434	0.431
widstat test statistic			109.3	98.85			109.3	98.85
sargan test statistic			10.59	9.789			2.016	1.804
sarganp test statistic			0.00503	0.00749			0.365	0.406

Table B-2: Total track mile models for employment density (NYC omitted)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
dependent variable	Emp. Dens., Urban Area	Emp. Dens., Urban Area	Emp. Dens., Urban Area	Emp. Dens., Urban Area	Emp. Dens., Prin. City	Emp. Dens., Prin. City	Emp. Dens., Prin. City	Emp. Dens., Prin. City
	OLS	OLS	IV	IV	OLS	OLS	IV	IV
APTA track miles	-0.315		-0.848		0.503		6.881	
(2 year lag)	(-0.78)		(-1.19)		(0.45)		(3.28)	
APTA track miles		-0.232		-1.052		0.444		7.279
(4 year lag)		(-0.59)		(-1.40)		(0.40)		(3.29)
Freeway/arterial miles	-0.131		-0.155		0.129		0.436	
(2 year lag)	(-2.09)		(-2.28)		(0.73)		(2.18)	
Freeway/arterial miles		-0.113		-0.143		0.133		0.393
(4 year lag)		(-1.70)		(-2.04)		(0.72)		(1.91)
Population, 2006	0.000157	0.000144	0.000184	0.000181	0.000147	0.000152	-0.000177	-0.000158
	(4.91)	(4.76)	(4.21)	(4.33)	(1.64)	(1.79)	(-1.38)	(-1.28)
% of population under 18	-3.187	-3.122	-2.580	-2.523	-73.71	-73.88	-74.32	-74.41
(2005-2007 ACS)	(-0.39)	(-0.38)	(-0.32)	(-0.31)	(-3.18)	(-3.18)	(-3.11)	(-3.08)
% of population over 65	-13.91	-13.84	-13.58	-13.39	-14.61	-14.68	-16.05	-16.58
(2005-2007 ACS)	(-2.17)	(-2.15)	(-2.14)	(-2.10)	(-0.81)	(-0.82)	(-0.86)	(-0.88)
% of population 25+ with	-2.157	-2.096	-2.234	-2.493	-43.75	-43.73	-37.57	-37.06
HS diploma (2005-07 ACS)	(-0.42)	(-0.41)	(-0.43)	(-0.48)	(-3.03)	(-3.02)	(-2.48)	(-2.43)
% of population 25+ with	15.40	15.36	15.56	15.60	25.79	25.73	23.71	23.65
coll. Diploma (2005-07 ACS)	(4.33)	(4.31)	(4.44)	(4.42)	(2.58)	(2.57)	(2.30)	(2.27)
% of population white	-2.684	-2.674	-2.922	-2.969	1.498	1.522	3.150	3.188
(2005-2007 ACS)	(-1.06)	(-1.05)	(-1.17)	(-1.18)	(0.21)	(0.21)	(0.43)	(0.43)
% of population black	-8.951	-8.950	-9.124	-9.222	-11.04	-11.04	-8.665	-8.562
(2005-2007 ACS)	(-3.23)	(-3.23)	(-3.34)	(-3.36)	(-1.42)	(-1.42)	(-1.08)	(-1.06)
% of population Hispanic	-0.721	-0.723	-0.940	-1.105	-2.575	-2.532	0.948	1.239
(2005-2007 ACS)	(-0.38)	(-0.38)	(-0.50)	(-0.58)	(-0.49)	(-0.48)	(0.17)	(0.22)
Median household income	0.00443	0.00414	0.00428	0.00397	0.0540	0.0542	0.0531	0.0538
(2005-2007 ACS)	(1.37)	(1.28)	(1.34)	(1.24)	(5.94)	(5.97)	(5.64)	(5.68)
Median value of own-occ.	-0.000308	-0.000281	-0.000295	-0.000260	-0.00186	-0.00188	-0.00190	-0.00198
housing unit (2005-07 ACS)	(-1.38)	(-1.27)	(-1.34)	(-1.18)	(-2.97)	(-3.01)	(-2.93)	(-3.04)
Constant	991.7	988.4	1000.0	1023.3	4204.1	4202.3	3641.7	3606.3
	(2.07)	(2.06)	(2.10)	(2.14)	(3.12)	(3.12)	(2.60)	(2.55)

Number of observations	353	353	350	350	353	353	350	350
Adjusted R-squared	0.455	0.453	0.454	0.447	0.375	0.375	0.316	0.304
widstat test statistic			49.60	40.75			49.60	40.75
sargan test statistic			10.72	10.03			2.005	1.739
sarganp test statistic			0.00471	0.00663			0.367	0.419

Table B-3: Track miles per square mile of MSA land area, employment density models

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
dependent variable	Emp. Dens., Urban Area	Emp. Dens., Urban Area	Emp. Dens., Urban Area	Emp. Dens., Urban Area	Emp. Dens., Prin. City	Emp. Dens., Prin. City	Emp. Dens., Prin. City	Emp. Dens., Prin. City
	OLS	OLS	IV	IV	OLS	OLS	IV	IV
APTA track miles per sq mi	1151.4		-13607.0		10212.9		49452.0	
(2 year lag)	(0.65)		(-3.12)		(2.10)		(4.15)	
APTA track miles per sq mi		885.6		-13199.4		10158.7		48252.0
(4 year lag)		(0.50)		(-3.14)		(2.07)		(4.17)
Freeway + arterial miles	-65.01		23.82		1294.4		1078.8	
per sq. mile (2 year lag)	(-0.46)		(0.15)		(3.33)		(2.56)	
Freeway + arterial miles		17.38		137.6		1361.2		1058.4
per sq. mile (4 year lag)		(0.11)		(0.82)		(3.20)		(2.29)
Population, 2006	0.0000729	0.0000726	0.000183	0.000176	0.000160	0.000163	-0.000134	-0.000117
	(4.34)	(4.36)	(5.32)	(5.36)	(3.47)	(3.57)	(-1.42)	(-1.30)
% of population under 18	-4.374	-3.460	-2.833	-1.789	-58.30	-59.61	-61.25	-63.03
(2005-2007 ACS)	(-0.51)	(-0.41)	(-0.31)	(-0.20)	(-2.50)	(-2.56)	(-2.44)	(-2.52)
% of population over 65	-13.50	-13.81	-11.46	-12.03	-22.29	-22.70	-27.41	-27.30
(2005-2007 ACS)	(-2.07)	(-2.11)	(-1.62)	(-1.71)	(-1.25)	(-1.27)	(-1.41)	(-1.42)
% of population 25+ with	-1.708	-1.169	-5.160	-4.103	-31.54	-30.98	-21.44	-22.00
HS diploma (2005-07 ACS)	(-0.32)	(-0.22)	(-0.88)	(-0.70)	(-2.16)	(-2.11)	(-1.33)	(-1.37)
% of population 25+ with	15.00	14.99	16.21	16.04	24.39	23.58	21.18	20.73
coll. Diploma (2005-07 ACS)	(4.17)	(4.16)	(4.17)	(4.16)	(2.47)	(2.39)	(1.99)	(1.96)
% of population white	-2.603	-2.674	-3.798	-3.739	1.941	2.329	4.929	5.020
(2005-2007 ACS)	(-1.01)	(-1.04)	(-1.37)	(-1.36)	(0.28)	(0.33)	(0.65)	(0.66)
% of population black	-8.468	-8.653	-10.33	-10.37	-12.88	-12.53	-7.904	-7.857
(2005-2007 ACS)	(-3.00)	(-3.07)	(-3.36)	(-3.41)	(-1.66)	(-1.62)	(-0.94)	(-0.94)
% of population Hispanic	-0.0198	0.0327	-2.345	-2.051	-0.717	-0.285	5.652	5.567
(2005-2007 ACS)	(-0.01)	(0.02)	(-1.08)	(-0.96)	(-0.14)	(-0.05)	(0.95)	(0.95)
Median household income	0.00519	0.00445	0.00308	0.00236	0.0407	0.0416	0.0458	0.0468
(2005-2007 ACS)	(1.50)	(1.30)	(0.82)	(0.64)	(4.29)	(4.42)	(4.44)	(4.58)
Median value of own-occ.	-0.000299	-0.000267	0.00000141	0.0000143	-0.00157	-0.00161	-0.00235	-0.00236
housing unit (2005-07 ACS)	(-1.31)	(-1.17)	(0.01)	(0.06)	(-2.51)	(-2.59)	(-3.33)	(-3.39)
Constant	934.7	889.7	1248.3	1150.7	3225.1	3174.8	2305.9	2376.9
	(1.89)	(1.79)	(2.30)	(2.14)	(2.38)	(2.33)	(1.55)	(1.61)

Number of observations	354	354	351	351	354	354	351	351
Adjusted R-squared	0.457	0.456	0.348	0.358	0.483	0.482	0.385	0.391
widstat test statistic			27.79	30.15			27.79	30.15
sargan test statistic			6.190	7.531			0.0477	0.000937
sarganp test statistic			0.0453	0.0232			0.976	1.000

Table B-4: Track miles per square mile of MSA land area, employment density models (NYC omitted)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
dependent variable	Emp. Dens., Urban Area	Emp. Dens., Urban Area	Emp. Dens., Urban Area	Emp. Dens., Urban Area	Emp. Dens., Prin. City	Emp. Dens., Prin. City	Emp. Dens., Prin. City	Emp. Dens., Prin. City
	OLS	OLS	IV	IV	OLS	OLS	IV	IV
APTA track miles per sq mi	3310.6		-15298.4		5116.5		60021.7	
(2 year lag)	(1.75)		(-2.01)		(0.98)		(2.81)	
APTA track miles per sq mi		3118.3		-14783.1		4711.2		58505.1
(4 year lag)		(1.62)		(-2.00)		(0.89)		(2.81)
Freeway + arterial miles	-95.00		36.87		1365.1		1000.4	
per sq. mile (2 year lag)	(-0.68)		(0.23)		(3.53)		(2.18)	
Freeway + arterial miles		-25.58		155.9		1466.0		947.0
per sq. mile (4 year lag)		(-0.17)		(0.86)		(3.46)		(1.85)
Population, 2006	0.0000823	0.0000816	0.000190	0.000182	0.000137	0.000141	-0.000181	-0.000160
	(4.88)	(4.88)	(4.10)	(4.14)	(2.95)	(3.06)	(-1.39)	(-1.30)
% of population under 18	-4.648	-3.808	-2.705	-1.635	-57.65	-58.76	-62.03	-63.97
(2005-2007 ACS)	(-0.55)	(-0.45)	(-0.29)	(-0.18)	(-2.49)	(-2.54)	(-2.35)	(-2.45)
% of population over 65	-13.96	-14.22	-11.19	-11.81	-21.21	-21.71	-29.03	-28.71
(2005-2007 ACS)	(-2.16)	(-2.20)	(-1.54)	(-1.64)	(-1.19)	(-1.22)	(-1.42)	(-1.42)
% of population 25+ with	-1.240	-0.785	-5.601	-4.464	-32.65	-31.91	-18.66	-19.61
HS diploma (2005-07 ACS)	(-0.24)	(-0.15)	(-0.90)	(-0.73)	(-2.25)	(-2.19)	(-1.07)	(-1.14)
% of population 25+ with	14.57	14.58	16.42	16.22	25.41	24.57	19.96	19.64
coll. diploma (2005-07 ACS)	(4.09)	(4.09)	(4.07)	(4.08)	(2.59)	(2.51)	(1.76)	(1.75)
% of population white	-2.102	-2.190	-4.000	-3.925	0.759	1.147	6.132	6.138
(2005-2007 ACS)	(-0.83)	(-0.86)	(-1.37)	(-1.37)	(0.11)	(0.16)	(0.75)	(0.76)
% of population black	-8.324	-8.503	-10.52	-10.53	-13.22	-12.89	-6.730	-6.762
(2005-2007 ACS)	(-2.98)	(-3.05)	(-3.27)	(-3.32)	(-1.72)	(-1.68)	(-0.74)	(-0.76)
% of population Hispanic	-0.0761	-0.0418	-2.529	-2.197	-0.585	-0.104	6.871	6.622
(2005-2007 ACS)	(-0.04)	(-0.02)	(-1.08)	(-0.97)	(-0.11)	(-0.02)	(1.05)	(1.03)
Median household income	0.00422	0.00355	0.00317	0.00245	0.0430	0.0438	0.0455	0.0465
(2005-2007 ACS)	(1.23)	(1.04)	(0.82)	(0.65)	(4.55)	(4.67)	(4.21)	(4.37)
Median value of own-occ.	-0.000300	-0.000270	0.0000246	0.0000347	-0.00157	-0.00161	-0.00250	-0.00250
housing unit (2005-07 ACS)	(-1.33)	(-1.20)	(0.09)	(0.13)	(-2.52)	(-2.60)	(-3.19)	(-3.25)
Constant	924.6	887.7	1280.3	1174.6	3249.0	3179.7	2098.6	2209.4

	(1.89)	(1.81)	(2.25)	(2.11)	(2.42)	(2.35)	(1.32)	(1.41)
Number of observations	353	353	350	350	353	353	350	350
Adjusted R-squared	0.453	0.452	0.299	0.313	0.399	0.398	0.203	0.215
widstat test statistic			10.42	11.28			10.42	11.28
sargan test statistic			6.095	7.539			0.0273	0.0135
sarganp test statistic			0.0475	0.0231			0.986	0.993

Table B-5: Track miles per capita, population models

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
dependent variable	**Population**	**Population**	**Population**	**Population**	**Population**	**Population**	**Population**	**Population**
	OLS	OLS	IV	IV	OLS	OLS	IV	IV
APTA track miles per capita	7.29612e+10		1.92076e+11		5.35190e+10		1.12126e+11	
(2 year lag)	(11.74)		(.)		(10.46)		(.)	
APTA track miles per capita		7.22308e+10		1.91069e+11		5.28065e+10		1.11852e+11
(4 year lag)		(11.67)		(.)		(10.34)		(.)
Freeway + arterial miles	-211720502		-132849461		-206582669		-171873095	
per capita (2 year lag)	(-2.94)		(-1.30)		(-3.61)		(-2.58)	
Freeway + arterial miles		-213482199		-136516366		-207240698		-173488301
per capita (4 year lag)		(-2.92)		(-1.31)		(-3.56)		(-2.55)
% of population under 18	-9875.3	-6466.6	277.1	3752.7	-9015.8	-5836.3	-4486.3	-1159.3
(2005-2007 ACS)	(-0.25)	(-0.16)	(0.00)	(0.07)	(-0.29)	(-0.18)	(-0.12)	(-0.03)
% of population over 65	-507.4	1030.4	-40205.0	-39099.8	-2587.6	-1046.3	-20256.3	-19034.2
(2005-2007 ACS)	(-0.02)	(0.03)	(-0.93)	(-0.90)	(-0.11)	(-0.04)	(-0.72)	(-0.67)
% of population 25+ with	14093.8	13762.6	69991.9	69746.7	10841.4	10494.1	37139.5	37038.5
HS diploma (2005-07 ACS)	(0.57)	(0.55)	(2.00)	(1.99)	(0.55)	(0.53)	(1.63)	(1.61)
% of population 25+ with	4315.7	5364.6	-26750.5	-25792.8	4885.8	5891.0	-9432.6	-8583.6
coll. diploma (2005-07 ACS)	(0.25)	(0.32)	(-1.12)	(-1.08)	(0.36)	(0.44)	(-0.61)	(-0.55)

% of population white	-14492.7	-15082.1	7091.0	5940.3	-13687.2	-14173.8	-3993.5	-4675.6
(2005-2007 ACS)	(-1.19)	(-1.23)	(0.41)	(0.34)	(-1.41)	(-1.46)	(-0.36)	(-0.42)
% of population black	4486.5	3896.5	7976.4	6523.8	3498.3	3068.9	5305.4	4456.8
(2005-2007 ACS)	(0.33)	(0.29)	(0.42)	(0.34)	(0.33)	(0.29)	(0.43)	(0.36)
% of population Hispanic	13910.6	13385.2	22481.8	21608.9	13455.3	13016.5	17488.5	16897.9
(2005-2007 ACS)	(1.53)	(1.47)	(1.75)	(1.68)	(1.87)	(1.80)	(2.09)	(2.01)
Median household income	10.27	9.719	-50.70	-52.20	19.58	19.24	-10.27	-11.37
(2005-2007 ACS)	(0.68)	(0.64)	(-2.43)	(-2.49)	(1.63)	(1.60)	(-0.76)	(-0.83)
Median value of own-occ.	-0.313	-0.235	-0.838	-0.696	-0.833	-0.768	-0.965	-0.869
housing unit (2005-07 ACS)	(-0.30)	(-0.22)	(-0.57)	(-0.47)	(-1.00)	(-0.92)	(-1.00)	(-0.89)
Constant	237479.4	189246.5	-2499156.6	-2447215.6	105150.6	45325.9	-1124547.8	-1144615.9
	(0.10)	(0.08)	(-0.75)	(-0.74)	(0.06)	(0.02)	(-0.52)	(-0.53)
Number of observations	364	364	361	361	363	363	360	360
Adjusted R-squared	0.427	0.425	0.202	0.202	0.418	0.415	0.236	0.235
widstat test statistic			55.19	55.09			63.32	62.74
sargan test statistic			154.1	153.3			128.5	127.2
sarganp test statistic			3.47e-34	5.12e-34			1.26e-28	2.36e-28

Table B-6: Track miles per square mile of urbanized area, population models

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
dependent variable	**Population**	**Population**	**Population**	**Population**	**Population**	**Population**	**Population**	**Population**
	OLS	OLS	IV	IV	OLS	OLS	IV	IV
APTA track miles per sq mi	67559530.4		96455407.6		51154923.3		89412557.1	
(2 year lag)	(19.01)		(18.84)		(12.62)		(11.70)	
APTA track miles per sq mi		68396610.7		97577299.1		51319128.5		91015000.5
(4 year lag)		(18.91)		(18.86)		(12.34)		(11.59)
Freeway + arterial miles	1617056.9		67638.4		1663543.8		246591.9	
per sq. mile (2 year lag)	(3.18)		(0.12)		(3.50)		(0.43)	
Freeway + arterial miles		1458858.6		-267267.7		1620651.1		-63378.7
per sq. mile (4 year lag)		(2.60)		(-0.42)		(3.08)		(-0.10)
% of population under 18	18121.5	14263.8	3750.8	797.5	17698.3	14754.9	5143.6	2156.8
(2005-2007 ACS)	(0.58)	(0.45)	(0.11)	(0.02)	(0.61)	(0.50)	(0.16)	(0.07)
% of population over 65	-6682.7	-5916.6	-10869.3	-8923.3	-4330.8	-4128.7	-9953.1	-8340.2
(2005-2007 ACS)	(-0.28)	(-0.25)	(-0.42)	(-0.35)	(-0.20)	(-0.18)	(-0.40)	(-0.33)
% of population 25+ with	30769.5	29779.9	33743.1	31098.7	25615.0	25357.2	32289.3	30103.4
HS diploma (2005-07 ACS)	(1.58)	(1.51)	(1.60)	(1.45)	(1.40)	(1.37)	(1.59)	(1.46)
% of population 25+ with	1022.9	415.6	-5823.5	-5209.7	3641.7	2894.0	-4472.3	-4137.4
coll. diploma (2005-07 ACS)	(0.08)	(0.03)	(-0.41)	(-0.36)	(0.30)	(0.23)	(-0.33)	(-0.30)

% of population white	-10236.1	-10126.6	-2855.4	-3234.1	-11972.5	-11866.2	-4065.1	-4280.6
(2005-2007 ACS)	(-1.08)	(-1.06)	(-0.28)	(-0.31)	(-1.35)	(-1.33)	(-0.41)	(-0.43)
% of population black	5727.1	6363.7	10171.2	10381.2	4788.2	5280.6	9469.6	9756.5
(2005-2007 ACS)	(0.55)	(0.60)	(0.90)	(0.92)	(0.49)	(0.54)	(0.87)	(0.89)
% of population Hispanic	18645.0	18911.3	19597.2	19074.7	17918.6	18328.6	19342.2	18952.5
(2005-2007 ACS)	(2.67)	(2.68)	(2.61)	(2.51)	(2.74)	(2.77)	(2.67)	(2.58)
Median household income	7.171	10.10	10.14	12.55	13.67	15.92	11.33	13.54
(2005-2007 ACS)	(0.58)	(0.81)	(0.76)	(0.94)	(1.18)	(1.37)	(0.88)	(1.04)
Median value of own-occ.	-0.609	-0.703	-1.588	-1.626	-0.647	-0.718	-1.490	-1.539
housing unit (2005-07 ACS)	(-0.73)	(-0.84)	(-1.75)	(-1.79)	(-0.83)	(-0.91)	(-1.70)	(-1.75)
Constant	-2544831.1	-2432755.3	-2505313.7	-2255594.4	-2342057.4	-2296857.9	-2465269.4	-2247183.4
	(-1.41)	(-1.33)	(-1.28)	(-1.14)	(-1.38)	(-1.34)	(-1.31)	(-1.18)
Number of observations	364	364	361	361	363	363	360	360
Adjusted R-squared	0.656	0.650	0.592	0.585	0.515	0.506	0.391	0.377
widstat test statistic			145.9	150.1			60.47	60.58
sargan test statistic			5.782	4.928			6.885	5.837
sarganp test statistic			0.0555	0.0851			0.0320	0.0540

Table B-7: Total track miles, heavy rail instrumented

dependent variable	**Employment density, UZA**	**Employment density, UZA**	**Employment density, principal city**	**Employment density, principal city**	**Population**	**Population**
	lag2	lag4	lag2	lag4	lag2	lag4
Comm. Rail Track miles, 2yr lag	1.046355		-8.164		14616.2	
	(1.00)		(-2.92)		(7.49)	
Comm. Rail Track miles, 4yr lag		1.522913		-8.56		13702.4
		(1.42)		(-3.00)		(7.24)
Heavy Rail Track miles, 2yr lag	-9.97145		46.9		-23408.9	
	(-2.31)		(4.04)		(-2.79)	
Heavy Rail Track miles, 4yr lag		-11.6549		46.74		-18888.8
		(-2.64)		(3.99)		(-2.31)
Light Rail Track miles, 2yr lag	4.558379		20.13		18181.2	
	(1.50)		(2.47)		(3.76)	
Light Rail Track miles, 4yr lag		5.464875		19.77		19639.1
		(1.75)		(2.38)		(3.92)
Freeway/arterial, 2yr lag	-5.62E-02		0.3		1643.3	
	(-0.77)		(1.52)		(22.42)	
Freeway/arterial, 4yr lag		-3.34E-02		0.26		1768.1
		(-0.43)		(1.26)		(22.40)
Population	1.48E-04	1.35E-04	4.74E-05	9.31E-05		
	(3.67)	(3.61)	(0.44)	(0.93)		
Constant	854.6961	849.5161	1454.4	1460.3	-206875.3	-200091.1
	(35.35)	(34.89)	(22.41)	(22.56)	(-5.27)	(-5.10)
N	351	351	351	351	361	361
Cragg-Donald	29.15	29.86	29.15	29.86	19.12	21.56
Stock-Yogo, 10%	22.3	22.3	22.3	22.3	22.3	22.3
Sargan	3.173	2.845	6.371	6.337	14.45	14.07
Sargan (P)	0.205	0.241	0.0414	0.0421	0.000729	0.000881

Table B-8: Track miles per square mile CBSA, heavy rail instrumented

dependent variable	**Employment density, UZA**	**Employment density, UZA**	**Employment density, principal city**	**Employment density, principal city**	**Population**	**Population**
	lag2	lag4	lag2	lag4	lag2	lag4
Comm. rail per sq mi CBSA, 2yr lag	9142.658		-24599.2		-5411201.7	
	(1.63)		(-1.76)		(-0.83)	
Comm. rail per sq mi CBSA, 4yr lag		10929.75		-27465.9		-4604326.6
		(1.89)		(-1.95)		(-0.73)
Heavy rail per sq mile CBSA, 2yr lag	-68116.7		183687.5		244698977.8	
	(-2.63)		(2.85)		(7.17)	
Heavy rail per sq mile CBSA, 4yr lag		-78217.6		193468		245285939.1
		(-2.91)		(2.94)		(7.43)
Light rail per sq mile CBSA, 2yr lag	62159.71		-17430.5		10678546.2	
	(4.48)		(-0.51)		(0.91)	
Light rail per sq mile CBSA, 4yr lag		68116.69		-18552.4		8596624.4
		(4.51)		(-0.50)		(0.72)
Freeway/arterial per sq mi, 2yr lag	-119.139		1715.4		-51615.9	
	(-0.71)		(4.11)		(-1.08)	
Freeway/arterial per sq mi, 4yr lag		-66.0447		1826.6		-55199.8
		(-0.36)		(4.03)		(-1.12)
Population	1.05E-04	1.07E-04	0.000161	0.000169		
	(4.71)	(4.77)	(2.91)	(3.09)		
Constant	872.826	857.2861	1160.2	1167.3	556183.0	554097.7
	(21.54)	(20.86)	(11.54)	(11.62)	(2.69)	(2.81)
N	351	351	351	351	351	336
Cragg-Donald	18.03	20.73	18.03	20.73	18.26	19.73
Stock-Yogo, 10%	22.3	22.3	22.3	22.3	22.3	22.3
Sargan	0.924	1.182	2.892	2.526	3.857	3.433
Sargan (P)	0.63	0.554	0.235	0.283	0.145	0.180

Table B-9: Seat capacity per capita models

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Emp. Dens., Prin. City	Emp. Dens., Prin. City	Emp. Dens., Prin. City	Emp. Dens., Prin. City	Population	Population	Population	Population
	OLS	OLS	IV	IV	OLS	OLS	IV	IV
Rail seat capacity per capita	42980.1		154556.5		336442415.8		518243585.6	
(2 year lag)	(2.23)		(4.11)		(15.85)		(17.33)	
Rail seat capacity per capita		57493.9		147707.0		360863317.7		496550310.4
(4 year lag)		(2.81)		(4.31)		(17.46)		(18.82)
Bus seat capacity per capita	43033.4		37344.1		40256530.8		6821535.0	
(2 year lag)	(5.00)		(4.08)		(3.12)		(0.47)	
Bus seat capacity per capita		39900.6		37392.4		37894720.8		17913563.1
(4 year lag)		(5.07)		(4.64)		(3.33)		(1.47)
Freeway + arterial miles	-56401.7		-81959.3		-196592883		-186019938	
per capita (2 year lag)	(-1.38)		(-1.91)		(-3.19)		(-2.76)	
Freeway + arterial miles		-63358.4		-85704.3		-194206423		-186161647
per capita (4 year lag)		(-1.53)		(-2.02)		(-3.23)		(-2.94)
Population, 2006	0.000174	0.000155	0.0000409	0.0000433				
	(4.94)	(4.24)	(0.78)	(0.87)				
% of population under 18	-58.78	-56.77	-59.71	-56.61	10780.3	14743.3	2748.8	9640.1
(2005-2007 ACS)	(-2.60)	(-2.52)	(-2.55)	(-2.48)	(0.31)	(0.45)	(0.07)	(0.28)
% of population over 65	-14.98	-14.95	-20.38	-18.33	2103.5	2147.6	-16600.1	-10832.4
(2005-2007 ACS)	(-0.85)	(-0.86)	(-1.12)	(-1.03)	(0.08)	(0.09)	(-0.58)	(-0.41)
% of population 25+ with	-41.42	-41.37	-35.80	-37.79	14674.6	14550.1	32316.7	27167.6
HS diploma (2005-07 ACS)	(-2.97)	(-2.98)	(-2.44)	(-2.65)	(0.69)	(0.72)	(1.40)	(1.27)
% of population 25+ with	15.03	16.78	13.81	15.76	-5839.0	-4301.5	-9045.3	-7943.9
coll. diploma (2005-07 ACS)	(1.53)	(1.73)	(1.37)	(1.61)	(-0.40)	(-0.31)	(-0.57)	(-0.54)
% of population white	8.454	7.426	8.128	7.152	-6967.4	-8165.4	-6141.5	-7034.1
(2005-2007 ACS)	(1.21)	(1.07)	(1.13)	(1.02)	(-0.65)	(-0.80)	(-0.53)	(-0.66)
% of population black	-6.798	-8.193	-8.031	-8.952	6738.5	4994.1	1096.4	1669.6
(2005-2007 ACS)	(-0.89)	(-1.08)	(-1.02)	(-1.17)	(0.58)	(0.45)	(0.09)	(0.14)
% of population Hispanic	-3.876	-4.099	-1.992	-2.718	12167.5	11571.9	14633.4	13384.1
(2005-2007 ACS)	(-0.76)	(-0.81)	(-0.38)	(-0.53)	(1.57)	(1.55)	(1.74)	(1.71)
Median household income	0.0457	0.0443	0.0403	0.0413	5.043	4.932	-13.71	-7.302
(2005-2007 ACS)	(5.22)	(5.09)	(4.37)	(4.64)	(0.39)	(0.40)	(-0.97)	(-0.56)
Median value of own-occ.	-0.00168	-0.00166	-0.00174	-0.00172	0.0775	0.0420	-0.0765	-0.108
housing unit (2005-07 ACS)	(-2.84)	(-2.81)	(-2.85)	(-2.89)	(0.09)	(0.05)	(-0.08)	(-0.12)
Constant	3661.8	3736.4	3693.6	3745.4	-670425.5	-684360.5	-685648.0	-789483.4
	(2.75)	(2.83)	(2.69)	(2.81)	(-0.33)	(-0.35)	(-0.31)	(-0.39)
Number of observations	354	354	351	351	364	364	361	361
Adjusted R-squared	0.507	0.512	0.460	0.485	0.582	0.613	0.494	0.565

widstat test statistic			45.89	65.86			196.3	263.8
sargan test statistic			0.565	0.465			0.601	1.228
sarganp test statistic			0.754	0.793			0.740	0.541

Table B-10: Rail revenue mile models, employment density

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
dependent variable	Emp. Dens., Urban Area	Emp. Dens., Urban Area	Emp. Dens., Urban Area	Emp. Dens., Urban Area	Emp. Dens., Prin. City	Emp. Dens., Prin. City	Emp. Dens., Prin. City	Emp. Dens., Prin. City
	OLS	OLS	IV	IV	OLS	OLS	IV	IV
Rail revenue miles	-0.0000134		-0.0000259		0.0000547		0.0000911	
(2 year lag)	(-2.37)		(-3.51)		(3.56)		(4.50)	
Rail revenue miles		-0.0000137		-0.0000265		0.0000562		0.0000932
(4 year lag)		(-2.38)		(-3.53)		(3.57)		(4.52)
Freeway + arterial miles	-70.20		-68.30		1393.1		1411.2	
per sq. mile (2 year lag)	(-0.50)		(-0.49)		(3.63)		(3.70)	
Freeway + arterial miles		14.04		17.22		1480.6		1495.7
per sq. mile (4 year lag)		(0.09)		(0.11)		(3.54)		(3.59)
Population, 2006	0.000110	0.000107	0.000136	0.000132	0.000121	0.000124	0.0000445	0.0000499
	(7.02)	(6.92)	(7.33)	(7.28)	(2.84)	(2.95)	(0.88)	(1.00)
% of population under 18	-4.551	-3.579	-3.984	-2.972	-56.88	-58.30	-57.12	-58.74
(2005-2007 ACS)	(-0.54)	(-0.42)	(-0.48)	(-0.36)	(-2.46)	(-2.53)	(-2.49)	(-2.56)
% of population over 65	-13.23	-13.57	-12.93	-13.26	-21.60	-22.22	-22.02	-22.77
(2005-2007 ACS)	(-2.05)	(-2.09)	(-2.01)	(-2.06)	(-1.22)	(-1.25)	(-1.25)	(-1.29)
% of population 25+ with	-2.566	-1.949	-2.479	-1.848	-32.06	-31.21	-31.31	-30.40
HS diploma (2005-07 ACS)	(-0.49)	(-0.37)	(-0.47)	(-0.35)	(-2.23)	(-2.16)	(-2.17)	(-2.10)
% of population 25+ with	15.11	15.08	15.09	15.07	25.19	24.24	25.26	24.26
coll. diploma (2005-07 ACS)	(4.24)	(4.23)	(4.28)	(4.27)	(2.59)	(2.48)	(2.61)	(2.50)
% of population white	-2.519	-2.581	-2.488	-2.563	0.520	1.031	0.203	0.761
(2005-2007 ACS)	(-0.99)	(-1.01)	(-0.99)	(-1.02)	(0.07)	(0.15)	(0.03)	(0.11)
% of population black	-8.728	-8.889	-8.830	-8.998	-13.71	-13.25	-13.39	-12.90
(2005-2007 ACS)	(-3.13)	(-3.19)	(-3.20)	(-3.26)	(-1.80)	(-1.74)	(-1.77)	(-1.70)
% of population Hispanic	-0.654	-0.565	-0.975	-0.888	-0.561	0.0272	0.577	1.192
(2005-2007 ACS)	(-0.35)	(-0.30)	(-0.52)	(-0.47)	(-0.11)	(0.01)	(0.11)	(0.23)
Median household income	0.00453	0.00380	0.00367	0.00293	0.0416	0.0425	0.0436	0.0445
(2005-2007 ACS)	(1.32)	(1.12)	(1.07)	(0.87)	(4.44)	(4.57)	(4.65)	(4.78)
Median value of own-occ.	-0.000243	-0.000216	-0.000197	-0.000169	-0.00151	-0.00156	-0.00162	-0.00168
housing unit (2005-07 ACS)	(-1.08)	(-0.96)	(-0.89)	(-0.76)	(-2.46)	(-2.56)	(-2.65)	(-2.76)
Constant	1014.3	961.1	1010.7	956.3	3268.0	3188.9	3180.7	3101.5
	(2.07)	(1.96)	(2.08)	(1.96)	(2.45)	(2.37)	(2.39)	(2.32)
Number of observations	354	354	351	351	354	354	351	351
Adjusted R-squared	0.465	0.465	0.459	0.459	0.495	0.494	0.487	0.487
widstat test statistic			141.0	146.8			141.0	146.8

sargan test statistic			6.928	8.163			0.437	0.262
sarganp test statistic			0.0313	0.0169			0.804	0.877

Table B-11: Rail revenue mile models, employment density (NYC omitted)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
dependent variable	Emp. Dens., Urban Area	Emp. Dens., Urban Area	Emp. Dens., Urban Area	Emp. Dens., Urban Area	Emp. Dens., Prin. City	Emp. Dens., Prin. City	Emp. Dens., Prin. City	Emp. Dens., Prin. City
	OLS	OLS	IV	IV	OLS	OLS	IV	IV
Rail revenue miles	-0.0000044		-0.0000483		0.0000463		0.000181	
(2 year lag)	(-0.41)		(-2.29)		(1.58)		(3.10)	
Rail revenue miles		-0.0000050		-0.0000481		0.0000466		0.000182
(4 year lag)		(-0.45)		(-2.26)		(1.53)		(3.09)
Freeway + arterial miles	-73.51		-59.56		1396.2		1379.0	
per sq. mile (2 year lag)	(-0.52)		(-0.42)		(3.64)		(3.53)	
Freeway + arterial miles		6.226		38.34		1489.3		1415.9
per sq. mile (4 year lag)		(0.04)		(0.25)		(3.55)		(3.32)
Population, 2006	0.000106	0.000103	0.000145	0.000139	0.000125	0.000128	0.00000320	0.0000143
	(6.54)	(6.49)	(6.28)	(6.31)	(2.83)	(2.95)	(0.05)	(0.23)
% of population under 18	-4.497	-3.588	-4.107	-2.928	-56.93	-58.29	-56.60	-58.87
(2005-2007 ACS)	(-0.53)	(-0.43)	(-0.48)	(-0.35)	(-2.46)	(-2.53)	(-2.41)	(-2.51)
% of population over 65	-13.44	-13.75	-12.40	-12.76	-21.41	-22.01	-24.14	-24.77
(2005-2007 ACS)	(-2.08)	(-2.12)	(-1.89)	(-1.95)	(-1.21)	(-1.24)	(-1.33)	(-1.37)
% of population 25+ with	-2.266	-1.688	-3.249	-2.501	-32.34	-31.50	-28.21	-27.66
HS diploma (2005-07 ACS)	(-0.43)	(-0.32)	(-0.60)	(-0.46)	(-2.24)	(-2.17)	(-1.90)	(-1.86)
% of population 25+ with	14.95	14.94	15.49	15.46	25.34	24.40	23.71	22.73
coll. diploma (2005-07 ACS)	(4.19)	(4.18)	(4.31)	(4.30)	(2.59)	(2.50)	(2.39)	(2.29)
% of population white	-2.433	-2.492	-2.714	-2.808	0.439	0.932	1.056	1.677
(2005-2007 ACS)	(-0.95)	(-0.98)	(-1.06)	(-1.10)	(0.06)	(0.13)	(0.15)	(0.24)
% of population black	-8.726	-8.877	-8.830	-9.020	-13.71	-13.26	-13.37	-12.78
(2005-2007 ACS)	(-3.12)	(-3.18)	(-3.15)	(-3.22)	(-1.80)	(-1.74)	(-1.72)	(-1.65)
% of population Hispanic	-0.591	-0.504	-1.124	-1.009	-0.621	-0.0399	1.231	1.805
(2005-2007 ACS)	(-0.31)	(-0.27)	(-0.59)	(-0.53)	(-0.12)	(-0.01)	(0.23)	(0.34)
Median household income	0.00417	0.00349	0.00462	0.00380	0.0419	0.0429	0.0400	0.0413
(2005-2007 ACS)	(1.21)	(1.02)	(1.32)	(1.10)	(4.45)	(4.58)	(4.13)	(4.31)
Median value of own-occ.	-0.000242	-0.000216	-0.000203	-0.000172	-0.00151	-0.00156	-0.00161	-0.00168
housing unit (2005-07 ACS)	(-1.08)	(-0.96)	(-0.90)	(-0.76)	(-2.46)	(-2.55)	(-2.57)	(-2.70)
Constant	1004.9	954.6	1033.4	969.5	3276.8	3196.2	3083.6	3034.5
	(2.05)	(1.94)	(2.09)	(1.96)	(2.45)	(2.38)	(2.26)	(2.22)
Number of observations	353	353	350	350	353	353	350	350
Adjusted R-squared	0.449	0.448	0.423	0.426	0.401	0.400	0.365	0.366
widstat test statistic			38.46	42.03			38.46	42.03

sargan test statistic			7.098	8.663			0.366	0.203
sarganp test statistic			0.0288	0.0131			0.833	0.903

Table B-12: Rail revenue mile models, population

	(1)	(2)	(3)	(4)
dependent variable	Population	Population	Population	Population
	OLS	OLS	IV	IV
Rail revenue miles	0.276		0.306	
(2 year lag)	(22.22)		(22.07)	
Rail revenue miles		0.285		0.317
(4 year lag)		(22.01)		(22.01)
Freeway + arterial miles	2397493.4		2098983.4	
per sq. mile (2 year lag)	(5.32)		(4.62)	
Freeway + arterial miles		2504869.1		2179517.8
per sq. mile (4 year lag)		(5.04)		(4.36)
% of population under 18	24515.8	21028.8	21333.3	17925.5
(2005-2007 ACS)	(0.86)	(0.73)	(0.75)	(0.62)
% of population over 65	-3393.8	-4607.3	-4705.1	-5997.9
(2005-2007 ACS)	(-0.16)	(-0.21)	(-0.22)	(-0.27)
% of population 25+ with	23584.0	25234.2	24307.6	25925.7
HS diploma (2005-07 ACS)	(1.32)	(1.39)	(1.35)	(1.42)
% of population 25+ with	5723.5	3945.7	4420.5	2750.1
coll. diploma (2005-07 ACS)	(0.47)	(0.32)	(0.37)	(0.23)
% of population white	-15346.9	-14696.8	-14046.7	-13398.6
(2005-2007 ACS)	(-1.77)	(-1.68)	(-1.63)	(-1.53)
% of population black	300.9	1262.2	852.4	1760.7
(2005-2007 ACS)	(0.03)	(0.13)	(0.09)	(0.18)
% of population Hispanic	16582.9	17890.0	16761.6	17999.7
(2005-2007 ACS)	(2.59)	(2.75)	(2.62)	(2.78)
Median household income	9.875	12.03	10.62	12.54
(2005-2007 ACS)	(0.87)	(1.05)	(0.93)	(1.10)
Median value of own-occ.	0.00319	-0.116	-0.171	-0.285
housing unit (2005-07 ACS)	(0.00)	(-0.15)	(-0.22)	(-0.37)
Constant	-2162741.2	-2276710.5	-2148052.8	-2252384.3
	(-1.30)	(-1.35)	(-1.30)	(-1.34)
Number of observations	364	364	361	361
Adjusted R-squared	0.710	0.703	0.705	0.698
widstat test statistic			452.6	468.5
sargan test statistic			12.77	10.83
sarganp test statistic			0.00169	0.00444

Table B-13: Total revenue mile models, employment density

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
dependent variable	Emp. Dens., Urban Area	Emp. Dens., Urban Area	Emp. Dens., Urban Area	Emp. Dens., Urban Area	Emp. Dens., Prin. City	Emp. Dens., Prin. City	Emp. Dens., Prin. City	Emp. Dens., Prin. City
	OLS	OLS	IV	IV	OLS	OLS	IV	IV
Freeway + arterial miles	-2.764		49.59		1304.0		1228.7	
per sq. mile (2 year lag)	(-0.02)		(0.28)		(2.96)		(2.77)	
Freeway + arterial miles		2.906		123.6		1199.9		1016.0
per sq. mile (4 year lag)		(0.02)		(0.63)		(2.42)		(2.02)
Total revenue miles	0.000000151		-0.0000131		0.0000199		0.0000389	
(2 year lag)	(0.08)		(-3.50)		(4.08)		(4.17)	
Total revenue miles		0.00000118		-0.0000120		0.0000211		0.0000412
(4 year lag)		(0.63)		(-3.27)		(4.15)		(4.37)
Population, 2006	0.0000761	0.0000593	0.000265	0.000244	-0.0000470	-0.0000563	-0.000319	-0.000338
	(2.67)	(2.09)	(4.85)	(4.63)	(-0.62)	(-0.73)	(-2.34)	(-2.50)
% of population under 18	-5.830	-7.286	-6.439	-5.261	-95.31	-102.2	-94.44	-105.3
(2005-2007 ACS)	(-0.50)	(-0.65)	(-0.52)	(-0.44)	(-3.11)	(-3.36)	(-3.07)	(-3.44)
% of population over 65	-17.80	-20.59	-17.78	-20.14	-34.71	-36.39	-34.74	-37.08
(2005-2007 ACS)	(-2.20)	(-2.55)	(-2.06)	(-2.34)	(-1.62)	(-1.65)	(-1.61)	(-1.68)
% of population 25+ with	-0.962	2.411	-1.868	1.614	-47.40	-45.20	-46.09	-43.99
HS diploma (2005-07 ACS)	(-0.14)	(0.36)	(-0.26)	(0.23)	(-2.67)	(-2.49)	(-2.58)	(-2.41)
% of population 25+ with	11.57	9.160	12.62	10.92	19.29	15.16	17.77	12.47
coll. diploma (2005-07 ACS)	(2.62)	(2.08)	(2.68)	(2.32)	(1.65)	(1.26)	(1.51)	(1.03)
% of population white	-2.257	-2.787	-3.086	-3.812	6.769	7.085	7.963	8.646
(2005-2007 ACS)	(-0.77)	(-0.97)	(-0.99)	(-1.24)	(0.88)	(0.91)	(1.02)	(1.10)
% of population black	-9.313	-9.581	-12.03	-12.74	-9.075	-8.416	-5.169	-3.598
(2005-2007 ACS)	(-2.86)	(-2.99)	(-3.40)	(-3.65)	(-1.05)	(-0.96)	(-0.59)	(-0.40)
% of population Hispanic	-0.206	0.598	-2.148	-1.769	1.614	3.459	4.408	7.066
(2005-2007 ACS)	(-0.09)	(0.26)	(-0.87)	(-0.71)	(0.27)	(0.56)	(0.71)	(1.11)
Median household income	0.00644	0.00827	0.00172	0.00223	0.0560	0.0618	0.0628	0.0710
(2005-2007 ACS)	(1.54)	(1.96)	(0.37)	(0.47)	(5.05)	(5.37)	(5.47)	(5.86)
Median value of own-occ.	-0.000238	-0.000327	0.0000253	-0.0000054	-0.00218	-0.00248	-0.00256	-0.00297
housing unit (2005-07 ACS)	(-0.92)	(-1.26)	(0.09)	(-0.02)	(-3.18)	(-3.51)	(-3.62)	(-4.04)
Constant	988.7	828.0	1266.6	1067.0	4809.3	4737.9	4409.4	4373.6
	(1.50)	(1.28)	(1.79)	(1.55)	(2.75)	(2.70)	(2.50)	(2.47)
Number of observations	280	275	280	275	280	275	280	275
Adjusted R-squared	0.445	0.463	0.338	0.361	0.523	0.520	0.495	0.492
widstat test statistic			33.88	37.61			33.88	37.61

sargan test statistic			4.027	1.962			1.436	0.373
sarganp test statistic			0.133	0.375			0.488	0.830

Table B-14: Total revenue mile models, employment density (NYC omitted)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
dependent variable	Emp. Dens., Urban Area	Emp. Dens., Urban Area	Emp. Dens., Urban Area	Emp. Dens., Urban Area	Emp. Dens., Prin. City	Emp. Dens., Prin. City	Emp. Dens., Prin. City	Emp. Dens., Prin. City
	OLS	OLS	IV	IV	OLS	OLS	IV	IV
Freeway + arterial miles	-89.40		646.8		1313.2		1248.5	
per sq. mile (2 year lag)	(-0.55)		(1.12)		(2.95)		(1.82)	
Freeway + arterial miles		-161.6		1022.3		1214.5		-24.09
per sq. mile (4 year lag)		(-0.90)		(1.26)		(2.39)		(-0.02)
Total revenue miles	0.00000820		-0.0000848		0.0000190		0.0000272	
(2 year lag)	(2.96)		(-1.50)		(2.52)		(0.40)	
Total revenue miles		0.0000110		-0.0000752		0.0000202		0.000110
(4 year lag)		(3.84)		(-1.42)		(2.50)		(1.29)
Population, 2006	0.0000111	-0.0000203	0.00100	0.000880	-0.0000401	-0.0000492	-0.000127	-0.000991
	(0.34)	(-0.62)	(1.66)	(1.59)	(-0.45)	(-0.53)	(-0.18)	(-1.11)
% of population under 18	-4.986	-7.491	-12.45	-1.160	-95.40	-102.2	-94.75	-108.8
(2005-2007 ACS)	(-0.44)	(-0.69)	(-0.49)	(-0.05)	(-3.11)	(-3.36)	(-3.11)	(-2.97)
% of population over 65	-17.40	-20.08	-20.01	-21.59	-34.75	-36.43	-34.52	-34.86
(2005-2007 ACS)	(-2.21)	(-2.57)	(-1.13)	(-1.34)	(-1.62)	(-1.65)	(-1.64)	(-1.33)
% of population 25+ with	-0.829	2.188	-4.385	1.306	-47.41	-45.18	-47.10	-44.26
HS diploma (2005-07 ACS)	(-0.13)	(0.34)	(-0.30)	(0.10)	(-2.66)	(-2.49)	(-2.68)	(-2.05)
% of population 25+ with	10.88	8.260	18.57	17.60	19.36	15.24	18.69	5.469
coll. diploma (2005-07 ACS)	(2.53)	(1.94)	(1.74)	(1.68)	(1.65)	(1.27)	(1.46)	(0.32)
% of population white	-1.162	-1.255	-10.96	-12.03	6.653	6.949	7.513	18.22
(2005-2007 ACS)	(-0.41)	(-0.45)	(-1.26)	(-1.38)	(0.85)	(0.88)	(0.72)	(1.29)
% of population black	-8.300	-7.882	-23.09	-25.07	-9.182	-8.566	-7.883	9.415
(2005-2007 ACS)	(-2.60)	(-2.52)	(-2.02)	(-2.04)	(-1.06)	(-0.97)	(-0.58)	(0.47)
% of population Hispanic	-0.143	0.855	-6.275	-6.639	1.608	3.437	2.146	11.28
(2005-2007 ACS)	(-0.06)	(0.39)	(-1.01)	(-1.03)	(0.27)	(0.55)	(0.29)	(1.08)
Median household income	0.00609	0.00871	-0.00544	-0.00927	0.0561	0.0618	0.0571	0.0806
(2005-2007 ACS)	(1.49)	(2.13)	(-0.47)	(-0.67)	(5.05)	(5.36)	(4.17)	(3.59)
Median value of own-occ.	-0.000290	-0.000418	0.000836	0.000898	-0.00217	-0.00248	-0.00227	-0.00385
housing unit (2005-07 ACS)	(-1.15)	(-1.66)	(0.94)	(0.94)	(-3.16)	(-3.48)	(-2.15)	(-2.49)
Constant	924.1	767.2	2175.6	1708.4	4816.1	4743.3	4706.2	3758.5
	(1.44)	(1.23)	(1.34)	(1.21)	(2.75)	(2.69)	(2.43)	(1.64)
Number of observations	279	274	279	274	279	274	279	274
Adjusted R-squared	0.454	0.481	-1.859	-1.313	0.416	0.412	0.413	0.132
widstat test statistic			2.323	3.330			2.323	3.330

sargan test statistic			0.510	0.385			9.154	4.716
sarganp test statistic			0.775	0.825			0.0103	0.0946

Table B-15: Total revenue mile models, population

	(1)	(2)	(3)	(4)
dependent variable	Population	Population	Population	Population
	OLS	OLS	IV	IV
Freeway + arterial miles	792928.0		714357.3	
per sq. mile (2 year lag)	(2.36)		(2.08)	
Freeway + arterial miles		518673.0		497496.7
per sq. mile (4 year lag)		(1.40)		(1.31)
Total revenue miles	0.0598		0.0606	
(2 year lag)	(40.06)		(33.41)	
Total revenue miles		0.0613		0.0615
(4 year lag)		(40.85)		(34.09)
% of population under 18	8545.5	-3183.5	8387.6	-3246.9
(2005-2007 ACS)	(0.35)	(-0.14)	(0.36)	(-0.14)
% of population over 65	-2796.8	-4448.1	-2416.5	-4353.8
(2005-2007 ACS)	(-0.17)	(-0.26)	(-0.15)	(-0.26)
% of population 25+ with	7510.9	8388.3	7142.6	8279.6
HS diploma (2005-07 ACS)	(0.53)	(0.59)	(0.52)	(0.59)
% of population 25+ with	-1929.0	-6018.0	-2051.3	-6041.8
coll. diploma (2005-07 ACS)	(-0.21)	(-0.65)	(-0.23)	(-0.67)
% of population white	626.9	2095.8	1001.7	2186.1
(2005-2007 ACS)	(0.10)	(0.34)	(0.17)	(0.36)
% of population black	12818.2	15541.3	12954.4	15577.9
(2005-2007 ACS)	(1.86)	(2.27)	(1.92)	(2.32)
% of population Hispanic	12331.0	14933.1	12131.4	14881.9
(2005-2007 ACS)	(2.58)	(3.11)	(2.59)	(3.16)
Median household income	22.89	29.42	23.04	29.47
(2005-2007 ACS)	(2.73)	(3.46)	(2.80)	(3.54)
Median value of own-occ.	-0.963	-1.286	-0.993	-1.293
housing unit (2005-07 ACS)	(-1.79)	(-2.37)	(-1.88)	(-2.42)
Constant	-1781499.6	-1760901.3	-1765025.2	-1755179.3
	(-1.29)	(-1.29)	(-1.31)	(-1.31)
Number of observations	290	285	290	285
Adjusted R-squared	0.903	0.906	0.903	0.906
widstat test statistic			170.1	177.6
sargan test statistic			15.05	13.74
sarganp test statistic			0.000539	0.00104

TABLE B-**16 Productivity models with two instruments, based on Abel et al. (2010)**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
dependent variable	Log of wages	Log of wages	Log of GDP per capita	Log of GDP per capita	Log of wages	Log of wages	Log of GDP per capita	Log of GDP per capita
	pcity	pcity	pcity	pcity	pcity	pcity	Pcity	pcity
Log of human capital	0.0830	0.0983	0.247	0.263	0.115	0.121	0.226	0.247
	(1.71)	(2.34)	(2.43)	(2.90)	(2.42)	(2.94)	(1.97)	(2.52)
Log of population	0.0339	0.0399	0.0269	0.0334	0.0366	0.0400	0.0284	0.0375
	(2.01)	(2.80)	(0.76)	(1.08)	(2.29)	(2.96)	(0.74)	(1.17)
Log of Employment density, Central City, 2yr lag	0.215		0.387		0.121		0.424	
	(2.43)		(2.10)		(1.28)		(1.86)	
Log of Employment density, Central City, 4yr lag		0.184		0.358		0.114		0.385
		(2.49)		(2.24)		(1.46)		(2.07)
Log of freeway/arterial per capita, 2yr lag					1.304		22.53	
					(0.17)		(1.21)	
Log of freeway/arterial per capita, 4yr lag						1.745		22.13
						(0.23)		(1.25)
Log of track miles per capita, 2yr lag					3103.9		297.8	
					(3.34)		(0.13)	
Log of track miles per capita, 4yr lag						2875.3		163.6
						(3.30)		(0.08)
Constant	8.596	8.770	-6.228	-6.064	9.291	9.310	-6.581	-6.368
	(16.20)	(19.55)	(-5.62)	(-6.25)	(15.67)	(18.66)	(-4.62)	(-5.38)
N	351	351	351	351	351	351	351	351
Cragg-Donald	7.155	9.227	7.155	9.227	4.881	6.987	4.881	6.987

Stock & Yogo 10%	19.93	19.93	19.93	19.93	19.93	19.93	19.93	19.93
Sargan	0.235	0.524	2.021	1.567	1.209	0.777	3.001	2.432
Sargan (P)	0.628	0.469	0.155	0.211	0.272	0.378	0.0832	0.119

TABLE B-17 **Productivity model with robust s.e., ordinary and two-stage least squares regressions (3 instruments)**

Robust SE	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
dependent variable	Log of wages	Log of wages	Log of GDP per capita00	Log of GDP per capita00	Log of wages	Log of wages	Log of GDP per capita00	Log of GDP per capita00
	OLS	OLS	OLS	OLS	IV	IV	IV	IV
Log of Employment density, Central City, 2yr lag	0.0554		0.152		0.114		0.135	
	(3.54)		(4.32)		(3.10)		(1.75)	
Log of Employment density, Central City, 4yr lag		0.0613		0.154		0.109		0.140
		(3.95)		(4.41)		(3.17)		(1.93)
Log of human capital	0.149	0.149	0.347	0.349	0.123	0.128	0.355	0.356
	(6.24)	(6.23)	(6.42)	(6.47)	(3.69)	(3.92)	(5.32)	(5.43)
Log of population	0.0420	0.0451	0.0610	0.0652	0.0344	0.0392	0.0633	0.0670
	(4.79)	(5.22)	(3.08)	(3.35)	(3.35)	(4.04)	(2.94)	(3.24)
Log of freeway/arterial per capita, 2yr lag	1.151		23.69		0.829		23.78	
	(0.15)		(1.37)		(0.14)		(1.46)	
Log of freeway/arterial per capita, 4yr lag		1.484		21.81		1.528		21.80
		(0.20)		(1.29)		(0.27)		(1.41)
Log of track miles per capita, 2yr lag	0.0299		0.0245		0.0259		0.0257	
	(4.23)		(1.54)		(3.01)		(1.94)	
Log of track miles per capita, 4yr lag		0.0258		0.0190		0.0224		0.0200
		(3.61)		(1.18)		(2.53)		(1.53)

Constant	9.754	9.674	-4.821	-4.877	9.383	9.370	-4.711	-4.785
	(60.77)	(60.35)	(-13.32)	(-13.51)	(34.56)	(35.71)	(-8.22)	(-8.66)
Number of observations	351	351	351	351	351	351	351	351
Adjusted R-squared	0.500	0.497	0.375	0.373	0.480	0.484	0.374	0.373

TABLE B-18, PART 1: Full sub-sector model results - wages (logged)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Agric.	Agric.	Mining	Mining	Utils.	Utils.	Constr.	Constr.	Manuf.	Manuf.	Whole.	Whole.
Log of sector-specific employment density, principal cities, 2-year lag	0.00214		-0.110		0.495		-0.0849		0.0387		0.0251	
	(0.06)		(-1.63)		(2.11)		(-0.97)		(2.33)		(0.48)	
Log of sector-specific employment density, principal cities, 4-year lag		-0.00149		-0.113		0.710		0.188		0.0374		0.0172
		(-0.04)		(-1.22)		(1.41)		(1.99)		(2.33)		(0.37)
Log of human capital	0.214	0.195	-0.137	-0.228	0.0932	-0.00266	0.160	0.0575	0.148	0.149	0.255	0.256
	(1.98)	(1.83)	(-0.71)	(-0.92)	(0.72)	(-0.01)	(3.08)	(0.96)	(3.79)	(3.80)	(5.21)	(5.26)
Log of population	0.0397	0.0440	0.146	0.179	-0.150	-0.249	0.0690	0.00801	0.0106	0.0114	0.0264	0.0292
	(1.00)	(1.08)	(2.90)	(3.07)	(-1.30)	(-1.08)	(3.03)	(0.33)	(0.95)	(1.02)	(1.23)	(1.46)
Log of track miles per capita	-456.8	-291.6	4341.5	3543.1	2295.6	2450.4	2222.9	1514.3	2466.6	2434.9	3238.8	3259.5
	(-0.18)	(-0.12)	(0.80)	(0.67)	(0.83)	(0.54)	(3.07)	(1.77)	(2.11)	(2.04)	(2.12)	(2.12)
Log of freeways/arterials per capita	161.4	172.3	205.7	250.9	-144.9	-222.2	47.81	36.46	-17.22	-16.16	-30.23	-29.88
	(2.30)	(2.27)	(2.22)	(1.89)	(-1.25)	(-1.10)	(2.44)	(1.67)	(-1.16)	(-1.07)	(-2.07)	(-2.03)
Constant	10.10	10.000	8.663	8.060	12.40	13.18	10.31	9.839	10.64	10.64	10.75	10.75
	(17.35)	(16.39)	(9.87)	(7.20)	(10.36)	(6.22)	(43.39)	(39.19)	(57.68)	(57.08)	(48.81)	(48.88)
N	214	213	180	175	166	167	351	351	350	350	350	350
Adj. R2	0.0151	0.0134	-0.418	-0.403	-1.445	-5.484	0.0652	0.146	0.176	0.175	0.367	0.370
Cragg-Donald	18.86	20.78	7.187	4.979	1.547	0.808	11.73	11.06	49.79	58.06	13.31	17.57
Hansen test	3.857	4.026	0.443	0.256	1.088	0.439	71.51	60.15	2.666	2.634	6.173	6.419
Hansen (P)	0.145	0.134	0.801	0.880	0.580	0.803	2.96e-16	8.68e-14	0.264	0.268	0.0457	0.0404

TABLE B-**18, PART 2: Full sub-sector model results - wages (logged)**

	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)
Logged independent variables:	Retail	Retail	Transp.	Transp.	Inform.	Inform.	Fin/Ins	Fin/Ins	R. Est.	R. Est.	Prof. S	Prof. S	Mgmt
Sector-specific employment density, principal cities, 2yr lag	0.208		-0.0695		-0.136		0.0992		-0.0541		0.0173		0.0599
	(1.94)		(-1.53)		(-1.46)		(1.35)		(-0.37)		(0.18)		(0.83)
Sector-specific employment density, principal cities, 4yr lag		-0.0617		-0.0524		-0.130		0.0719		-0.0769		0.00931	
		(-0.83)		(-1.13)		(-1.48)		(1.27)		(-0.54)		(0.11)	
Log of human capital	0.0171	0.0721	-0.100	-0.0994	0.379	0.375	0.244	0.264	0.158	0.179	0.375	0.384	0.0936
	(0.57)	(2.78)	(-2.37)	(-2.36)	(4.01)	(4.20)	(3.76)	(4.75)	(1.41)	(1.51)	(3.52)	(3.95)	(0.99)
Log of population	0.0070	0.0240	0.0807	0.0719	0.119	0.120	0.0568	0.0632	0.105	0.112	0.0843	0.0869	0.0615
	(0.64)	(2.94)	(3.26)	(2.82)	(5.28)	(5.36)	(2.53)	(3.33)	(2.66)	(2.77)	(2.52)	(2.78)	(1.27)
Log of track miles per capita	409.1	2116.6	1782.6	1734.8	5502.3	5428.7	4147.0	4298.9	3450.3	3543.2	2021.0	2090.6	1490.8
	(0.44)	(2.96)	(2.27)	(2.17)	(2.56)	(2.58)	(3.43)	(3.28)	(2.95)	(3.24)	(1.75)	(1.89)	(0.74)
Log of freeways/arterials per capita	-2.529	-2.319	35.11	30.75	-48.52	-44.49	-18.70	-19.73	5.244	6.297	-8.688	-8.821	-44.40
	(-0.24)	(-0.25)	(1.57)	(1.42)	(-1.84)	(-1.77)	(-1.24)	(-1.25)	(0.24)	(0.29)	(-0.52)	(-0.52)	(-1.40)
Constant	8.881	10.14	9.510	9.570	10.33	10.28	10.07	10.14	9.396	9.412	10.22	10.23	10.40
	(17.91)	(28.44)	(38.98)	(39.18)	(28.05)	(30.00)	(46.12)	(51.27)	(42.56)	(44.00)	(41.17)	(43.32)	(22.26)
N	351	351	349	349	337	337	350	350	350	350	350	350	274
Adj. R2	-0.258	0.139	-0.0688	-0.0397	0.220	0.225	0.568	0.573	0.319	0.298	0.553	0.549	0.121
Cragg-Donald	3.374	3.677	9.928	8.288	6.569	8.091	14.34	17.34	2.833	2.906	4.510	5.385	5.944
Hansen test	25.52	35.16	3.603	4.488	1.690	1.662	4.446	4.241	7.079	6.852	2.604	2.594	0.613
Hansen (P)	0.00000288	2.31e-08	0.165	0.106	0.430	0.436	0.108	0.120	0.0290	0.0325	0.272	0.273	0.736

TABLE B-18, PART 3 – Full sub-sector model results - wages (logged)

	(26)	(27)	(28)	(29)	(30)	(31)	(32)	(33)	(34)	(35)	(36)	(37)	(38)
Logged independent variables:	Mgmt.	Admin.	Admin.	Educ.	Educ.	Health	Health	Art/Ent.	Art/Ent.	Acc-Fd	Acc-Fd	Other	Other
Sector-specific employment density, principal cities, 2-year lag		-0.169		-0.0950		-0.0849		-0.00018		0.242		0.0168	
		(-1.34)		(-1.13)		(-3.68)		(-0.00)		(1.65)		(0.46)	
Sector-specific employment density, principal cities, 4-year lag	0.0545		-0.148		-0.0834		-0.0866		-0.0097		0.136		0.00609
	(0.83)		(-1.06)		(-1.02)		(-3.71)		(-0.09)		(1.08)		(0.17)
Human capital	0.0918	0.211	0.208	0.196	0.195	0.142	0.139	0.0794	0.0880	0.0465	0.0923	0.190	0.195
	(0.98)	(4.37)	(4.04)	(2.85)	(2.77)	(5.25)	(5.10)	(0.81)	(0.91)	(0.62)	(1.31)	(5.06)	(5.24)
Population	0.0633	0.114	0.104	0.112	0.110	0.0353	0.0362	0.132	0.134	0.0203	0.0297	0.0448	0.0465
	(1.38)	(2.57)	(2.20)	(5.71)	(5.85)	(4.36)	(4.44)	(4.22)	(4.35)	(1.02)	(1.74)	(4.35)	(4.49)
Track miles per capita	1470.1	1543.2	1805.3	3719.7	3641.1	1608.5	1608.8	4710.0	4777.6	736.5	1422.8	2133.3	2260.9
	(0.75)	(2.10)	(2.25)	(3.17)	(3.13)	(2.95)	(2.94)	(2.88)	(2.80)	(0.66)	(1.46)	(2.21)	(2.30)
Freeways/arterials per capita	-43.36	-18.53	-15.40	-44.04	-43.26	12.28	13.32	-48.84	-48.54	3.039	2.356	0.663	1.173
	(-1.38)	(-0.86)	(-0.77)	(-1.43)	(-1.38)	(1.06)	(1.14)	(-1.63)	(-1.62)	(0.17)	(0.14)	(0.05)	(0.09)
Constant	10.39	9.778	9.786	9.443	9.418	10.81	10.80	8.329	8.337	8.109	8.581	9.679	9.707
	(22.55)	(43.65)	(43.08)	(23.83)	(23.89)	(65.77)	(66.96)	(22.74)	(22.57)	(12.51)	(14.92)	(56.04)	(55.44)
N	273	351	351	317	317	351	351	347	347	351	351	351	351
Adj. R2	0.106	0.155	0.186	0.288	0.301	0.136	0.133	0.277	0.274	0.149	0.260	0.399	0.386
Cragg-Donald	6.710	2.903	2.515	5.368	5.888	30.29	32.76	13.21	11.04	2.772	3.127	20.55	20.96
Hansen test	0.706	2.191	2.344	2.429	2.785	6.242	5.824	0.742	0.781	22.76	22.82	11.61	11.38
Hansen (P)	0.703	0.334	0.310	0.297	0.248	0.0441	0.0544	0.690	0.677	0.00001	0.00001	0.00301	0.00337

TABLE B-19 Instrumental variable analysis of sub-sectors, with 3 instruments and robust s.e.

	Log of wages	Log of wages	Log of wages	Log of wages	Log of wages	Log of wages
dependent variable	Manufacturing (31)	Manufacturing (31)	Finance/Ins (52)	Finance/Ins (52)	Health (62)	Health (62)
	(9)	(10)	(19)	(20)	(31)	(32)
Log of Sector-specific Employment density, Central City, 2yr lag	0.0387		0.0992		-0.0849	
	(2.33)		(1.35)		(-3.68)	
Log of Sector-specific Employment density, Central City, 4yr lag		0.0374		0.0719		-0.0866
		(2.33)		(1.27)		(-3.71)
Log of human capital	0.148	0.149	0.244	0.264	0.142	0.139
	(3.79)	(3.80)	(3.76)	(4.75)	(5.25)	(5.10)
Log of population	0.0106	0.0114	0.0568	0.0632	0.0353	0.0362
	(0.95)	(1.02)	(2.53)	(3.33)	(4.36)	(4.44)
Log of track miles per capita	2466.6	2434.9	4147.0	4298.9	1608.5	1608.8
	(2.11)	(2.04)	(3.43)	(3.28)	(2.95)	(2.94)
Log of freeways/arterials per capita	-17.22	-16.16	-18.70	-19.73	12.28	13.32
	(-1.16)	(-1.07)	(-1.24)	(-1.25)	(1.06)	(1.14)
Constant	10.64	10.64	10.07	10.14	10.81	10.80
	(57.68)	(57.08)	(46.12)	(51.27)	(65.77)	(66.96)
N	350	350	350	350	351	351
Adj. R2	0.176	0.175	0.568	0.573	0.136	0.133
Cragg-Donald	49.79	58.06	14.34	17.34	30.29	32.76
Hansen test	2.666	2.634	4.446	4.241	6.242	5.824
Hansen (P)	0.264	0.268	0.108	0.120	0.0441	0.0544

APPENDIX C. REVIEW OF ACADEMIC LITERATURE

The purpose of this review of academic literature is to describe and critique theoretical and empirical research on the economic impacts of transit investments. Existing academic literature relevant for these purposes includes literature on broader topics, including how increased accessibility to jobs and other destinations may spur economic growth and development; the economic benefits of road and highway projects; and how agglomeration—development densification and firm clustering—may increase economic productivity. Researchers are still grappling with the complexity of these issues, and we therefore do not find a consensus on the scope and magnitude of the economic impacts of transportation investments; but we do find ample work which informs our framework for analysis.

Our focus is on theoretical economic models, and empirical tests of the hypotheses that they suggest. We generally exclude literature on computable general equilibrium models, integrated land-use and transportation models, and regional input-output models. Other work sponsored by FTA is developing such models, which are helpful for some purposes, but not for providing impact estimates, nor for inferring how the effects are transmitted. Larger scale models also tend to rely on numerous assumptions, not all of which are realistic or empirically verifiable.

Theoretical Issues

Transportation investments are thought to have economic benefits primarily because they improve transportation access, particularly by reducing travel time. Most transit projects do not reduce the monetary cost of travel, and in most cases the monetary cost is a small component of total costs, relative to the value associated with travel time. By reducing travel time, transportation investments may also have indirect effects, both positive and negative. Such effects include increases or decreases in agglomeration economies (particularly due to economies of employment cluster size); travel externalities (such as road congestion and vehicle pollution); and network externalities (transit networks may exhibit increasing economies of scale because of user-side time savings with service frequency increases).

In this review of theoretical literature we discuss how reductions in travel time cause almost all impacts of transportation investments, including the less conventionally measured ones; how these in turn may affect the spatial pattern of new development, population and employment; and how agglomeration, or firm clustering, increases economic output and is potentially increased by transportation investments.

Accessibility and Development Responses

Accessibility—the speed and monetary cost of travel to and from various locations—is closely linked to economic development. Faster and cheaper travel may cause more people to be willing to look for work, to find jobs more quickly when out of work, and to travel farther to find the right job (Berechman 1994). All are potential economic benefits, although they are not likely *additional* to travel time savings, and they may or may not exceed the real cost of the transportation investment. Faster and cheaper travel may also change where firms locate, how close they try to be to their suppliers, how much inventory they hold, where they warehouse their goods, and so on. These decisions in turn may result in higher or lower productivity in aggregate, *additional* economic benefits, as we discuss in the next section.

The implications of accessibility-driven changes in household and firm behavior are quite complex. Our focus here is to explain what is meant by “accessibility” and to emphasize that almost all subsequent economic benefits and costs associated with transportation projects flow from changes in accessibility.

Different indexes are used to measure the accessibility of any given location in a region, and to assess changes in accessibility that would be caused by a transportation investment that reduces travel time. A popular measure is Hansen’s accessibility index (1959), which (like other, similar measures) calculates the accessibility of any given neighborhood or “zone” by adding up the attractiveness of all other zones to which people in that zone could travel, divided or discounted by the time it takes to get there. The attractiveness, or destination value, of zones is measured in different ways, all of which are intended to represent the value of making a trip to the zone. Different measures of attractiveness are used for different measures of accessibility. A measure of “employment accessibility” might use total employment per zone; a measure of “shopping accessibility” might use retail employment as the measure of attractiveness; and so on. The time to travel between zones can be estimated from the distance between zones, from output from a regional travel model, or in other ways. The mathematical formulation of this particular index is:

$$A_i = \frac{\sum_{j=1}^{n} W_j . e^{-\beta . c_{ij}}}{\sum_{j=1}^{n} W_j} ,$$

where Ai = the accessibility of zone i to opportunities in zones 1 to n; Wj = some measure of attractiveness of zone j; cij = the time or distance of travel from zone i to zone j; and β is a parameter typically calibrated to observed zone-to-zone traffic flows from a real-world survey. The β parameter reflects the specific characteristics of the transportation system such as comfort level, safety, and so on, that cannot be directly measured by travel time or distance between zones. A common value used for β in the literature is –2. This default value establishes an inverse relationship between the square of travel time and accessibility; hence the value of this index increases as accessibility improves. Other measures of accessibility have been proposed and implemented *(36)*.

Households and firms may respond to increased accessibility provided by transportation investments by traveling more frequently to visit others, purchase goods, and otherwise interact with other firms and households. They may also demand floor space (that is, attempt to relocate) in places where accessibility has increased significantly. This process takes time. Certain places will become more favored than they previously were, while other places in the region may become less desirable. The price of more accessible locations will increase, and this will signal to land developers and redevelopers that investments in further intensification of development are likely to pay off.

Locations near network access points such as freeway on- and off-ramps or rail stations may become particularly sought after. But at the same time, properties particularly close to access points may also experience negative impacts such as noise, congestion, pollution, and accidents, because of a concentration of traffic.

In addition to the first-stage changes in accessibility, these potential changes in the distribution of population and employment are the immediate reasons for the external economic changes that we discuss later in the paper. We discuss them here despite the fact the FTA guidelines already exist for estimating development impacts, because these are crucial inputs to estimating those additional economic impacts.

The land market will respond to accessibility increases if firms and households value it, and, crucially, if regulations and governments permit intensified development and/or intensified occupancy of existing development. But this is often not the case in the United States. Regulations that hinder development include large lot zoning, density maximums, and minimum parking requirements. Thus greater accessibility is usually a necessary (but not sufficient) condition for significant development-driven economic growth to occur. Without permission to develop, economic impacts will be limited, as will the negative impacts of development.

If there were no possibility of in-migration, one might expect property values to increase near rail stations and bus stops while possibly decreasing in less advantaged areas, because improvements in transportation decrease travel costs, and therefore the bid-rent surface for land tends to flatten. If this were to happen, one might see a more concentrated development pattern near stations—and dispersion or reduced density farther away from stations in places where quick walking, transit, and short-drive access to the stations is no longer possible or feasible. Localized agglomeration mechanisms might increase *or* decrease in such a situation; this is an empirical question that theory can do little to resolve. The more clustered employment that might be thought typical of effective transit (particularly rail) investments might be better for productivity than highway or road investments.

But, crucially, the economic benefits of a transportation investment are not limited to existing workers, firms, and residents. Because the investment reduces the average cost of living and doing business in the area served by the network—that is, by reducing the average cost of traveling on the network—one might expect that this lower cost would result in in-migration from outside the region to take advantage of the lower cost of transportation. This can in turn give rise to agglomeration economies related to city size, also known as urbanization economies.

Agglomeration Economies

Agglomeration is the clustering of development that is caused by the tendency of firms and households to locate near other firms and households. Firms sometimes agglomerate with other firms in the same industry, and sometimes with firms to which they have some cross-industry or supplier relationship. Agglomeration at a larger scale includes households clustering with those firms, and retailers locating in clusters with good access to those households. Firms and workers are thought to be more productive and efficient when in bigger, denser, and more accessible agglomerations.

Reducing travel time to and from existing agglomerations has the potential to cause agglomerations to grow, particularly where demand for growth and densification is pent up. Reducing travel time means reducing various costs of access faced by firms—by their workers to the workplace, to suppliers of production inputs, and to the markets that purchase their goods. A reduction in transportation cost may make it possible for new and existing firms to join agglomerations or expand within them—for example, to pay for an expensive multistory building in an industrial district. Even without such changes, the increased accessibility may be itself increase productivity per unit of labor or capital input.

Also, transportation facilities, particularly nodal facilities like multimodal transfer centers, are “sharable inputs” to firm production, like other public infrastructure such as water and sewer systems that might also result in larger cities. Thus it is thought that transport investments (like other public infrastructure investments) increase “the efficient operation of cities, particularly large cities, and thus also promote the realization of agglomeration economies" (Eberts and McMillen 1999).

Agglomeration is of particular interest to those who wish to estimate economic benefits of public investments because of "externalities"—significant costs and benefits that are not directly captured by firms making location and expansion decisions. Externalities also make agglomeration somewhat harder to measure empirically. These external costs and benefits are not captured by conventional benefit–cost analysis, nor by accessibility-based estimates of economic impacts of transportation investments. In particular, firms do not take into account how their presence may benefit other firms and the economy as a whole; those benefits to others may significantly exceed the benefits to the firm itself if the productivity returns to agglomeration are highly nonlinear.

Discussion of agglomeration is commonly focused on questions of industrial production and firm location, rather than personal/household utility and residential location, although the latter also play a role in agglomeration, particularly at the regional scale. Anas, Arnott, and Small define "economies of agglomeration" as "a term which refers to the decline in average cost as more production occurs within a specified geographical area" (1998: 1427):

> One class of agglomeration economies is intra-firm economies of scale and scope that take place at a single location. Another class is positive technological and pecuniary externalities that arise between economic agents in close spatial proximity due, for example, to knowledge spillovers, access to a common specialized labor pool, or economies of scale in producing intermediate goods. Agglomeration economies may be dynamic as well as static, and are suspected of giving cities a key role in generating aggregate economic growth.

These agglomeration economies may cause higher productivity even without an increase in physical concentration, when travel speeds increase and if the interactions that give rise to agglomeration are facilitated by travel via the affected mode.

Another, more conventional and somewhat disfavored explanation for industrial agglomerations is comparative advantage, or what Anas, Arnott, and Small (1998) call "spatial inhomogeneities." Access to a public good, such as a port or a transportation hub, is an example.

Trade Theory

Regional industrial agglomerations could develop not because of externalities, but because industries seek advantage in serving their markets. Industrial agglomeration can arguably be largely explained by firms locating their plants centrally in order to maximize internal economies of scale in production while easily accessing their markets:

> Because of economies of scale, production of each manufactured good will take place at only a limited number of sites. Other things equal, the preferred sites will be those with relatively large nearby demand, since producing near one's main market minimizes transportation costs. Other locations will then be served from these main sites. (Krugman 1991: 485-6)

When the increasing returns to scale are strong, transportation costs are low, and manufacturing employs a large enough share of the population, a dynamic process of growth and concentration feeding upon itself will end up with population becoming concentrated into a few regions. Thus transportation investment could cause agglomeration (that is, a spatial concentration of firms) without there being the need to calculate *additional* impacts due to the agglomeration increasing productivity. In the New and Small Starts context, such agglomeration would be accounted for in the capitalization of transportation benefits into the production process—and therefore should be captured by calculating travel time savings and increased ridership. But *if* agglomeration externalities are important—if example, if they create significantly increasing *external* returns to scale for a given industrial agglomeration (see below for more on this point)—then a reduction in transportation costs, by simply enabling the agglomeration tendency, gives rise to increasing returns that would not be included merely by calculating the firm and household value of travel time reductions.

Glaeser (2000) is skeptical that the Krugman model applies in the modern day, because he interprets the fact that transport costs are smaller than ever as meaning that the importance of locating near markets has become less important, and therefore that Krugman's model will not yield the observed pattern of agglomeration. This may be a misunderstanding of the model. Using an equilibrium model version of the Krugman theory, Puga (1998) shows that the agglomeration equilibrium is even more centralized under the assumption of decreased transportation costs, which is one explanation for the importance of primate cities in developing countries.

Regardless of how important trade theory is to explain modern metropolitan-level agglomerations, lower transportation costs of trade, along with increasing returns to scale, are essential for explaining the geographical distribution of economic activities. Transportation investments, by enabling more efficient trade, can in turn also enable other non-trade-related (production) economies of scale.

Externalities

The concept of agglomeration economies—external returns to firm and household clustering—has long been recognized, being mentioned even by Adam Smith. Alfred Marshall has been credited with the development of the underpinning concepts. He argued that producers within the same industry end up locating near each other to share specialized local input providers, to benefit from a pool of skilled workers, and to have ready access to specialized information that was created by other firms (Marshall 1997 (1920)).

For most of the twentieth century, research advances on agglomeration economies were theoretical. Henderson (Henderson 1974, 1983, 1988) embedded agglomeration economies within a general equilibrium framework and urban economics. Later, the theory was incorporated as an integral part of thinking on "new economic geography," initially credited to Krugman (1991); see also Ottaviano and Puga (1998) and Fujita, Krugman, and Venables (1999) for surveys of this literature.

Two distinct types of agglomeration economies have been identified. ”Localization” or "Marshallian" economies are said to explain the productivity gains from co-location that are external to the firm, but internal to a particular industry. The development of a local, specialized labor market is one example of such effects. ”Urbanization” or ”Jacobsian” economies (after Jacobs 1969) describe economies that are external to the firm *and* to the industry, but internal to the city or metropolitan area. These economies are caused by the existence of local public goods, economies of scale in the size of markets (e.g. thicker labor markets), and various inter-industry interactions.

Why Firms and Households Agglomerate

Duranton and Puga (2004) elaborate on motivations for agglomeration. Their categories of “sharing,” “matching,” and “learning” include both within- and across-industry relationships, as well as relationships between retailers and household customers.

Sharing mechanisms include sharing of indivisible facilities (like ports) in order to reduce costs, as well as sharing diverse pools of input suppliers to increase productivity, enable narrower specialization, and spread risk. This can also result in an increase in the number of suppliers, rather than an increase in the scale of existing suppliers. While greater division of labor may result in extra coordination costs (Becker and Murphy 1992), agglomeration presumably makes this coordination easier by reducing the cost of such negotiations which are so integral to the vertical disaggregation of production (Williamson 1979). The net effect is likely greater efficiency.

An “indivisible” good or facility has high cost and large economies of scale. Such a facility is feasible only when it can be shared by many users. Examples include large public transit systems (particularly rail systems), sports arenas, marketplaces, and recreational areas. However, most shared facilities are also subject to crowding, which implies a diseconomy of scale beyond some range. Benefits from fixed and indivisible facilities accrue due to the constant marginal cost of use, at least up to the point at which significant congestion of roads, rails, and/or transit vehicles occurs.

Input sharing must demonstrate economies of scale in order to contribute to agglomeration benefits. One strand of research examines the purchased input intensity of various industries relative to the national mean. Purchased input intensity is the amount of purchased inputs divided by sales, which serves as a measure of vertical disintegration. Holmes (1999) finds that the most concentrated industries exhibit the highest degrees of input sharing, consistent with the theory, and furthermore for the ten most concentrated industries the effect is twice as large (Rosenthal and Strange 2004).

While a higher degree of supplier specialization would be expected to occur in industrial agglomerations, the manufacturing data is generally organized in a way that precludes a refined analysis of specialization. However, the one exception, the textile industry, does show a higher degree of specialization as the degree of concentration increases, consistent with the theory. Plants may also choose locations with a preferable milieu of input suppliers, but the research generally supports the idea that input sharing is a benefit of (and motivation for) agglomeration (Rosenthal and Strange 2004).

Matching mechanisms help buyers and sellers of production inputs to find each other. A larger pool of labor for employers, and a larger pool of firms for workers, lower production costs by reducing the amount of time to match skills and tasks, the time for firms to fill vacated or new positions, and both the travel time and the search time for workers to find jobs. Thus firms and workers are attracted to agglomerations which provide more workplace and worker choices.

Easier matching also reduces risk and increases competitiveness. Intermediate suppliers can market to multiple firms rather than relying on just one firm, making production inputs more competitive and reducing the risk of capital investments. When assets are repossessed due to project failure they may be more easily recycled in an urban agglomeration because it is easier to find a match; similarly, when cities get larger, it may be easier for entrepreneurs to find appropriate production machinery (Helsley and Strange 1991).

Similarly, workers benefit from being able to move to other firms if one firm fails; they are therefore more likely, when living in large cities or near large industrial clusters with appropriate jobs, to take on riskier positions in more innovative firms. Labor market pooling reduces risk for both employers, who need to respond to positive demand shocks, and employees, who mitigate their risk of unemployment by locating near industrial agglomerations. There is also industry-specific risk, which in a specialized city would increase the risk of unemployment.

While most agglomeration research focuses on its effects on productivity, large cities are also thought to benefit consumers via access to specialized goods and services (opera, professional sports); aesthetic charms (attractive architecture, a good climate); specialized public goods (e.g., arts high schools, skateboard parks); and more potential for interaction with other households and firms (Glaeser, Kolko, and Saiz 2001). An increase in households who value such amenities may explain why there was a rise of reverse commuting between 1980 and 1990 (although center city locations also might provide accessibility to many employment opportunities). Tabuchi and Yoshida (2000) find that while the nominal elasticity of wages with respect to city size is 10%, the real (cost-adjusted) elasticity of wages with respect to city size ranges from -7% to -12%. Workers may be willing to pay a wage penalty to live in a large city because of the consumption opportunities. Waldfogel (2003) and George and Waldfogel (2003) argue that the large market of consumers in large cities allows “goods to be more closely tailored to individual consumers’ tastes”. Waldfogel’s (2003) study of radio listening habits shows that the average percentage of the population listening to radio increases by 2% for each one million person increase in the population.

Learning mechanisms include the generation, diffusion, and accumulation of knowledge. Since learning is a social activity, cities may have an advantage in facilitating learning by bringing large numbers of learners and knowledgeable people together. Chamley and Gale (1994) argue that observing the decisions of other firms is an externality which firms may avail themselves of to make better decisions, following Marshall (1997 (1920)). Firms making risky investments may also benefit from firsthand experience of what others have done. Young firms need time to experiment to find the right combination of inputs and processes for an optimal production process. Diversified cities provide the broad range of suppliers and knowledge that facilitates this phase and makes it more productive for a firm to start up there, rather than in a more specialized city. The fact that diversified cities are more expensive suggests that the benefits of living there may be large; otherwise, firms and households would not be willing to pay more to live there (Duranton and Puga 2004).

Transport and Agglomeration

Most of the work above conceives of agglomeration as depending on tradeoffs between proximity to various firm amenities. Agglomeration is also affected by the time cost of travel because lower travel time makes the learning, matching, and sharing mechanisms easier for firms, making it more likely for them to benefit from agglomerations. But little of the work outside Krugman (1991) has explicitly discussed how changes in transportation cost may alter agglomerations. In this subsection we focus on such theoretical literature.

Changing the cost of transportation by making a transportation investment—and therefore reducing the costs of transportation for freight, for commuting, for business-to-business travel, for marketing, and/or for any of a number of economic activities that depend on transportation—has several potential effects on agglomeration and hence productivity, but much depends on context and details of the investment. Reduced transportation cost for firms can allow larger market areas and hence larger and denser agglomerations. Reduced transportation cost for households can make job searching easier and commuting less costly, with effects on labor participation and hence on agglomerations.

We paraphrase from Eberts and McMillen (1999) here. Mills (1967) developed a general equilibrium model that included agglomeration economies along with intracity transportation, built on costly land, to bring workers to the central business district (CBD). The amount of land used for transportation limits city size. The amount of land used at a site is proportional to the number of passenger miles at the site. There are decreasing economies of scale in transportation as city size increases, so that doubling population requires more than twice as much land for transportation use. On Henderson's account (1974; 1982a; 1982b; 1983, 1988) transportation reduces commute times, freeing labor for housing production, which reduces the price of housing and allows firms to pay lower wages. Thus transportation investment stimulates growth (although whether the value of the growth exceeds the transportation investment cost is a separate question). Similar to Krugman, Mori (1997) modeled firm location as driven by agglomeration economies. In this model, declining transportation costs cause a large city to grow because manufacturers can support a larger market area. These savings more than compensate for higher shipping costs for agricultural products.

Methods

Measures of agglomeration unrestricted to administrative geographical units (those that consider the attenuation over distance) are another way to incorporate the impact of transport projects on agglomeration and hence the economy. Venables (2005) demonstrates how this could work in practice, in a stylized core-periphery setting. He considers a CBD that draws employment from outside. As travel times are reduced, more workers are willing to commute to the CBD and to work, which leads to increased productivity from agglomeration.

Rice et al. (2006) examines the magnitude and geographical reach of agglomeration economies in the UK using a simulation model. They analyze regional differences in productivity, controlling for differences in skills and sectoral composition, and attempt to explain the residual variation using proximity to "urban mass" as measured by journey times. They find a modest agglomeration elasticity of 5%. They also find that firms can benefit from proximity to other firms as far 80 minutes away. They calculate that under their assumptions a 10% increase in the speed of all transport across the UK could deliver a productivity gain of 1.2%.

Venables (2007) argues that transport improvement can increase urban center employment on the one hand by increasing links between nearby companies, which increases the "effective density" (accessibility) of employment, and on the other hand increasing the commute catchment area for firms in the agglomeration. Venables argues that the agglomeration benefits of the transport improvement derive from two market imperfections: (1) new employment increases the productivity of existing as well as new urban center workers (a classic externality), and (2) because commuters reach equilibrium between location and commute costs and wages based on after-tax income, whereas the value of extra output produced by a migrant exceeds cost incurred but accrues to the government. He develops a theoretical model with a transport dimension, and shows how a transport improvement, represented by a decrease in the cost per unit distance of travel, can lead to an increase in real income exceeding the decreased cost per unit of travel. He also develops a numerical monocentric city model to estimate the agglomeration benefits, suggesting that agglomeration externalities could increase total benefits by 2.5 to 5 times the amount of the travel cost savings.

Pilegaard and Fosgerau (2008) argue that reducing labor search costs by making transport improvements could have substantial external benefits in manufacturing industries, because job turnover in those industries, which is costly, can be in the range of 8% to 12% per year. The authors assume that the turnover leads to unemployment spells, instead of retirements and new employment (e.g. by immigrants and young adults entering the workforce). Employing this assumption in a simple mathematical model with two regions connected by a commuting link, and employing input parameters based on the Danish economy, they suggest that a 10% reduction in inter-region travel times could result in a 29% increase in the net benefits that would calculated in an ordinary benefit–cost analysis.

Competition Externalities

We move on to effects that are not directly from agglomeration. Improved transportation can also play a role in increasing competition, by allowing geographically limited markets to overlap to a greater extent. Increased competition due to better transportation may increase economic efficiency and consumer surplus when compared to monopolistic or oligopolistic markets. Local competition is also thought to increase productivity, by forcing companies to innovate (Porter 1990). On the other hand, the work of Marshall (1997 (1920)), Arrow (1996 (1962)) and Romer (1986) suggests that local competition may decrease productivity because the gains from innovation cannot be completely captured at the firm level.

The ability of increased accessibility to make markets more competitive and efficient depends on the type of firm and industry, the geographic locations, and the size of the markets firms serve. Commercial shops and services tend to serve local markets and will often be dispersed throughout a region, but decreased transportation costs increase the incentives even of these “convenience” land uses to grow larger and serve larger retail markets. Firms marketing their products globally can be subject to competitive pressures at large distances, and those that survive do so via innovation and productivity enhancements. The scale of localized firms is also important. Increasing the market area of a grocery store may lead to less localized competition as the increased productivity due to scale reduces consumer prices and results in fewer but larger grocery stores; on the other hand, the competitive market increases in spatial size due to the reduced transportation cost.

Travel savings, both during work activities requiring travel to and from work sites, and on the commute to work, may have a positive economic impact not only because of the taxation wedge but because competition may increase, *if* the worker uses the freed-up time to do more work. A common example is the time saved by a plumber who can access more jobs in a shorter period of time. The competitive plumber would pass these savings on to the customer; if the market suffers from imperfect competition the plumber can capture this gain for him or herself.

If prices are inefficiently high, and productivity suffers as a result, then benefit–cost analyses valuing saved worker travel time at the wage rate would underestimate the economic benefits (e.g. Venables and Gasoriek 1998). Davies (1998) shows that a good approximation to the magnitude of these benefits is $dW/dT = 1 + e(m/p)/\{1-(m/p))$, where dW is the benefit of increasing competition, dT is the benefit to in-work travelers, e is the aggregate price elasticity of demand with respect to price and m/p is the average price-cost mark-up. If the mark-up is about 20% and the aggregate demand price elasticity is 0.50, and the mark-up disappears with a transportation investment, then the additional benefits caused by imperfect competition would amount to about 10% of conventionally measured benefits.

However, one may expect a relatively small impact on accessibility, and therefore on regional competition, from the average public transportation infrastructure project in the US, where existing transportation networks are highly connected (e.g. Jiwittanakulpaisarn et al. 2009a). Furthermore, capture of consumer surplus by producers could be just a net transfer without net economic impacts, unless imperfect competition lowers productivity and reduces output.

Labor Taxation and Work Travel

Transportation improvements likely affect individual decisions about whether to work, how much to work, or where to work. Because workers pay income taxes, which are a disincentive to at least some people in some wage ranges to work more or seek higher-paying (more productive) work, the supply of labor is suboptimal (Venables 2007), although it is unknown by how much. Transport improvements may increase labor supply, which will have an economic value that exceeds the wage net of taxes. Similarly, Cogan (1980) argues that modeled differences between the minimum number of hours women will work are caused by differences in fixed costs of work, such as transportation costs. Even if such changes can be demonstrated, Venables (2007) points out that impacts on individuals' incomes of starting to work must be exactly offset by their perceived cost of working, leaving only the transport benefits as a real economic welfare gain to the transport users.

Network Externalities

Transit networks may exhibit increasing economies of scale because of user-side time savings with service frequency increases. The existence of increasing returns to scale in transit network density and size was first demonstrated theoretically by Mohring (1972). This theoretical work has been discussed and refined by others (Nash 1988; Kerin 1992; Walters 1982). Some have argued that there may *not* be increasing returns to scale depending on the details—for example, whether there is regulation of market entry and exit by private transit operators (van Reeven 2008).

There may also be road network increasing returns to scale, despite the fact that there are no reductions in user wait times with greater network density. Holl (2006) argues that benefit–cost analysis may fail to consider the network benefits of transportation investments because the transport network is typically truncated in such analysis.

Empirical Studies

Theories and simulation models are not in the end sufficient to give us accurate estimates of the economic impacts of transit beyond the estimated value of travel time savings. Agglomeration economies might attenuate rapidly with distance, might be more important for some economies than others, and might be heavily context-dependent. Transportation investments might even disperse rather than concentrate development, actually reducing productivity and having economic costs rather than benefits. Transit investments could have a net dispersing effect depending on the existing transit network (e.g. Haughwout 1999). Factors include the particular project being added to that system; the transportation technology; the tradeoffs firms make between proximity to other firms in the same industry; suppliers; inputs; labor force; and markets.

Therefore, in this section we focus on empirical studies in four areas. We explain but do not provide a complete review of literature on our first two topics, which are studies of how accessibility changes affect economic growth and property values, respectively. These two study approaches are not suited to discriminating between the myriad, often simultaneous, mechanisms that may have economic effects when a transportation investment is made. Our third topic is modeling economic output as a function of transportation investments; we cover this literature in more detail. Finally, we focus on new and more relevant research attempting to discriminate between direct accessibility effects and other additional effects like increasing agglomeration economies. Measuring the net impacts of any or all of the theoretical agglomeration mechanisms described in the previous section is a significant challenge.

Accessibility and Economic Change

Some empirical studies directly test whether changes in travel time lead to economic growth, and many of these have found a significant positive relationship between accessibility improvements and economic development (see Berechman and Paaswell 2001; Ozbay, Ozmen, and Berechman 2006). We give two examples below.

The accessibility index proposed in Allen et al. (1993) was used to capture the overall transportation access level of Philadelphia and other largest US metropolitan areas. Using this index, a regression analysis was performed for data from sixty largest US metropolitan areas in order to investigate the impact of accessibility on employment growth rate. The results showed that accessibility was highly correlated with regional economic growth.

Isserman et al. (1989) used a quasi-experimental approach to investigate the effect of highways on smaller communities and rural areas. They examined income growth rates during the period of 1969-1984 for 231 small rural cities, some with highway access, and some without. Cities located near highways had faster economic growth.

Accessibility studies do not attempt to distinguish capture or capitalization of travel time savings in firm production processes from additional economic impacts.

Property Value Studies

Property values offer a potentially fruitful measure of net economic impacts of all kinds of public investments, including transportation, but typically without distinguishing the reasons for, or causes of, net benefits or costs. Modeling property values has the advantage of being empirical, although the approach inevitably lacks the specificity of a simulation model because data are limited.

If residents and businesses value a new transit improvement, they will be willing to pay more to locate near it so as to be better able to access it. Cities with good transit systems may have higher rents than those without, because of the improved accessibility enabled by the system. This is the premise of using “hedonic modeling” techniques to estimate the larger economic impacts of transit investments. It is long established that developers, property owners, and tenants are willing to pay more to purchase or rent real estate that is more accessible to their labor force, employers, commercial opportunities, and other spatially-dependent resources. Observed rents and sales prices can thus reflect part of the value of this accessibility (i.e., part of the benefit of access is capitalized in land prices).

On the other hand, land values in the region as a whole could (and arguably, should) go down overall as proximity loses its value, assuming no in-migration (Mohring 1993). Thus it is better thought of as a way to value local impacts, and not regional impacts. Production function studies (see below) are better for understanding regional impacts.

Property values may measure several kinds of economic impacts of transportation. First, there is an option value to having transit nearby (e.g., if a car breaks down), even if this rarely translates into ridership. Second, buyers may anticipate the value of being near the line in the future if they believe that attractive destinations may develop near stops, the transit network may become denser, and so on. (Thus investigating development right after a system is developed is seen as an inferior measure to price measures, which can anticipate such changes before they occur (see, e.g., Cervero and Landis 1997)). Third, the economic benefits of transit can only be partly estimated by riders' willingness to pay transit fares; there is a consumer surplus associated with transit consumption just as with other goods, and this may be capitalized into home prices. Fourth, some share of the other benefits discussed above—agglomeration benefits and search reduction benefits in particular—may also be reflected in land values.

However, there are several problems using property values as measures of economic impact. First, they amount to double-counting if other measures (e.g., estimates of the value of time savings) are included. Second, land economics predicts that in a somewhat elastic property market, not all benefits are capitalized in property prices; so property values provide a partial measure, or lower bound, of benefits and costs of investments. Third, property values reflect the bids of firms and households, but those bids ignore the external component of agglomeration benefits, as well as other externalities. These caveats are rarely addressed (or stated) in the property value literature.

Industry Output and Growth Studies

Another means of estimating the economic impacts of transportation investments is to investigate measures of economic productivity in places with different levels of transportation infrastructure, or better yet, in places before and after investments occur. However, like land value studies, studies of economic productivity as a function of transportation investment do not tend to specify a particular theoretical mechanism, such as agglomeration economies (Holl 2007, citing Haughwout 2002 & 1998). The estimated effects are net of all possible causal mechanisms which may have both positive and negative economic impacts.

Aschauer (1989) found a strong positive relationship between investment in public infrastructure and output using an aggregate production function model. But there are severe causality problems (e.g., investment may equally lag growth), as well as difficulties in identifying relevant measures of public infrastructure capital and investment. Later studies trying to correct for these problems generally find a much weaker relationship (see Banister and Berechman (2000) for a review). One review found that economic productivity increases somewhere between 5% and 30% for every 100% increase in public capital investment (Quinet and Vickerman 2004). Some estimates are considerably smaller. Jiwattanakulpaisarn et al. (2005) constructed a dynamic model of the private economic output elasticity of additional highway infrastructure, calculating a short-run elasticity of output with respect to highways of 0.007% and a long-run elasticity of output of 0.04% per additional 1% increase in highway density.

Although most studies have identified some kind of positive relationship between improved highway accessibility and local economic development, several studies find little or no effect of transportation investment on local economic growth. A common claim of negative- or no-finding studies is that economic growth would have occurred anyway near highways, or that a booming economy leads to more transportation investments, rather than the reverse. If so, estimates of capital investment effects on productivity could be too high. Stephanedes and Eagle (1986) used a time-series approach to investigate the relationship between state highway expenditures and changes in employment levels in 30 non-metropolitan Minnesota counties between 1964 and 1982. The authors found no overall relationship between highway expenditures and changes in employment levels. For a subgroup of regional centers, however, highway expenditures did appear to engender job growth. Duffy-Deno (1991) tested the direction of causation between infrastructure and output using a production function and a demand for public capital function, and found that the direction is in fact from infrastructure capital to output growth, rather than the other way around. Other studies controlling for this potential endogeneity find little bias, on average (Melo, et al. 2009).

A recent literature review suggests that the effect of transportation investments (primarily roads) on productivity across the city has declined over time in the US, and is "currently indistinguishable from zero" (Baird 2005). This could indicate that studied US cities have generally met or exceeded their maximum transportation capacity, given their population before negative externalities (such as congestion) and the opportunity cost of land combine to overwhelm any positive effects of the investments. He cites Fernald, who studied industry data and concluded, "the evidence suggests that the massive road-building of the 1950s and 1960s…offered a one-time increase in the level of productivity."

Eberts (1986) models the direct effects of public infrastructure on manufacturing output and public capital stock, measured using the perpetual inventory technique. The study includes highways, sewage, and water infrastructure for MSAs, and finds a positive and significant contribution to output. Deno (1988) estimated an industry profit function for 1970 to 1978 data using the same capital stock measures (multiplying capital stock by manufacturing's share of employment). Calculated elasticities for water, sewer, and highway infrastructure were 0.08, 0.30, and 0.31, implying that doubling highway investment increases firm profits 31%. These relatively high numbers suggest underinvestment in public capital. In Europe, Seitz (1993) used similar methods and found that for each doubling of public capital stock, industrial production costs decrease about 12.7%. But other studies have found smaller effects. In particular, Holtz-Eakin (1992) found that infrastructure investment effects diminished or disappeared once state-specific industrial productivity effects were controlled.

Most of the work has been production function-based but some has used aggregate cost functions (ACFs), which allow a better understanding of how economic productivity may be related to specific elements of production (Baird 2005).

Holl (2006) investigates the relationship between firm birth and new highway infrastructure in Portugal, demonstrating that areas within 10km of new infrastructure were absolute and relative winners in the rates of new firm birth, partially at the expense of adjacent areas between 10 and 50km from the new infrastructure. Furthermore, she concludes that firm birth rates in areas beyond 50km from new highway infrastructure have not been meaningfully impacted—implying net growth due to highway infrastructure, rather than merely a redistribution of growth.

Agglomeration Estimates

In this section we first cover a voluminous empirical literature on the size of agglomeration economies, and then discuss the relatively few entries in the literature that explicitly include measures of travel time or transportation investment.

Empirical work on agglomeration economies has typically been focused on manufacturing, as it was there that the most explicit examples of clustering were seen historically. Data is often much more readily available for the manufacturing sector, and on a longer time-series. Notable exceptions are Ciccone and Hall (1996), Ciccone (2002), Graham (2007a; 2007b) and Brülhart and Mathys (2008) who either study the whole economy or subsectors of both manufacturing and services.

The empirical literature has generally followed three broad approaches. The longest standing body of research has sought to determine whether variations in labor productivity are explained by variation in concentration. These studies have typically estimated a MSA-wide production function, where measures of concentration are included as a technology-shift parameter within the production function. Often, concentration is measured by total employment, total employment by industry, or total output. The second strand of empirical work has aimed at measuring clustering in individual industries. Following the work of Ellison and Glaeser (1997), the attempt is to verify the existence of ‘genuine’ industrial agglomeration. The third strand is the so far small, but growing, body of literature seeking to identify the sources and mechanism through which agglomeration effects lead to productivity gains. We concentrate on this third strand below.

Knowledge spillovers or “learning mechanisms” are considered one of the most important sources of localization economies, but are thought to be often informal; difficult to relate directly to agglomeration or productivity; and poorly understood, challenging empirical testing (Rosenthal and Strange 2004). Researchers have taken various approaches to measure the degree of agglomeration of informational spillovers. For instance, Jaffe, Trajtenberg, and Henderson (1993), using patents as a proxy for information exchange, find that there is a high degree of concentration in the spatial distribution of patents. Patents were five to ten times more likely to originate from the same SMSA as the control patents in the study. Audretsch and Feldman (1996) find that significant new product introductions (as reported by the Small Business Administration) are spatially concentrated, suggesting that information-intensive industries are beneficiaries of the knowledge spillovers that can occur as a result of industry localization.

Empirical studies have provided some evidence on the role that *labor pooling*, and consequent risk reduction for firm firing decisions and household unemployment spells, plays in agglomerations. Simon (1988) shows that unemployment is higher the more specialized a city is. Diamond and Simon (1990) show that wages are higher in more specialized cities, consistent with the theory that workers will demand higher wages in such cities as compensation for the increased risk of unemployment. In this vein, Costa and Kahn (2000) find that the percentage of dual-bachelor degree couples living in large cities increased from 32% in 1940 to 50% in 1990. The mundane explanation is that such couples met and married in large cities. The more interesting interpretation is that large cities provide an opportunity for both individuals to find suitable employment (Rosenthal and Strange 2004). Baumgardner (1988) shows that physicians in large markets tend to be more specialized (Rosenthal and Strange 2004). Specialization is another measure that may be evidence of labor market pooling.

Some labor pooling-related mechanisms associated with urbanization economies have been explicitly studied. One example is urban human capital. Using census data, Rauch (1993) investigates the impact of average level of education on wages and rents. He finds that a one-year increase in average schooling level leads to an increase of 3% in wages and 13% in rents. Other studies use local compulsory schooling laws (Acemoglu and Angrist 1999) or the number of college graduates as instruments to investigate impacts on wages, generally finding a positive effect.

Various measures of better *labor market matching* have been proposed in order to enable empirical analysis; but not all of these represent the theory well. An example is the “termination rate” measure. In a thin labor market, employers may be reluctant to fire on the basis of a mediocre match simply because there is no alternative. In a thicker labor market, workers should be able to change jobs more readily, but on the other hand if the match is better they may have less incentive to do so. So this measure is ambiguous.

Graham and Kim (2008) suggest measuring agglomeration externalities within an empirical framework which attempts to analyze total factor (labor and capital) productivity, partial factor productivity, factor prices and factor demand, as well as to distinguish agglomeration effects from returns to scale. The framework makes it possible to identify direct (irrespective of labor and capital productivity) and indirect (related to labor and capital) agglomeration externalities. They develop an empirical model using data for small, single-location firms of about 100 employees derived from the British Annual Business Inquiry, a survey of business activity in 10,780 wards (average 21km^2). The output from this model shows that six of nine industries have positive elasticities of labor productivity with respect to agglomeration. In contrast, they find that six of nine industries have negative elasticities of capital productivity with respect to agglomeration. Service industries show the highest elasticities of labor productivity with respect to agglomeration.

Some studies use estimates of elasticities of production with respect to firm agglomeration or density to simulate the consequences of transport investments. Graham (2007a) assumes a link between agglomeration externalities and transport by employing a density factor that implicitly captures the effect of a transport investment. He uses spatially disaggregated firm-level accounting data available from the British Department of Trade and Industry, from which he draws on employee headcount, revenues (turnover), as well as labor costs and capital inputs from the balance sheet. From this he derives a measure of effective density that relates the employment density of a ward (about 22 km^2) to all other wards, normalized by distance; in other words, an employment accessibility measure. He estimates agglomeration elasticities for several primary industries, ranging from negative values for industries such as rubber-related products and medical and precision equipment, to positive elasticities for other industries such as publishing and food manufacturing, the latter of which he attributes to the need for market proximity. He finds average elasticities with respect to total employment density of .129, 0.07 for manufacturing and 0.20 for services.

Shefer and Aviram (2005) investigate the potential agglomeration benefits of a light rail transit system in the Tel Aviv agglomeration. Their model combines the results of detailed engineering-based studies of the capacity and potential ridership of the system, as well as potential employment gains, with estimates of agglomeration elasticities culled from the literature. They calculate the potential economic benefit due to agglomeration economies using a basic Cobb-Douglas production function as an additional $73 to $355 million (US) in agglomeration benefits.

Labor Supply and Market Competition

Labor supply effects

Despite a considerable body of research studying determinants of labor supply decisions, few studies have considered the role played by transport costs. Kolodziejczyk (2006) finds that there is a link between fixed costs of working and retirement age based on French data. Gonzalez (2008) finds that workers living further away from urban centers are likely to retire earlier, although this did not control for the possibility that individuals change residential location in anticipation of retirement. The simulation model setup suggested by Venables (2007) and put to practice in DfT (2003) requires evidence on labor supply elasticities with respect to (actual or expected) commute travel time or distance. Findings vary significantly between studies. DfT (2003) calculates a mean value of -0.10 for men and -0.40 for women, based on studies for the UK by Blundell (1992) and Ashenfelder et al (1999). Evers et al. (2005) perform a meta-analysis of about 50 studies, and find elasticities of between -0.10 and -0.20 for men and around -0.50 for women. There are few if any studies testing whether job seekers have shorter unemployment spells in larger cities, in clustered industries, or in industries with good transit access.

Competition

Empirical work on the effects of transportation on increasing competition tends to look at the effect of employment, plant size, and the number of plants, both inside and outside the industry (Rosenthal and Strange 2004, pp. 2141-2142). Some evidence exists on the relationship between trade barriers and productivity, the former including the cost of transport. The European Commission (2003) finds that the introduction of the single market in the European Union in 1992 led its member states' GDP in 2002 to be 1.8% higher. It is of course impossible to judge how important increased competition was for this productivity gain.

Hausman et al. (2005) estimate the consumer benefits from the increased variation and price effects in the retail food market of the entry of a major supermarket, and find that the additional variety offered to local consumers is worth 20% of expenditures on food, while lower prices are worth only about 5%. Note that this particular change to economic competitiveness is more clearly facilitated by faster and cheaper *auto* travel, because few households access grocery stores on transit.

Most of the empirical literature on transportation cost's effect on competition has focused on improved trade linkages between countries, and not the competitive impact on internal domestic trade. Thus, it is hard to draw definitive conclusions from the empirical evidence. Griffith et al. (2006) find that a reduction in trade barriers led to a reduction in firm price-cost mark-ups. The 5% reduction in the tariff rates experienced by most EU countries over the 15 years to 2000 was found to have decreased mark-ups by 4.5%. DfT (2005) suggests that a 70% to 100% reduction in travel costs would be required to have a similar effect. Bernard et al. (2006) studied trade costs for US manufacturing industries and found evidence that firms in sectors with falling trade costs have higher productivity growth and higher firm death rates.

Glaeser et al. (1992) use as a measure of competition the ratio of establishments per employee in a city for a given industry relative to the equivalent ratio for the entire US. They find that an increase in this ratio is positively associated with growth. In a study encompassing the high-tech and machinery industries, Henderson (2003) investigates the relationship of average size of plants in the own industry and county to plant productivity. Henderson finds that the number of plants in the own industry in the county does positively affect productivity, whereas the average employment per plant does not. Rosenthal and Strange (2003) measure the number of new firm births as a function of the average number of establishments per worker in the own industry and other industries. In all six industries, as the number of establishments per worker increased in other industries, the number of firm births in the own industry decreased. On the other hand, for five of the six industries, the average establishment size within the own industry was positively associated with firm births (Rosenthal and Strange 2004, pp. 2141-2142).

Transport investments might make markets more competitive; there remains the question of how uncompetitive they are currently. There is limited evidence that they are significantly uncompetitive, based on price-cost margins. Harris (1998) and Davies (1998) find average mark-ups in the UK manufacturing sector of between 15% and 30%, while Gorg's (2003) findings suggest between 0% and 15%. Other estimates of margins include Small (1997), who find average margins for service sectors typically range between 25% to 40%. Martins, Scarpetta, and Pilat (1996) finds significant mark-ups in most US manufacturing sectors, with most falling between 10% and 30%. The meaning of these mark-ups for competitiveness is unclear—they could fall under the category of "normal profits" and have no net economic impact.

Much harder to come by are widely accepted estimates of aggregate demand elasticities. Harris (1998), Davies (1998), and Newbery (1998) suggest a value of -0.50 for the UK, while Venables et al. (1998) believe the figure should be considerably higher. However, they all admit that their suggestions are based on intuition rather than on empirical work.

Discussion and Conclusions

The particular hypothesized effects of transit investments, subject to testing or prediction in order to quantify the additional economic benefits or costs, depends very much on the specific details and context. How large is the project? By how much are travel times reduced, and in what parts of the network? Is it an extension of an existing system, or is it stand-alone, integrating only via transfers to other modes? To what extent does it strengthen an already existing network serving major industrial or commercial centers? Are there existing capacity constraints that the investment relieves? Are served areas settled by growing industries? These specific questions are rarely dealt with in the literature but generalization of methods and results likely requires more attention to these specific differences.

Diverse Scale of Analysis

The relevant scale of analysis in empirical studies will depend on the particular effect one is seeking to test—for example, neighborhood-level agglomeration effects or land prices, versus citywide urbanization economies of industrial production or increases in network density. It is arguably always necessary to investigate the regional level (or whatever spatial boundary beyond which there is little to no direct effect of the investment) in order to account for the possibility that transport investments simply redistribute development rather than increasing economic growth overall, causing more growth only in spatially targeted areas, possibly along with relative economic declines in areas that do not benefit from greater accessibility. These merely redistributive effects are arguably immaterial, from the federal government's perspective, if not from that of local agencies.

Reliance on Simulation Models

There is a basic paradox in empirical work versus simulation work when estimating the economic impacts of transit investments. Empirical models are based on real measures of the economy, transportation investments, and other factors, but these models remain limited in their ability to test the complex sets of causal factors that we believe are at work in the spatial economy that reacts to these investments—so that it is difficult to know what exactly is happening to yield whatever impacts are found, and therefore it is difficult to know whether the empirical model has included all relevant controls. Simulation models can represent the complexity of any particular hypothesized system of causal relationships, but they rely on assumptions that are subject to error, and the hypothesized sets of causal relationships are themselves not testable except in careful empirical studies of perhaps one or at most two of the relationships.

Testing for Concentrating AND Dispersing Impacts of Transportation

Labor search is facilitated both by agglomerations and by good transport facilities. But transport investments could also have a net dispersing effect (e.g. Haughwout 1999) depending on the system; the particular project within the system; the transportation technology; and the tradeoffs firms make between proximity to numerous other firms in the same industry; suppliers; inputs; labor force; and markets.

Distinguishing by Industry

Some but not all literature discriminates by industry when calculating agglomeration economies, but “the variation across industries suggests that one ought to estimate agglomeration economies separately” (Rosenthal and Strange 2004: 2134). This does not render estimates incorrect for the dataset, but it does at the very least limit the ability to generalize to other locales with different industrial mixes, and it certainly suggests the need for present purposes to have a better understanding of the industrial mix of any particular place in which a new transit system or extension is proposed.

Much of the empirical literature focuses on agglomerations of high-tech and traditional machine manufacturing, in large part because of the focus on informational spillovers, which are believed to be most important in these sectors. However, the densest parts of contemporary cities are more typically dominated by other uses, such as professional service firms and front-office functions, while vertically disaggregated manufacturing and cultural production sectors still maintain a foothold. We have less evidence on the importance of agglomeration economies in these types of cities, which is important because such industries will likely account for most urban growth.

The research literature has been largely concerned with questions such as comparing the relative strength of within-firm and across-firm agglomeration externalities. Translating this work to estimating the specific impacts of a change to travel times due to a transit investment is a difficult challenge.

Distinguishing Transit from Road Investments

Transit and highway investments seem likely to cause different development and agglomeration patterns with different economic consequences, though this has not been explored much in the literature. For example, rail systems, with the highest passenger capacity, may enable very high-density industrial and commercial nodes near stations, with few effects farther away from stations (depending in part on parking capacity and cost); while highway investments may enable more relatively modest but spatially broader increases in industrial and commercial density. Rail transit in particular, but shared transportation modes generally, have the potential to allow higher but more localized densities before congestion creates a disincentive for further densification. Road investments have generally much lower capacity for additional travelers to and from any existing concentration of firms, and so localized intense density is not as likely to occur; but citywide density is possibly *better* supported, because a city’s road network is almost always substantially larger and denser than is its transit networks. This brings to mind the localization vs. urbanization economies distinction.

Congestion costs may be much higher with road-served agglomerations than transit-served agglomerations, depending on density. In sufficiently dense cities, transit improvements may be superior to road improvements when considering agglomeration economies net of transportation costs.

The distinction between different transportation investments is crucial. When comparing rail to bus projects, and even comparing among rail projects, the particular characteristics of the system will dictate the market potential and development pattern that can be supported, and consequently the nature of agglomeration benefits and costs that is likely to result.

Most production function studies of transport or agglomeration use very large-scale measures (citywide), with a few exceptions as noted above. Citywide measures may be more appropriate for highway and road investments than for transit investments because we expect in some cases very localized impacts from the latter, in addition to effects on overall city size. Whether or not impacts are spatially contained near access points, they should show up in citywide figures if there is a substantial net benefit or cost. While modeling net economic output for cities as a function of citywide measures of accessibility, density, and industrial clustering may not inform us very much about the nature and mechanisms of industrial responses (if any) to transit, it is arguably a better measure than the alternatives.

Distribution of Benefits and Costs

Who benefits from transit investments, and from the larger cities, larger industrial clusters, or denser downtowns that may be the result of such investments? Industrial agglomerations imply longer-distance commutes, all else equal, because they go hand in hand with higher prices, pushing out residential development. At the same time, in order for transit investments to have any effects on the economy, they must enable faster and/or cheaper travel; it is this that makes it possible for this nonresidential segregation to occur in the first place (on the assumption that wages must reflect commute costs as well as other factors).

So if those longer-distance commutes are equal or less in duration, commuters aren't worse off; if they are more productive and therefore get paid more, then they are even better off. But the dynamics of agglomeration growth and of the cost structures, profit structures, and incentives of the firms that employ workers in those agglomerations, may mean, for example, that commuters actually get longer commutes and are paid less. One might expect just one of those effects, but both are simultaneously possible. Theory may in the end be of relatively little use empirically, particularly when data are limited (as is usually the case).

Methodological Issues

Recently there has been an emphasis on using micro-data for a cross-section of firms. In theory this can better measure the productivity of firms as the specific inputs and outputs of each firm are measured, as opposed to using proxies for citywide or regional productivity. Graham (2007b) did precisely this in estimating models that included a proxy for transport and congestion levels.

Although the spatial focus of transit investment is typically localized to city centers, the likely spatial scope of agglomeration effect is likely to extend much further. This suggests the need for cross-metropolitan area studies, not just case studies of individual projects. Undertaking analyses on a cross-MSA level also has the attraction of treating a self-contained regional economy and, in some parts of the world, the availability of longitudinal datasets collected at this level.

In the vast amount of literature on agglomeration over recent years, an increasingly common approach to measuring the extent of spatial concentration of activity has been using measures of distance or travel time in its specification (Brülhart and Mathys 2007; Ciccone and Hall 1996; Duranton and Overman 2002; e.g. Fogarty and Garofalo 1988; Graham 2007a, 2007; Hansen 1990; Hanson 1996, 1997; Henderson et al.1995; Rice et al.2006; Rosenthal and Strange 2003; Graham 2007b). These studies take account of the distance over which externalities are present. This introduces two advances: first, it offers an explicit measure of distance decay that allows firms to contribute heterogeneously to an agglomeration depending on their locations relative to it; and second, it enables an analysis of agglomeration economies at a spatial level independent of artificial administrative or statistical boundaries.

A more flexible spatial treatment of agglomeration has further attractions. Introducing the cost of movement into the analysis makes explicit the role of transportation. Based on often readily available data on journey times and costs, individual sectors can now be modeled as having different geographical scope. The downside is that one has to make explicit assumptions about the nature and strength of the distance decay. It is possible to construct models that allows for decay parameters to be estimated empirically, but examples are rare (Rice et al. (2006) is an exception).

The literature uses a variety of data. Most commonly used are aggregate measures of firm characteristics within a region. Also gaining popularity is firm-level data, typically from commercial providers or from government sources. Both types of data have been used with cross-sectional and panel approaches, the latter allowing for a better accounting of unmeasurable effects and controlling for the possibility that transportation or population density, rather than leading to increased productivity, may instead occur in places where productivity is higher.

Melo et al. (2009) provide a recent review and meta-analysis of production function studies of agglomeration. They examine 34 studies and over 700 estimates to determine how the specific characteristics of various studies affect the agglomeration estimates. Their results are useful in providing some context for the large range of estimates found in the literature. One of the key conclusions is that one should not necessarily expect agglomeration elasticities estimated in different regions, for different industrial sectors, and frequently with different methods, to be similar. Those elasticities found in analysis of the service sector tend to be higher than the manufacturing sector, suggesting the need for more focus on how agglomeration affects service sector productivity.

APPENDIX D: SUMMARY OF INTERVIEWS

Interviews - Sections 1, 2, and 3

The focus of the interviews was on how and whether state and regional agencies in the United States and Britain estimate the economic benefits of their transit projects, either for their internal purposes, to discriminate between potential projects, or to provide additional arguments for a favored project. In this appendix we organize a summary of their responses in the following categories: the use of economic benefit measures, and what types are used; what data sources are used; what documentary sources or documentary guidance is relied upon; and who conducts the analysis. A list of the 18 interview subjects appears below.

TABLE **D 1 Interview subjects**

Name	Title	Organization	State/Nation
Richard Bickel (with Greg Krykewycz and Karen Morris)	Director of Planning	Delaware Valley Regional Planning Commission	PA
Peter Fahrenwald (with staff from Strategic Planning)	Manager	Chicago Transit Authority	IL
Rick Gustafson	Executive Director	Portland Streetcar	OR
Wil Guzman (with Mark Seaman and others)	Senior Program Manager	Port Authority of New York and New Jersey	NY
John Haley	Vice President, Infrastructure and Service Development	Houston Metro	TX
Tom Marchwinski	Senior Director, Forecasting and Research	New Jersey Transit	NJ
Diana Mendes	Senior Vice President	DMJM Harris, AECOM	
David Nelson	Director of Transit Planning	JACOBS	
Robert Padgette	Director of Policy Development and Research	American Public Transit Association	
Carmine Palombo	Director of Transportation Planning	Southeast Michigan Council of Governments	MI
Rich Pereira	Project Director, Capital Program Management	Miami Dade Transit	FL
Stephen Salin	Vice President, Rail Planning	Dallas Area Rapid Transit	TX

Name	Title	Organization	State/Nation
Mark Soronson	Vice President	HDR/S.R. Beard and Assoc. & Phoenix Metro	AZ
Andrew Summers (with Mike Salter)	Senior Executive	East of England Development Agency	U.K.
David Crockett	Director – Public Transport Sector	Halcrow	U.K.
Julian Morison	Director and Senior Consultant	EconSearch	AUS
Paul Roberts	TIF Technical Manager	West Yorkshire Public Transport Executive	U.K.
Vicky Cadman	Economic Adviser	U.K. Department for Transport	U.K.

Accounts of Current Practice

Use and Types of Benefit Measures – General

Interviewees were asked about the types of benefit measures used in the project development process of major transit projects. Consistent with the benefit–cost measures required by the New Starts process, the most frequently cited benefits measures were forecasted ridership, revenue, and travel time savings derived from travel demand models. Other benefit measures noted included catchment area, accidents, and reliability. Other measures derived from travel demand forecasting include mode shift from auto to transit, vehicle miles traveled (VMT) reduction, and air quality improvement. One respondent stated that, in his opinion, no current benefit measures adequately document the trip reduction benefits of changes in urban form and density that result from job and home relocation. It was noted by one respondent that agency decision makers rely on benefit–cost measures because they are better understood and less “speculative” than environmental, land-use, and economic development measures.

One respondent told us that the most successful projects first document the qualitative land-use and community benefits that are most meaningful to the community, in order to build local public and political support, and then initiate the New Starts/Small starts process. Agencies that start with the technical analyses of the New Starts process are more likely to fail because they lack an understanding of local needs that comes from the qualitative analysis.

Staff of New Jersey Transit and the Delaware Valley Regional Planning Commission said that the approach they used in developing the “transit score model,” used for transit investment screening, may also have applicability in creating a model for estimating transit benefits. The transit score model computes a score for a geographic area, using a simple equation with a small number of variables and coefficients. The score is then interpreted, by comparison to a set of point value ranges for different transit modes, to determine how much potential the area has to support different modes of transit. The variables and coefficients are determined through regression analysis, which allowed the model developers to eliminate a large number of non-significant explanatory variables.

A number of respondents in the UK said that the types of benefit measures used varied depending on the scale of investment as well as the client or audience of the study. Some investments may have congestion relief as their main objective, while others are aimed at delivering benefits to the wider economy (Gross Value Added or productivity). This may indicate some inconsistency in interpreting the economic benefits of transportation, as congestion relief supports economic growth, which in turn brings increased congestion. However, it also indicates the different scales at which investments are appraised. For example, the impact of congestion at an intersection may have limited economic effects, but nevertheless an investment to improve the intersection's performance may be worthwhile. Another example is Transport for London, which often seeks to understand the social benefit from transport investments as this is more heavily weighted in assessment criteria. When working for private transit operators, on the other hand, social impacts are less important than the bottom line.

Use and Types of Economic Benefit Measures

Interview subjects were asked about their familiarity with different types of economic benefit measures in the context of major transit investments. The consensus among respondents in the US is that there is no accepted best practice methodology for economic benefits estimation in the transit industry. There was a general lack of consensus on how to define economic benefits, beyond the direct employment benefits of project construction and operations, but there is a perception that local decision makers value the economic benefits of transit projects and want them to count towards the New Starts/Small Starts project rating process. Some respondents asserted that economic benefits measures are used by agencies to boost a New Starts/Small Starts project rating when it does not meet cost effectiveness criteria, although others disagree with this assertion.

Several respondents made a distinction between localized and regional economic benefits, and argued that different transit modes differ in the geographic scale of their economic effects. A streetcar or BRT will have a much more localized effect than commuter rail, for example, so if the same economic benefit measure is used for all modes, the systems will not compete on an equal footing. New Jersey Transit's Hudson River rail tunnel project, known as Access to the Region's Core, documented both macro and micro benefits. In addition to construction jobs, they estimated long-term benefits from additional jobs and taxes. Property value increases were also forecast.

One respondent said that job creation estimates are an economic benefit measure required by the federal government to apply for funding under the American Recovery and Reinvestment Act, and that there is a general lack of guidance on methods. Another respondent suggested that the level of unemployment should be considered in job creation estimates.

Some respondents consider travel demand forecasting to include economic benefits because agencies can convert costs and user benefits to dollar amounts. The value of time (wages) is included in travel time estimates, which is essentially an economic benefit. Some agencies have estimated regional economic benefits by taking into account housing price, retail and recreational jobs and sales, retail spending, etc. While estimating economic impacts, some agencies have also gone towards estimating carbon emissions impacts as well.

Input-output (I-O) models have been used by some agencies, including New Jersey Transit, the Chicago Transit Authority and one of the consultants with whom we spoke, to estimate economic benefits. Two respondents noted the difficulty in distinguishing job creation from relocation when looking on a regional scale. In the United Kingdom, it was noted that models that are not national in scope do not fully reflect economic reality with regard to movement and trade. Another limitation noted by one respondent is that their I-O analysis did not capture changes in the cost of capital, land values, density, or housing. The same respondent suggested that a benefit–cost analysis may be a better methodology for determining how to allocate resources.

Another approach to measuring economic benefit that does not involve estimation is to document real estate investment and changes in real estate value over time. Some agencies conduct this analysis themselves, while others use the services of consulting economists or universities. Work has also been done in the UK to estimate the potential for transportation to enable economic development, focused on how accessibility improvements can encourage job growth in particular areas, subject to access to workforce, available floorspace/land and views, and evidence of local business planning entry or expansion in the area.

Interview subjects in the US were generally unfamiliar with agglomeration benefits and were unaware of its use as a factor in estimating overall economic benefits. Those that were familiar with agglomeration, primarily consultants and UK transport agency staff, thought that while it is potentially a valuable measure, in practice it would be too complex and expensive to calculate. US respondents stated that it is more common to rely on property value, tax base, and joint developments as evidence of economic benefits. In the United Kingdom and Australia, respondents were generally aware of agglomeration impacts and methods to analyze this were generally accepted in practice. As discussed in Appendix C in more detail, the UK Department for Transport recently published guidance on the assessment of “wider economic impacts” of transport investments, which includes a methodology for estimating agglomeration benefits. (One of the interview respondents works developing this guidance.) Respondents in the UK and Australia said the UK approach was generally straightforward to apply and data were generally available, although it can, at times, be a challenge to manipulate the required economic inputs to the necessary format and spatial level needed for modeling. Similarly, US respondents said that regional economic models like REMI have been widely used to estimate economic benefits for major transit and transportation projects, but there is a perception that it is too complex and technical for use by most transit planners.

One respondent described attempts to estimate business-to-business impacts of transport improvements as well as impacts on retail areas. In this case agglomeration, land-use changes and access to markets, and attempts at job creation were all estimated.

Specifics on Data

Respondents generally did not identify issues with data availability and quality for performing typical analyses, which rely on population and employment forecasts. Commonly noted data issues relate to differences between local-level data; such as cross acceptance and conformance of local, county, and regional population and employment forecasts; and differing update schedules of different data collecting agencies. Some respondents said that for economic data, agencies will use a wide variety of sources, including Chamber of Commerce reports, and benefits estimates for sports stadiums. Outside the United States, some respondents felt that the sharing of consistent data between government agencies was very easy. However, one of the problems noted with acquiring economic data is the difficulty which can be encountered when trying to manipulate it to the needed spatial and zonal requirements.

One difficulty that was noted was the exclusion of fares from transport modeling and the impact this could have.

Guidebooks and Reports

Interview subjects in the US were unable to identify an accepted national standard of practice for economic benefit estimation. A few respondents noted that agencies are reluctant to accept methods from other regions. A review of the practice-oriented reports and guidebooks identified through the interviews can be found in Appendix C.

In the UK, the Department for Transport publishes standard guidance for the assessment of economic impacts from transport investments. A number of interview respondents noted the guidance in directing their work.

Who Conducts the Analysis

Interview subjects were asked about the mix of staff and consultant involvement in conducting transit benefits analysis and economic benefits analysis. The level of staffing and the technical expertise of transit agency staff may bear on the economic benefit methods to be developed by this study.

There is diversity in the approaches employed by transit agencies reported across all of our interview subjects. Some make extensive use of consultants, while others do almost all work in-house. One agency with an expanding transit system employs long-term contractors who work alongside staff. Travel demand modeling is conducted in-house at some agencies, while others rely on the MPO to maintain these models.

Consultants typically play a significant role in the preparation of New Starts/Small Starts documents as well as in a great deal of work in the UK and Australia. One agency representative said that only a small number of consultants are able to do New Starts benefit estimation work. Estimation of economic benefits based on real estate value is often done by a transit agency or MPO, although more sophisticated analysis is sometimes done by economic consultants or universities.

Suggestions for Methods and Guidance

Interview subjects were asked to provide general suggestions about the data and methods that have been or may be used to estimate the economic benefits of major transit investments, and what kind of guidance they feel would be most useful on these methods.

Complexity

Respondents expressed concern about the ability of small agencies to complete any new analysis developed through this research. Several respondents requested a how-to document or user guide that would allow a few people at an agency to complete the analysis using available data within a few days. Emphasis was on simple calculations and straightforward methods, so that another analyst could replicate the analysis and get the same result. Training workshops and webinars were suggested.

Respondents in the UK expressed less concern about complexity. Standard guidance makes the process of economic evaluation more straightforward. Nevertheless, the transport modeling was highlighted as a very complicated area by some of the respondents, and some stated that good models can take years to build.

Some respondents said that the UK appraisal system is complex relative to other European countries. In addition, one respondent said that investment analysis may not be too complex, but politics adds a layer of complexity.

Methods

There was little consensus on whether identifying modeling variables and procedures, or providing parameter estimates, would be a better approach for estimating economic impacts of transit investments. Some respondents suggested that the outcome of this project should include parameter estimates or multiplier tables for agencies to produce forecasts of economic benefit factors so that agencies should not be required to produce parameters or multipliers themselves.

One MPO representative said that agency leadership and politicians may be less likely to use a highly technical analysis in their decision making, therefore the method should use a short list of understandable primary inputs and outputs, with subsidiary factors. Politicians are primarily interested in four benefits measures: real estate value, job creation, mobility, and cost effectiveness.

Conversations about methods were invariably about estimation of benefits for existing systems, not prediction, perhaps because prediction is more complex and is rarely conducted as part of transit project planning. While UK guidance covers a number of benefit areas respondents generally noted the benefits that were missing from guidance and expressed the desire for methods to be developed. There were, however, some comments that UK guidance is slightly too onerous and can sometimes create “paralysis by analysis.”

Several respondents argued that environmental benefits should be considered part of economic benefits because of the social costs and benefits involved.

Transferability

For the method to be applicable in all areas, one respondent suggested that researchers could prepare a different standard for each “megapolitan” area in the US. Another respondent suggested that the analysis could be separated into parts, and that agencies would be required to complete a subset of those parts based on the mode and regional characteristics.

Interview Scripts

The interview scripts for both US and international use are provided below for reference.

United States Interview Script

Purpose of interview: 1. To obtain information about what practitioners expect to be the economic benefits of transit projects, and how they (or their consultants) have calculated those benefits. 2. To obtain reports and other documentary evidence of the above, that we have been unable to obtain from internet searches. 3. To find out what sort of guidance is useful to practitioners.

Target of interview: Individuals with direct experience with New Starts, Small Starts, or the development of other major transit investment projects, working at transit agencies, metropolitan planning organizations, state departments of transportation, the Federal Transit Administration, APTA, or consulting firms. (We will focus on transit agencies and their consultants, as we expect these to have the most direct knowledge of relevant transit projects.)

Note: The script below is meant as a list of topics, rather than questions (i.e. an interview guide, rather than a questionnaire). Interview discussions will be respondent-driven, and interviewers are directed to alter the order of the questions, skip questions that are obviously irrelevant, etc., as appropriate.

---

1. Have you ever been directly involved in any major transit investment projects such as New Starts, Small Starts, or another major investment?

    a) Yes
    b) No → **IF NO, SKIP TO 15**

2. How many projects, and in what capacity, were you involved? (e.g., project manager/supervisor, consultant, data analyst…)

3. Can you please provide a brief description of these projects? (mode, location, magnitude in miles and cost, ongoing or completed, if completed then outcome, funding source, and if federally funded, funding status, e.g. funding program, applications date, approval date)

4. What kind of benefit measures did you use in your project development process? (e.g., ridership, congestion relief, air quality, economic benefits)

5. Did you use any economic benefit measures, and if you did, what measures did you use? (e.g., land value increase, increase in density, new jobs, new housing, agglomeration economy)

6. Can you provide or tell us how to acquire reports, guidebooks, or other documents describing expected economic development impacts, or discussing methods for calculating economic impacts?

7. What data and methods did you use to estimate expected economic development impacts and what were the data sources? What references documents did you use for the selected methods?

8. Was it difficult to get the necessary data, and if so, what were the difficulties?

9. Would you be willing to share your data with us and consider being a case study for our effort?

10. Who did the analysis? (e.g., staff, consultants,…)

11. Did you find the required analysis for the project development process complex, and if so, why? What remedies would you suggest?

12. Do you think that the analysis/method you used misses any important economic benefits, and if so, what are they?

13. What guidance from the FTA do you feel would be helpful in estimating economic impacts of transit investments? How should guidance be presented? (e.g., report, website, spreadsheet, software,…)

14. Do you have any general suggestions about the data and methods that have been or can be used for New Starts/other major investments?

→ **SKIP TO 21**

(Note that this section is for those with no direct experience with New Starts, Small Starts or other major transit investments.)

15. Why are you interested in New Starts, Small Starts or other major investment projects?

16. In what capacity do you work and how did you get exposure to the project development process?

17. How familiar are you with benefit estimation for New Starts, Small Starts or other major transit investments?

18. What can you tell us from your experience that will help us improve the methods of analysis for project development, particularly in regard to the estimation of economic benefits?

19. Can you provide or tell us about any documents/reports that are useful for estimating benefits from New Starts or other major investment projects?

20. Is there anyone at your agency or in your region who is involved with New Starts, Small Starts or other major investments, and if so, can we get their contact information?

Interviewer states: Now we would like a little information about your agency for our records.

If transit agency, ask directly. If consultant, ask if they know the following about the agency they worked for most recently on New Starts or other major investments.

21. What modes does the agency operate?
22. In what area?
23. Annual ridership?
24. Annual revenue?
25. Number of employees?

International Interview Script

Purpose of interview: 1. To obtain information about what practitioners expect to be the economic benefits of transit projects, and how they (or their consultants) have calculated those benefits. 2. To obtain reports and other documentary evidence of the above, that we have been unable to obtain from internet searches. 3. To find out what sort of guidance is useful to practitioners.

Target of interview: Individuals with direct experience with transit investments or evaluation outside the US, including those working at transportation agencies and consulting firms.

Note: The script below is meant as a list of topics, rather than questions--an interview guide, rather than a questionnaire. Interview discussions will be respondent-driven, and interviewers are directed to alter the order of the questions, skip questions that are obviously irrelevant, etc., as appropriate.

---

1. Have you ever been directly involved in any major public transport investment projects?

   c) Yes
   d) No → **IF NO, SKIP TO 15**

2. How many projects, and in what capacity, were you involved? (e.g., project manager/supervisor, consultant, data analyst…)

3. Can you please provide a brief description of these projects? (mode, location, magnitude in miles and cost, ongoing or completed, if completed then outcome, funding source, and if federally funded, funding status, e.g. funding program, applications date, approval date)

4. What kind of benefit measures have you used in your project development process? (e.g., ridership, congestion relief, air quality, economic benefits)

5. Did you use any economic benefit measures, and if you did, what measures did you use? (e.g., land value increase, increase in density, new jobs, new housing, agglomeration economy)

6. Can you provide or tell us how to acquire reports, guidebooks, or other documents describing expected economic development impacts, or discussing methods for calculating economic impacts?

7. What data and methods did you use to estimate expected economic development impacts and what were the data sources? What references documents did you use for the selected methods?

8. Was it difficult to get the necessary data, and if so, what were the difficulties?

9. Would you be willing to share your data with us and consider being a case study for our effort?

10. Who did the analysis? (e.g., staff, consultants,…)

11. Did you find the required analysis for the project development process complex, and if so, why? What remedies would you suggest?

12. Do you think that the analysis/method you used misses any important economic benefits, and if so, what are they? What were the outcomes of the analysis? Which elements, if any, had any impacts on decision making and to what extent?

13. What additional guidance from the DfT do you feel would have be helpful in estimating economic impacts of public transport investments?

14. Do you have any general suggestions about the data and methods that have been or can be used for public transport investments?

(Note that this section is for those with no direct experience with major public transport investments.)

15. What is your interest in public transport investment projects?

16. In what capacity do you work and how did you get exposure to the project development process?

17. How familiar are you with benefit estimation for public transport investments?

18. What can you tell us from your experience that will help us improve the methods of analysis for project development, particularly in regard to the estimation of economic benefits?

19. Can you provide or tell us about any documents/reports that are useful for estimating benefits from public transport investments?

Interviews- Section 5 (Case Studies)

Interview Script

Start by asking about the person's role, their involvement in transit development – let them guide the discussion as much as possible.

*Thank you for taking the time to speak with us. We are working on a project funded by the Transit Cooperative Research Program and the Federal Transit Administration that is seeking to develop methods to evaluate the economic productivity impacts of New Starts investments. As part of that work, we are conducting a series of case studies to determine how these considerations were taken into account, as well as to gather information to both inform the methods we are developing and to test them.

*We would like to record this call for transcription purposes. Is that okay?

*I will start the recording now. Let me know if you wish to pause it or go off the record at any time, okay?

Introductions

* What is your title?
* Have you held any previous positions related to transit?
* Walk me through your involvement in the transit development process.
* What else does your organization (or past organizations you've worked for) do to support transit development?

Interview Themes

1. Evidence of Densification
* Have you seen any evidence of densification along the transit routes?
2. Evidence of Firm Clustering
* Can you give examples of firms that have opened or expanded along the line?
3. Transit Benefits from Congestion
* Is traffic congestion an issue in the corridor? Does transit offer a speed advantage?
4. Types of Economic Development Strategies
* How has economic development been pursued around transit stations? Is this different than elsewhere in the region?
5. Industry Development Strategies
* Have efforts been made to attract new firms, expand existing firms, or both? By who?
6. Spatial Aspects of Transit Development
* Have development plans targeted underdeveloped areas or existing dense areas?

Wrapup

*Thank you for your time; I've found this very valuable. Are you aware of any other people who might be able to speak with use concerning any of these issues? Do you have any contacts with developers that you could share with us?

APPENDIX E: REVIEW OF PRACTICE REPORTS AND GUIDANCE

Governments, transportation agencies, and other public and private organizations estimate the economic impacts of proposed transit investments in order to prioritize funding, argue for or against projects, and to evaluate whether investments have been an effective use of public funds. Here we describe how the economic impacts of transit investments are calculated in practice, with examples from the US, the UK and the Netherlands. We cover reports, documented regulations and published administrative guidance.

Both the practice of transport modeling, and the ridership forecasts that are sometimes partly or largely based on such models, are important inputs to the estimation of economic impacts. However, we do not cover the practice of transport modeling or ridership forecasting here. The assessment of additional economic benefits goes beyond direct ridership or regional employment effects. Many studies are typically done to justify projects at a regional level and methods vary widely.

British practice provides additional insight about how to assess both the overall impacts and the additional economic benefits of transit projects. The UK's "New Approach to Assessment", stemming from changes in policy in 1997, provides an explicit linkage between national goals and specified project outcomes.

Our main objective was to find examples in current practice of estimating additional economic benefits of transit in a transparent and theoretically valid manner. However, as we describe below, we found no practice studies in the US that addressed agglomeration economies or related benefits. The UK guidance does offer some insights into how to carry out such estimates, some of which are transferable to US practice.

The following sections first summarize US practice at the federal, and then at lower levels of government in the United States. We then provide more detail on specific modeling approaches that may be relevant to the project. This is followed by a description of the basic method used in Britain.

United States: Federal Level

The FTA New Starts and Small Starts programs are the primary federal funding resource for capital investments in fixed guideway transit systems. SAFETEA-LU identifies specific criteria that FTA must consider. In order to advance a New Start project through the project development process and to enter into a funding agreement, FTA must evaluate each project based on five project justification criteria: mobility improvements, environmental benefits, cost effectiveness, transit-supportive land use, and “other factors.” Measures of environmental benefits are limited to Environmental Protection Agency (EPA) air quality status. Projects located in federally designated “non-attainment” areas for any transportation-related pollutant receive a “high” environmental benefit rating, and other projects receive a “medium” rating. Economic benefits, or “economic development impacts,” are included as optional measures under the “other factors” category. This criterion is documented by project sponsors in a “Making the Case” report that is submitted to FTA. Specific reporting guidance is not provided.

While SAFETEA-LU required FTA to consider the economic development effects of New Starts projects, this criterion was not required for the FY 2008 and FY 2009 evaluation cycles because FTA (2009) "desires through the rulemaking process to work with the industry on the development of appropriate factors for measuring the economic development effects of candidate projects."

FTA (2008) recently published a Proposed New Starts Economic Development Criterion, which lays out a method and reporting requirements for a new, stand-alone economic development criterion that would first apply starting with FY 2011 projects. This criterion is based on the ability to develop land near stations, the presence of transit-supportive plans and policies, and the economic climate. The “developability” criterion is documented through population and employment forecasts, tax assessment data, a build-out analysis of the total additional development that could be accommodated under existing or proposed zoning, and a subjective market assessment by a local analyst. “Transit-supportive plans and policies” are defined as those that support pedestrian mobility and accessibility, and include pedestrian network connectivity, building setbacks, parking design, requirements, and regulations, the land-use mix, and residential and commercial densities. These are documented through an inventory of relevant plans, policies, and ordinances as well as a narrative description of potential barriers such as environmental contamination. “Economic climate” is documented through long-term metropolitan growth forecasts, recent growth in the station area and project corridor property values, commercial and residential rents, and commercial vacancy rates.

United States: State, Regional and Local Level

The studies produced by practitioners in the transit-oriented economic development field employ a variety of methods to estimate and compare the economic impacts of transportation investments. Because estimating such impacts has not been part of the FTA application process, these studies are typically done for local purposes. We summarize the reports here and provide more detail below.

In many cases, estimated economic benefits are just monetized time savings, not additional economic impacts as defined here. In other cases, the estimates are from multiplier effects arising from time savings. Some reports and documentation did not have sufficient detail to determine whether any additional economic benefits were estimated.

Benefit–cost analysis was the predominant methodology used, but not all studies use a formal methodology for making investment decisions. Benefits estimation is accomplished with a variety of formal and ad hoc methods, and commonly accomplished with the use of computerized transportation demand models (including the traditional four-step method) that can be used to estimate direct user benefits. Such estimates are already included in the FTA requirements for funding applications.

Other economic benefits can be categorized as either “indirect” or “induced.” Indirect benefits may include the employment and intermediate output impacts from construction projects or ongoing maintenance. Induced effects include better access of firms to workers (and vice versa) and recirculation of savings into the economy. Such models use input-output modeling, sometimes in conjunction with land-use modeling, to estimate the economic impact of transportation investments, and explicitly adjust for any double-counting of benefits. A few rail freight studies used ad hoc methods, developing spreadsheet-based rate models in combination with surveys of logistics providers to estimate the market share that could potentially be captured by proposed rail freight improvement alternatives. Occasionally projects eschew formal evaluation methodologies entirely—for example, because the project solution entailed a negotiated financial agreement between public and private parties and alternative proposals were not considered.

Monetizable benefits that were considered in the various benefit–cost analyses included travel time savings accruing to businesses (especially logistics operations) and consumers;

vehicle capital and operating expense savings from modal shift (including pedestrian share); monetized reductions in pollution, greenhouse gases, and accidents from decreased automobile travel; increased business revenue from higher transportation system efficiency and an expanded labor pool; increased retail spending; fiscal impacts from tax revenue increases; project construction-related economic impacts (wages, employment, GRP); long-term wage increases; and property value increases, which may reflect any of a number of the economic impacts above.

Input-output models attempt to model the linkages between industries with a matrix that captures the consumption and production dependencies amongst them, and how changes in these factor prices affect economic output. Input-output studies use project construction, maintenance, and travel time savings as inputs to estimate changes in economic output. These are essentially measuring multiplier effects from any construction expenditures plus any structural changes from travel time reductions. While construction impacts are certainly of interest to local areas, from a national perspective they would not be relevant, under the assumption that construction expenditures in other regions would have similar impacts.

A few of the studies employ real estate industry methods (in particular, hedonic modeling) to estimate the impact of transportation investments on property values. Since such changes in property values largely reflect travel time improvements, this is double-counting under the current FTA evaluation approach. (Property values might also reflect the marginal internal value of agglomeration, in addition to the value of the greater accessibility. However, relying on property value measures without double-counting would imply entirely replacing measures of travel time with property value estimates, and assuming 100% capitalization, which is unlikely to occur in a competitive market.) Examples of hedonic value or property development studies include the Portland Streetcar study, which uses zoning data, developer surveys, and comparable transit investment programs in the city to estimate the real estate impact of new streetcar investment. The DART Fiscal Impact study uses similar methods as well as employing GIS for visual inspection to estimate the amount of development attributable to light rail access. The Phoenix Metro study also estimated the real estate impact of light rail investment. The DART TOD guidelines provide detailed real estate and physical design guidelines to practitioners in order to evaluate and maximize the development impact near light rail transit stations. These and other specific studies are described in more detail below.

Other studies use econometric models, which are multiple regression models that attempt to estimate empirically the contribution of various economic input factors on regional economic output. REMI, the Bureau of Economic Analysis, and TREDIS offer econometric models or frameworks that include econometric modeling components. Input-output models are derived from econometric estimates of multipliers that are then used in input-output models, but the two techniques are not the same. We discuss REMI and TREDIS in more detail below.

Economic Modeling Systems

There are also modeling systems that attempt to model regional economies and in so doing enable estimates of how alterations to infrastructure and accessibility affect economic development. We discuss input-output methods, regional travel demand models, and econometric methods for estimating production functions. Of these, the last are most applicable to estimating agglomeration effects.

Input-Output Models

Input-output models focus on the interrelationships of sales and purchases among sectors of the economy by using multiplier effects. Regional input-output models can be used to estimate the impacts of transportation investments on the economy. This is done by changing input assumptions on travel costs and accessibility, and by allowing the inter-industry interactions to determine the outputs using multiplier effects.

These models require extensive data that might not always be available at the regional level. For any region, a survey of a representative sample of firms for each industry included in the IO model is needed to develop an accurate region-specific technology matrix. This can be a very expensive and time-consuming endeavor. Moreover, multipliers used in these models are assumed to be temporally and spatially invariant, and so might not accurately capture long-term spatial changes due to mechanisms such as agglomeration and other changes in land use.

We examined documentation for REMI and TREDIS to confirm whether any components of the model could adequately capture agglomeration externalities. As documentation on the details of both models is not fully available, our review is limited to documentation on their respective websites and in supporting papers.

REMI combines travel demand, input-output, and econometric modeling components in their framework. The REMI model addresses the connection between transport costs and productivity via the ability of firms to access labor markets and the potential variety and concentration of those labor markets. Commuting time and expenses are input within equations that are stated in the documentation as providing productivity measures based on the location of where employees live and work for each occupational sector. The time dynamics within the equations allow for simulated forecasts and dynamic linkages to other parts of the model structure.

The models include an elasticity of substitution among product inputs, with respect to costs, which is based on estimates from an analysis of traffic analysis zones in Chicago. These were based on cross-commuting patterns of workers between the various zones. The derived elasticity appears to be occupation-specific, although details are vague within the documentation (REMI 2008). This is a good example of the difficulty of replicating this sort of modeling system, which is not fully documented. Despite this drawback, REMI has been used by many agencies.

Another example of a modeling system is TREDIS (Transportation Economic Development Impact System), designed for passenger and freight transportation economic impact modeling. It offers components for transportation demand and economic impact estimation. It can be used by itself or in conjunction with other modeling packages such as REMI, and is compatible with other transportation demand modeling packages. TREDIS uses input-output and economic geography modeling techniques to estimate the economic impact of transportation investments. The Chicago Metropolis 2020 study used the TREDIS framework, but only used the input-output component to estimate indirect benefits. TREDIS is integrated with the LEAP model to estimate market access benefits, which closely resemble the additional economic benefits that we are concerned with here. The database and resulting estimates derived to evaluate sensitivity of responses from each industrial sector to changes in market access are proprietary, and we are unable to provide further information on this.

Econometric Estimation of Production Functions

Another approach is to develop econometric models of production functions. The resulting relationship between economic output and transportation inputs (measured via accessibility) is the agglomeration elasticity used in the UK guidance on wider economic benefits.

Most research in this area has focused on highway capital or infrastructure and typically does not consider transit. The empirical work conducted by Ozbay et al. focuses on highway capital and investments for several reasons. First, quite often highway capital is the major component of regional transportation infrastructure (Holtz-Eakin 1994; Boarnet 1995). Second, as shown by Ozbay et al. (2003), employment growth clusters mainly near highways. Third, in New Jersey, highways are the predominant mode of travel.

A series of production function models for the NY/NJ metropolitan area using a time-series dataset for the decade of 1990-2000 have been estimated by Ozbay et al.(2003; 2006; 2007a; 2007b; 2008). Three basic models were developed for different cases. The first case considered the effect of private capital on the gross county product (GCP). The second case included the effects of both private and public highway capital stocks. The third case tests the hypothesis that the output within a metropolitan area depends, in part, on highway capital stocks within the area. This third case also examines the question of whether or not the economic benefit from a particular transportation corridor is mainly a redistribution of economic activity from nearby areas. Ozbay et al. (2003; 2006; 2007a; 2007b) have considered important issues such as “lagged variable effects,” “spillover effects,” and the “dynamic nature of the investment-output relationship”. Jiwattanakulpaisarn et al. (2009a, 2009b) also examine how infrastructure affects employment levels using similar techniques.

The models estimated in Ozbay et al. (2007a; 2007b) and Berechman et al. (2006) implicitly assume that county economic growth is caused by investments made in transportation. However, it is also conceivable to hypothesize that high economic growth creates the need for transportation services and thus investment. Disregarding such causality might result in problems of simultaneity bias in the empirical analysis, which in turn will generate incorrect estimates.

These methods might be applicable to our research in that they provide a technique for linking various infrastructure features to economic output, while controlling for various other economic factors. They also suggest that any model that examines the impact of transit must not omit highway infrastructure effects, which might have large impacts on output. The output elasticity of highway capital investment was found by Ozbay et al. (2003; 2006; 2007a; 2007b; 2008) to range between 0.135 and 0.206 (depending on the time lags) suggesting that a 1% increase in highway capital leads to approximately a 0.171% average increase in county economic output. The magnitude of this elasticity falls toward the lower end of the range of elasticities reported in the literature (Duffy-Deno and Eberts 1991).

These methods are quite similar to those used in the UK to estimate agglomeration impacts. The main difference is that they use regional data (i.e., county or state level) as opposed to firm-level data. As discussed in our framework, we hope to conduct a mix of different estimates to tease out how infrastructure affects productivity.

Sample US Studies

This section describes the sample of economic studies that we were able to obtain. These were found through web searches but also via the interviews conducted with practitioners. In no way should this be seen as a comprehensive list, but it does demonstrate the difficulty in obtaining what are not typically widely circulated studies. None of the studies provide sufficient detail to fully understand all of the analysis that underlies them. They also do not address the key issue of additional economic benefits.

Chicago Metropolis 2020

The Chicago Metropolis 2020 study analyzed the potential economic impact of four public transit investment planning scenarios: decline (stable capital and operating funding), maintain (stable level of service with attendant capital and operating support), expand (significant increases in public transit funding) and expand and plan (expand scenario, with land-use reform to stimulate redevelopment). The research methodology was based on two computer models. The first was a regional transportation model, which was used to estimate the change in transportation demand under the alternative transit investment scenarios. The second was an input-output model of the Chicago region economy using the TREDIS framework, which translated changes in transportation demand to increased business production as well as the effect of reinvestment of those savings into the local economy. The study only included the direct and indirect benefits related to travel time savings in the model, and excluded the effect of construction spending, fiscal impacts and property values.

Scarborough

The Scarborough Rapid Transit study commissioned by Toronto Metrolynx evaluated the impact of five alternative improvement programs to a semi-automated rapid transit line. The methodology employed consisted of a 30-year discounted benefit–cost analysis considering five categories of impacts: transportation user benefits; financial impact on Metrolynx; land value appreciation; environmental impacts; and direct and indirect economic impacts and socio-community impacts such as noise, health, and aesthetics. Impacts were monetized where possible. The socio-economic and environmental impacts, as well as user benefits such as comfort and accessibility, were not monetized. The study modeled both short-term economic impacts, primarily from construction-related employment and wages, and longer-term impacts on wages and GRP, reflecting enhanced regional competitiveness derived from more efficient transportation, using Ontario-specific input-output multipliers. The origin of the input-output model was not specified in the study report.

Access to the Region's Core (ARC)

The ARC study analyzed the economic, fiscal, and real estate impact of the planned trans-Hudson tunnel and extension connecting New Jersey Transit rail lines between Newark and Manhattan. The study used the REMI framework to evaluate the short-term economic impact of tunnel construction on jobs as well as long-run economy-wide impacts. Within the REMI framework, long-term economic impacts are driven by NJ Transit maintenance and operations, improved quality of life (lower emissions, reduced transportation-related accidents, and increased leisure time), travel time savings and lower expected regional housing costs. The study estimated the permanent employment impact at an additional 74,000 jobs, which is expected to generate significant office space growth, primarily in Manhattan. The study also analyzed the fiscal impacts of the project on New York and New Jersey based on the outputs of the REMI model, regional tax rates, household size, and regional home-ownership trends. Although a benefit–cost ratio was not explicitly calculated, the methodology otherwise conforms to a benefit–cost analysis.

DART Fiscal

The authors performed a study of the fiscal impacts of existing and proposed development attributable to DART station-area development. Tax revenues accruing to state, local and special districts were considered. The researchers developed criteria to identify development which was partly or entirely motivated by access to a DART station, while filtering out those developments that could not be attributable to DART station proximity (e.g. drive-through fast food restaurants). The researchers used both quantitative and qualitative methods to evaluate development value and tax assessments. Sources included tax rolls for existing developments, interviews with real estate developers, DART officials, local chambers of commerce, periodicals, aerial photography to identify new developments, and field observations.

Return on Investment in Rail Freight Capacity Improvement

This study examines ten case studies of projects that seek to improve or expand rail freight capacity. The benefits captured by the projects fall under economic, environmental, safety/security, transportation, and other categories. Likewise, the benefits are evaluated using methods appropriate to each category of benefit. Not all the projects use all of these methods and some do not use any formal methods, so the presentation is divided into the description of formal and informal methods and a brief listing of projects using some of these methods.

Formal methods employed by the project evaluators included benefit–cost analysis, input-output models, regional economic simulation models (REMI was used in three of the projects), and the Bureau of Economic Analysis model, as well as reliance on domain experts in transportation and real estate to estimate impacts that were fed into the models. Even in cases in which benefits were not strictly monetized, such as emissions reduction, benefit–cost analysis was used to compare the efficiency of alternatives in domain-specific terms (e.g. $/kg of emissions reduced). Some projects that evaluated the impact of rail improvements versus highway improvements for truck freight employed the FHWA’s HERS model to calculate effects of alternative highway investments.

Projects employing formal decision methods include the Chicago Region Environmental and Transportation Efficiency Project, the Iowa CMAQ rail projects, the New York Cross Harbor Goods Movement Environmental Impact Statement, the Mid-Atlantic Rail Operations Study (MAROps), and the Palouse River and Coulee City Railroad (PCC) study.

Informal methods include internally developed models and processes to estimate project impacts. Some projects sought to evaluate the competitive requirements of rail freight versus truck freight. They developed rate models derived from surveys and interviews of shippers and carriers to estimate the required performance goals and investments needed to achieve them. A couple of projects evaluated the impacts of local freight facilities improvements with informal methods.

Projects employing informal methods included the Alameda Corridor transportation project in the Los Angeles port district, the Rail Freight Bottom Line Report, the I-81 Marketing Analysis for Virginia, the Northern Ohio Corridor Study, and the Shellpot Bridge project.

Portland Streetcar

The Portland Streetcar report analyzed the economic, environmental, and fiscal impacts of the new westside streetcar line in Portland Oregon. The report is oriented towards the linkage between transportation and land use, and promotes streetcar expansion and higher density development as a way to efficiently improve environmental and economic performance. The analysis methods consisted of real estate-based projections derived from previous experience with streetcar alignments, and the policy changes in terms of FAR and attendant land uses negotiated with developers to make high-density development feasible.

NJ Transit Retail and Recreational

New Jersey Transit conducted a rider survey-based evaluation of the retail and recreational spending attributable to ridership on New Jersey Transit lines. The study aggregated the responses to these surveys to estimate the total economic impact of transit-based spending on local revenues and taxes. The study also calculated a benefit–cost ratio for this incremental spending with respect to transit operating costs.

DART TOD Guidelines and Policy

The DART TOD guidelines describe the recommended physical design of stations and station areas that lead to successful transit-oriented development.

Phoenix Metro

Phoenix Metro published a summary of the economic impacts of their light rail investment strategy, describing the value of planned and executed real estate development in the light rail station areas.

Howland Hook

The Howland Hook study used a benefit–cost analysis to determine the preferred investment program for transportation investments to improve truck freight traffic out of the Howland Hook terminal.

The Netherlands

Annema, Koopmans, and Van Wee (2007) investigate benefit–cost analysis practice for infrastructure investments in the Netherlands, where a standardized approach has been mandated by law since 2000. The Dutch Ministries of Transport, Public Works, and Water Management and Economic Affairs developed a standard CBA practice guide, which would serve as the basis for future CBA. The researchers developed a benchmark system to measure the quality, transparency (i.e. accessibility for a non-expert reader), correctness, completeness, and risk analysis of benefit–cost analyses conducted for 13 major infrastructure projects ranging in size from 300 million to 12 billion euros. Their evaluation of these CBAs found 10 out of 13 inadequate in terms of transparency, 12 out of 13 were considered “fairly complete,” and only 6 of 13 received positive marks for quality. The authors concluded that while the Dutch standardized CBA approach has improved ex ante project evaluations and provide fairly complete information for policymakers, they suffer from a lack of quality in their methods and assumptions.

Overview of UK Appraisal Procedures

The Department for Transport in the UK publishes and regularly updates guidance to be used by consultants and agencies conducting appraisal and benefit–cost analysis of transport investments. The guidance is designed to allow the department to make a standard comparison of transport investments across the country in a balanced way, providing a linkage to national goals and objectives. This process provides a framework for multi-attribute assessment and was originally an outcome of changes in assessment policy in 1997. Originally known as the New Approach to Assessment (NATA), the overall process is focused around achieving national objectives in five areas: environmental impacts, safety impacts, economic (welfare) impacts, integration, and accessibility.

Within each of these areas there are a number of sub-objectives about which the UK guidance provides detail on how to assess and quantify. Some sub-objectives are qualitatively assessed, but this does not imply they are less important than those that receive a quantitative analysis. One outcome of these procedures is to diminish the importance of standard benefit–cost analysis, which is one of many line items within the list of sub-objectives.

Nellthorp and Mackie (2000) found that NATA initially resulted in decision makers placing a greater emphasis on environmental outcomes than in past practice. Noland (2007) provides a discussion of NATA and its integration with Strategic Environmental Assessment with a brief review of how ultimate decisions are strongly influenced by public input and political considerations, regardless of what the assessment determines is the "best" solution.

"Wider economic benefits" is also a specific sub-objective, which is of the greatest relevance for this project because it corresponds to the idea of truly additional economic benefits—that is, benefits beyond the monetization or capitalization of decreases in travel time (increases in travel speed). The sections below explain the details of the guidance on estimating these "wider economic benefits".

TABLE **E 1 Objectives and sub-objectives in UK transport appraisal**

Objectives	Sub-objectives
Environment	Noise Local air quality Greenhouse gases Landscape Townscape Heritage of Historic Resources Biodiversity Water environment Physical fitness Journey ambience
Safety	Accidents Security
Economy	Transport Economic Efficiency Reliability Wider Economic Impacts
Accessibility	Option values Severance Access to the Transport System
Integration	Transport interchange Land-use policy Other government policies

The assessment of economic development impacts in UK appraisal includes two distinct elements. The first is "regeneration," or supporting the economy of deprived areas, as measured by the employment rate. This is calculated using a relatively straightforward accessibility analysis. Formal guidance already exists for the assessment of regeneration benefits in DfT (2003). The second is "wider impacts," which includes agglomeration externalities, competition effects and labor market externalities.

Guidance on the calculation of "wider impacts" is in the final stages of development, but a draft methodology was recently published DfT (2009). This methodology has been applied extensively over the last two years and consists of four elements:

- **Agglomeration economies**: "Effective density" (that is, employment accessibility) is calculated with and without the project, based on official employment data and journey costs for work and commuting travel. The transport data are extracted from standard transport models. The proportional change in effective density by location from the base case to the intervention scenario drives productivity growth using Graham's elasticities. In practice, these elasticities may or may not be adjusted for local conditions, but should be.
- **Changes in accessibility:** The main impact that transport has on productivity via agglomeration in this model is via changes in accessibility to employment, rather than increased concentration of employment in space. The DfT discussion paper recommends including an assessment of the impact of land-use changes where evidence is available. Some argue that these typically only account for a small proportion of the total agglomeration benefits (Feldman et al. 2008). But much may be dependent on local regulatory context. In the US, land use may change faster than in the UK, where land use is more strongly regulated. However, in the UK density restrictions may be easier to remove.
- **Imperfect competition**: Based on Davies (1998), the discussion paper recommends adding 10% of work-related travel user benefits to appraisal benefits (10% is based on Davies (1998) relationship between price–cost margins, the elasticity of aggregated demand, and the magnitude of the additional benefits occurring under imperfect competition. As Davies (1998) shows, the "missing" user benefits are equal to a proportion of the conventionally measured benefits, where this proportion is the product of the average price–cost marking in the economy and the aggregate demand elasticity. The discussion paper finds the average price–cost margin to be 20% and the demand elasticity -0.5 and hence the missing benefits to equal 10%). This is certainly also subject to local economic conditions. It assumes that the transport investment perfects price competition, and that mark-ups are entirely uncompetitive; and is therefore unlikely to represent a quality estimate of competition benefits.
- **Labor supply:** The two impacts described in "commuting costs and taxation" in Chapter 2 are part of the DfT's methodology.

One of the first applications of this type of agglomeration analysis was for the CrossRail project in London. An underground East–West rail link connecting two of the major rail stations in the city was estimated to deliver significant capacity and accessibility benefits to the capital, worth about £12.8bn to transport users (NPV). It was estimated that these improvements would attract an additional 26,000 jobs to the CBD by 2026, delivering agglomeration benefits of around £3bn.

Detailed Guidance on Assessing Wider Economic Benefits

Although the UK guidance on assessing "wider economic benefits" is still in draft form (DfT 2009), consultants have begun using this for the assessment of various transport projects and plans, most notably the CrossRail project in London. Although the guidance is designed for all transportation projects, two of the measures are most important for public transportation projects: the agglomeration benefits associated with increased employment density, and the potential increase in employment (and reductions in time to find employment) from greater accessibility to jobs. Since these two measures are related, the guidance attempts to assure that no double-counting occurs. In both cases the chief input used in calculating the effects is the change in time and money costs of travel due to the transportation project.

Some of the measures are not relevant to transit, in particular those focused on benefits of reducing "business" travel, the preponderance of which is via private vehicle. Road congestion might also be affected if a public transit project is significant enough to permanently reduce road traffic. We do not address potential road congestion effects in this report that would be accounted for in a traditional benefit–cost analysis. In the UK the benefits associated with any estimated congestion reduction would be input into standard benefit–cost analysis based on travel demand modeling outputs and variable demand matrices.

Method for Estimating Agglomeration Benefits

Agglomeration benefits are estimated based on how changes in travel time between firms may increase their productivity by making interactions among more firms possible. In theory, this kind of effect is more likely to occur with increases in localized interactions; thus the scale is important, particularly for transit effects which would be partially based on localized walking distances. Effective employment density, as the concept is defined in the UK guidance, can be calculated in several ways, but essentially represents the employment accessibility of a given spatial unit, such as a county, municipality, or even a census tract. The measure is intended to represent reductions in travel time that lead to easier interactions among firms, or among workers who are employed in firms. These interactions are thought to cause higher productivity.

The scale used is dependent on data availability and the details of the study being undertaken. It is convenient for it to be consistent with required outputs from a transportation model to match the generalized costs (usually travel times) associated with the spatial unit (in this case a transport analysis zone for a transport model). Thus, changes in generalized cost of travel associated with the project are a required input to the calculation of agglomeration benefits.

Effective density of employment is essentially a gravity-based employment accessibility measure, representing the size of employment clusters divided by a function of the time to travel between them. It is calculated as:

$$ED_{j,t} = \sum_k E_{k,t} T^{\alpha}_{j,k}$$

E_k = *workplace-based employment in zone k in year t.*
T_{jk} = *generalized cost of travel between areas j and k in year t.*
α = *is a parameter which can be estimated, different decay parameters may be used for different sectors (DfT 2009).*

As travel speed increases, the value of far-away zones similarly increases. DfT (2009) suggests breaking down the various components of generalized cost. For example, this can be done by trip purpose, time-of-day, and mode.

One critical assumption made in the UK methodology is that residential and employment locations are static. Thus, agglomeration benefits are only calculated on the basis of direct changes in accessibility via transport improvements. The guidance suggests that an integrated land-use/transport model could be used to further investigate endogenous changes to residential and employment location, as a sensitivity analysis of the static case.

A second major input is estimates of percent increases in industrial productivity as a function of employment accessibility. These were estimated for the UK by Graham (2005) for each of the major sectors of the economy and for each ward (similar to a census tract). The estimates can be aggregated to larger spatial units if needed.

The formula used to calculate agglomeration benefits (simplified from DfT 2003 and modified according to DfT 2009) is:

$$WB1 = \sum_{i,j}\left[\left(\frac{ED_{jA}}{ED_{jB}} - 1\right)^{\rho^k} \times GDP_{ij} \times E_{ij}\right]$$

Where,

WB1 = "wider benefit," type 1

ED = effective density of employment (ΔED is change in ED), for alternative case, A, and base case, B

ρ^k *= productivity elasticity with respect to effective density for sector k*

GDP = GDP per worker

E = workplace-based employment

i and j denote the disaggregate sectors and spatial units in the analysis.

In the United Kingdom, method productivity effects are discounted over a 60-year time horizon from the project start with standard assumptions used about demand growth. These are compared to a base case scenario in which the project is not constructed. The growth in GDP takes into account the effect of agglomeration-related productivity improvements. Results are clearly dependent on the time frame and discount rates used, suggesting that some sensitivity analysis would be beneficial. The difference in GDP between the base case and the "do something" case is then aggregated over all spatial units and each year of calculations, with appropriate discounting to determine the overall agglomeration benefit.

Considerable thought was given to the appropriate definition of "effective density" (employment accessibility). However, the chosen relationship between distance and the decay of agglomeration effects was selected for convenience rather than reflecting empirical evidence. Essentially, the importance of activity further away is assumed to decay at a rate equal to the inverse of the generalized cost of travel (so activity twice as far away has half the impact on agglomeration).

Whether or not the chosen relationship is correct, there is a conceptual problem with using a distance decay function based on generalized cost when estimating the relationship between density and productivity (the agglomeration elasticities). Although perceived cost of movement may be the intuitively correct measure of distance, there is a dual causality between the accessibility, productivity and effective density measured in this way.

The overall pattern of results by industry based on either measure of effective density is very similar. However, generalized cost based estimates tend to be of higher magnitude than the distance based measures. This reflects the fact that distance based measures of agglomeration do not account for the fact that speeds may vary systematically with city size—that is, they do not recognize congestion diseconomies. In effect, the exclusion of travel time information in the definition of effective density induces a downwards bias on the agglomeration elasticity values for the most urbanized wards.

Graham notes that from the point of view of transport appraisal, the use of the generalized cost based elasticity estimates may actually be less appropriate than those based on straight-line distance. This is because the benefits to business and freight users from congestion reductions are already included in standard cost–benefit analysis and so inclusion of the congestion effect implied by the generalized cost agglomeration estimates could risk some double-counting of these benefits.

If we choose to measure density in a way that recognizes differences in transport networks (i.e. time or generalized cost), there will be two routes through which differences in density can contribute to the measured productivity differences across locations:

First, there are agglomeration economies (e.g. input and output market sharing and knowledge spillovers).

Second, locations with better transport networks will have lower input costs (e.g. cheaper to transport goods in and out).

For the first impact, agglomeration economies result indirectly from generalized cost savings which in turn allow greater interactions and therefore greater productivity benefits. The second set of impacts are those that result more directly from the generalized cost saving where for example the cost saving allows greater output from firms - increased output that is not associated with agglomeration economies. In respect of the second impact, the use of elasticities calculated on the basis of generalized cost effective densities would be problematic as it would risk double-counting some of the user benefits already captured in appraisal.

Effects of Increased Competition and Reductions in Market Imperfections

Two of the additional measures considered in the UK guidance are 1) how transport can increase competition between economic agents, and 2) reductions in market imperfections that can lead to increased output. Increased competition is considered not to be a measurable effect, due to the mature nature of existing transport networks. It is unlikely that small changes would affect the relative level of competition, except perhaps in very isolated areas. The reduction in market imperfections is how businesses can reduce costs when travel costs are lower, and the increased output that they may be able to achieve. UK guidance recommends the use of an ‘uprate factor’, estimated to be about 10% of business travel time savings plus reliability gains. This is derived from differences between price and marginal costs as well as the demand elasticity of the specific market under consideration. These effects would likely be mainly associated with reductions in road traffic that might occur due to a transit investment, and in most cases would be swamped by additional induced traffic. Therefore, when evaluating transit projects, we believe this benefit would be trivial, if present at all.

Labor Market Effects

Various labor market effects also can be estimated related to the commute to work. These include 1) increased employment due to lower transport costs, 2) increased work hours due to shorter commutes, and 3) increased employment in more productive jobs. The second of these is considered minor and not elaborated upon in UK guidance. Methods for the first and third are elaborated on below.

The increase in labor supply, that is more people choosing to work, is spurred by the effective reduction in the costs of working by reducing transport costs. This is an important consideration, especially when considering the distributional impacts of investment and how transport costs disproportionately affect lower income employees. One critical input necessary for evaluating this effect is an estimate of the elasticity of labor supply with respect to wages, on the assumption that reduced travel times have the same effect as an increase in wages (of course, wages may *decrease* to reflect decreased cost of access; which is a problem with this assumption). UK guidance recommends using a range between 0.05 and 0.15 with a best estimate of 0.1, based on reviews of the literature. In theory these should be sector-specific and also based on household demographics.

This effect is calculated as:

$$GP1_t = -\sum_t \left[\frac{\sum_j dT_{ij,t} \times C_{ij,t}}{\sum_j W_{j,t} \times C_{it,t}} \times \sum_j GDP_{j,t} \times C_{it,t} \right] \times El$$

C_{ij} = *Commuters that live in area i and work in area j.*

dT_{ij} = *Change in generalized cost of commuting from i to j.*

GDP_j = *GDP per worker entering the labor market in area j.*

W_j = *Average wage from working in j.*

El = *Elasticity of labor supply*

Given the need for transport generalized cost data, the level of aggregation should again correspond to travel demand model outputs. The key unknown, in our view, is how to estimate the elasticity of labor supply.

The other labor market effect to consider is the relocation of employees to more productive regions. This is distinct from any agglomeration benefits associated with co-location of firms. UK guidance assumes that different industries have variations in productivity according to which region they are located in. This is done by defining a productivity index for a given industry and region that is also dependent on specific worker characteristics (e.g., skills, educational level and age).

The formula used is:

$$GP3_t = \sum_A \sum_I \Delta E_{AI,t} \times PI_{AI,t} \times GDP_{I,t}$$

Where,

ΔE_{AI} = Change in employment in area A and industry i.

PI_{AI} = Index of productivity per worker in area A and industry I, where the base is average national productivity per worker.

GDP = National average industry GDP per worker.

All estimates are also forecast over the 60 year time horizon and discounted back to the present.

Deficiencies in Existing Practice

It may be desirable that FTA guidelines for determining land development impacts be combined with the additional economic impacts related to agglomeration and labor search. Most of these effects, however, are highly dependent on how the land market responds. But how the land market responds is contingent upon development policies, so it is not accurate to assume that land development can be treated as an assumed input to calculations of economic impact. UK guidance, in fact, assumes land use does not change, but allows sensitivity analysis if one can use an integrated transport/land-use model. We do not believe this level of modeling detail is necessary for assessing localized access around transport stations.

The UK experience with calculating economic impacts is based on guidance developed by the UK Department for Transport, which is based on a limited amount of commissioned research. It is likely that procedures in the US would demand more numerous, robust examples of research evidence and a more established consensus on effects, before adopting a given approach. To estimate wider economic benefits, UK practice is currently relying on one approach to estimate a set of agglomeration elasticities to determine benefits. One potential problem is endogeneity, that is, whether more productive firms locate in agglomerations as opposed to the agglomerations resulting in more productive firms. The procedure used also suggests using straight-line distances (ostensibly to avoid double-counting) rather than actual travel costs; again it is unclear whether this is a robust technique (see discussion in section 6.4.2.1 above).

A further problem is the reliance on large-scale transportation (and land-use models). Some of these tend to be black boxes that are difficult to explain to the public and whose workings may not be well understood by anyone except model developers. While these are used in transportation and air quality conformity analysis in the US, there are many uncertainties associated with the results that they generate (Rodier 2007). In any case, direct transference of UK estimates to the US would be questionable. At the very least, estimates of agglomeration effects focused specifically on transit impacts are needed.

UK practice in terms of assessing projects focuses on multi-attribute assessment, where economic benefits are one of many attributes, some of which are expressed qualitatively and in non-monetary terms. This type of procedure is not used in the United States, but could provide a means of considering other attributes associated with transit, both positive and negative. For example, it would provide a non-monetized value for emissions reductions that might be achievable. It could likewise provide a qualitative assessment of how urban amenities could be improved with development around a transit station.

APPENDIX F: ELASTICITY ESTIMATES

TABLE F 1 Elasticities of employment density and population w.r.t. transit, specific to each MSA

	Elasticities of employment density		Population	
	Total track miles	**Track miles per sqm CBSA area**	**Total track miles per capita**	**Track miles per sqm UZA area**
Albuquerque, NM	0.0359 - 0.1228	0.0217 - 0.1055	4.6664 - 10.2513	4.3644 - 8.1623
Atlanta-Sandy Springs-Marietta, GA	0.0347 - 0.1187	0.0232 - 0.1131	0.1359 - 0.2985	0.107 - 0.2002
Baltimore-Towson, MD	0.0523 - 0.1789	0.1124 - 0.5472	1.1883 - 2.6105	1.1516 - 2.1538
Buffalo-Niagara Falls, NY	0.0054 - 0.0184	0.0192 - 0.0934	0.4033 - 0.8861	0.3557 - 0.6653
Charlotte-Gastonia-Concord, NC-SC	0.0251 - 0.0857	0.0454 - 0.2208	0.2625 - 0.5767	0.1982 - 0.3707
Chicago-Naperville-Joliet, IL-IN-WI	0.3691 - 1.2632	0.2871 - 1.3977	0.6079 - 1.3355	0.7484 - 1.3996
Cleveland-Elyria-Mentor, OH	0.0262 - 0.0896	0.0733 - 0.3568	0.6265 - 1.3763	0.5673 - 1.0609
Dallas-Fort Worth-Arlington, TX	0.082 - 0.2805	0.0511 - 0.249	0.1697 - 0.3727	0.1953 - 0.3653
Denver-Aurora, CO	0.024 - 0.0821	0.0161 - 0.0784	0.4407 - 0.9681	0.63 - 1.1783
Houston-Baytown-Sugar Land, TX	0.0106 - 0.0364	0.0067 - 0.0326	0.0347 - 0.0763	0.0395 - 0.0739
Little Rock-North Little Rock, AR	0.0039 - 0.0135	0.0054 - 0.0263	0.5926 - 1.3018	0.5035 - 0.9417
Los Angeles-Long Beach-Santa Ana, CA	0.244 - 0.835	0.2822 - 1.3738	0.2351 - 0.5164	0.5024 - 0.9397
Memphis, TN-MS-AR	0.0082 - 0.0282	0.0101 - 0.0492	0.3306 - 0.7262	0.3058 - 0.572
Miami-Fort Lauderdale-Miami Beach, FL	0.0547 - 0.187	0.0598 - 0.2912	0.252 - 0.5536	0.3779 - 0.7068
Minneapolis-St. Paul-Bloomington, MN-WI	0.0079 - 0.027	0.0073 - 0.0356	0.0919 - 0.2019	0.0905 - 0.1692
Nashville-Davidson--Murfreesboro, TN	0.0401 - 0.1371	0.0395 - 0.1924	1.052 - 2.311	0.8629 - 1.6137
New Orleans-Metairie-Kenner, LA	0.0111 - 0.0381	0.0198 - 0.0965	0.7523 - 1.6526	0.7713 - 1.4424
New York-Northern New Jersey-Long Island, NY-NJ-PA	0.2554 - 0.8741	0.213 - 1.0371	0.2751 - 0.6044	0.4706 - 0.8801
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	0.1434 - 0.4908	0.1738 - 0.846	0.7586 - 1.6666	0.7191 - 1.3449
Pittsburgh, PA	0.0099 - 0.034	0.0105 - 0.0514	0.3158 - 0.6937	0.2264 - 0.4234
Portland-Vancouver-Beaverton, OR-WA	0.0338 - 0.1155	0.0283 - 0.1379	0.7936 - 1.7434	1.0308 - 1.9277
Providence-New Bedford-Fall River, RI-MA	0.005 - 0.0171	0.0175 - 0.0851	0.2117 - 0.4651	0.1609 - 0.3009
Sacramento--Arden-Arcade--Roseville, CA	0.0315 - 0.1076	0.0346 - 0.1686	0.6656 - 1.4621	0.9212 - 1.7228

St. Louis, MO-IL	0.0284 - 0.097	0.0184 - 0.0895	0.46 - 1.0106	0.4033 - 0.7543
Salt Lake City, UT	0.0101 - 0.0347	0.006 - 0.0291	1.2244 - 2.6898	1.6626 - 3.1093
San Diego-Carlsbad-San Marcos, CA	0.0702 - 0.2402	0.0938 - 0.4564	0.8115 - 1.7827	0.9443 - 1.7661
San Francisco-Oakland-Fremont, CA	0.0822 - 0.2812	0.1864 - 0.9072	0.8182 - 1.7975	1.3531 - 2.5306
San Jose-Sunnyvale-Santa Clara, CA	0.0947 - 0.3239	0.1982 - 0.9646	3.8473 - 8.4519	6.813 - 12.7416
Seattle-Tacoma-Bellevue, WA	0.0456 - 0.156	0.0434 - 0.2111	0.6135 - 1.3477	0.6078 - 1.1368
Tampa-St. Petersburg-Clearwater, FL	0.0018 - 0.006	0.0039 - 0.0188	0.0256 - 0.0563	0.0231 - 0.0431
Trenton-Ewing, NJ	0.0044 - 0.0152	0.1102 - 0.5366	4.1339 - 9.0814	3.6953 - 6.911
Washington-Arlington-Alexandria, DC-VA-MD-WV	0.1131 - 0.3869	0.1421 - 0.6919	0.9003 - 1.9778	1.0271 - 1.9208

TABLE **F 2 Productivity elasticities (average payroll and GDP per capita) w.r.t principal city employment density, for two track mile measures**

Employment agglomeration elasticities	**Total track miles**		**Track miles per sqm CBSA area**	
	Average payroll	**GDP per capita**	**Average payroll**	**GDP per capita**
Albuquerque, NM	0.002 - 0.014	0.0055 - 0.0166	0.0012 - 0.012	0.0033 - 0.0142
Atlanta-Sandy Springs-Marietta, GA	0.0019 - 0.0135	0.0053 - 0.016	0.0013 - 0.0129	0.0035 - 0.0153
Baltimore-Towson, MD	0.0029 - 0.0204	0.0079 - 0.0242	0.0062 - 0.0624	0.0171 - 0.0739
Buffalo-Niagara Falls, NY	0.0003 - 0.0021	0.0008 - 0.0025	0.0011 - 0.0107	0.0029 - 0.0126
Charlotte-Gastonia-Concord, NC-SC	0.0014 - 0.0098	0.0038 - 0.0116	0.0025 - 0.0252	0.0069 - 0.0298
Chicago-Naperville-Joliet, IL-IN-WI	0.0205 - 0.144	0.0561 - 0.1705	0.0159 - 0.1593	0.0436 - 0.1887
Cleveland-Elyria-Mentor, OH	0.0015 - 0.0102	0.004 - 0.0121	0.0041 - 0.0407	0.0111 - 0.0482
Dallas-Fort Worth-Arlington, TX	0.0045 - 0.032	0.0125 - 0.0379	0.0028 - 0.0284	0.0078 - 0.0336
Denver-Aurora, CO	0.0013 - 0.0094	0.0036 - 0.0111	0.0009 - 0.0089	0.0024 - 0.0106
Houston-Baytown-Sugar Land, TX	0.0006 - 0.0042	0.0016 - 0.0049	0.0004 - 0.0037	0.001 - 0.0044
Little Rock-North Little Rock, AR	0.0002 - 0.0015	0.0006 - 0.0018	0.0003 - 0.003	0.0008 - 0.0036
Los Angeles-Long Beach-Santa Ana, CA	0.0135 - 0.0952	0.0371 - 0.1127	0.0156 - 0.1566	0.0429 - 0.1855
Memphis, TN-MS-AR	0.0005 - 0.0032	0.0013 - 0.0038	0.0006 - 0.0056	0.0015 - 0.0066
Miami-Fort Lauderdale-Miami Beach, FL	0.003 - 0.0213	0.0083 - 0.0252	0.0033 - 0.0332	0.0091 - 0.0393
Minneapolis-St. Paul-Bloomington, MN-WI	0.0004 - 0.0031	0.0012 - 0.0036	0.0004 - 0.0041	0.0011 - 0.0048
Nashville-Davidson--Murfreesboro, TN	0.0022 - 0.0156	0.0061 - 0.0185	0.0022 - 0.0219	0.006 - 0.026
New Orleans-Metairie-Kenner, LA	0.0006 - 0.0043	0.0017 - 0.0051	0.0011 - 0.011	0.003 - 0.013
New York-Northern New Jersey-Long Island, NY-NJ-PA	0.0142 - 0.0996	0.0388 - 0.118	0.0118 - 0.1182	0.0324 - 0.14
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	0.0079 - 0.056	0.0218 - 0.0663	0.0096 - 0.0964	0.0264 - 0.1142
Pittsburgh, PA	0.0006 - 0.0039	0.0015 - 0.0046	0.0006 - 0.0059	0.0016 - 0.0069
Portland-Vancouver-Beaverton, OR-WA	0.0019 - 0.0132	0.0051 - 0.0156	0.0016 - 0.0157	0.0043 - 0.0186
Providence-New Bedford-Fall River, RI-MA	0.0003 - 0.0019	0.0008 - 0.0023	0.001 - 0.0097	0.0027 - 0.0115
Sacramento--Arden-Arcade--Roseville, CA	0.0017 - 0.0123	0.0048 - 0.0145	0.0019 - 0.0192	0.0053 - 0.0228
St. Louis, MO-IL	0.0016 - 0.0111	0.0043 - 0.0131	0.001 - 0.0102	0.0028 - 0.0121

Salt Lake City, UT	0.0006 - 0.004	0.0015 - 0.0047	0.0003 - 0.0033	0.0009 - 0.0039
San Diego-Carlsbad-San Marcos, CA	0.0039 - 0.0274	0.0107 - 0.0324	0.0052 - 0.052	0.0143 - 0.0616
San Francisco-Oakland-Fremont, CA	0.0046 - 0.0321	0.0125 - 0.038	0.0103 - 0.1034	0.0283 - 0.1225
San Jose-Sunnyvale-Santa Clara, CA	0.0052 - 0.0369	0.0144 - 0.0437	0.011 - 0.11	0.0301 - 0.1302
Seattle-Tacoma-Bellevue, WA	0.0025 - 0.0178	0.0069 - 0.0211	0.0024 - 0.0241	0.0066 - 0.0285
Tampa-St. Petersburg-Clearwater, FL	0.0001 - 0.0007	0.0003 - 0.0008	0.0002 - 0.0021	0.0006 - 0.0025
Trenton-Ewing, NJ	0.0002 - 0.0017	0.0007 - 0.0021	0.0061 - 0.0612	0.0168 - 0.0724
Washington-Arlington-Alexandria, DC-VA-MD-WV	0.0063 - 0.0441	0.0172 - 0.0522	0.0079 - 0.0789	0.0216 - 0.0934

TABLE **F 3 Productivity elasticities (average payroll and GDP per capita) w.r.t population, for two track mile measures**

Population agglomeration elasticities	**Total track miles per capita**		**Track miles per sqm UZA area**	
	Average payroll	**GDP per capita**	**Average payroll**	**GDP per capita**
Albuquerque, NM	0.196 - 0.3526	0.2847 - 0.6489	0.1833 - 0.2808	0.2662 - 0.5167
Atlanta-Sandy Springs-Marietta, GA	0.0057 - 0.0103	0.0083 - 0.0189	0.0045 - 0.0069	0.0065 - 0.0127
Baltimore-Towson, MD	0.0499 - 0.0898	0.0725 - 0.1652	0.0484 - 0.0741	0.0702 - 0.1363
Buffalo-Niagara Falls, NY	0.0169 - 0.0305	0.0246 - 0.0561	0.0149 - 0.0229	0.0217 - 0.0421
Charlotte-Gastonia-Concord, NC-SC	0.011 - 0.0198	0.016 - 0.0365	0.0083 - 0.0128	0.0121 - 0.0235
Chicago-Naperville-Joliet, IL-IN-WI	0.0255 - 0.0459	0.0371 - 0.0845	0.0314 - 0.0481	0.0457 - 0.0886
Cleveland-Elyria-Mentor, OH	0.0263 - 0.0473	0.0382 - 0.0871	0.0238 - 0.0365	0.0346 - 0.0672
Dallas-Fort Worth-Arlington, TX	0.0071 - 0.0128	0.0104 - 0.0236	0.0082 - 0.0126	0.0119 - 0.0231
Denver-Aurora, CO	0.0185 - 0.0333	0.0269 - 0.0613	0.0265 - 0.0405	0.0384 - 0.0746
Houston-Baytown-Sugar Land, TX	0.0015 - 0.0026	0.0021 - 0.0048	0.0017 - 0.0025	0.0024 - 0.0047
Little Rock-North Little Rock, AR	0.0249 - 0.0448	0.0361 - 0.0824	0.0211 - 0.0324	0.0307 - 0.0596
Los Angeles-Long Beach-Santa Ana, CA	0.0099 - 0.0178	0.0143 - 0.0327	0.0211 - 0.0323	0.0306 - 0.0595
Memphis, TN-MS-AR	0.0139 - 0.025	0.0202 - 0.046	0.0128 - 0.0197	0.0187 - 0.0362
Miami-Fort Lauderdale-Miami Beach, FL	0.0106 - 0.019	0.0154 - 0.035	0.0159 - 0.0243	0.0231 - 0.0447
Minneapolis-St. Paul-Bloomington, MN-WI	0.0039 - 0.0069	0.0056 - 0.0128	0.0038 - 0.0058	0.0055 - 0.0107
Nashville-Davidson--Murfreesboro, TN	0.0442 - 0.0795	0.0642 - 0.1463	0.0362 - 0.0555	0.0526 - 0.1021
New Orleans-Metairie-Kenner, LA	0.0316 - 0.0568	0.0459 - 0.1046	0.0324 - 0.0496	0.047 - 0.0913
New York-Northern New Jersey-Long Island, NY-NJ-PA	0.0116 - 0.0208	0.0168 - 0.0383	0.0198 - 0.0303	0.0287 - 0.0557
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	0.0319 - 0.0573	0.0463 - 0.1055	0.0302 - 0.0463	0.0439 - 0.0851
Pittsburgh, PA	0.0133 - 0.0239	0.0193 - 0.0439	0.0095 - 0.0146	0.0138 - 0.0268
Portland-Vancouver-Beaverton, OR-WA	0.0333 - 0.06	0.0484 - 0.1104	0.0433 - 0.0663	0.0629 - 0.122
Providence-New Bedford-Fall River, RI-MA	0.0089 - 0.016	0.0129 - 0.0294	0.0068 - 0.0104	0.0098 - 0.019
Sacramento--Arden-Arcade--Roseville, CA	0.028 - 0.0503	0.0406 - 0.0926	0.0387 - 0.0593	0.0562 - 0.1091
St. Louis, MO-IL	0.0193 - 0.0348	0.0281 - 0.064	0.0169 - 0.0259	0.0246 - 0.0477
Salt Lake City, UT	0.0514 - 0.0925	0.0747 - 0.1703	0.0698 - 0.107	0.1014 - 0.1968

San Diego-Carlsbad-San Marcos, CA	0.0341 - 0.0613	0.0495 - 0.1128	0.0397 - 0.0608	0.0576 - 0.1118
San Francisco-Oakland-Fremont, CA	0.0344 - 0.0618	0.0499 - 0.1138	0.0568 - 0.0871	0.0825 - 0.1602
San Jose-Sunnyvale-Santa Clara, CA	0.1616 - 0.2907	0.2347 - 0.535	0.2861 - 0.4383	0.4156 - 0.8065
Seattle-Tacoma-Bellevue, WA	0.0258 - 0.0464	0.0374 - 0.0853	0.0255 - 0.0391	0.0371 - 0.072
Tampa-St. Petersburg-Clearwater, FL	0.0011 - 0.0019	0.0016 - 0.0036	0.001 - 0.0015	0.0014 - 0.0027
Trenton-Ewing, NJ	0.1736 - 0.3124	0.2522 - 0.5749	0.1552 - 0.2377	0.2254 - 0.4375
Washington-Arlington-Alexandria, DC-VA-MD-WV	0.0378 - 0.068	0.0549 - 0.1252	0.0431 - 0.0661	0.0627 - 0.1216

TABLE **F 4 Elasticities of employment density and population w.r.t. transit, specific to each MSA**

Rail revenue miles	**Elasticities of employment density**	**Population**
Atlanta-Sandy Springs-Marietta, GA	0.0946 - 0.1569	0.2302 - 0.256
Baltimore-Towson, MD	0.0537 - 0.089	0.3768 - 0.4192
Buffalo-Niagara Falls, NY	0.0098 - 0.0163	0.0959 - 0.1067
Charlotte-Gastonia-Concord, NC-SC	0.0282 - 0.0467	0.0581 - 0.0646
Chicago-Naperville-Joliet, IL-IN-WI	0.6827 - 1.1322	1.234 - 1.3725
Cleveland-Elyria-Mentor, OH	0.0464 - 0.077	0.2681 - 0.2982
Dallas-Fort Worth-Arlington, TX	0.0923 - 0.1531	0.1389 - 0.1545
Denver-Aurora, CO	0.0795 - 0.1318	0.4211 - 0.4684
Houston-Baytown-Sugar Land, TX	0.0178 - 0.0295	0.0383 - 0.0427
Little Rock-North Little Rock, AR	0.0019 - 0.0032	0.0223 - 0.0249
Los Angeles-Long Beach-Santa Ana, CA	0.5003 - 0.8297	0.7098 - 0.7895
Memphis, TN-MS-AR	0.0163 - 0.0271	0.0982 - 0.1093
Miami-Fort Lauderdale-Miami Beach, FL	0.0403 - 0.0668	0.1178 - 0.131
Minneapolis-St. Paul-Bloomington, MN-WI	0.0212 - 0.0351	0.0921 - 0.1025
Nashville-Davidson--Murfreesboro, TN	0.0037 - 0.0062	0.0175 - 0.0195
New Orleans-Metairie-Kenner, LA	0.0203 - 0.0336	0.1846 - 0.2053
New York-Northern New Jersey-Long Island, NY-NJ-PA	0.4483 - 0.7434	1.0563 - 1.1748
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	0.1933 - 0.3206	0.7004 - 0.7791
Pittsburgh, PA	0.017 - 0.0283	0.1473 - 0.1638
Portland-Vancouver-Beaverton, OR-WA	0.0831 - 0.1378	0.4964 - 0.5521
Sacramento--Arden-Arcade--Roseville, CA	0.0426 - 0.0706	0.2184 - 0.2429
St. Louis, MO-IL	0.0648 - 0.1075	0.342 - 0.3804
Salt Lake City, UT	0.027 - 0.0447	0.417 - 0.4638
San Diego-Carlsbad-San Marcos, CA	0.0859 - 0.1424	0.3457 - 0.3845
San Francisco-Oakland-Fremont, CA	0.4553 - 0.755	2.2277 - 2.4778
San Jose-Sunnyvale-Santa Clara, CA	0.0392 - 0.0649	0.3323 - 0.3696

Seattle-Tacoma-Bellevue, WA	0.0056 - 0.0093	0.0291 - 0.0324
Tampa-St. Petersburg-Clearwater, FL	0.0019 - 0.0031	0.0085 - 0.0095
Washington-Arlington-Alexandria, DC-VA-MD-WV	0.1749 - 0.2901	0.8638 - 0.9608

TABLE **F 5 Agglomeration elasticities (employment density and population) w.r.t. rail revenue miles**

Agglomeration elasticities, rail revenue miles	**Principal city employment density agglomeration elasticity**		**Population agglomeration elasticities**	
	Average payroll	**GDP per capita**	**Average payroll**	**GDP per capita**
Atlanta-Sandy Springs-Marietta, GA	0.0052 - 0.0179	0.0144 - 0.0212	0.0128 - 0.0292	0.035 - 0.0346
Baltimore-Towson, MD	0.003 - 0.0101	0.0082 - 0.012	0.0209 - 0.0478	0.0573 - 0.0566
Buffalo-Niagara Falls, NY	0.0005 - 0.0019	0.0015 - 0.0022	0.0053 - 0.0122	0.0146 - 0.0144
Charlotte-Gastonia-Concord, NC-SC	0.0016 - 0.0053	0.0043 - 0.0063	0.0032 - 0.0074	0.0088 - 0.0087
Chicago-Naperville-Joliet, IL-IN-WI	0.0378 - 0.1291	0.1038 - 0.1528	0.0684 - 0.1565	0.1876 - 0.1853
Cleveland-Elyria-Mentor, OH	0.0026 - 0.0088	0.0071 - 0.0104	0.0149 - 0.034	0.0408 - 0.0403
Dallas-Fort Worth-Arlington, TX	0.0051 - 0.0175	0.014 - 0.0207	0.0077 - 0.0176	0.0211 - 0.0209
Denver-Aurora, CO	0.0044 - 0.015	0.0121 - 0.0178	0.0233 - 0.0534	0.064 - 0.0632
Houston-Baytown-Sugar Land, TX	0.001 - 0.0034	0.0027 - 0.004	0.0021 - 0.0049	0.0058 - 0.0058
Little Rock-North Little Rock, AR	0.0001 - 0.0004	0.0003 - 0.0004	0.0012 - 0.0028	0.0034 - 0.0034
Los Angeles-Long Beach-Santa Ana, CA	0.0277 - 0.0946	0.076 - 0.112	0.0393 - 0.09	0.1079 - 0.1066
Memphis, TN-MS-AR	0.0009 - 0.0031	0.0025 - 0.0037	0.0054 - 0.0125	0.0149 - 0.0147
Miami-Fort Lauderdale-Miami Beach, FL	0.0022 - 0.0076	0.0061 - 0.009	0.0065 - 0.0149	0.0179 - 0.0177
Minneapolis-St. Paul-Bloomington, MN-WI	0.0012 - 0.004	0.0032 - 0.0047	0.0051 - 0.0117	0.014 - 0.0138
Nashville-Davidson--Murfreesboro, TN	0.0002 - 0.0007	0.0006 - 0.0008	0.001 - 0.0022	0.0027 - 0.0026
New Orleans-Metairie-Kenner, LA	0.0011 - 0.0038	0.0031 - 0.0045	0.0102 - 0.0234	0.0281 - 0.0277
New York-Northern New Jersey-Long Island, NY-NJ-PA	0.0248 - 0.0847	0.0681 - 0.1004	0.0585 - 0.1339	0.1606 - 0.1586
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	0.0107 - 0.0365	0.0294 - 0.0433	0.0388 - 0.0888	0.1065 - 0.1052
Pittsburgh, PA	0.0009 - 0.0032	0.0026 - 0.0038	0.0082 - 0.0187	0.0224 - 0.0221
Portland-Vancouver-Beaverton, OR-WA	0.0046 - 0.0157	0.0126 - 0.0186	0.0275 - 0.0629	0.0754 - 0.0745
Sacramento--Arden-Arcade--Roseville, CA	0.0024 - 0.0081	0.0065 - 0.0095	0.0121 - 0.0277	0.0332 - 0.0328
St. Louis, MO-IL	0.0036 - 0.0123	0.0099 - 0.0145	0.0189 - 0.0434	0.052 - 0.0514
Salt Lake City, UT	0.0015 - 0.0051	0.0041 - 0.006	0.0231 - 0.0529	0.0634 - 0.0626

San Diego-Carlsbad-San Marcos, CA	0.0048 - 0.0162	0.0131 - 0.0192	0.0192 - 0.0438	0.0525 - 0.0519
San Francisco-Oakland-Fremont, CA	0.0252 - 0.0861	0.0692 - 0.1019	0.1234 - 0.2825	0.3386 - 0.3345
San Jose-Sunnyvale-Santa Clara, CA	0.0022 - 0.0074	0.006 - 0.0088	0.0184 - 0.0421	0.0505 - 0.0499
Seattle-Tacoma-Bellevue, WA	0.0003 - 0.0011	0.0008 - 0.0013	0.0016 - 0.0037	0.0044 - 0.0044
Tampa-St. Petersburg-Clearwater, FL	0.0001 - 0.0004	0.0003 - 0.0004	0.0005 - 0.0011	0.0013 - 0.0013
Washington-Arlington-Alexandria, DC-VA-MD-WV	0.0097 - 0.0331	0.0266 - 0.0392	0.0479 - 0.1095	0.1313 - 0.1297

TABLE **F 6 Total revenue miles, MSA specific elasticities (employment density and population)**

Total revenue mile elasticities	**Principal city employment density**	**Population**
Abilene, TX	0.0096 - 0.0188	0.1628 - 0.1633
Albany, GA	0.0148 - 0.0289	0.1983 - 0.1989
Albany-Schenectady-Troy, NY	0.0422 - 0.0825	0.5231 - 0.5249
Albuquerque, NM	0.0505 - 0.0985	0.367 - 0.3682
Alexandria, LA	0.0088 - 0.0172	0.2079 - 0.2086
Allentown-Bethlehem-Easton, PA-NJ	0.0214 - 0.0419	0.179 - 0.1795
Altoona, PA	0.0038 - 0.0074	0.217 - 0.2177
Amarillo, TX	0.0121 - 0.0237	0.1648 - 0.1653
Ames, IA	0.0149 - 0.0291	0.7773 - 0.7798
Anchorage, AK	0.0333 - 0.0649	0.3604 - 0.3615
Anderson, IN	0.0105 - 0.0206	0.1377 - 0.1382
Ann Arbor, MI	0.0201 - 0.0392	0.5872 - 0.5891
Appleton, WI	0.0085 - 0.0167	0.286 - 0.2869
Athens-Clarke County, GA	0.018 - 0.0352	0.249 - 0.2498
Atlanta-Sandy Springs-Marietta, GA	0.33 - 0.6443	0.4598 - 0.4613
Auburn-Opelika, AL	0.002 - 0.004	0.0366 - 0.0368
Augusta-Richmond County, GA-SC	0.0168 - 0.0327	0.0654 - 0.0656
Bakersfield, CA	0.0443 - 0.0864	0.2644 - 0.2652
Bangor, ME	0.0071 - 0.0139	0.2221 - 0.2228
Baton Rouge, LA	0.0271 - 0.0529	0.1836 - 0.1842
Battle Creek, MI	0.0075 - 0.0146	0.1696 - 0.1702
Bay City, MI	0.0167 - 0.0326	0.5833 - 0.5852
Beaumont-Port Arthur, TX	0.0173 - 0.0338	0.148 - 0.1484
Bellingham, WA	0.0241 - 0.0471	0.5923 - 0.5942
Bend, OR	0.003 - 0.0059	0.0764 - 0.0767
Billings, MT	0.009 - 0.0175	0.2343 - 0.2351

Binghamton, NY	0.0136 - 0.0265	0.4591 - 0.4606
Birmingham-Hoover, AL	0.0411 - 0.0803	0.1524 - 0.1529
Bismarck, ND	0.0035 - 0.0068	0.1787 - 0.1793
Blacksburg-Christiansburg-Radford, VA	0.0147 - 0.0287	0.2749 - 0.2758
Bloomington, IN	0.0114 - 0.0223	0.325 - 0.326
Bloomington-Normal, IL	0.0134 - 0.0262	0.401 - 0.4023
Boise City-Nampa, ID	0.0163 - 0.0318	0.1408 - 0.1413
Bradenton-Sarasota-Venice, FL	0.0364 - 0.0711	0.3287 - 0.3297
Bremerton-Silverdale, WA	0.0332 - 0.0649	0.6071 - 0.609
Brownsville-Harlingen, TX	0.0141 - 0.0276	0.1247 - 0.1252
Brunswick, GA	0.142 - 0.2773	6.0693 - 6.0891
Canton-Massillon, OH	0.042 - 0.0821	0.3776 - 0.3789
Cape Coral-Fort Myers, FL	0.0649 - 0.1267	0.313 - 0.314
Casper, WY	0.0042 - 0.0082	0.1755 - 0.1761
Cedar Rapids, IA	0.0135 - 0.0263	0.2504 - 0.2512
Champaign-Urbana, IL	0.0374 - 0.0731	0.9794 - 0.9826
Charleston, WV	0.0226 - 0.0441	0.4688 - 0.4703
Charleston-North Charleston, SC	0.0442 - 0.0862	0.2577 - 0.2585
Charlotte-Gastonia-Concord, NC-SC	0.3679 - 0.7184	0.4347 - 0.4361
Chattanooga, TN-GA	0.0337 - 0.0658	0.2325 - 0.2333
Cheyenne, WY	0.0053 - 0.0103	0.2672 - 0.268
Chicago-Naperville-Joliet, IL-IN-WI	0.8275 - 1.6157	0.8568 - 0.8596
Chico, CA	0.0154 - 0.03	0.2818 - 0.2827
Cincinnati-Middletown, OH-KY-IN	0.1267 - 0.2474	0.3976 - 0.3989
Clarksville, TN-KY	0.0376 - 0.0735	0.1975 - 0.1982
Cleveland-Elyria-Mentor, OH	0.2388 - 0.4663	0.7904 - 0.793
College Station-Bryan, TX	0.0429 - 0.0838	0.5564 - 0.5582
Columbia, MO	0.0098 - 0.0191	0.2263 - 0.227
Columbia, SC	0.016 - 0.0313	0.1311 - 0.1316
Columbus, GA-AL	0.0199 - 0.0389	0.1963 - 0.1969

Columbus, OH	0.0818 - 0.1597	0.2628 - 0.2636
Corpus Christi, TX	0.0494 - 0.0965	0.4121 - 0.4135
Cumberland, MD-WV	0.0042 - 0.0082	0.1641 - 0.1647
Dallas-Fort Worth-Arlington, TX	0.412 - 0.8044	0.3551 - 0.3562
Davenport-Moline-Rock Island, IA-IL	0.0496 - 0.0968	0.526 - 0.5277
Dayton, OH	0.0709 - 0.1385	0.4179 - 0.4193
Decatur, AL	0 - 0	0 - 0
Decatur, IL	0.0187 - 0.0364	0.5275 - 0.5292
Deltona-Daytona Beach-Ormond Beach, FL	0.0643 - 0.1255	0.3057 - 0.3067
Denver-Aurora, CO	0.3707 - 0.7239	1.1253 - 1.129
Des Moines, IA	0.0233 - 0.0455	0.2565 - 0.2573
Detroit-Warren-Livonia, MI	0.2704 - 0.528	0.3686 - 0.3698
Dothan, AL	0 - 0	0 - 0
Dubuque, IA	0.0042 - 0.0083	0.1995 - 0.2002
Duluth, MN-WI	0.031 - 0.0606	0.3934 - 0.3947
Eau Claire, WI	0.0093 - 0.0182	0.2623 - 0.2631
El Centro, CA	0.0078 - 0.0153	0.2447 - 0.2455
El Paso, TX	0.0806 - 0.1573	0.5416 - 0.5433
Elkhart-Goshen, IN	0.0061 - 0.0119	0.1321 - 0.1325
Elmira, NY	0.0064 - 0.0126	0.5087 - 0.5103
Erie, PA	0.014 - 0.0273	0.3639 - 0.3651
Eugene-Springfield, OR	0.0422 - 0.0823	0.5866 - 0.5885
Evansville, IN-KY	0.0132 - 0.0258	0.2083 - 0.209
Fairbanks, AK	0.0078 - 0.0152	0.2341 - 0.2349
Fayetteville-Springdale-Rogers, AR-MO	0.0112 - 0.022	0.0831 - 0.0834
Flagstaff, AZ	0.0104 - 0.0202	0.3103 - 0.3113
Flint, MI	0.0491 - 0.0958	0.4586 - 0.4601
Florence, SC	0.0031 - 0.006	0.0443 - 0.0445
Fond du Lac, WI	0.0018 - 0.0036	0.1038 - 0.1041
Fort Collins-Loveland, CO	0.015 - 0.0292	0.1958 - 0.1965

Fort Smith, AR-OK	0.0041 - 0.0081	0.0593 - 0.0595
Fort Walton Beach-Crestview-Destin, FL	0.0062 - 0.0121	0.151 - 0.1515
Fort Wayne, IN	0.0279 - 0.0544	0.2273 - 0.2281
Fresno, CA	0.0552 - 0.1079	0.3164 - 0.3174
Gainesville, FL	0.0516 - 0.1008	0.6733 - 0.6755
Glens Falls, NY	0.0019 - 0.0038	0.1457 - 0.1461
Grand Forks, ND-MN	0.005 - 0.0098	0.2362 - 0.2369
Grand Junction, CO	0.0149 - 0.0291	0.3212 - 0.3223
Grand Rapids-Wyoming, MI	0.037 - 0.0722	0.3248 - 0.3258
Great Falls, MT	0.0071 - 0.0139	0.3294 - 0.3305
Greeley, CO	0.0054 - 0.0105	0.0967 - 0.097
Green Bay, WI	0.0194 - 0.0379	0.2629 - 0.2637
Greenville, SC	0.0065 - 0.0127	0.0562 - 0.0564
Hagerstown-Martinsburg, MD-WV	0.0044 - 0.0086	0.0951 - 0.0954
Hanford-Corcoran, CA	0.0166 - 0.0324	0.3162 - 0.3172
Harrisburg-Carlisle, PA	0.0063 - 0.0124	0.1997 - 0.2004
Holland-Grand Haven, MI	0.0039 - 0.0076	0.074 - 0.0742
Honolulu, HI	0.1149 - 0.2243	1.2426 - 1.2467
Houston-Baytown-Sugar Land, TX	0.3529 - 0.6892	0.4357 - 0.4371
Huntington-Ashland, WV-KY-OH	0.0087 - 0.017	0.1683 - 0.1688
Huntsville, AL	0.0142 - 0.0278	0.0945 - 0.0948
Indianapolis, IN	0.0876 - 0.171	0.2422 - 0.243
Iowa City, IA	0.0158 - 0.0309	0.634 - 0.636
Ithaca, NY	0.0116 - 0.0226	0.9865 - 0.9897
Jackson, MI	0.0028 - 0.0054	0.1345 - 0.135
Jackson, MS	0.0165 - 0.0322	0.1088 - 0.1091
Jackson, TN	0.0098 - 0.019	0.3013 - 0.3023
Jacksonville, FL	0.1616 - 0.3154	0.4626 - 0.4641
Janesville, WI	0.021 - 0.0411	0.4744 - 0.476
Jefferson City, MO	0.0046 - 0.0089	0.1575 - 0.158

Johnson City, TN	0.0089 - 0.0174	0.1307 - 0.1311
Johnstown, PA	0.0061 - 0.012	0.2873 - 0.2882
Kalamazoo-Portage, MI	0.0241 - 0.0471	0.2866 - 0.2875
Kankakee-Bradley, IL	0.0101 - 0.0196	0.35 - 0.3511
Kansas City, MO-KS	0.148 - 0.2889	0.2903 - 0.2912
Kennewick-Richland-Pasco, WA	0.0627 - 0.1225	0.6557 - 0.6579
Killeen-Temple-Fort Hood, TX	0.0193 - 0.0376	0.1285 - 0.1289
Knoxville, TN	0.038 - 0.0743	0.2366 - 0.2374
Kokomo, IN	0 - 0	0 - 0
La Crosse, WI-MN	0.0077 - 0.0151	0.3492 - 0.3503
Lafayette, IN	0.0169 - 0.033	0.4729 - 0.4745
Lafayette, LA	0.0075 - 0.0147	0.1476 - 0.1481
Lakeland, FL	0.0315 - 0.0614	0.221 - 0.2218
Lancaster, PA	0.0061 - 0.0119	0.1801 - 0.1807
Lansing-East Lansing, MI	0.0227 - 0.0443	0.4246 - 0.426
Laredo, TX	0.0255 - 0.0499	0.4275 - 0.4288
Las Cruces, NM	0.0078 - 0.0152	0.1346 - 0.135
Las Vegas-Paradise, NV	0.0934 - 0.1823	0.5415 - 0.5433
Lawrence, KS	0.0083 - 0.0161	0.3438 - 0.3449
Lawton, OK	0.0295 - 0.0577	0.3158 - 0.3168
Lebanon, PA	0.0047 - 0.0093	0.2105 - 0.2112
Lewiston-Auburn, ME	0.0029 - 0.0058	0.1218 - 0.1222
Lexington-Fayette, KY	0.0235 - 0.0459	0.2833 - 0.2842
Lincoln, NE	0.019 - 0.0371	0.308 - 0.309
Little Rock-North Little Rock, AR	0.0314 - 0.0613	0.2107 - 0.2114
Logan, UT-ID	0.0108 - 0.021	0.4275 - 0.4289
Longview, WA	0.0032 - 0.0063	0.1296 - 0.1301
Los Angeles-Long Beach-Santa Ana, CA	1.3054 - 2.549	1.061 - 1.0645
Louisville, KY-IN	0.1249 - 0.2439	0.3808 - 0.3821
Lubbock, TX	0.0226 - 0.0442	0.3552 - 0.3564

Lynchburg, VA	0.0221 - 0.0431	0.2734 - 0.2743
Macon, GA	0.0199 - 0.0389	0.2822 - 0.2831
Madison, WI	0.0327 - 0.0639	0.5133 - 0.5149
Mansfield, OH	0.0045 - 0.0089	0.1138 - 0.1142
McAllen-Edinburg-Pharr, TX	0.0191 - 0.0374	0.0963 - 0.0966
Medford, OR	0.0067 - 0.0131	0.1797 - 0.1803
Memphis, TN-MS-AR	0.0912 - 0.178	0.3142 - 0.3153
Merced, CA	0.0373 - 0.0728	0.6986 - 0.7009
Miami-Fort Lauderdale-Miami Beach, FL	0.4015 - 0.784	0.673 - 0.6752
Milwaukee-Waukesha-West Allis, WI	0.1367 - 0.2669	0.7077 - 0.71
Minneapolis-St. Paul-Bloomington, MN-WI	0.2411 - 0.4707	0.6002 - 0.6022
Missoula, MT	0.0092 - 0.018	0.355 - 0.3561
Mobile, AL	0.0263 - 0.0513	0.1881 - 0.1887
Modesto, CA	0.023 - 0.045	0.2348 - 0.2356
Monroe, LA	0.0085 - 0.0167	0.221 - 0.2218
Morgantown, WV	0.0167 - 0.0325	0.4875 - 0.4891
Muncie, IN	0.015 - 0.0294	0.4602 - 0.4617
Muskegon-Norton Shores, MI	0.0089 - 0.0174	0.146 - 0.1465
Myrtle Beach-Conway-North Myrtle Beach, SC	0.0122 - 0.0237	0.189 - 0.1896
Naples-Marco Island, FL	0.0181 - 0.0354	0.236 - 0.2368
Nashville-Davidson--Murfreesboro, TN	0.0653 - 0.1275	0.1763 - 0.1769
New Orleans-Metairie-Kenner, LA	0.0516 - 0.1008	0.2692 - 0.2701
New York-Northern New Jersey-Long Island, NY-NJ-PA	0.9863 - 1.9259	1.3314 - 1.3358
Niles-Benton Harbor, MI	0.0012 - 0.0024	0.0205 - 0.0206
Odessa, TX	0.0119 - 0.0233	0.3446 - 0.3457
Oklahoma City, OK	0.0451 - 0.088	0.1583 - 0.1588
Olympia, WA	0.0219 - 0.0427	0.6439 - 0.646
Omaha-Council Bluffs, NE-IA	0.0454 - 0.0887	0.2919 - 0.2928
Orlando, FL	0.128 - 0.2499	0.461 - 0.4625

Oshkosh-Neenah, WI	0.006 - 0.0118	0.2066 - 0.2073
Oxnard-Thousand Oaks-Ventura, CA	0.047 - 0.0918	0.2403 - 0.2411
Palm Bay-Melbourne-Titusville, FL	0.0367 - 0.0716	0.151 - 0.1515
Panama City-Lynn Haven, FL	0.0164 - 0.032	0.3632 - 0.3644
Pensacola-Ferry Pass-Brent, FL	0.0202 - 0.0395	0.2837 - 0.2846
Peoria, IL	0.0247 - 0.0483	0.302 - 0.303
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	0.3012 - 0.5882	0.6253 - 0.6274
Phoenix-Mesa-Scottsdale, AZ	0.3648 - 0.7122	0.549 - 0.5508
Pittsburgh, PA	0.1462 - 0.2854	0.7235 - 0.7259
Pocatello, ID	0.0058 - 0.0114	0.2045 - 0.2051
Port St. Lucie-Fort Pierce, FL	0.0185 - 0.036	0.0374 - 0.0375
Portland-Vancouver-Beaverton, OR-WA	0.2568 - 0.5015	0.879 - 0.8819
Poughkeepsie-Newburgh-Middletown, NY	0.0296 - 0.0577	0.2509 - 0.2517
Providence-New Bedford-Fall River, RI-MA	0.0792 - 0.1546	0.3551 - 0.3562
Pueblo, CO	0.0098 - 0.0191	0.2169 - 0.2176
Punta Gorda, FL	0 - 0	0 - 0
Racine, WI	0.0125 - 0.0243	0.3555 - 0.3566
Rapid City, SD	0.0038 - 0.0073	0.1052 - 0.1056
Reading, PA	0.0096 - 0.0187	0.2292 - 0.2299
Redding, CA	0.0165 - 0.0322	0.2336 - 0.2344
Reno-Sparks, NV	0.0892 - 0.1742	1.0622 - 1.0657
Richmond, VA	0.0036 - 0.007	0.0209 - 0.021
Riverside-San Bernardino-Ontario, CA	0.1758 - 0.3432	0.1782 - 0.1788
Roanoke, VA	0.0388 - 0.0757	0.6183 - 0.6203
Rochester, MN	0.0121 - 0.0235	0.3282 - 0.3293
Rochester, NY	0.0289 - 0.0564	0.3039 - 0.3049
Rockford, IL	0.0188 - 0.0368	0.2232 - 0.224
Rome, GA	0.0102 - 0.02	0.3026 - 0.3036
Sacramento--Arden-Arcade--Roseville, CA	0.1798 - 0.351	0.5281 - 0.5298
Saginaw-Saginaw Township North, MI	0.0111 - 0.0218	0.2154 - 0.2161

Salem, OR	0.0254 - 0.0495	0.3376 - 0.3387
Salt Lake City, UT	0.1145 - 0.2236	1.0147 - 1.018
San Angelo, TX	0.0104 - 0.0203	0.2044 - 0.2051
San Antonio, TX	0.2459 - 0.4801	0.5917 - 0.5936
San Diego-Carlsbad-San Marcos, CA	0.2668 - 0.5209	0.6152 - 0.6172
San Francisco-Oakland-Fremont, CA	0.5441 - 1.0624	1.5252 - 1.5302
San Jose-Sunnyvale-Santa Clara, CA	0.1608 - 0.3141	0.7821 - 0.7846
San Luis Obispo-Paso Robles, CA	0.005 - 0.0097	0.0882 - 0.0885
Sandusky, OH	0 - 0	0 - 0
Santa Barbara-Santa Maria-Goleta, CA	0.0695 - 0.1357	1.0318 - 1.0352
Santa Cruz-Watsonville, CA	0.0576 - 0.1125	1.5831 - 1.5883
Santa Fe, NM	0.0129 - 0.0251	0.3662 - 0.3674
Santa Rosa-Petaluma, CA	0.071 - 0.1386	0.7192 - 0.7215
Savannah, GA	0.0313 - 0.0612	0.4654 - 0.4669
Scranton--Wilkes-Barre, PA	0.0175 - 0.0341	0.2313 - 0.2321
Seattle-Tacoma-Bellevue, WA	0.3707 - 0.7239	1.1067 - 1.1103
Sebastian-Vero Beach, FL	0.0074 - 0.0145	0.1355 - 0.136
Sheboygan, WI	0.0086 - 0.0167	0.3156 - 0.3166
Sherman-Denison, TX	0.0065 - 0.0126	0.1184 - 0.1188
Shreveport-Bossier City, LA	0.0547 - 0.1068	0.3678 - 0.369
Sioux City, IA-NE-SD	0.0107 - 0.0208	0.2177 - 0.2184
Sioux Falls, SD	0.0085 - 0.0166	0.1888 - 0.1894
South Bend-Mishawaka, IN-MI	0.0292 - 0.0571	0.3392 - 0.3403
Spartanburg, SC	0.0044 - 0.0086	0.0593 - 0.0594
Spokane, WA	0.0582 - 0.1137	0.758 - 0.7605
Springfield, IL	0.0145 - 0.0282	0.3559 - 0.357
Springfield, MO	0.0134 - 0.0263	0.1534 - 0.1539
Springfield, OH	0.0045 - 0.0088	0.1024 - 0.1028
St. Cloud, MN	0.0125 - 0.0244	0.3494 - 0.3506
St. Joseph, MO-KS	0.0143 - 0.0279	0.375 - 0.3762

St. Louis, MO-IL	0.1727 - 0.3372	0.5219 - 0.5236
State College, PA	0.013 - 0.0253	0.5468 - 0.5486
Stockton, CA	0.0485 - 0.0948	0.3783 - 0.3796
Sumter, SC	0.0144 - 0.0281	0.3178 - 0.3188
Syracuse, NY	0.0333 - 0.0651	0.5763 - 0.5782
Tallahassee, FL	0.0221 - 0.0431	0.3202 - 0.3212
Tampa-St. Petersburg-Clearwater, FL	0.1538 - 0.3004	0.4042 - 0.4055
Terre Haute, IN	0.008 - 0.0155	0.1472 - 0.1477
Toledo, OH	0.052 - 0.1016	0.3248 - 0.3258
Topeka, KS	0.0142 - 0.0277	0.2608 - 0.2617
Tucson, AZ	0.1029 - 0.2008	0.4589 - 0.4604
Tulsa, OK	0.0298 - 0.0582	0.1747 - 0.1753
Tuscaloosa, AL	0.0049 - 0.0096	0.0693 - 0.0695
Utica-Rome, NY	0.0127 - 0.0248	0.2232 - 0.2239
Victoria, TX	0.0142 - 0.0276	0.1928 - 0.1935
Virginia Beach-Norfolk-Newport News, VA-NC	0.1922 - 0.3753	0.4441 - 0.4455
Visalia-Porterville, CA	0.022 - 0.0429	0.2155 - 0.2162
Waco, TX	0.0125 - 0.0243	0.2057 - 0.2063
Washington-Arlington-Alexandria, DC-VA-MD-WV	0.4834 - 0.944	1.3678 - 1.3723
Waterloo-Cedar Falls, IA	0.0124 - 0.0241	0.2327 - 0.2335
Wausau, WI	0.006 - 0.0118	0.2665 - 0.2674
Wenatchee, WA	0.0229 - 0.0448	0.9606 - 0.9638
Wheeling, WV-OH	0.0077 - 0.015	0.2841 - 0.2851
Wichita, KS	0.0242 - 0.0473	0.1623 - 0.1628
Williamsport, PA	0.0073 - 0.0142	0.4299 - 0.4313
Yakima, WA	0.0134 - 0.0262	0.2169 - 0.2176
York-Hanover, PA	0.007 - 0.0136	0.1956 - 0.1962
Youngstown-Warren-Boardman, OH-PA	0.013 - 0.0255	0.0747 - 0.075
Yuba City, CA	0.0166 - 0.0324	0.3041 - 0.3051
Yuma, AZ	0.0108 - 0.021	0.1728 - 0.1733

TABLE **F 7 Agglomeration elasticies w.r.t. total revenue miles**

	Principal city employment density		Population	
	Average wages	**GDP per capita**	**Average wages**	**GDP per capita**
Abilene, TX	0.0005 - 0.0021	0.0015 - 0.0025	0.009 - 0.0186	0.0247 - 0.022
Albany, GA	0.0008 - 0.0033	0.0023 - 0.0039	0.011 - 0.0227	0.0301 - 0.0269
Albany-Schenectady-Troy, NY	0.0023 - 0.0094	0.0064 - 0.0111	0.029 - 0.0598	0.0795 - 0.0709
Albuquerque, NM	0.0028 - 0.0112	0.0077 - 0.0133	0.0203 - 0.042	0.0558 - 0.0497
Alexandria, LA	0.0005 - 0.002	0.0013 - 0.0023	0.0115 - 0.0238	0.0316 - 0.0282
Allentown-Bethlehem-Easton, PA-NJ	0.0012 - 0.0048	0.0033 - 0.0057	0.0099 - 0.0205	0.0272 - 0.0242
Altoona, PA	0.0002 - 0.0008	0.0006 - 0.001	0.012 - 0.0248	0.033 - 0.0294
Amarillo, TX	0.0007 - 0.0027	0.0018 - 0.0032	0.0091 - 0.0188	0.025 - 0.0223
Ames, IA	0.0008 - 0.0033	0.0023 - 0.0039	0.0431 - 0.0889	0.1181 - 0.1053
Anchorage, AK	0.0018 - 0.0074	0.0051 - 0.0088	0.02 - 0.0412	0.0548 - 0.0488
Anderson, IN	0.0006 - 0.0023	0.0016 - 0.0028	0.0076 - 0.0158	0.0209 - 0.0187
Ann Arbor, MI	0.0011 - 0.0045	0.003 - 0.0053	0.0325 - 0.0672	0.0893 - 0.0795
Appleton, WI	0.0005 - 0.0019	0.0013 - 0.0023	0.0158 - 0.0327	0.0435 - 0.0387
Athens-Clarke County, GA	0.001 - 0.004	0.0027 - 0.0048	0.0138 - 0.0285	0.0379 - 0.0337
Atlanta-Sandy Springs-Marietta, GA	0.0183 - 0.0735	0.0502 - 0.087	0.0255 - 0.0526	0.0699 - 0.0623
Auburn-Opelika, AL	0.0001 - 0.0005	0.0003 - 0.0005	0.002 - 0.0042	0.0056 - 0.005
Augusta-Richmond County, GA-SC	0.0009 - 0.0037	0.0025 - 0.0044	0.0036 - 0.0075	0.0099 - 0.0089
Bakersfield, CA	0.0025 - 0.0099	0.0067 - 0.0117	0.0146 - 0.0302	0.0402 - 0.0358
Bangor, ME	0.0004 - 0.0016	0.0011 - 0.0019	0.0123 - 0.0254	0.0338 - 0.0301
Baton Rouge, LA	0.0015 - 0.006	0.0041 - 0.0071	0.0102 - 0.021	0.0279 - 0.0249
Battle Creek, MI	0.0004 - 0.0017	0.0011 - 0.002	0.0094 - 0.0194	0.0258 - 0.023
Bay City, MI	0.0009 - 0.0037	0.0025 - 0.0044	0.0323 - 0.0667	0.0887 - 0.079
Beaumont-Port Arthur, TX	0.001 - 0.0039	0.0026 - 0.0046	0.0082 - 0.0169	0.0225 - 0.02
Bellingham, WA	0.0013 - 0.0054	0.0037 - 0.0064	0.0328 - 0.0677	0.09 - 0.0802
Bend, OR	0.0002 - 0.0007	0.0005 - 0.0008	0.0042 - 0.0087	0.0116 - 0.0104
Billings, MT	0.0005 - 0.002	0.0014 - 0.0024	0.013 - 0.0268	0.0356 - 0.0317

Binghamton, NY	0.0008 - 0.003	0.0021 - 0.0036	0.0254 - 0.0525	0.0698 - 0.0622
Birmingham-Hoover, AL	0.0023 - 0.0092	0.0063 - 0.0108	0.0084 - 0.0174	0.0232 - 0.0206
Bismarck, ND	0.0002 - 0.0008	0.0005 - 0.0009	0.0099 - 0.0204	0.0272 - 0.0242
Blacksburg-Christiansburg-Radford, VA	0.0008 - 0.0033	0.0022 - 0.0039	0.0152 - 0.0314	0.0418 - 0.0372
Bloomington, IN	0.0006 - 0.0025	0.0017 - 0.003	0.018 - 0.0372	0.0494 - 0.044
Bloomington-Normal, IL	0.0007 - 0.003	0.002 - 0.0035	0.0222 - 0.0459	0.0609 - 0.0543
Boise City-Nampa, ID	0.0009 - 0.0036	0.0025 - 0.0043	0.0078 - 0.0161	0.0214 - 0.0191
Bradenton-Sarasota-Venice, FL	0.002 - 0.0081	0.0055 - 0.0096	0.0182 - 0.0376	0.05 - 0.0445
Bremerton-Silverdale, WA	0.0018 - 0.0074	0.0051 - 0.0088	0.0336 - 0.0694	0.0923 - 0.0822
Brownsville-Harlingen, TX	0.0008 - 0.0031	0.0021 - 0.0037	0.0069 - 0.0143	0.019 - 0.0169
Brunswick, GA	0.0079 - 0.0316	0.0216 - 0.0374	0.3362 - 0.6942	0.9225 - 0.822
Canton-Massillon, OH	0.0023 - 0.0094	0.0064 - 0.0111	0.0209 - 0.0432	0.0574 - 0.0511
Cape Coral-Fort Myers, FL	0.0036 - 0.0144	0.0099 - 0.0171	0.0173 - 0.0358	0.0476 - 0.0424
Casper, WY	0.0002 - 0.0009	0.0006 - 0.0011	0.0097 - 0.0201	0.0267 - 0.0238
Cedar Rapids, IA	0.0007 - 0.003	0.0021 - 0.0036	0.0139 - 0.0286	0.0381 - 0.0339
Champaign-Urbana, IL	0.0021 - 0.0083	0.0057 - 0.0099	0.0543 - 0.112	0.1489 - 0.1326
Charleston, WV	0.0012 - 0.005	0.0034 - 0.0059	0.026 - 0.0536	0.0713 - 0.0635
Charleston-North Charleston, SC	0.0024 - 0.0098	0.0067 - 0.0116	0.0143 - 0.0295	0.0392 - 0.0349
Charlotte-Gastonia-Concord, NC-SC	0.0204 - 0.0819	0.0559 - 0.097	0.0241 - 0.0497	0.0661 - 0.0589
Chattanooga, TN-GA	0.0019 - 0.0075	0.0051 - 0.0089	0.0129 - 0.0266	0.0353 - 0.0315
Cheyenne, WY	0.0003 - 0.0012	0.0008 - 0.0014	0.0148 - 0.0306	0.0406 - 0.0362
Chicago-Naperville-Joliet, IL-IN-WI	0.0458 - 0.1842	0.1258 - 0.2181	0.0475 - 0.098	0.1302 - 0.116
Chico, CA	0.0009 - 0.0034	0.0023 - 0.0041	0.0156 - 0.0322	0.0428 - 0.0382
Cincinnati-Middletown, OH-KY-IN	0.007 - 0.0282	0.0193 - 0.0334	0.022 - 0.0455	0.0604 - 0.0538
Clarksville, TN-KY	0.0021 - 0.0084	0.0057 - 0.0099	0.0109 - 0.0226	0.03 - 0.0268
Cleveland-Elyria-Mentor, OH	0.0132 - 0.0532	0.0363 - 0.063	0.0438 - 0.0904	0.1201 - 0.107
College Station-Bryan, TX	0.0024 - 0.0096	0.0065 - 0.0113	0.0308 - 0.0636	0.0846 - 0.0754
Columbia, MO	0.0005 - 0.0022	0.0015 - 0.0026	0.0125 - 0.0259	0.0344 - 0.0307
Columbia, SC	0.0009 - 0.0036	0.0024 - 0.0042	0.0073 - 0.015	0.0199 - 0.0178
Columbus, GA-AL	0.0011 - 0.0044	0.003 - 0.0053	0.0109 - 0.0224	0.0298 - 0.0266

Columbus, OH	0.0045 - 0.0182	0.0124 - 0.0216	0.0146 - 0.0301	0.0399 - 0.0356
Corpus Christi, TX	0.0027 - 0.011	0.0075 - 0.013	0.0228 - 0.0471	0.0626 - 0.0558
Cumberland, MD-WV	0.0002 - 0.0009	0.0006 - 0.0011	0.0091 - 0.0188	0.0249 - 0.0222
Dallas-Fort Worth-Arlington, TX	0.0228 - 0.0917	0.0626 - 0.1086	0.0197 - 0.0406	0.054 - 0.0481
Davenport-Moline-Rock Island, IA-IL	0.0027 - 0.011	0.0075 - 0.0131	0.0291 - 0.0602	0.08 - 0.0712
Dayton, OH	0.0039 - 0.0158	0.0108 - 0.0187	0.0232 - 0.0478	0.0635 - 0.0566
Decatur, IL	0 - 0	0 - 0	0 - 0	0 - 0
Deltona-Daytona Beach-Ormond Beach, FL	0.001 - 0.0042	0.0028 - 0.0049	0.0292 - 0.0603	0.0802 - 0.0714
Denver-Aurora, CO	0.0036 - 0.0143	0.0098 - 0.0169	0.0169 - 0.035	0.0465 - 0.0414
Des Moines, IA	0.0205 - 0.0825	0.0564 - 0.0977	0.0623 - 0.1287	0.171 - 0.1524
Detroit-Warren-Livonia, MI	0.0013 - 0.0052	0.0035 - 0.0061	0.0142 - 0.0293	0.039 - 0.0347
Dubuque, IA	0.015 - 0.0602	0.0411 - 0.0713	0.0204 - 0.0422	0.056 - 0.0499
Duluth, MN-WI	0 - 0	0 - 0	0 - 0	0 - 0
Eau Claire, WI	0.0002 - 0.0009	0.0006 - 0.0011	0.0111 - 0.0228	0.0303 - 0.027
El Centro, CA	0.0017 - 0.0069	0.0047 - 0.0082	0.0218 - 0.045	0.0598 - 0.0533
El Paso, TX	0.0005 - 0.0021	0.0014 - 0.0025	0.0145 - 0.03	0.0399 - 0.0355
Elkhart-Goshen, IN	0.0004 - 0.0017	0.0012 - 0.0021	0.0136 - 0.028	0.0372 - 0.0331
Elmira, NY	0.0045 - 0.0179	0.0122 - 0.0212	0.03 - 0.0619	0.0823 - 0.0733
Erie, PA	0.0003 - 0.0014	0.0009 - 0.0016	0.0073 - 0.0151	0.0201 - 0.0179
Eugene-Springfield, OR	0.0004 - 0.0014	0.001 - 0.0017	0.0282 - 0.0582	0.0773 - 0.0689
Evansville, IN-KY	0.0008 - 0.0031	0.0021 - 0.0037	0.0202 - 0.0416	0.0553 - 0.0493
Fairbanks, AK	0.0023 - 0.0094	0.0064 - 0.0111	0.0325 - 0.0671	0.0892 - 0.0794
Fayetteville-Springdale-Rogers, AR-MO	0.0007 - 0.0029	0.002 - 0.0035	0.0115 - 0.0238	0.0317 - 0.0282
Flagstaff, AZ	0.0004 - 0.0017	0.0012 - 0.002	0.013 - 0.0268	0.0356 - 0.0317
Flint, MI	0.0006 - 0.0025	0.0017 - 0.003	0.0046 - 0.0095	0.0126 - 0.0113
Florence, SC	0.0006 - 0.0023	0.0016 - 0.0027	0.0172 - 0.0355	0.0472 - 0.042
Fond du Lac, WI	0.0027 - 0.0109	0.0075 - 0.0129	0.0254 - 0.0525	0.0697 - 0.0621
Fort Collins-Loveland, CO	0.0002 - 0.0007	0.0005 - 0.0008	0.0025 - 0.0051	0.0067 - 0.006
Fort Smith, AR-OK	0.0001 - 0.0004	0.0003 - 0.0005	0.0057 - 0.0119	0.0158 - 0.0141
Fort Walton Beach-Crestview-Destin, FL	0.0008 - 0.0033	0.0023 - 0.0039	0.0109 - 0.0224	0.0298 - 0.0265

Fort Wayne, IN	0.0002 - 0.0009	0.0006 - 0.0011	0.0033 - 0.0068	0.009 - 0.008
Fresno, CA	0.0003 - 0.0014	0.0009 - 0.0016	0.0084 - 0.0173	0.023 - 0.0205
Gainesville, FL	0.0015 - 0.0062	0.0042 - 0.0073	0.0126 - 0.026	0.0346 - 0.0308
Glens Falls, NY	0.0031 - 0.0123	0.0084 - 0.0146	0.0175 - 0.0362	0.0481 - 0.0429
Grand Forks, ND-MN	0.0029 - 0.0115	0.0078 - 0.0136	0.0373 - 0.077	0.1023 - 0.0912
Grand Junction, CO	0.0001 - 0.0004	0.0003 - 0.0005	0.0081 - 0.0167	0.0221 - 0.0197
Grand Rapids-Wyoming, MI	0.0003 - 0.0011	0.0008 - 0.0013	0.0131 - 0.027	0.0359 - 0.032
Great Falls, MT	0.0008 - 0.0033	0.0023 - 0.0039	0.0178 - 0.0367	0.0488 - 0.0435
Greeley, CO	0.002 - 0.0082	0.0056 - 0.0097	0.018 - 0.0371	0.0494 - 0.044
Green Bay, WI	0.0004 - 0.0016	0.0011 - 0.0019	0.0183 - 0.0377	0.0501 - 0.0446
Greenville, SC	0.0003 - 0.0012	0.0008 - 0.0014	0.0054 - 0.0111	0.0147 - 0.0131
Hagerstown-Martinsburg, MD-WV	0.0011 - 0.0043	0.003 - 0.0051	0.0146 - 0.0301	0.04 - 0.0356
Hanford-Corcoran, CA	0.0004 - 0.0015	0.001 - 0.0017	0.0031 - 0.0064	0.0085 - 0.0076
Harrisburg-Carlisle, PA	0.0002 - 0.001	0.0007 - 0.0012	0.0053 - 0.0109	0.0145 - 0.0129
Holland-Grand Haven, MI	0.0009 - 0.0037	0.0025 - 0.0044	0.0175 - 0.0362	0.0481 - 0.0428
Honolulu, HI	0.0004 - 0.0014	0.001 - 0.0017	0.0111 - 0.0228	0.0304 - 0.027
Houston-Baytown-Sugar Land, TX	0.0002 - 0.0009	0.0006 - 0.001	0.0041 - 0.0085	0.0112 - 0.01
Huntington-Ashland, WV-KY-OH	0.0064 - 0.0256	0.0175 - 0.0303	0.0688 - 0.1421	0.1889 - 0.1683
Huntsville, AL	0.0196 - 0.0786	0.0536 - 0.093	0.0241 - 0.0498	0.0662 - 0.059
Indianapolis, IN	0.0005 - 0.0019	0.0013 - 0.0023	0.0093 - 0.0192	0.0256 - 0.0228
Iowa City, IA	0.0008 - 0.0032	0.0022 - 0.0037	0.0052 - 0.0108	0.0144 - 0.0128
Ithaca, NY	0.0049 - 0.0195	0.0133 - 0.0231	0.0134 - 0.0277	0.0368 - 0.0328
Jackson, MI	0.0009 - 0.0035	0.0024 - 0.0042	0.0351 - 0.0725	0.0964 - 0.0859
Jackson, MS	0.0006 - 0.0026	0.0018 - 0.003	0.0547 - 0.1128	0.15 - 0.1336
Jackson, TN	0.0002 - 0.0006	0.0004 - 0.0007	0.0075 - 0.0154	0.0204 - 0.0182
Jacksonville, FL	0.0009 - 0.0037	0.0025 - 0.0044	0.006 - 0.0124	0.0165 - 0.0147
Janesville, WI	0.0005 - 0.0022	0.0015 - 0.0026	0.0167 - 0.0345	0.0458 - 0.0408
Jefferson City, MO	0.0089 - 0.036	0.0246 - 0.0426	0.0256 - 0.0529	0.0703 - 0.0627
Johnson City, TN	0.0012 - 0.0047	0.0032 - 0.0055	0.0263 - 0.0543	0.0721 - 0.0643
Johnstown, PA	0.0003 - 0.001	0.0007 - 0.0012	0.0087 - 0.018	0.0239 - 0.0213

Kalamazoo-Portage, MI	0.0005 - 0.002	0.0014 - 0.0023	0.0072 - 0.0149	0.0199 - 0.0177
Kankakee-Bradley, IL	0.0003 - 0.0014	0.0009 - 0.0016	0.0159 - 0.0329	0.0437 - 0.0389
Kansas City, MO-KS	0.0013 - 0.0054	0.0037 - 0.0064	0.0159 - 0.0328	0.0436 - 0.0388
Kennewick-Richland-Pasco, WA	0.0006 - 0.0022	0.0015 - 0.0026	0.0194 - 0.04	0.0532 - 0.0474
Killeen-Temple-Fort Hood, TX	0.0082 - 0.0329	0.0225 - 0.039	0.0161 - 0.0332	0.0441 - 0.0393
Knoxville, TN	0.0035 - 0.014	0.0095 - 0.0165	0.0363 - 0.075	0.0997 - 0.0888
La Crosse, WI-MN	0.0011 - 0.0043	0.0029 - 0.0051	0.0071 - 0.0147	0.0195 - 0.0174
Lafayette, IN	0.0021 - 0.0085	0.0058 - 0.01	0.0131 - 0.0271	0.036 - 0.0321
Lafayette, LA	0 - 0	0 - 0	0 - 0	0 - 0
Lakeland, FL	0.0004 - 0.0017	0.0012 - 0.002	0.0193 - 0.0399	0.0531 - 0.0473
Lancaster, PA	0.0009 - 0.0038	0.0026 - 0.0045	0.0262 - 0.0541	0.0719 - 0.0641
Lansing-East Lansing, MI	0.0004 - 0.0017	0.0011 - 0.002	0.0082 - 0.0169	0.0224 - 0.02
Laredo, TX	0.0017 - 0.007	0.0048 - 0.0083	0.0122 - 0.0253	0.0336 - 0.0299
Las Cruces, NM	0.0003 - 0.0014	0.0009 - 0.0016	0.01 - 0.0206	0.0274 - 0.0244
Las Vegas-Paradise, NV	0.0013 - 0.0051	0.0035 - 0.006	0.0235 - 0.0486	0.0645 - 0.0575
Lawrence, KS	0.0014 - 0.0057	0.0039 - 0.0067	0.0237 - 0.0489	0.065 - 0.0579
Lawton, OK	0.0004 - 0.0017	0.0012 - 0.0021	0.0075 - 0.0154	0.0205 - 0.0182
Lebanon, PA	0.0052 - 0.0208	0.0142 - 0.0246	0.03 - 0.0619	0.0823 - 0.0733
Lewiston-Auburn, ME	0.0005 - 0.0018	0.0013 - 0.0022	0.019 - 0.0393	0.0523 - 0.0466
Lexington-Fayette, KY	0.0016 - 0.0066	0.0045 - 0.0078	0.0175 - 0.0361	0.048 - 0.0428
Lincoln, NE	0.0003 - 0.0011	0.0007 - 0.0013	0.0117 - 0.0241	0.032 - 0.0285
Little Rock-North Little Rock, AR	0.0002 - 0.0007	0.0004 - 0.0008	0.0067 - 0.0139	0.0185 - 0.0165
Logan, UT-ID	0.0013 - 0.0052	0.0036 - 0.0062	0.0157 - 0.0324	0.0431 - 0.0384
Longview, WA	0.0011 - 0.0042	0.0029 - 0.005	0.0171 - 0.0352	0.0468 - 0.0417
Los Angeles-Long Beach-Santa Ana, CA	0.0017 - 0.007	0.0048 - 0.0083	0.0117 - 0.0241	0.032 - 0.0285
Louisville, KY-IN	0.0006 - 0.0024	0.0016 - 0.0028	0.0237 - 0.0489	0.065 - 0.0579
Lubbock, TX	0.0002 - 0.0007	0.0005 - 0.0008	0.0072 - 0.0148	0.0197 - 0.0176
Lynchburg, VA	0.0723 - 0.2906	0.1984 - 0.3441	0.0588 - 0.1213	0.1613 - 0.1437
Macon, GA	0.0069 - 0.0278	0.019 - 0.0329	0.0211 - 0.0436	0.0579 - 0.0516
Madison, WI	0.0013 - 0.005	0.0034 - 0.006	0.0197 - 0.0406	0.054 - 0.0481

Mansfield, OH	0.0012 - 0.0049	0.0034 - 0.0058	0.0151 - 0.0313	0.0416 - 0.037
McAllen-Edinburg-Pharr, TX	0.0011 - 0.0044	0.003 - 0.0053	0.0156 - 0.0323	0.0429 - 0.0382
Medford, OR	0.0018 - 0.0073	0.005 - 0.0086	0.0284 - 0.0587	0.078 - 0.0695
Memphis, TN-MS-AR	0.0003 - 0.001	0.0007 - 0.0012	0.0063 - 0.013	0.0173 - 0.0154
Merced, CA	0.0011 - 0.0043	0.0029 - 0.005	0.0053 - 0.011	0.0146 - 0.013
Miami-Fort Lauderdale-Miami Beach, FL	0.0004 - 0.0015	0.001 - 0.0018	0.01 - 0.0206	0.0273 - 0.0243
Milwaukee-Waukesha-West Allis, WI	0.0051 - 0.0203	0.0139 - 0.024	0.0174 - 0.0359	0.0478 - 0.0426
Minneapolis-St. Paul-Bloomington, MN-WI	0.0021 - 0.0083	0.0057 - 0.0098	0.0387 - 0.0799	0.1062 - 0.0946
Missoula, MT	0.0222 - 0.0894	0.061 - 0.1058	0.0373 - 0.077	0.1023 - 0.0911
Mobile, AL	0.0076 - 0.0304	0.0208 - 0.036	0.0392 - 0.0809	0.1076 - 0.0959
Modesto, CA	0.0134 - 0.0537	0.0366 - 0.0635	0.0333 - 0.0686	0.0912 - 0.0813
Monroe, LA	0.0005 - 0.002	0.0014 - 0.0024	0.0197 - 0.0406	0.054 - 0.0481
Morgantown, WV	0.0015 - 0.0058	0.004 - 0.0069	0.0104 - 0.0215	0.0286 - 0.0255
Muncie, IN	0.0013 - 0.0051	0.0035 - 0.0061	0.013 - 0.0269	0.0357 - 0.0318
Muskegon-Norton Shores, MI	0.0005 - 0.0019	0.0013 - 0.0023	0.0122 - 0.0253	0.0336 - 0.0299
Myrtle Beach-Conway-North Myrtle Beach, SC	0.0009 - 0.0037	0.0025 - 0.0044	0.027 - 0.0558	0.0741 - 0.066
Naples-Marco Island, FL	0.0008 - 0.0033	0.0023 - 0.004	0.0255 - 0.0526	0.0699 - 0.0623
Nashville-Davidson--Murfreesboro, TN	0.0005 - 0.002	0.0014 - 0.0023	0.0081 - 0.0167	0.0222 - 0.0198
New Orleans-Metairie-Kenner, LA	0.0007 - 0.0027	0.0018 - 0.0032	0.0105 - 0.0216	0.0287 - 0.0256
New York-Northern New Jersey-Long Island, NY-NJ-PA	0.001 - 0.004	0.0028 - 0.0048	0.0131 - 0.027	0.0359 - 0.032
Niles-Benton Harbor, MI	0.0036 - 0.0145	0.0099 - 0.0172	0.0098 - 0.0202	0.0268 - 0.0239
Odessa, TX	0.0029 - 0.0115	0.0078 - 0.0136	0.0149 - 0.0308	0.0409 - 0.0365
Oklahoma City, OK	0.0546 - 0.2196	0.1499 - 0.26	0.0738 - 0.1523	0.2024 - 0.1803
Olympia, WA	0.0001 - 0.0003	0.0002 - 0.0003	0.0011 - 0.0023	0.0031 - 0.0028
Omaha-Council Bluffs, NE-IA	0.0007 - 0.0027	0.0018 - 0.0031	0.0191 - 0.0394	0.0524 - 0.0467
Orlando, FL	0.0025 - 0.01	0.0068 - 0.0119	0.0088 - 0.0181	0.0241 - 0.0214
Oshkosh-Neenah, WI	0.0012 - 0.0049	0.0033 - 0.0058	0.0357 - 0.0736	0.0979 - 0.0872
Oxnard-Thousand Oaks-Ventura, CA	0.0025 - 0.0101	0.0069 - 0.012	0.0162 - 0.0334	0.0444 - 0.0395
Palm Bay-Melbourne-Titusville, FL	0.0071 - 0.0285	0.0194 - 0.0337	0.0255 - 0.0527	0.0701 - 0.0624
Panama City-Lynn Haven, FL	0.0003 - 0.0013	0.0009 - 0.0016	0.0114 - 0.0236	0.0314 - 0.028

Pensacola-Ferry Pass-Brent, FL	0.0026 - 0.0105	0.0071 - 0.0124	0.0133 - 0.0275	0.0365 - 0.0325
Peoria, IL	0.002 - 0.0082	0.0056 - 0.0097	0.0084 - 0.0173	0.023 - 0.0205
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	0.0009 - 0.0036	0.0025 - 0.0043	0.0201 - 0.0415	0.0552 - 0.0492
Phoenix-Mesa-Scottsdale, AZ	0.0011 - 0.0045	0.0031 - 0.0053	0.0157 - 0.0324	0.0431 - 0.0384
Pittsburgh, PA	0.0014 - 0.0055	0.0038 - 0.0065	0.0167 - 0.0345	0.0459 - 0.0409
Pocatello, ID	0.0167 - 0.0671	0.0458 - 0.0794	0.0346 - 0.0715	0.0951 - 0.0847
Port St. Lucie-Fort Pierce, FL	0.0202 - 0.0812	0.0554 - 0.0962	0.0304 - 0.0628	0.0835 - 0.0744
Portland-Vancouver-Beaverton, OR-WA	0.0081 - 0.0325	0.0222 - 0.0385	0.0401 - 0.0827	0.11 - 0.098
Poughkeepsie-Newburgh-Middletown, NY	0.0003 - 0.0013	0.0009 - 0.0015	0.0113 - 0.0234	0.0311 - 0.0277
Providence-New Bedford-Fall River, RI-MA	0.001 - 0.0041	0.0028 - 0.0049	0.0021 - 0.0043	0.0057 - 0.0051
Pueblo, CO	0.0142 - 0.0572	0.039 - 0.0677	0.0487 - 0.1005	0.1336 - 0.1191
Racine, WI	0.0016 - 0.0066	0.0045 - 0.0078	0.0139 - 0.0287	0.0381 - 0.034
Rapid City, SD	0.0044 - 0.0176	0.012 - 0.0209	0.0197 - 0.0406	0.054 - 0.0481
Reading, PA	0.0005 - 0.0022	0.0015 - 0.0026	0.012 - 0.0248	0.033 - 0.0294
Redding, CA	0 - 0	0 - 0	0 - 0	0 - 0
Reno-Sparks, NV	0.0007 - 0.0028	0.0019 - 0.0033	0.0197 - 0.0407	0.054 - 0.0481
Richmond, VA	0.0002 - 0.0008	0.0006 - 0.001	0.0058 - 0.012	0.016 - 0.0143
Riverside-San Bernardino-Ontario, CA	0.0005 - 0.0021	0.0015 - 0.0025	0.0127 - 0.0262	0.0348 - 0.031
Roanoke, VA	0.0009 - 0.0037	0.0025 - 0.0043	0.0129 - 0.0267	0.0355 - 0.0316
Rochester, MN	0.0049 - 0.0199	0.0136 - 0.0235	0.0588 - 0.1215	0.1615 - 0.1439
Rochester, NY	0.0002 - 0.0008	0.0005 - 0.001	0.0012 - 0.0024	0.0032 - 0.0028
Rockford, IL	0.0097 - 0.0391	0.0267 - 0.0463	0.0099 - 0.0204	0.0271 - 0.0241
Rome, GA	0.0021 - 0.0086	0.0059 - 0.0102	0.0343 - 0.0707	0.094 - 0.0837
Sacramento--Arden-Arcade--Roseville, CA	0.0007 - 0.0027	0.0018 - 0.0032	0.0182 - 0.0375	0.0499 - 0.0445
Saginaw-Saginaw Township North, MI	0.0016 - 0.0064	0.0044 - 0.0076	0.0168 - 0.0348	0.0462 - 0.0412
Salem, OR	0.001 - 0.0042	0.0029 - 0.005	0.0124 - 0.0255	0.0339 - 0.0302
Salt Lake City, UT	0.0006 - 0.0023	0.0016 - 0.0027	0.0168 - 0.0346	0.046 - 0.041
San Angelo, TX	0.01 - 0.04	0.0273 - 0.0474	0.0293 - 0.0604	0.0803 - 0.0715
San Antonio, TX	0.0006 - 0.0025	0.0017 - 0.0029	0.0119 - 0.0246	0.0327 - 0.0292
San Diego-Carlsbad-San Marcos, CA	0.0014 - 0.0056	0.0039 - 0.0067	0.0187 - 0.0386	0.0513 - 0.0457

San Francisco-Oakland-Fremont, CA	0.0063 - 0.0255	0.0174 - 0.0302	0.0562 - 0.1161	0.1542 - 0.1374
San Jose-Sunnyvale-Santa Clara, CA	0.0006 - 0.0023	0.0016 - 0.0027	0.0113 - 0.0234	0.0311 - 0.0277
San Luis Obispo-Paso Robles, CA	0.0136 - 0.0547	0.0374 - 0.0648	0.0328 - 0.0677	0.0899 - 0.0801
Santa Barbara-Santa Maria-Goleta, CA	0.0148 - 0.0594	0.0406 - 0.0703	0.0341 - 0.0704	0.0935 - 0.0833
Santa Cruz-Watsonville, CA	0.0301 - 0.1211	0.0827 - 0.1434	0.0845 - 0.1744	0.2318 - 0.2066
Santa Fe, NM	0.0089 - 0.0358	0.0244 - 0.0424	0.0433 - 0.0894	0.1189 - 0.1059
Santa Rosa-Petaluma, CA	0.0003 - 0.0011	0.0008 - 0.0013	0.0049 - 0.0101	0.0134 - 0.0119
Savannah, GA	0 - 0	0 - 0	0 - 0	0 - 0
Scranton--Wilkes-Barre, PA	0.0039 - 0.0155	0.0106 - 0.0183	0.0572 - 0.118	0.1568 - 0.1398
Seattle-Tacoma-Bellevue, WA	0.0032 - 0.0128	0.0088 - 0.0152	0.0877 - 0.1811	0.2406 - 0.2144
Sebastian-Vero Beach, FL	0.0007 - 0.0029	0.002 - 0.0034	0.0203 - 0.0419	0.0557 - 0.0496
Sheboygan, WI	0.0039 - 0.0158	0.0108 - 0.0187	0.0398 - 0.0823	0.1093 - 0.0974
Sherman-Denison, TX	0.0017 - 0.007	0.0048 - 0.0083	0.0258 - 0.0532	0.0707 - 0.063
Shreveport-Bossier City, LA	0.001 - 0.0039	0.0027 - 0.0046	0.0128 - 0.0265	0.0352 - 0.0313
Sioux City, IA-NE-SD	0.0205 - 0.0825	0.0563 - 0.0977	0.0613 - 0.1266	0.1682 - 0.1499
Sioux Falls, SD	0.0004 - 0.0016	0.0011 - 0.002	0.0075 - 0.0155	0.0206 - 0.0184
South Bend-Mishawaka, IN-MI	0.0005 - 0.0019	0.0013 - 0.0023	0.0175 - 0.0361	0.048 - 0.0427
Spartanburg, SC	0.0004 - 0.0014	0.001 - 0.0017	0.0066 - 0.0135	0.018 - 0.016
Spokane, WA	0.003 - 0.0122	0.0083 - 0.0144	0.0204 - 0.0421	0.0559 - 0.0498
Springfield, IL	0.0006 - 0.0024	0.0016 - 0.0028	0.0121 - 0.0249	0.0331 - 0.0295
Springfield, MO	0.0005 - 0.0019	0.0013 - 0.0022	0.0105 - 0.0216	0.0287 - 0.0256
Springfield, OH	0.0016 - 0.0065	0.0044 - 0.0077	0.0188 - 0.0388	0.0516 - 0.0459
St. Cloud, MN	0.0002 - 0.001	0.0007 - 0.0012	0.0033 - 0.0068	0.009 - 0.008
St. Joseph, MO-KS	0.0032 - 0.013	0.0089 - 0.0154	0.042 - 0.0867	0.1152 - 0.1027
St. Louis, MO-IL	0.0008 - 0.0032	0.0022 - 0.0038	0.0197 - 0.0407	0.0541 - 0.0482
State College, PA	0.0007 - 0.003	0.002 - 0.0035	0.0085 - 0.0175	0.0233 - 0.0208
Stockton, CA	0.0002 - 0.001	0.0007 - 0.0012	0.0057 - 0.0117	0.0156 - 0.0139
Sumter, SC	0.0007 - 0.0028	0.0019 - 0.0033	0.0194 - 0.04	0.0531 - 0.0473
Syracuse, NY	0.0008 - 0.0032	0.0022 - 0.0038	0.0208 - 0.0429	0.057 - 0.0508
Tallahassee, FL	0.0096 - 0.0384	0.0263 - 0.0455	0.0289 - 0.0597	0.0793 - 0.0707

Tampa-St. Petersburg-Clearwater, FL	0.0007 - 0.0029	0.002 - 0.0034	0.0303 - 0.0625	0.0831 - 0.0741
Terre Haute, IN	0.0027 - 0.0108	0.0074 - 0.0128	0.021 - 0.0433	0.0575 - 0.0512
Toledo, OH	0.0008 - 0.0032	0.0022 - 0.0038	0.0176 - 0.0363	0.0483 - 0.043
Topeka, KS	0.0018 - 0.0074	0.0051 - 0.0088	0.0319 - 0.0659	0.0876 - 0.0781
Tucson, AZ	0.0012 - 0.0049	0.0034 - 0.0058	0.0177 - 0.0366	0.0487 - 0.0434
Tulsa, OK	0.0085 - 0.0342	0.0234 - 0.0406	0.0224 - 0.0462	0.0614 - 0.0547
Tuscaloosa, AL	0.0004 - 0.0018	0.0012 - 0.0021	0.0082 - 0.0168	0.0224 - 0.0199
Utica-Rome, NY	0.0029 - 0.0116	0.0079 - 0.0137	0.018 - 0.0371	0.0494 - 0.044
Victoria, TX	0.0008 - 0.0032	0.0022 - 0.0037	0.0144 - 0.0298	0.0396 - 0.0353
Virginia Beach-Norfolk-Newport News, VA-NC	0.0057 - 0.0229	0.0156 - 0.0271	0.0254 - 0.0525	0.0698 - 0.0622
Visalia-Porterville, CA	0.0016 - 0.0066	0.0045 - 0.0079	0.0097 - 0.02	0.0266 - 0.0237
Waco, TX	0.0003 - 0.0011	0.0007 - 0.0013	0.0038 - 0.0079	0.0105 - 0.0094
Washington-Arlington-Alexandria, DC-VA-MD-WV	0.0007 - 0.0028	0.0019 - 0.0034	0.0124 - 0.0255	0.0339 - 0.0302
Waterloo-Cedar Falls, IA	0.0008 - 0.0032	0.0022 - 0.0037	0.0107 - 0.0221	0.0293 - 0.0261
Wausau, WI	0.0106 - 0.0428	0.0292 - 0.0507	0.0246 - 0.0508	0.0675 - 0.0601
Wenatchee, WA	0.0012 - 0.0049	0.0033 - 0.0058	0.0119 - 0.0246	0.0327 - 0.0292
Wheeling, WV-OH	0.0007 - 0.0028	0.0019 - 0.0033	0.0114 - 0.0235	0.0313 - 0.0279
Wichita, KS	0.0268 - 0.1076	0.0735 - 0.1274	0.0758 - 0.1564	0.2079 - 0.1853
Williamsport, PA	0.0007 - 0.0028	0.0019 - 0.0033	0.0129 - 0.0266	0.0354 - 0.0315
Yakima, WA	0.0003 - 0.0013	0.0009 - 0.0016	0.0148 - 0.0305	0.0405 - 0.0361
York-Hanover, PA	0.0013 - 0.0051	0.0035 - 0.006	0.0532 - 0.1099	0.146 - 0.1301
Youngstown-Warren-Boardman, OH-PA	0.0004 - 0.0017	0.0012 - 0.002	0.0157 - 0.0325	0.0432 - 0.0385
Yuba City, CA	0.0013 - 0.0054	0.0037 - 0.0064	0.009 - 0.0186	0.0247 - 0.022
Yuma, AZ	0.0004 - 0.0016	0.0011 - 0.0019	0.0238 - 0.0492	0.0653 - 0.0582

TABLE **F 8 Seat capacity (rail and motor bus) elasticities, employment density and population**

	Employment density		**Population**	
	Rail seat capacity per capita	**Motor bus seat capacity per capita**	**Rail seat capacity per capita**	**Motor bus seat capacity per capita**
Abilene, TX	-	0.1553 - 0.1455	-	0.8586 - 0.4059
Akron, OH	-	0.1686 - 0.158	-	0.3947 - 0.1866
Albany, GA	-	0.1513 - 0.1418	-	0.6617 - 0.3128
Albany-Schenectady-Troy, NY	-	0.1001 - 0.0938	-	0.4054 - 0.1916
Albuquerque, NM	-	0.1291 - 0.121	-	0.307 - 0.1451
Alexandria, LA	-	0.0979 - 0.0918	-	0.7535 - 0.3562
Allentown-Bethlehem-Easton, PA-NJ	-	0.064 - 0.0599	-	0.1746 - 0.0825
Altoona, PA	-	0.1448 - 0.1357	-	2.6967 - 1.2748
Amarillo, TX	-	0.0669 - 0.0626	-	0.2964 - 0.1401
Ames, IA	-	0.6619 - 0.6203	-	11.2932 - 5.3385
Anchorage, AK	-	0.1682 - 0.1576	-	0.5956 - 0.2816
Anderson, IN	-	0.1967 - 0.1844	-	0.8402 - 0.3972
Ann Arbor, MI	-	0.13 - 0.1218	-	1.2439 - 0.588
Anniston-Oxford, AL	-	0.1218 - 0.1142	-	0.6664 - 0.315
Appleton, WI	-	0.082 - 0.0768	-	0.8969 - 0.424
Athens-Clarke County, GA	-	0.222 - 0.208	-	1.0024 - 0.4738
Atlanta-Sandy Springs-Marietta, GA	0.0788 - 0.2025	0.1067 - 0.1	0.2373 - 0.3265	0.0486 - 0.023
Auburn-Opelika, AL	-	0.0941 - 0.0882	-	0.5551 - 0.2624
Augusta-Richmond County, GA-SC	-	0.0749 - 0.0702	-	0.0955 - 0.0452
Austin-Round Rock, TX	-	0.1422 - 0.1333	-	0.1901 - 0.0898
Bakersfield, CA	-	0.0931 - 0.0873	-	0.1818 - 0.0859
Baltimore-Towson, MD	0.156 - 0.4008	0.1666 - 0.1561	1.3554 - 1.865	0.219 - 0.1035
Bangor, ME	-	0.0857 - 0.0804	-	0.8747 - 0.4135
Baton Rouge, LA	-	0.0661 - 0.0619	-	0.1463 - 0.0692
Battle Creek, MI	-	0.1956 - 0.1833	-	1.4471 - 0.6841

Bay City, MI	-	0.353 - 0.3308	-	4.0312 - 1.9056
Beaumont-Port Arthur, TX	-	0.0913 - 0.0856	-	0.2554 - 0.1207
Bellingham, WA	-	0.2543 - 0.2383	-	2.0403 - 0.9645
Bend, OR	-	0.0474 - 0.0444	-	0.3915 - 0.1851
Billings, MT	-	0.1679 - 0.1573	-	1.4316 - 0.6767
Binghamton, NY	-	0.0959 - 0.0898	-	1.0608 - 0.5015
Birmingham-Hoover, AL	-	0.0741 - 0.0695	-	0.0897 - 0.0424
Bismarck, ND	-	0.116 - 0.1088	-	1.9476 - 0.9207
Blacksburg-Christiansburg-Radford, VA	-	0.852 - 0.7984	-	5.2016 - 2.4589
Bloomington, IN	-	0.1473 - 0.1381	-	1.3722 - 0.6487
Bloomington-Normal, IL	-	0.1204 - 0.1128	-	1.1738 - 0.5549
Boise City-Nampa, ID	-	0.0444 - 0.0416	-	0.1257 - 0.0594
Bradenton-Sarasota-Venice, FL	-	0.08 - 0.0749	-	0.2361 - 0.1116
Bremerton-Silverdale, WA	-	0.4757 - 0.4458	-	2.84 - 1.3425
Brownsville-Harlingen, TX	-	0.0743 - 0.0697	-	0.2148 - 0.1015
Buffalo-Niagara Falls, NY	0.0325 - 0.0836	0.248 - 0.2324	0.3926 - 0.5403	0.4529 - 0.2141
Burlington-South Burlington, VT	-	0.1625 - 0.1522	-	1.6621 - 0.7857
Canton-Massillon, OH	-	0.1426 - 0.1337	-	0.419 - 0.1981
Cape Coral-Fort Myers, FL	-	0.1222 - 0.1145	-	0.1927 - 0.0911
Carson City, NV	-	0.1028 - 0.0963	-	2.044 - 0.9662
Casper, WY	-	0.0885 - 0.0829	-	1.2062 - 0.5702
Cedar Rapids, IA	-	0.1599 - 0.1498	-	0.9701 - 0.4586
Champaign-Urbana, IL	-	0.3116 - 0.292	-	2.6661 - 1.2603
Charleston, WV	-	0.0966 - 0.0906	-	0.6563 - 0.3103
Charleston-North Charleston, SC	-	0.1239 - 0.1161	-	0.2363 - 0.1117
Charlotte-Gastonia-Concord, NC-SC	-	0.4258 - 0.3991	-	0.1644 - 0.0777
Charlottesville, VA	-	0.2241 - 0.2101	-	2.7074 - 1.2798
Chattanooga, TN-GA	-	0.1489 - 0.1395	-	0.3361 - 0.1589
Cheyenne, WY	-	0.1493 - 0.14	-	2.4682 - 1.1667
Chicago-Naperville-Joliet, IL-IN-WI	0.455 - 1.1691	0.1468 - 0.1376	1.018 - 1.4007	0.0497 - 0.0235

Chico, CA	-	0.1431 - 0.1341	-	0.8571 - 0.4052
Cincinnati-Middletown, OH-KY-IN	-	0.1638 - 0.1535	-	0.168 - 0.0794
Clarksville, TN-KY	-	0.1584 - 0.1484	-	0.2717 - 0.1284
Cleveland-Elyria-Mentor, OH	0.0988 - 0.2539	0.205 - 0.1921	0.7066 - 0.9724	0.2218 - 0.1048
College Station-Bryan, TX	-	0.1972 - 0.1848	-	0.8356 - 0.395
Colorado Springs, CO	-	0.161 - 0.1509	-	0.3725 - 0.1761
Columbia, MO	-	0.1689 - 0.1583	-	1.2755 - 0.603
Columbia, SC	-	0.046 - 0.0431	-	0.1231 - 0.0582
Columbus, GA-AL	-	0.15 - 0.1406	-	0.4833 - 0.2284
Columbus, IN	-	0.035 - 0.0328	-	0.5915 - 0.2796
Columbus, OH	-	0.1022 - 0.0958	-	0.1074 - 0.0508
Corpus Christi, TX	-	0.22 - 0.2061	-	0.5999 - 0.2836
Corvallis, OR	-	0.0922 - 0.0864	-	1.8688 - 0.8834
Cumberland, MD-WV	-	0.0434 - 0.0407	-	0.5531 - 0.2615
Dallas-Fort Worth-Arlington, TX	0.069 - 0.1773	0.1263 - 0.1184	0.1285 - 0.1769	0.0356 - 0.0168
Danville, IL	-	0.189 - 0.1771	-	2.1889 - 1.0347
Davenport-Moline-Rock Island, IA-IL	-	0.2487 - 0.2331	-	0.8626 - 0.4078
Dayton, OH	-	0.1197 - 0.1122	-	0.2305 - 0.1089
Decatur, IL	-	0.259 - 0.2428	-	2.3939 - 1.1316
Deltona-Daytona Beach-Ormond Beach, FL	-	0.1735 - 0.1626	-	0.2698 - 0.1275
Denver-Aurora, CO	0.0529 - 0.1359	0.2797 - 0.2621	0.3469 - 0.4774	0.2775 - 0.1312
Des Moines, IA	-	0.1687 - 0.1581	-	0.6063 - 0.2866
Detroit-Warren-Livonia, MI	-	0.1385 - 0.1298	-	0.0617 - 0.0292
Dubuque, IA	-	0.1322 - 0.1239	-	2.0319 - 0.9605
Duluth, MN-WI	-	0.3324 - 0.3115	-	1.3776 - 0.6512
Eau Claire, WI	-	0.1054 - 0.0988	-	0.9722 - 0.4596
El Centro, CA	-	0.1018 - 0.0954	-	1.0374 - 0.4904
El Paso, TX	-	0.1897 - 0.1777	-	0.4169 - 0.1971
Elkhart-Goshen, IN	-	0.0333 - 0.0312	-	0.2367 - 0.1119

Elmira, NY	-	0.1153 - 0.108	-	2.9815 - 1.4094
Erie, PA	-	0.1243 - 0.1164	-	1.0563 - 0.4993
Eugene-Springfield, OR	-	0.3151 - 0.2953	-	1.4329 - 0.6774
Evansville, IN-KY	-	0.0646 - 0.0606	-	0.3334 - 0.1576
Fairbanks, AK	-	0.1113 - 0.1043	-	1.0975 - 0.5188
Fargo, ND-MN	-	0.0838 - 0.0785	-	0.8737 - 0.413
Farmington, NM	-	0.0211 - 0.0198	-	0.2228 - 0.1053
Fayetteville-Springdale-Rogers, AR-MO	-	0.1096 - 0.1027	-	0.2647 - 0.1251
Flagstaff, AZ	-	0.0755 - 0.0707	-	0.7385 - 0.3491
Flint, MI	-	0.3632 - 0.3404	-	1.11 - 0.5247
Florence, SC	-	0.0379 - 0.0355	-	0.1797 - 0.085
Fond du Lac, WI	-	0.0511 - 0.0479	-	0.947 - 0.4477
Fort Collins-Loveland, CO	-	0.12 - 0.1124	-	0.5127 - 0.2424
Fort Smith, AR-OK	-	0.0384 - 0.036	-	0.1804 - 0.0853
Fort Walton Beach-Crestview-Destin, FL	-	0.0422 - 0.0396	-	0.336 - 0.1588
Fort Wayne, IN	-	0.0921 - 0.0863	-	0.2458 - 0.1162
Fresno, CA	-	0.1285 - 0.1204	-	0.2405 - 0.1137
Gadsden, AL	-	0.0982 - 0.092	-	0.575 - 0.2718
Gainesville, FL	-	0.5868 - 0.5499	-	2.5027 - 1.1831
Gainesville, GA	-	0.016 - 0.015	-	0.1032 - 0.0488
Glens Falls, NY	-	0.0406 - 0.038	-	0.9912 - 0.4685
Grand Forks, ND-MN	-	0.0744 - 0.0697	-	1.1392 - 0.5385
Grand Junction, CO	-	0.1255 - 0.1176	-	0.8844 - 0.4181
Grand Rapids-Wyoming, MI	-	0.095 - 0.0891	-	0.2729 - 0.129
Great Falls, MT	-	0.2434 - 0.2281	-	3.6834 - 1.7412
Greeley, CO	-	0.04 - 0.0374	-	0.2357 - 0.1114
Green Bay, WI	-	0.1314 - 0.1231	-	0.5811 - 0.2747
Greenville, SC	-	0.0187 - 0.0175	-	0.0526 - 0.0249
Gulfport-Biloxi, MS	-	0.0894 - 0.0838	-	0.3319 - 0.1569
Hagerstown-Martinsburg, MD-WV	-	0.0464 - 0.0435	-	0.3271 - 0.1546

Hanford-Corcoran, CA	-	0.1668 - 0.1563	-	1.0389 - 0.4911
Harrisburg-Carlisle, PA	-	0.0345 - 0.0323	-	0.3552 - 0.1679
Hattiesburg, MS	-	0.0288 - 0.027	-	0.2632 - 0.1244
Holland-Grand Haven, MI	-	0.0442 - 0.0414	-	0.2761 - 0.1305
Honolulu, HI	-	0.307 - 0.2877	-	1.0856 - 0.5132
Hot Springs, AR	-	0.0942 - 0.0883	-	0.7476 - 0.3534
Houston-Baytown-Sugar Land, TX	0.0061 - 0.0158	0.1624 - 0.1522	0.0164 - 0.0226	0.0655 - 0.031
Huntington-Ashland, WV-KY-OH	-	0.086 - 0.0806	-	0.5423 - 0.2564
Huntsville, AL	-	0.0517 - 0.0484	-	0.1122 - 0.053
Idaho Falls, ID	-	0.0471 - 0.0441	-	0.6067 - 0.2868
Indianapolis, IN	-	0.0813 - 0.0762	-	0.0735 - 0.0348
Iowa City, IA	-	0.3347 - 0.3136	-	4.3898 - 2.0751
Ithaca, NY	-	0.307 - 0.2877	-	8.5656 - 4.0491
Jackson, MI	-	0.031 - 0.0291	-	0.4956 - 0.2343
Jackson, MS	-	0.0597 - 0.0559	-	0.1284 - 0.0607
Jackson, TN	-	0.1176 - 0.1102	-	1.1873 - 0.5612
Jacksonville, FL	-	0.1764 - 0.1654	-	0.1652 - 0.0781
Janesville, WI	-	0.2109 - 0.1977	-	1.5549 - 0.735
Jefferson City, MO	-	0.0852 - 0.0798	-	0.9618 - 0.4546
Johnson City, TN	-	0.0969 - 0.0908	-	0.4645 - 0.2196
Johnstown, PA	-	0.1474 - 0.1382	-	2.2618 - 1.0692
Jonesboro, AR	-	0.0383 - 0.0359	-	0.2207 - 0.1043
Kalamazoo-Portage, MI	-	0.1277 - 0.1196	-	0.4962 - 0.2346
Kankakee-Bradley, IL	-	0.1169 - 0.1095	-	1.33 - 0.6287
Kansas City, MO-KS	-	0.1556 - 0.1458	-	0.0998 - 0.0472
Kennewick-Richland-Pasco, WA	-	0.504 - 0.4723	-	1.722 - 0.814
Killeen-Temple-Fort Hood, TX	-	0.0632 - 0.0592	-	0.1378 - 0.0651
Kingsport-Bristol-Bristol, TN-VA	-	0.0741 - 0.0694	-	0.1999 - 0.0945
Kingston, NY	-	0.1985 - 0.186	-	1.8862 - 0.8917
Knoxville, TN	-	0.1132 - 0.106	-	0.2301 - 0.1088

La Crosse, WI-MN	-	0.1233 - 0.1155	-	1.8203 - 0.8605
Lafayette, IN	-	0.2725 - 0.2554	-	2.4936 - 1.1788
Lafayette, LA	-	0.0718 - 0.0673	-	0.4612 - 0.218
Lake Charles, LA	-	0.0404 - 0.0379	-	0.2542 - 0.1202
Lakeland, FL	-	0.0963 - 0.0902	-	0.2213 - 0.1046
Lancaster, PA	-	0.0211 - 0.0197	-	0.2039 - 0.0964
Lansing-East Lansing, MI	-	0.1114 - 0.1044	-	0.6811 - 0.322
Laredo, TX	-	0.2343 - 0.2196	-	1.2823 - 0.6062
Las Cruces, NM	-	0.0912 - 0.0854	-	0.5154 - 0.2436
Las Vegas-Paradise, NV	-	0.1115 - 0.1045	-	0.2114 - 0.0999
Lawrence, KS	-	0.0974 - 0.0912	-	1.3249 - 0.6263
Lawton, OK	-	0.2481 - 0.2325	-	0.8668 - 0.4098
Lebanon, PA	-	0.0539 - 0.0505	-	0.7819 - 0.3696
Lewiston, ID-WA	-	0.0233 - 0.0218	-	0.3882 - 0.1835
Lewiston-Auburn, ME	-	0.0695 - 0.0651	-	0.9388 - 0.4438
Lexington-Fayette, KY	-	0.0805 - 0.0754	-	0.3173 - 0.15
Lima, OH	-	0.0629 - 0.0589	-	0.7823 - 0.3698
Lincoln, NE	-	0.1663 - 0.1559	-	0.8822 - 0.4171
Little Rock-North Little Rock, AR	0.0122 - 0.0312	0.0755 - 0.0707	0.1762 - 0.2425	0.1656 - 0.0783
Logan, UT-ID	-	0.2893 - 0.2711	-	3.7573 - 1.7762
Longview, TX	-	0.0316 - 0.0296	-	0.1571 - 0.0743
Longview, WA	-	0.0673 - 0.0631	-	0.887 - 0.4193
Los Angeles-Long Beach-Santa Ana, CA	0.0475 - 0.1221	0.1817 - 0.1702	0.0835 - 0.1149	0.0483 - 0.0228
Louisville, KY-IN	-	0.2404 - 0.2253	-	0.2397 - 0.1133
Lubbock, TX	-	0.2401 - 0.225	-	1.2313 - 0.5821
Lynchburg, VA	-	0.7731 - 0.7245	-	3.131 - 1.4801
Macon, GA	-	0.1015 - 0.0951	-	0.4699 - 0.2221
Madera, CA	-	0.066 - 0.0619	-	0.3819 - 0.1805
Madison, WI	-	0.1942 - 0.182	-	0.996 - 0.4708
Mansfield, OH	-	0.0888 - 0.0832	-	0.7283 - 0.3443

McAllen-Edinburg-Pharr, TX	-	0.0292 - 0.0273	-	0.048 - 0.0227
Medford, OR	-	0.0919 - 0.0862	-	0.805 - 0.3806
Memphis, TN-MS-AR	0.0194 - 0.0499	0.1091 - 0.1023	0.1447 - 0.1991	0.1229 - 0.0581
Merced, CA	-	0.1656 - 0.1552	-	1.015 - 0.4798
Miami-Fort Lauderdale-Miami Beach, FL	0.0461 - 0.1183	0.1373 - 0.1286	0.1668 - 0.2295	0.0752 - 0.0356
Michigan City-La Porte, IN	-	0.0571 - 0.0535	-	0.5332 - 0.2521
Milwaukee-Waukesha-West Allis, WI	-	0.1952 - 0.1829	-	0.3303 - 0.1561
Minneapolis-St. Paul-Bloomington, MN-WI	0.0115 - 0.0296	0.2493 - 0.2337	0.062 - 0.0853	0.2029 - 0.0959
Missoula, MT	-	0.1612 - 0.1511	-	2.0338 - 0.9614
Mobile, AL	-	0.1039 - 0.0974	-	0.2432 - 0.115
Modesto, CA	-	0.0966 - 0.0905	-	0.3216 - 0.152
Monroe, LA	-	0.0948 - 0.0888	-	0.8022 - 0.3792
Montgomery, AL	-	0.0759 - 0.0711	-	0.2186 - 0.1033
Morgantown, WV	-	0.1946 - 0.1824	-	1.8616 - 0.88
Mount Vernon-Anacortes, WA	-	0.2449 - 0.2295	-	2.0128 - 0.9515
Muncie, IN	-	0.2968 - 0.2782	-	2.9694 - 1.4037
Muskegon-Norton Shores, MI	-	0.1536 - 0.144	-	0.8246 - 0.3898
Myrtle Beach-Conway-North Myrtle Beach, SC	-	0.0537 - 0.0504	-	0.2731 - 0.1291
Napa, CA	-	0.1745 - 0.1635	-	1.9348 - 0.9146
Naples-Marco Island, FL	-	0.0405 - 0.0379	-	0.1724 - 0.0815
Nashville-Davidson--Murfreesboro, TN	0.0274 - 0.0705	0.101 - 0.0947	0.16 - 0.2201	0.0892 - 0.0422
New Orleans-Metairie-Kenner, LA	0.045 - 0.1155	0.146 - 0.1368	0.5066 - 0.6971	0.2489 - 0.1177
New York-Northern New Jersey-Long Island, NY-NJ-PA	0.2092 - 0.5374	0.1173 - 0.1099	0.61 - 0.8394	0.0518 - 0.0245
Niles-Benton Harbor, MI	-	0.0126 - 0.0118	-	0.0695 - 0.0329
Ocala, FL	-	0.0478 - 0.0448	-	0.1606 - 0.0759
Odessa, TX	-	0.105 - 0.0984	-	0.9908 - 0.4683
Oklahoma City, OK	-	0.0779 - 0.073	-	0.0894 - 0.0423
Olympia, WA	-	0.1787 - 0.1675	-	1.7208 - 0.8134

Omaha-Council Bluffs, NE-IA	-	0.1485 - 0.1391	-	0.312 - 0.1475
Orlando, FL	-	0.0904 - 0.0847	-	0.1065 - 0.0503
Oshkosh-Neenah, WI	-	0.0845 - 0.0792	-	0.9454 - 0.4469
Owensboro, KY	-	0.0487 - 0.0456	-	0.5738 - 0.2712
Oxnard-Thousand Oaks-Ventura, CA	-	0.1399 - 0.1311	-	0.2337 - 0.1105
Palm Bay-Melbourne-Titusville, FL	-	0.0835 - 0.0782	-	0.1124 - 0.0531
Panama City-Lynn Haven, FL	-	0.0639 - 0.0599	-	0.4632 - 0.219
Parkersburg-Marietta, WV-OH	-	0.0488 - 0.0457	-	0.3849 - 0.1819
Pensacola-Ferry Pass-Brent, FL	-	0.0562 - 0.0526	-	0.2578 - 0.1218
Peoria, IL	-	0.1223 - 0.1146	-	0.4884 - 0.2309
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	0.1862 - 0.4784	0.1046 - 0.098	0.8351 - 1.1492	0.071 - 0.0336
Phoenix-Mesa-Scottsdale, AZ	-	0.1291 - 0.121	-	0.0635 - 0.03
Pine Bluff, AR	-	0.1184 - 0.111	-	0.7382 - 0.349
Pittsburgh, PA	0.0268 - 0.0687	0.1622 - 0.152	0.2861 - 0.3937	0.2624 - 0.1241
Pocatello, ID	-	0.1474 - 0.1381	-	1.6864 - 0.7972
Port St. Lucie-Fort Pierce, FL	-	0.0966 - 0.0905	-	0.064 - 0.0303
Portland-South Portland-Biddeford, ME	0.0277 - 0.0711	0.0448 - 0.042	0.8057 - 1.1087	0.1977 - 0.0934
Portland-Vancouver-Beaverton, OR-WA	0.0762 - 0.1957	0.2047 - 0.1918	0.5633 - 0.775	0.229 - 0.1083
Poughkeepsie-Newburgh-Middletown, NY	-	0.0999 - 0.0937	-	0.2772 - 0.131
Providence-New Bedford-Fall River, RI-MA	-	0.1475 - 0.1382	-	0.2162 - 0.1022
Pueblo, CO	-	0.1198 - 0.1122	-	0.8703 - 0.4114
Racine, WI	-	0.1216 - 0.114	-	1.1347 - 0.5364
Rapid City, SD	-	0.0677 - 0.0635	-	0.6198 - 0.293
Reading, PA	-	0.0591 - 0.0554	-	0.4629 - 0.2188
Redding, CA	-	0.1588 - 0.1488	-	0.7351 - 0.3475
Reno-Sparks, NV	-	0.1796 - 0.1683	-	0.699 - 0.3304
Richmond, VA	-	0.1058 - 0.0991	-	0.2004 - 0.0947
Riverside-San Bernardino-Ontario, CA	-	0.1083 - 0.1014	-	0.0359 - 0.017

Roanoke, VA	-	0.2035 - 0.1908	-	1.061 - 0.5016
Rochester, NY	-	0.1129 - 0.1058	-	0.3884 - 0.1836
Rockford, IL	-	0.0911 - 0.0853	-	0.3528 - 0.1668
Rome, GA	-	0.6693 - 0.6273	-	6.4738 - 3.0603
Sacramento--Arden-Arcade--Roseville, CA	0.0634 - 0.163	0.1541 - 0.1444	0.4026 - 0.5539	0.148 - 0.07
Saginaw-Saginaw Township North, MI	-	0.179 - 0.1677	-	1.131 - 0.5347
Salem, OR	-	0.1491 - 0.1397	-	0.6486 - 0.3066
Salinas, CA	-	0.1252 - 0.1173	-	0.732 - 0.346
Salisbury, MD	-	0.0939 - 0.088	-	1.2731 - 0.6018
Salt Lake City, UT	0.0544 - 0.1398	0.2051 - 0.1922	1.0417 - 1.4334	0.5939 - 0.2808
San Angelo, TX	-	0.0519 - 0.0486	-	0.3336 - 0.1577
San Antonio, TX	-	0.1951 - 0.1829	-	0.1535 - 0.0726
San Diego-Carlsbad-San Marcos, CA	0.102 - 0.262	0.1549 - 0.1451	0.5081 - 0.6992	0.1167 - 0.0552
San Francisco-Oakland-Fremont, CA	0.2327 - 0.5979	0.2064 - 0.1934	1.4095 - 1.9395	0.1891 - 0.0894
San Jose-Sunnyvale-Santa Clara, CA	0.0751 - 0.1929	0.1679 - 0.1574	0.7889 - 1.0856	0.2669 - 0.1262
San Luis Obispo-Paso Robles, CA	-	0.1363 - 0.1277	-	0.7881 - 0.3725
Santa Barbara-Santa Maria-Goleta, CA	-	0.2508 - 0.235	-	1.2168 - 0.5752
Santa Cruz-Watsonville, CA	-	0.2591 - 0.2428	-	2.3277 - 1.1003
Santa Fe, NM	-	0.1513 - 0.1418	-	1.4074 - 0.6653
Santa Rosa-Petaluma, CA	-	0.1754 - 0.1644	-	0.5809 - 0.2746
Savannah, GA	-	0.127 - 0.119	-	0.6167 - 0.2915
Scranton--Wilkes-Barre, PA	-	0.0837 - 0.0784	-	0.3617 - 0.171
Seattle-Tacoma-Bellevue, WA	0.0284 - 0.0729	0.3109 - 0.2914	0.183 - 0.2519	0.3034 - 0.1434
Sebastian-Vero Beach, FL	-	0.0834 - 0.0782	-	0.4992 - 0.236
Sheboygan, WI	-	0.1686 - 0.158	-	2.028 - 0.9587
Sherman-Denison, TX	-	0.0515 - 0.0483	-	0.3077 - 0.1455
Shreveport-Bossier City, LA	-	0.2068 - 0.1938	-	0.4546 - 0.2149
Sioux City, IA-NE-SD	-	0.1939 - 0.1817	-	1.294 - 0.6117
Sioux Falls, SD	-	0.0801 - 0.0751	-	0.5816 - 0.2749
South Bend-Mishawaka, IN-MI	-	0.1714 - 0.1606	-	0.6502 - 0.3074

Spartanburg, SC	-	0.0427 - 0.04	-	0.1866 - 0.0882
Spokane, WA	-	0.2592 - 0.2429	-	1.1026 - 0.5212
Springfield, IL	-	0.1928 - 0.1806	-	1.5502 - 0.7328
Springfield, MO	-	0.0358 - 0.0336	-	0.1336 - 0.0632
Springfield, OH	-	0.1039 - 0.0973	-	0.7733 - 0.3656
St. Cloud, MN	-	0.1325 - 0.1242	-	1.2121 - 0.573
St. George, UT	-	0.0314 - 0.0294	-	0.2829 - 0.1337
St. Joseph, MO-KS	-	0.1393 - 0.1305	-	1.1955 - 0.5651
St. Louis, MO-IL	0.0438 - 0.1124	0.0872 - 0.0818	0.2858 - 0.3932	0.0862 - 0.0407
State College, PA	-	0.2431 - 0.2279	-	3.3536 - 1.5853
Stockton, CA	-	0.1677 - 0.1571	-	0.4272 - 0.2019
Sumter, SC	-	0.3402 - 0.3188	-	2.4538 - 1.16
Syracuse, NY	-	0.1332 - 0.1248	-	0.7524 - 0.3557
Tallahassee, FL	-	0.1394 - 0.1306	-	0.6614 - 0.3127
Tampa-St. Petersburg-Clearwater, FL	0.0041 - 0.0105	0.0903 - 0.0846	0.0231 - 0.0318	0.0775 - 0.0367
Terre Haute, IN	-	0.0504 - 0.0472	-	0.3046 - 0.144
Texarkana, TX-Texarkana, AR	-	0.046 - 0.0431	-	0.3046 - 0.144
Topeka, KS	-	0.1548 - 0.1451	-	0.9299 - 0.4396
Tucson, AZ	-	0.2124 - 0.199	-	0.3098 - 0.1464
Tulsa, OK	-	0.047 - 0.0441	-	0.0902 - 0.0426
Tuscaloosa, AL	-	0.0583 - 0.0546	-	0.2675 - 0.1264
Tyler, TX	-	0.0278 - 0.0261	-	0.1903 - 0.0899
Utica-Rome, NY	-	0.1147 - 0.1075	-	0.6581 - 0.3111
Vallejo-Fairfield, CA	-	0.4954 - 0.4643	-	1.3274 - 0.6275
Victoria, TX	-	0.1903 - 0.1784	-	0.8478 - 0.4008
Virginia Beach-Norfolk-Newport News, VA-NC	-	0.2755 - 0.2581	-	0.208 - 0.0983
Visalia-Porterville, CA	-	0.1154 - 0.1081	-	0.3697 - 0.1748
Waco, TX	-	0.1009 - 0.0946	-	0.5444 - 0.2574
Washington-Arlington-Alexandria, DC-VA-	0.2508 - 0.6444	0.1868 - 0.175	1.5331 - 2.1096	0.1727 - 0.0817

MD-WV				
Waterloo-Cedar Falls, IA	-	0.1185 - 0.1111	-	0.7297 - 0.345
Wausau, WI	-	0.1753 - 0.1643	-	2.5249 - 1.1936
Weirton-Steubenville, WV-OH	-	0.095 - 0.089	-	0.5576 - 0.2636
Wenatchee, WA	-	0.2886 - 0.2704	-	3.9503 - 1.8674
Wheeling, WV-OH	-	0.0803 - 0.0753	-	0.9688 - 0.458
Wichita Falls, TX	-	0.1105 - 0.1035	-	0.5854 - 0.2767
Wichita, KS	-	0.0846 - 0.0793	-	0.1853 - 0.0876
Williamsport, PA	-	0.147 - 0.1378	-	2.8329 - 1.3391
Winchester, VA-WV	-	0.1196 - 0.1121	-	2.5682 - 1.214
Yakima, WA	-	0.1149 - 0.1077	-	0.6077 - 0.2873
York-Hanover, PA	-	0.0238 - 0.0223	-	0.2174 - 0.1028
Youngstown-Warren-Boardman, OH-PA	-	0.1067 - 0.1	-	0.2001 - 0.0946
Yuba City, CA	-	0.2579 - 0.2417	-	1.5439 - 0.7298
Yuma, AZ	-	0.0698 - 0.0654	-	0.3658 - 0.1729

TABLE **F 9 Productivity elasticities (based on employment density) rail and motor bus seat capacity per capita**

	Rail seat capacity per capita		**Motor bus seat capacity per capita**	
	Average payroll	**GDP per capita**	**Average payroll**	**GDP per capita**
Abilene, TX	-	-	0.0086 - 0.0166	0.0236 - 0.0196
Akron, OH	-	-	0.0093 - 0.018	0.0256 - 0.0213
Albany, GA	-	-	0.0084 - 0.0162	0.023 - 0.0191
Albany-Schenectady-Troy, NY	-	-	0.0055 - 0.0107	0.0152 - 0.0127
Albuquerque, NM	-	-	0.0072 - 0.0138	0.0196 - 0.0163
Alexandria, LA	-	-	0.0054 - 0.0105	0.0149 - 0.0124
Allentown-Bethlehem-Easton, PA-NJ	-	-	0.0035 - 0.0068	0.0097 - 0.0081
Altoona, PA	-	-	0.008 - 0.0155	0.022 - 0.0183
Amarillo, TX	-	-	0.0037 - 0.0071	0.0102 - 0.0085
Ames, IA	-	-	0.0367 - 0.0707	0.1006 - 0.0837
Anchorage, AK	-	-	0.0093 - 0.018	0.0256 - 0.0213
Anderson, IN	-	-	0.0109 - 0.021	0.0299 - 0.0249
Ann Arbor, MI	-	-	0.0072 - 0.0139	0.0198 - 0.0164
Anniston-Oxford, AL	-	-	0.0068 - 0.013	0.0185 - 0.0154
Appleton, WI	-	-	0.0045 - 0.0088	0.0125 - 0.0104
Athens-Clarke County, GA	-	-	0.0123 - 0.0237	0.0337 - 0.0281
Atlanta-Sandy Springs-Marietta, GA	0.0044 - 0.0231	0.012 - 0.0273	0.0059 - 0.0114	0.0162 - 0.0135
Auburn-Opelika, AL	-	-	0.0052 - 0.0101	0.0143 - 0.0119
Augusta-Richmond County, GA-SC	-	-	0.0042 - 0.008	0.0114 - 0.0095
Austin-Round Rock, TX	-	-	0.0079 - 0.0152	0.0216 - 0.018
Bakersfield, CA	-	-	0.0052 - 0.0099	0.0142 - 0.0118
Baltimore-Towson, MD	0.0086 - 0.0457	0.0237 - 0.0541	0.0092 - 0.0178	0.0253 - 0.0211
Bangor, ME	-	-	0.0048 - 0.0092	0.013 - 0.0108
Baton Rouge, LA	-	-	0.0037 - 0.0071	0.01 - 0.0084
Battle Creek, MI	-	-	0.0108 - 0.0209	0.0297 - 0.0247
Bay City, MI	-	-	0.0196 - 0.0377	0.0537 - 0.0447

Beaumont-Port Arthur, TX	-	-	0.0051 - 0.0098	0.0139 - 0.0116
Bellingham, WA	-	-	0.0141 - 0.0272	0.0386 - 0.0322
Bend, OR	-	-	0.0026 - 0.0051	0.0072 - 0.006
Billings, MT	-	-	0.0093 - 0.0179	0.0255 - 0.0212
Binghamton, NY	-	-	0.0053 - 0.0102	0.0146 - 0.0121
Birmingham-Hoover, AL	-	-	0.0041 - 0.0079	0.0113 - 0.0094
Bismarck, ND	-	-	0.0064 - 0.0124	0.0176 - 0.0147
Blacksburg-Christiansburg-Radford, VA	-	-	0.0472 - 0.091	0.1295 - 0.1078
Bloomington, IN	-	-	0.0082 - 0.0157	0.0224 - 0.0186
Bloomington-Normal, IL	-	-	0.0067 - 0.0129	0.0183 - 0.0152
Boise City-Nampa, ID	-	-	0.0025 - 0.0047	0.0068 - 0.0056
Bradenton-Sarasota-Venice, FL	-	-	0.0044 - 0.0085	0.0122 - 0.0101
Bremerton-Silverdale, WA	-	-	0.0264 - 0.0508	0.0723 - 0.0602
Brownsville-Harlingen, TX	-	-	0.0041 - 0.0079	0.0113 - 0.0094
Buffalo-Niagara Falls, NY	0.0018 - 0.0095	0.0049 - 0.0113	0.0137 - 0.0265	0.0377 - 0.0314
Burlington-South Burlington, VT	-	-	0.009 - 0.0174	0.0247 - 0.0206
Canton-Massillon, OH	-	-	0.0079 - 0.0152	0.0217 - 0.018
Cape Coral-Fort Myers, FL	-	-	0.0068 - 0.0131	0.0186 - 0.0155
Carson City, NV	-	-	0.0057 - 0.011	0.0156 - 0.013
Casper, WY	-	-	0.0049 - 0.0095	0.0134 - 0.0112
Cedar Rapids, IA	-	-	0.0089 - 0.0171	0.0243 - 0.0202
Champaign-Urbana, IL	-	-	0.0173 - 0.0333	0.0474 - 0.0394
Charleston, WV	-	-	0.0054 - 0.0103	0.0147 - 0.0122
Charleston-North Charleston, SC	-	-	0.0069 - 0.0132	0.0188 - 0.0157
Charlotte-Gastonia-Concord, NC-SC	-	-	0.0236 - 0.0455	0.0647 - 0.0539
Charlottesville, VA	-	-	0.0124 - 0.0239	0.0341 - 0.0284
Chattanooga, TN-GA	-	-	0.0082 - 0.0159	0.0226 - 0.0188
Cheyenne, WY	-	-	0.0083 - 0.016	0.0227 - 0.0189
Chicago-Naperville-Joliet, IL-IN-WI	0.0252 - 0.1333	0.0692 - 0.1578	0.0081 - 0.0157	0.0223 - 0.0186
Chico, CA	-	-	0.0079 - 0.0153	0.0218 - 0.0181

Cincinnati-Middletown, OH-KY-IN	-	-	0.0091 - 0.0175	0.0249 - 0.0207
Clarksville, TN-KY	-	-	0.0088 - 0.0169	0.0241 - 0.02
Cleveland-Elyria-Mentor, OH	0.0055 - 0.0289	0.015 - 0.0343	0.0114 - 0.0219	0.0312 - 0.0259
College Station-Bryan, TX	-	-	0.0109 - 0.0211	0.03 - 0.0249
Colorado Springs, CO	-	-	0.0089 - 0.0172	0.0245 - 0.0204
Columbia, MO	-	-	0.0094 - 0.018	0.0257 - 0.0214
Columbia, SC	-	-	0.0026 - 0.0049	0.007 - 0.0058
Columbus, GA-AL	-	-	0.0083 - 0.016	0.0228 - 0.019
Columbus, IN	-	-	0.0019 - 0.0037	0.0053 - 0.0044
Columbus, OH	-	-	0.0057 - 0.0109	0.0155 - 0.0129
Corpus Christi, TX	-	-	0.0122 - 0.0235	0.0334 - 0.0278
Corvallis, OR	-	-	0.0051 - 0.0098	0.014 - 0.0117
Cumberland, MD-WV	-	-	0.0024 - 0.0046	0.0066 - 0.0055
Dallas-Fort Worth-Arlington, TX	0.0038 - 0.0202	0.0105 - 0.0239	0.007 - 0.0135	0.0192 - 0.016
Danville, IL	-	-	0.0105 - 0.0202	0.0287 - 0.0239
Davenport-Moline-Rock Island, IA-IL	-	-	0.0138 - 0.0266	0.0378 - 0.0315
Dayton, OH	-	-	0.0066 - 0.0128	0.0182 - 0.0151
Decatur, IL	-	-	0.0144 - 0.0277	0.0394 - 0.0328
Deltona-Daytona Beach-Ormond Beach, FL	-	-	0.0096 - 0.0185	0.0264 - 0.0219
Denver-Aurora, CO	0.0029 - 0.0155	0.008 - 0.0183	0.0155 - 0.0299	0.0425 - 0.0354
Des Moines, IA	-	-	0.0093 - 0.018	0.0256 - 0.0213
Detroit-Warren-Livonia, MI	-	-	0.0077 - 0.0148	0.021 - 0.0175
Dubuque, IA	-	-	0.0073 - 0.0141	0.0201 - 0.0167
Duluth, MN-WI	-	-	0.0184 - 0.0355	0.0505 - 0.0421
Eau Claire, WI	-	-	0.0058 - 0.0113	0.016 - 0.0133
El Centro, CA	-	-	0.0056 - 0.0109	0.0155 - 0.0129
El Paso, TX	-	-	0.0105 - 0.0203	0.0288 - 0.024
Elkhart-Goshen, IN	-	-	0.0018 - 0.0036	0.0051 - 0.0042
Elmira, NY	-	-	0.0064 - 0.0123	0.0175 - 0.0146

Erie, PA	-	-	0.0069 - 0.0133	0.0189 - 0.0157
Eugene-Springfield, OR	-	-	0.0175 - 0.0337	0.0479 - 0.0399
Evansville, IN-KY	-	-	0.0036 - 0.0069	0.0098 - 0.0082
Fairbanks, AK	-	-	0.0062 - 0.0119	0.0169 - 0.0141
Fargo, ND-MN	-	-	0.0046 - 0.0089	0.0127 - 0.0106
Farmington, NM	-	-	0.0012 - 0.0023	0.0032 - 0.0027
Fayetteville-Springdale-Rogers, AR-MO	-	-	0.0061 - 0.0117	0.0167 - 0.0139
Flagstaff, AZ	-	-	0.0042 - 0.0081	0.0115 - 0.0095
Flint, MI	-	-	0.0201 - 0.0388	0.0552 - 0.046
Florence, SC	-	-	0.0021 - 0.004	0.0058 - 0.0048
Fond du Lac, WI	-	-	0.0028 - 0.0055	0.0078 - 0.0065
Fort Collins-Loveland, CO	-	-	0.0066 - 0.0128	0.0182 - 0.0152
Fort Smith, AR-OK	-	-	0.0021 - 0.0041	0.0058 - 0.0049
Fort Walton Beach-Crestview-Destin, FL	-	-	0.0023 - 0.0045	0.0064 - 0.0053
Fort Wayne, IN	-	-	0.0051 - 0.0098	0.014 - 0.0117
Fresno, CA	-	-	0.0071 - 0.0137	0.0195 - 0.0163
Gadsden, AL	-	-	0.0054 - 0.0105	0.0149 - 0.0124
Gainesville, FL	-	-	0.0325 - 0.0627	0.0892 - 0.0742
Gainesville, GA	-	-	0.0009 - 0.0017	0.0024 - 0.002
Glens Falls, NY	-	-	0.0022 - 0.0043	0.0062 - 0.0051
Grand Forks, ND-MN	-	-	0.0041 - 0.0079	0.0113 - 0.0094
Grand Junction, CO	-	-	0.007 - 0.0134	0.0191 - 0.0159
Grand Rapids-Wyoming, MI	-	-	0.0053 - 0.0102	0.0144 - 0.012
Great Falls, MT	-	-	0.0135 - 0.026	0.037 - 0.0308
Greeley, CO	-	-	0.0022 - 0.0043	0.0061 - 0.0051
Green Bay, WI	-	-	0.0073 - 0.014	0.02 - 0.0166
Greenville, SC	-	-	0.001 - 0.002	0.0028 - 0.0024
Gulfport-Biloxi, MS	-	-	0.005 - 0.0095	0.0136 - 0.0113
Hagerstown-Martinsburg, MD-WV	-	-	0.0026 - 0.005	0.0071 - 0.0059
Hanford-Corcoran, CA	-	-	0.0092 - 0.0178	0.0254 - 0.0211

Harrisburg-Carlisle, PA	-	-	0.0019 - 0.0037	0.0052 - 0.0044
Hattiesburg, MS	-	-	0.0016 - 0.0031	0.0044 - 0.0036
Holland-Grand Haven, MI	-	-	0.0024 - 0.0047	0.0067 - 0.0056
Honolulu, HI	-	-	0.017 - 0.0328	0.0467 - 0.0388
Hot Springs, AR	-	-	0.0052 - 0.0101	0.0143 - 0.0119
Houston-Baytown-Sugar Land, TX	0.0003 - 0.0018	0.0009 - 0.0021	0.009 - 0.0173	0.0247 - 0.0205
Huntington-Ashland, WV-KY-OH	-	-	0.0048 - 0.0092	0.0131 - 0.0109
Huntsville, AL	-	-	0.0029 - 0.0055	0.0079 - 0.0065
Idaho Falls, ID	-	-	0.0026 - 0.005	0.0072 - 0.006
Indianapolis, IN	-	-	0.0045 - 0.0087	0.0124 - 0.0103
Iowa City, IA	-	-	0.0185 - 0.0358	0.0509 - 0.0423
Ithaca, NY	-	-	0.017 - 0.0328	0.0467 - 0.0388
Jackson, MI	-	-	0.0017 - 0.0033	0.0047 - 0.0039
Jackson, MS	-	-	0.0033 - 0.0064	0.0091 - 0.0075
Jackson, TN	-	-	0.0065 - 0.0126	0.0179 - 0.0149
Jacksonville, FL	-	-	0.0098 - 0.0189	0.0268 - 0.0223
Janesville, WI	-	-	0.0117 - 0.0225	0.0321 - 0.0267
Jefferson City, MO	-	-	0.0047 - 0.0091	0.013 - 0.0108
Johnson City, TN	-	-	0.0054 - 0.0104	0.0147 - 0.0123
Johnstown, PA	-	-	0.0082 - 0.0158	0.0224 - 0.0187
Jonesboro, AR	-	-	0.0021 - 0.0041	0.0058 - 0.0048
Kalamazoo-Portage, MI	-	-	0.0071 - 0.0136	0.0194 - 0.0161
Kankakee-Bradley, IL	-	-	0.0065 - 0.0125	0.0178 - 0.0148
Kansas City, MO-KS	-	-	0.0086 - 0.0166	0.0236 - 0.0197
Kennewick-Richland-Pasco, WA	-	-	0.0279 - 0.0538	0.0766 - 0.0638
Killeen-Temple-Fort Hood, TX	-	-	0.0035 - 0.0068	0.0096 - 0.008
Kingsport-Bristol-Bristol, TN-VA	-	-	0.0041 - 0.0079	0.0113 - 0.0094
Kingston, NY	-	-	0.011 - 0.0212	0.0302 - 0.0251
Knoxville, TN	-	-	0.0063 - 0.0121	0.0172 - 0.0143
La Crosse, WI-MN	-	-	0.0068 - 0.0132	0.0187 - 0.0156

Lafayette, IN	-	-	0.0151 - 0.0291	0.0414 - 0.0345
Lafayette, LA	-	-	0.004 - 0.0077	0.0109 - 0.0091
Lake Charles, LA	-	-	0.0022 - 0.0043	0.0061 - 0.0051
Lakeland, FL	-	-	0.0053 - 0.0103	0.0146 - 0.0122
Lancaster, PA	-	-	0.0012 - 0.0023	0.0032 - 0.0027
Lansing-East Lansing, MI	-	-	0.0062 - 0.0119	0.0169 - 0.0141
Laredo, TX	-	-	0.013 - 0.025	0.0356 - 0.0296
Las Cruces, NM	-	-	0.0051 - 0.0097	0.0139 - 0.0115
Las Vegas-Paradise, NV	-	-	0.0062 - 0.0119	0.017 - 0.0141
Lawrence, KS	-	-	0.0054 - 0.0104	0.0148 - 0.0123
Lawton, OK	-	-	0.0137 - 0.0265	0.0377 - 0.0314
Lebanon, PA	-	-	0.003 - 0.0058	0.0082 - 0.0068
Lewiston, ID-WA	-	-	0.0013 - 0.0025	0.0035 - 0.0029
Lewiston-Auburn, ME	-	-	0.0038 - 0.0074	0.0106 - 0.0088
Lexington-Fayette, KY	-	-	0.0045 - 0.0086	0.0122 - 0.0102
Lima, OH	-	-	0.0035 - 0.0067	0.0096 - 0.008
Lincoln, NE	-	-	0.0092 - 0.0178	0.0253 - 0.021
Little Rock-North Little Rock, AR	0.0007 - 0.0036	0.0018 - 0.0042	0.0042 - 0.0081	0.0115 - 0.0096
Logan, UT-ID	-	-	0.016 - 0.0309	0.044 - 0.0366
Longview, TX	-	-	0.0018 - 0.0034	0.0048 - 0.004
Longview, WA	-	-	0.0037 - 0.0072	0.0102 - 0.0085
Los Angeles-Long Beach-Santa Ana, CA	0.0026 - 0.0139	0.0072 - 0.0165	0.0101 - 0.0194	0.0276 - 0.023
Louisville, KY-IN	-	-	0.0133 - 0.0257	0.0365 - 0.0304
Lubbock, TX	-	-	0.0133 - 0.0256	0.0365 - 0.0304
Lynchburg, VA	-	-	0.0428 - 0.0826	0.1175 - 0.0978
Macon, GA	-	-	0.0056 - 0.0108	0.0154 - 0.0128
Madera, CA	-	-	0.0037 - 0.0071	0.01 - 0.0084
Madison, WI	-	-	0.0108 - 0.0208	0.0295 - 0.0246
Mansfield, OH	-	-	0.0049 - 0.0095	0.0135 - 0.0112
McAllen-Edinburg-Pharr, TX	-	-	0.0016 - 0.0031	0.0044 - 0.0037

Medford, OR	-	-	0.0051 - 0.0098	0.014 - 0.0116
Memphis, TN-MS-AR	0.0011 - 0.0057	0.003 - 0.0067	0.006 - 0.0117	0.0166 - 0.0138
Merced, CA	-	-	0.0092 - 0.0177	0.0252 - 0.0209
Miami-Fort Lauderdale-Miami Beach, FL	0.0026 - 0.0135	0.007 - 0.016	0.0076 - 0.0147	0.0209 - 0.0174
Michigan City-La Porte, IN	-	-	0.0032 - 0.0061	0.0087 - 0.0072
Milwaukee-Waukesha-West Allis, WI	-	-	0.0108 - 0.0209	0.0297 - 0.0247
Minneapolis-St. Paul-Bloomington, MN-WI	0.0006 - 0.0034	0.0018 - 0.004	0.0138 - 0.0266	0.0379 - 0.0315
Missoula, MT	-	-	0.0089 - 0.0172	0.0245 - 0.0204
Mobile, AL	-	-	0.0058 - 0.0111	0.0158 - 0.0131
Modesto, CA	-	-	0.0054 - 0.0103	0.0147 - 0.0122
Monroe, LA	-	-	0.0053 - 0.0101	0.0144 - 0.012
Montgomery, AL	-	-	0.0042 - 0.0081	0.0115 - 0.0096
Morgantown, WV	-	-	0.0108 - 0.0208	0.0296 - 0.0246
Mount Vernon-Anacortes, WA	-	-	0.0136 - 0.0262	0.0372 - 0.031
Muncie, IN	-	-	0.0164 - 0.0317	0.0451 - 0.0376
Muskegon-Norton Shores, MI	-	-	0.0085 - 0.0164	0.0234 - 0.0194
Myrtle Beach-Conway-North Myrtle Beach, SC	-	-	0.003 - 0.0057	0.0082 - 0.0068
Napa, CA	-	-	0.0097 - 0.0186	0.0265 - 0.0221
Naples-Marco Island, FL	-	-	0.0022 - 0.0043	0.0062 - 0.0051
Nashville-Davidson--Murfreesboro, TN	0.0015 - 0.008	0.0042 - 0.0095	0.0056 - 0.0108	0.0154 - 0.0128
New Orleans-Metairie-Kenner, LA	0.0025 - 0.0132	0.0068 - 0.0156	0.0081 - 0.0156	0.0222 - 0.0185
New York-Northern New Jersey-Long Island, NY-NJ-PA	0.0116 - 0.0613	0.0318 - 0.0725	0.0065 - 0.0125	0.0178 - 0.0148
Niles-Benton Harbor, MI	-	-	0.0007 - 0.0013	0.0019 - 0.0016
Ocala, FL	-	-	0.0026 - 0.0051	0.0073 - 0.006
Odessa, TX	-	-	0.0058 - 0.0112	0.016 - 0.0133
Oklahoma City, OK	-	-	0.0043 - 0.0083	0.0118 - 0.0098
Olympia, WA	-	-	0.0099 - 0.0191	0.0272 - 0.0226
Omaha-Council Bluffs, NE-IA	-	-	0.0082 - 0.0159	0.0226 - 0.0188

Orlando, FL	-	-	0.005 - 0.0097	0.0137 - 0.0114
Oshkosh-Neenah, WI	-	-	0.0047 - 0.009	0.0128 - 0.0107
Owensboro, KY	-	-	0.0027 - 0.0052	0.0074 - 0.0062
Oxnard-Thousand Oaks-Ventura, CA	-	-	0.0078 - 0.0149	0.0213 - 0.0177
Palm Bay-Melbourne-Titusville, FL	-	-	0.0046 - 0.0089	0.0127 - 0.0106
Panama City-Lynn Haven, FL	-	-	0.0035 - 0.0068	0.0097 - 0.0081
Parkersburg-Marietta, WV-OH	-	-	0.0027 - 0.0052	0.0074 - 0.0062
Pensacola-Ferry Pass-Brent, FL	-	-	0.0031 - 0.006	0.0085 - 0.0071
Peoria, IL	-	-	0.0068 - 0.0131	0.0186 - 0.0155
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	0.0103 - 0.0545	0.0283 - 0.0646	0.0058 - 0.0112	0.0159 - 0.0132
Phoenix-Mesa-Scottsdale, AZ	-	-	0.0072 - 0.0138	0.0196 - 0.0163
Pine Bluff, AR	-	-	0.0066 - 0.0127	0.018 - 0.015
Pittsburgh, PA	0.0015 - 0.0078	0.0041 - 0.0093	0.009 - 0.0173	0.0247 - 0.0205
Pocatello, ID	-	-	0.0082 - 0.0157	0.0224 - 0.0186
Port St. Lucie-Fort Pierce, FL	-	-	0.0054 - 0.0103	0.0147 - 0.0122
Portland-South Portland-Biddeford, ME	0.0015 - 0.0081	0.0042 - 0.0096	0.0025 - 0.0048	0.0068 - 0.0057
Portland-Vancouver-Beaverton, OR-WA	0.0042 - 0.0223	0.0116 - 0.0264	0.0113 - 0.0219	0.0311 - 0.0259
Poughkeepsie-Newburgh-Middletown, NY	-	-	0.0055 - 0.0107	0.0152 - 0.0126
Providence-New Bedford-Fall River, RI-MA	-	-	0.0082 - 0.0158	0.0224 - 0.0187
Pueblo, CO	-	-	0.0066 - 0.0128	0.0182 - 0.0152
Racine, WI	-	-	0.0067 - 0.013	0.0185 - 0.0154
Rapid City, SD	-	-	0.0038 - 0.0072	0.0103 - 0.0086
Reading, PA	-	-	0.0033 - 0.0063	0.009 - 0.0075
Redding, CA	-	-	0.0088 - 0.017	0.0241 - 0.0201
Reno-Sparks, NV	-	-	0.0099 - 0.0192	0.0273 - 0.0227
Richmond, VA	-	-	0.0059 - 0.0113	0.0161 - 0.0134
Riverside-San Bernardino-Ontario, CA	-	-	0.006 - 0.0116	0.0165 - 0.0137
Roanoke, VA	-	-	0.0113 - 0.0217	0.0309 - 0.0258

Rochester, NY	-	-	0.0063 - 0.0121	0.0172 - 0.0143
Rockford, IL	-	-	0.005 - 0.0097	0.0138 - 0.0115
Rome, GA	-	-	0.0371 - 0.0715	0.1017 - 0.0847
Sacramento--Arden-Arcade--Roseville, CA	0.0035 - 0.0186	0.0096 - 0.022	0.0085 - 0.0165	0.0234 - 0.0195
Saginaw-Saginaw Township North, MI	-	-	0.0099 - 0.0191	0.0272 - 0.0226
Salem, OR	-	-	0.0083 - 0.0159	0.0227 - 0.0189
Salinas, CA	-	-	0.0069 - 0.0134	0.019 - 0.0158
Salisbury, MD	-	-	0.0052 - 0.01	0.0143 - 0.0119
Salt Lake City, UT	0.003 - 0.0159	0.0083 - 0.0189	0.0114 - 0.0219	0.0312 - 0.0259
San Angelo, TX	-	-	0.0029 - 0.0055	0.0079 - 0.0066
San Antonio, TX	-	-	0.0108 - 0.0208	0.0297 - 0.0247
San Diego-Carlsbad-San Marcos, CA	0.0057 - 0.0299	0.0155 - 0.0354	0.0086 - 0.0165	0.0235 - 0.0196
San Francisco-Oakland-Fremont, CA	0.0129 - 0.0682	0.0354 - 0.0807	0.0114 - 0.022	0.0314 - 0.0261
San Jose-Sunnyvale-Santa Clara, CA	0.0042 - 0.022	0.0114 - 0.026	0.0093 - 0.0179	0.0255 - 0.0212
San Luis Obispo-Paso Robles, CA	-	-	0.0075 - 0.0146	0.0207 - 0.0172
Santa Barbara-Santa Maria-Goleta, CA	-	-	0.0139 - 0.0268	0.0381 - 0.0317
Santa Cruz-Watsonville, CA	-	-	0.0144 - 0.0277	0.0394 - 0.0328
Santa Fe, NM	-	-	0.0084 - 0.0162	0.023 - 0.0191
Santa Rosa-Petaluma, CA	-	-	0.0097 - 0.0187	0.0267 - 0.0222
Savannah, GA	-	-	0.007 - 0.0136	0.0193 - 0.0161
Scranton--Wilkes-Barre, PA	-	-	0.0046 - 0.0089	0.0127 - 0.0106
Seattle-Tacoma-Bellevue, WA	0.0016 - 0.0083	0.0043 - 0.0098	0.0172 - 0.0332	0.0473 - 0.0393
Sebastian-Vero Beach, FL	-	-	0.0046 - 0.0089	0.0127 - 0.0106
Sheboygan, WI	-	-	0.0093 - 0.018	0.0256 - 0.0213
Sherman-Denison, TX	-	-	0.0029 - 0.0055	0.0078 - 0.0065
Shreveport-Bossier City, LA	-	-	0.0115 - 0.0221	0.0314 - 0.0262
Sioux City, IA-NE-SD	-	-	0.0107 - 0.0207	0.0295 - 0.0245
Sioux Falls, SD	-	-	0.0044 - 0.0086	0.0122 - 0.0101
South Bend-Mishawaka, IN-MI	-	-	0.0095 - 0.0183	0.026 - 0.0217
Spartanburg, SC	-	-	0.0024 - 0.0046	0.0065 - 0.0054

Spokane, WA	-	-	0.0144 - 0.0277	0.0394 - 0.0328
Springfield, IL	-	-	0.0107 - 0.0206	0.0293 - 0.0244
Springfield, MO	-	-	0.002 - 0.0038	0.0054 - 0.0045
Springfield, OH	-	-	0.0058 - 0.0111	0.0158 - 0.0131
St. Cloud, MN	-	-	0.0073 - 0.0142	0.0201 - 0.0168
St. George, UT	-	-	0.0017 - 0.0034	0.0048 - 0.004
St. Joseph, MO-KS	-	-	0.0077 - 0.0149	0.0212 - 0.0176
St. Louis, MO-IL	0.0024 - 0.0128	0.0067 - 0.0152	0.0048 - 0.0093	0.0133 - 0.011
State College, PA	-	-	0.0135 - 0.026	0.037 - 0.0308
Stockton, CA	-	-	0.0093 - 0.0179	0.0255 - 0.0212
Sumter, SC	-	-	0.0188 - 0.0363	0.0517 - 0.043
Syracuse, NY	-	-	0.0074 - 0.0142	0.0202 - 0.0168
Tallahassee, FL	-	-	0.0077 - 0.0149	0.0212 - 0.0176
Tampa-St. Petersburg-Clearwater, FL	0.0002 - 0.0012	0.0006 - 0.0014	0.005 - 0.0096	0.0137 - 0.0114
Terre Haute, IN	-	-	0.0028 - 0.0054	0.0077 - 0.0064
Texarkana, TX-Texarkana, AR	-	-	0.0025 - 0.0049	0.007 - 0.0058
Topeka, KS	-	-	0.0086 - 0.0165	0.0235 - 0.0196
Tucson, AZ	-	-	0.0118 - 0.0227	0.0323 - 0.0269
Tulsa, OK	-	-	0.0026 - 0.005	0.0071 - 0.0059
Tuscaloosa, AL	-	-	0.0032 - 0.0062	0.0089 - 0.0074
Tyler, TX	-	-	0.0015 - 0.003	0.0042 - 0.0035
Utica-Rome, NY	-	-	0.0064 - 0.0123	0.0174 - 0.0145
Vallejo-Fairfield, CA	-	-	0.0274 - 0.0529	0.0753 - 0.0627
Victoria, TX	-	-	0.0105 - 0.0203	0.0289 - 0.0241
Virginia Beach-Norfolk-Newport News, VA-NC	-	-	0.0153 - 0.0294	0.0419 - 0.0348
Visalia-Porterville, CA	-	-	0.0064 - 0.0123	0.0175 - 0.0146
Waco, TX	-	-	0.0056 - 0.0108	0.0153 - 0.0128
Washington-Arlington-Alexandria, DC-VA-MD-WV	0.0139 - 0.0735	0.0381 - 0.087	0.0103 - 0.02	0.0284 - 0.0236

Waterloo-Cedar Falls, IA	-	-	0.0066 - 0.0127	0.018 - 0.015
Wausau, WI	-	-	0.0097 - 0.0187	0.0266 - 0.0222
Weirton-Steubenville, WV-OH	-	-	0.0053 - 0.0101	0.0144 - 0.012
Wenatchee, WA	-	-	0.016 - 0.0308	0.0439 - 0.0365
Wheeling, WV-OH	-	-	0.0045 - 0.0086	0.0122 - 0.0102
Wichita Falls, TX	-	-	0.0061 - 0.0118	0.0168 - 0.014
Wichita, KS	-	-	0.0047 - 0.009	0.0129 - 0.0107
Williamsport, PA	-	-	0.0081 - 0.0157	0.0223 - 0.0186
Winchester, VA-WV	-	-	0.0066 - 0.0128	0.0182 - 0.0151
Yakima, WA	-	-	0.0064 - 0.0123	0.0175 - 0.0145
York-Hanover, PA	-	-	0.0013 - 0.0025	0.0036 - 0.003
Youngstown-Warren-Boardman, OH-PA	-	-	0.0059 - 0.0114	0.0162 - 0.0135
Yuba City, CA	-	-	0.0143 - 0.0275	0.0392 - 0.0326
Yuma, AZ	-	-	0.0039 - 0.0075	0.0106 - 0.0088

TABLE **F 10 Productivity elasticities (based on population) rail and motor bus seat capacity per capita**

	Rail seat capacity per capita		**Motor bus seat capacity per capita**	
	Average payroll	**GDP per capita**	**Average payroll**	**GDP per capita**
Abilene, TX	-	-	0.0476 - 0.0463	0.1305 - 0.0548
Akron, OH	-	-	0.0219 - 0.0213	0.06 - 0.0252
Albany, GA	-	-	0.0367 - 0.0357	0.1006 - 0.0422
Albany-Schenectady-Troy, NY	-	-	0.0225 - 0.0218	0.0616 - 0.0259
Albuquerque, NM	-	-	0.017 - 0.0165	0.0467 - 0.0196
Alexandria, LA	-	-	0.0417 - 0.0406	0.1145 - 0.0481
Allentown-Bethlehem-Easton, PA-NJ	-	-	0.0097 - 0.0094	0.0265 - 0.0111
Altoona, PA	-	-	0.1494 - 0.1453	0.4099 - 0.1721
Amarillo, TX	-	-	0.0164 - 0.016	0.0451 - 0.0189
Ames, IA	-	-	0.6256 - 0.6086	1.7166 - 0.7207
Anchorage, AK	-	-	0.033 - 0.0321	0.0905 - 0.038
Anderson, IN	-	-	0.0465 - 0.0453	0.1277 - 0.0536
Ann Arbor, MI	-	-	0.0689 - 0.067	0.1891 - 0.0794
Anniston-Oxford, AL	-	-	0.0369 - 0.0359	0.1013 - 0.0425
Appleton, WI	-	-	0.0497 - 0.0483	0.1363 - 0.0572
Athens-Clarke County, GA	-	-	0.0555 - 0.054	0.1524 - 0.064
Atlanta-Sandy Springs-Marietta, GA	0.0131 - 0.0372	0.0361 - 0.0441	0.0027 - 0.0026	0.0074 - 0.0031
Auburn-Opelika, AL	-	-	0.0308 - 0.0299	0.0844 - 0.0354
Augusta-Richmond County, GA-SC	-	-	0.0053 - 0.0051	0.0145 - 0.0061
Austin-Round Rock, TX	-	-	0.0105 - 0.0102	0.0289 - 0.0121
Bakersfield, CA	-	-	0.0101 - 0.0098	0.0276 - 0.0116
Baltimore-Towson, MD	0.0751 - 0.2126	0.206 - 0.2518	0.0121 - 0.0118	0.0333 - 0.014
Bangor, ME	-	-	0.0485 - 0.0471	0.133 - 0.0558
Baton Rouge, LA	-	-	0.0081 - 0.0079	0.0222 - 0.0093
Battle Creek, MI	-	-	0.0802 - 0.078	0.22 - 0.0923
Bay City, MI	-	-	0.2233 - 0.2172	0.6127 - 0.2573

Beaumont-Port Arthur, TX	-	-	0.0142 - 0.0138	0.0388 - 0.0163
Bellingham, WA	-	-	0.113 - 0.11	0.3101 - 0.1302
Bend, OR	-	-	0.0476 - 0.0463	0.1305 - 0.0548
Billings, MT	-	-	0.0219 - 0.0213	0.06 - 0.0252
Binghamton, NY	-	-	0.0367 - 0.0357	0.1006 - 0.0422
Birmingham-Hoover, AL	-	-	0.0225 - 0.0218	0.0616 - 0.0259
Bismarck, ND	-	-	0.017 - 0.0165	0.0467 - 0.0196
Blacksburg-Christiansburg-Radford, VA	-	-	0.0417 - 0.0406	0.1145 - 0.0481
Bloomington, IN	-	-	0.0097 - 0.0094	0.0265 - 0.0111
Bloomington-Normal, IL	-	-	0.1494 - 0.1453	0.4099 - 0.1721
Boise City-Nampa, ID	-	-	0.0164 - 0.016	0.0451 - 0.0189
Bradenton-Sarasota-Venice, FL	-	-	0.6256 - 0.6086	1.7166 - 0.7207
Bremerton-Silverdale, WA	-	-	0.033 - 0.0321	0.0905 - 0.038
Brownsville-Harlingen, TX	-	-	0.0465 - 0.0453	0.1277 - 0.0536
Buffalo-Niagara Falls, NY	-	-	0.0689 - 0.067	0.1891 - 0.0794
Burlington-South Burlington, VT	-	-	0.0369 - 0.0359	0.1013 - 0.0425
Canton-Massillon, OH	-	-	0.0497 - 0.0483	0.1363 - 0.0572
Cape Coral-Fort Myers, FL	-	-	0.0555 - 0.054	0.1524 - 0.064
Carson City, NV	0.0131 - 0.0372	0.0361 - 0.0441	0.0027 - 0.0026	0.0074 - 0.0031
Casper, WY	-	-	0.0308 - 0.0299	0.0844 - 0.0354
Cedar Rapids, IA	-	-	0.0053 - 0.0051	0.0145 - 0.0061
Champaign-Urbana, IL	-	-	0.0105 - 0.0102	0.0289 - 0.0121
Charleston, WV	-	-	0.0101 - 0.0098	0.0276 - 0.0116
Charleston-North Charleston, SC	0.0751 - 0.2126	0.206 - 0.2518	0.0121 - 0.0118	0.0333 - 0.014
Charlotte-Gastonia-Concord, NC-SC	-	-	0.0485 - 0.0471	0.133 - 0.0558
Charlottesville, VA	-	-	0.0081 - 0.0079	0.0222 - 0.0093
Chattanooga, TN-GA	-	-	0.0802 - 0.078	0.22 - 0.0923
Cheyenne, WY	-	-	0.2233 - 0.2172	0.6127 - 0.2573
Chicago-Naperville-Joliet, IL-IN-WI	-	-	0.0142 - 0.0138	0.0388 - 0.0163
Chico, CA	-	-	0.113 - 0.11	0.3101 - 0.1302

Cincinnati-Middletown, OH-KY-IN	-	-	0.0476 - 0.0463	0.1305 - 0.0548
Clarksville, TN-KY	-	-	0.0219 - 0.0213	0.06 - 0.0252
Cleveland-Elyria-Mentor, OH	-	-	0.0367 - 0.0357	0.1006 - 0.0422
College Station-Bryan, TX	-	-	0.0225 - 0.0218	0.0616 - 0.0259
Colorado Springs, CO	-	-	0.017 - 0.0165	0.0467 - 0.0196
Columbia, MO	-	-	0.0417 - 0.0406	0.1145 - 0.0481
Columbia, SC	-	-	0.0097 - 0.0094	0.0265 - 0.0111
Columbus, GA-AL	-	-	0.1494 - 0.1453	0.4099 - 0.1721
Columbus, IN	-	-	0.0164 - 0.016	0.0451 - 0.0189
Columbus, OH	-	-	0.6256 - 0.6086	1.7166 - 0.7207
Corpus Christi, TX	-	-	0.033 - 0.0321	0.0905 - 0.038
Corvallis, OR	-	-	0.0465 - 0.0453	0.1277 - 0.0536
Cumberland, MD-WV	-	-	0.0689 - 0.067	0.1891 - 0.0794
Dallas-Fort Worth-Arlington, TX	-	-	0.0369 - 0.0359	0.1013 - 0.0425
Danville, IL	-	-	0.0497 - 0.0483	0.1363 - 0.0572
Davenport-Moline-Rock Island, IA-IL	-	-	0.0555 - 0.054	0.1524 - 0.064
Dayton, OH	0.0131 - 0.0372	0.0361 - 0.0441	0.0027 - 0.0026	0.0074 - 0.0031
Decatur, IL	-	-	0.0308 - 0.0299	0.0844 - 0.0354
Deltona-Daytona Beach-Ormond Beach, FL	-	-	0.0053 - 0.0051	0.0145 - 0.0061
Denver-Aurora, CO	-	-	0.0105 - 0.0102	0.0289 - 0.0121
Des Moines, IA	-	-	0.0101 - 0.0098	0.0276 - 0.0116
Detroit-Warren-Livonia, MI	0.0751 - 0.2126	0.206 - 0.2518	0.0121 - 0.0118	0.0333 - 0.014
Dubuque, IA	-	-	0.0485 - 0.0471	0.133 - 0.0558
Duluth, MN-WI	-	-	0.0081 - 0.0079	0.0222 - 0.0093
Eau Claire, WI	-	-	0.0802 - 0.078	0.22 - 0.0923
El Centro, CA	-	-	0.2233 - 0.2172	0.6127 - 0.2573
El Paso, TX	-	-	0.0142 - 0.0138	0.0388 - 0.0163
Elkhart-Goshen, IN	-	-	0.113 - 0.11	0.3101 - 0.1302
Elmira, NY	-	-	0.0476 - 0.0463	0.1305 - 0.0548

Erie, PA	-	-	0.0219 - 0.0213	0.06 - 0.0252
Eugene-Springfield, OR	-	-	0.0367 - 0.0357	0.1006 - 0.0422
Evansville, IN-KY	-	-	0.0225 - 0.0218	0.0616 - 0.0259
Fairbanks, AK	-	-	0.017 - 0.0165	0.0467 - 0.0196
Fargo, ND-MN	-	-	0.0417 - 0.0406	0.1145 - 0.0481
Farmington, NM	-	-	0.0097 - 0.0094	0.0265 - 0.0111
Fayetteville-Springdale-Rogers, AR-MO	-	-	0.1494 - 0.1453	0.4099 - 0.1721
Flagstaff, AZ	-	-	0.0164 - 0.016	0.0451 - 0.0189
Flint, MI	-	-	0.6256 - 0.6086	1.7166 - 0.7207
Florence, SC	-	-	0.033 - 0.0321	0.0905 - 0.038
Fond du Lac, WI	-	-	0.0465 - 0.0453	0.1277 - 0.0536
Fort Collins-Loveland, CO	-	-	0.0689 - 0.067	0.1891 - 0.0794
Fort Smith, AR-OK	-	-	0.0369 - 0.0359	0.1013 - 0.0425
Fort Walton Beach-Crestview-Destin, FL	-	-	0.0497 - 0.0483	0.1363 - 0.0572
Fort Wayne, IN	-	-	0.0555 - 0.054	0.1524 - 0.064
Fresno, CA	0.0131 - 0.0372	0.0361 - 0.0441	0.0027 - 0.0026	0.0074 - 0.0031
Gadsden, AL	-	-	0.0308 - 0.0299	0.0844 - 0.0354
Gainesville, FL	-	-	0.0053 - 0.0051	0.0145 - 0.0061
Gainesville, GA	-	-	0.0105 - 0.0102	0.0289 - 0.0121
Glens Falls, NY	-	-	0.0101 - 0.0098	0.0276 - 0.0116
Grand Forks, ND-MN	0.0751 - 0.2126	0.206 - 0.2518	0.0121 - 0.0118	0.0333 - 0.014
Grand Junction, CO	-	-	0.0485 - 0.0471	0.133 - 0.0558
Grand Rapids-Wyoming, MI	-	-	0.0081 - 0.0079	0.0222 - 0.0093
Great Falls, MT	-	-	0.0802 - 0.078	0.22 - 0.0923
Greeley, CO	-	-	0.2233 - 0.2172	0.6127 - 0.2573
Green Bay, WI	-	-	0.0142 - 0.0138	0.0388 - 0.0163
Greenville, SC	-	-	0.113 - 0.11	0.3101 - 0.1302
Gulfport-Biloxi, MS	-	-	0.0476 - 0.0463	0.1305 - 0.0548
Hagerstown-Martinsburg, MD-WV	-	-	0.0219 - 0.0213	0.06 - 0.0252
Hanford-Corcoran, CA	-	-	0.0367 - 0.0357	0.1006 - 0.0422

Harrisburg-Carlisle, PA	-	-	0.0225 - 0.0218	0.0616 - 0.0259
Hattiesburg, MS	-	-	0.017 - 0.0165	0.0467 - 0.0196
Holland-Grand Haven, MI	-	-	0.0417 - 0.0406	0.1145 - 0.0481
Honolulu, HI	-	-	0.0097 - 0.0094	0.0265 - 0.0111
Hot Springs, AR	-	-	0.1494 - 0.1453	0.4099 - 0.1721
Houston-Baytown-Sugar Land, TX	-	-	0.0164 - 0.016	0.0451 - 0.0189
Huntington-Ashland, WV-KY-OH	-	-	0.6256 - 0.6086	1.7166 - 0.7207
Huntsville, AL	-	-	0.033 - 0.0321	0.0905 - 0.038
Idaho Falls, ID	-	-	0.0465 - 0.0453	0.1277 - 0.0536
Indianapolis, IN	-	-	0.0689 - 0.067	0.1891 - 0.0794
Iowa City, IA	-	-	0.0369 - 0.0359	0.1013 - 0.0425
Ithaca, NY	-	-	0.0497 - 0.0483	0.1363 - 0.0572
Jackson, MI	-	-	0.0555 - 0.054	0.1524 - 0.064
Jackson, MS	0.0131 - 0.0372	0.0361 - 0.0441	0.0027 - 0.0026	0.0074 - 0.0031
Jackson, TN	-	-	0.0308 - 0.0299	0.0844 - 0.0354
Jacksonville, FL	-	-	0.0053 - 0.0051	0.0145 - 0.0061
Janesville, WI	-	-	0.0105 - 0.0102	0.0289 - 0.0121
Jefferson City, MO	-	-	0.0101 - 0.0098	0.0276 - 0.0116
Johnson City, TN	0.0751 - 0.2126	0.206 - 0.2518	0.0121 - 0.0118	0.0333 - 0.014
Johnstown, PA	-	-	0.0485 - 0.0471	0.133 - 0.0558
Jonesboro, AR	-	-	0.0081 - 0.0079	0.0222 - 0.0093
Kalamazoo-Portage, MI	-	-	0.0802 - 0.078	0.22 - 0.0923
Kankakee-Bradley, IL	-	-	0.2233 - 0.2172	0.6127 - 0.2573
Kansas City, MO-KS	-	-	0.0142 - 0.0138	0.0388 - 0.0163
Kennewick-Richland-Pasco, WA	-	-	0.113 - 0.11	0.3101 - 0.1302
Killeen-Temple-Fort Hood, TX	-	-	0.0476 - 0.0463	0.1305 - 0.0548
Kingsport-Bristol-Bristol, TN-VA	-	-	0.0219 - 0.0213	0.06 - 0.0252
Kingston, NY	-	-	0.0367 - 0.0357	0.1006 - 0.0422
Knoxville, TN	-	-	0.0225 - 0.0218	0.0616 - 0.0259
La Crosse, WI-MN	-	-	0.017 - 0.0165	0.0467 - 0.0196

Lafayette, IN	-	-	0.0417 - 0.0406	0.1145 - 0.0481
Lafayette, LA	-	-	0.0097 - 0.0094	0.0265 - 0.0111
Lake Charles, LA	-	-	0.1494 - 0.1453	0.4099 - 0.1721
Lakeland, FL	-	-	0.0164 - 0.016	0.0451 - 0.0189
Lancaster, PA	-	-	0.6256 - 0.6086	1.7166 - 0.7207
Lansing-East Lansing, MI	-	-	0.033 - 0.0321	0.0905 - 0.038
Laredo, TX	-	-	0.0465 - 0.0453	0.1277 - 0.0536
Las Cruces, NM	-	-	0.0689 - 0.067	0.1891 - 0.0794
Las Vegas-Paradise, NV	-	-	0.0369 - 0.0359	0.1013 - 0.0425
Lawrence, KS	-	-	0.0497 - 0.0483	0.1363 - 0.0572
Lawton, OK	-	-	0.0555 - 0.054	0.1524 - 0.064
Lebanon, PA	0.0131 - 0.0372	0.0361 - 0.0441	0.0027 - 0.0026	0.0074 - 0.0031
Lewiston, ID-WA	-	-	0.0308 - 0.0299	0.0844 - 0.0354
Lewiston-Auburn, ME	-	-	0.0053 - 0.0051	0.0145 - 0.0061
Lexington-Fayette, KY	-	-	0.0105 - 0.0102	0.0289 - 0.0121
Lima, OH	-	-	0.0101 - 0.0098	0.0276 - 0.0116
Lincoln, NE	0.0751 - 0.2126	0.206 - 0.2518	0.0121 - 0.0118	0.0333 - 0.014
Little Rock-North Little Rock, AR	-	-	0.0485 - 0.0471	0.133 - 0.0558
Logan, UT-ID	-	-	0.0081 - 0.0079	0.0222 - 0.0093
Longview, TX	-	-	0.0802 - 0.078	0.22 - 0.0923
Longview, WA	-	-	0.2233 - 0.2172	0.6127 - 0.2573
Los Angeles-Long Beach-Santa Ana, CA	-	-	0.0142 - 0.0138	0.0388 - 0.0163
Louisville, KY-IN	-	-	0.113 - 0.11	0.3101 - 0.1302
Lubbock, TX	-	-	0.0476 - 0.0463	0.1305 - 0.0548
Lynchburg, VA	-	-	0.0219 - 0.0213	0.06 - 0.0252
Macon, GA	-	-	0.0367 - 0.0357	0.1006 - 0.0422
Madera, CA	-	-	0.0225 - 0.0218	0.0616 - 0.0259
Madison, WI	-	-	0.017 - 0.0165	0.0467 - 0.0196
Mansfield, OH	-	-	0.0417 - 0.0406	0.1145 - 0.0481
McAllen-Edinburg-Pharr, TX	-	-	0.0097 - 0.0094	0.0265 - 0.0111

Medford, OR	-	-	0.1494 - 0.1453	0.4099 - 0.1721
Memphis, TN-MS-AR	-	-	0.0164 - 0.016	0.0451 - 0.0189
Merced, CA	-	-	0.6256 - 0.6086	1.7166 - 0.7207
Miami-Fort Lauderdale-Miami Beach, FL	-	-	0.033 - 0.0321	0.0905 - 0.038
Michigan City-La Porte, IN	-	-	0.0465 - 0.0453	0.1277 - 0.0536
Milwaukee-Waukesha-West Allis, WI	-	-	0.0689 - 0.067	0.1891 - 0.0794
Minneapolis-St. Paul-Bloomington, MN-WI	-	-	0.0369 - 0.0359	0.1013 - 0.0425
Missoula, MT	-	-	0.0497 - 0.0483	0.1363 - 0.0572
Mobile, AL	-	-	0.0555 - 0.054	0.1524 - 0.064
Modesto, CA	0.0131 - 0.0372	0.0361 - 0.0441	0.0027 - 0.0026	0.0074 - 0.0031
Monroe, LA	-	-	0.0308 - 0.0299	0.0844 - 0.0354
Montgomery, AL	-	-	0.0053 - 0.0051	0.0145 - 0.0061
Morgantown, WV	-	-	0.0105 - 0.0102	0.0289 - 0.0121
Mount Vernon-Anacortes, WA	-	-	0.0101 - 0.0098	0.0276 - 0.0116
Muncie, IN	0.0751 - 0.2126	0.206 - 0.2518	0.0121 - 0.0118	0.0333 - 0.014
Muskegon-Norton Shores, MI	-	-	0.0485 - 0.0471	0.133 - 0.0558
Myrtle Beach-Conway-North Myrtle Beach, SC	-	-	0.0081 - 0.0079	0.0222 - 0.0093
Napa, CA	-	-	0.0802 - 0.078	0.22 - 0.0923
Naples-Marco Island, FL	-	-	0.2233 - 0.2172	0.6127 - 0.2573
Nashville-Davidson-Murfreesboro, TN	-	-	0.0142 - 0.0138	0.0388 - 0.0163
New Orleans-Metairie-Kenner, LA	-	-	0.113 - 0.11	0.3101 - 0.1302
New York-Northern New Jersey-Long Island, NY-NJ-PA	-	-	0.0476 - 0.0463	0.1305 - 0.0548
Niles-Benton Harbor, MI	-	-	0.0219 - 0.0213	0.06 - 0.0252
Ocala, FL	-	-	0.0367 - 0.0357	0.1006 - 0.0422
Odessa, TX	-	-	0.0225 - 0.0218	0.0616 - 0.0259
Oklahoma City, OK	-	-	0.017 - 0.0165	0.0467 - 0.0196
Olympia, WA	-	-	0.0417 - 0.0406	0.1145 - 0.0481
Omaha-Council Bluffs, NE-IA	-	-	0.0097 - 0.0094	0.0265 - 0.0111

Orlando, FL	-	-	0.1494 - 0.1453	0.4099 - 0.1721
Oshkosh-Neenah, WI	-	-	0.0164 - 0.016	0.0451 - 0.0189
Owensboro, KY	-	-	0.6256 - 0.6086	1.7166 - 0.7207
Oxnard-Thousand Oaks-Ventura, CA	-	-	0.033 - 0.0321	0.0905 - 0.038
Palm Bay-Melbourne-Titusville, FL	-	-	0.0465 - 0.0453	0.1277 - 0.0536
Panama City-Lynn Haven, FL	-	-	0.0689 - 0.067	0.1891 - 0.0794
Parkersburg-Marietta, WV-OH	-	-	0.0369 - 0.0359	0.1013 - 0.0425
Pensacola-Ferry Pass-Brent, FL	-	-	0.0497 - 0.0483	0.1363 - 0.0572
Peoria, IL	-	-	0.0555 - 0.054	0.1524 - 0.064
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	0.0131 - 0.0372	0.0361 - 0.0441	0.0027 - 0.0026	0.0074 - 0.0031
Phoenix-Mesa-Scottsdale, AZ	-	-	0.0308 - 0.0299	0.0844 - 0.0354
Pine Bluff, AR	-	-	0.0053 - 0.0051	0.0145 - 0.0061
Pittsburgh, PA	-	-	0.0105 - 0.0102	0.0289 - 0.0121
Pocatello, ID	-	-	0.0101 - 0.0098	0.0276 - 0.0116
Port St. Lucie-Fort Pierce, FL	0.0751 - 0.2126	0.206 - 0.2518	0.0121 - 0.0118	0.0333 - 0.014
Portland-South Portland-Biddeford, ME	-	-	0.0485 - 0.0471	0.133 - 0.0558
Portland-Vancouver-Beaverton, OR-WA	-	-	0.0081 - 0.0079	0.0222 - 0.0093
Poughkeepsie-Newburgh-Middletown, NY	-	-	0.0802 - 0.078	0.22 - 0.0923
Providence-New Bedford-Fall River, RI-MA	-	-	0.2233 - 0.2172	0.6127 - 0.2573
Pueblo, CO	-	-	0.0142 - 0.0138	0.0388 - 0.0163
Racine, WI	-	-	0.113 - 0.11	0.3101 - 0.1302
Rapid City, SD	-	-	0.0476 - 0.0463	0.1305 - 0.0548
Reading, PA	-	-	0.0219 - 0.0213	0.06 - 0.0252
Redding, CA	-	-	0.0367 - 0.0357	0.1006 - 0.0422
Reno-Sparks, NV	-	-	0.0225 - 0.0218	0.0616 - 0.0259
Richmond, VA	-	-	0.017 - 0.0165	0.0467 - 0.0196
Riverside-San Bernardino-Ontario, CA	-	-	0.0417 - 0.0406	0.1145 - 0.0481
Roanoke, VA	-	-	0.0097 - 0.0094	0.0265 - 0.0111

Rochester, NY	-	-	0.1494 - 0.1453	0.4099 - 0.1721
Rockford, IL	-	-	0.0164 - 0.016	0.0451 - 0.0189
Rome, GA	-	-	0.6256 - 0.6086	1.7166 - 0.7207
Sacramento-Arden-Arcade-Roseville, CA	-	-	0.033 - 0.0321	0.0905 - 0.038
Saginaw-Saginaw Township North, MI	-	-	0.0465 - 0.0453	0.1277 - 0.0536
Salem, OR	-	-	0.0689 - 0.067	0.1891 - 0.0794
Salinas, CA	-	-	0.0369 - 0.0359	0.1013 - 0.0425
Salisbury, MD	-	-	0.0497 - 0.0483	0.1363 - 0.0572
Salt Lake City, UT	-	-	0.0555 - 0.054	0.1524 - 0.064
San Angelo, TX	0.0131 - 0.0372	0.0361 - 0.0441	0.0027 - 0.0026	0.0074 - 0.0031
San Antonio, TX	-	-	0.0308 - 0.0299	0.0844 - 0.0354
San Diego-Carlsbad-San Marcos, CA	-	-	0.0053 - 0.0051	0.0145 - 0.0061
San Francisco-Oakland-Fremont, CA	-	-	0.0105 - 0.0102	0.0289 - 0.0121
San Jose-Sunnyvale-Santa Clara, CA	-	-	0.0101 - 0.0098	0.0276 - 0.0116
San Luis Obispo-Paso Robles, CA	0.0751 - 0.2126	0.206 - 0.2518	0.0121 - 0.0118	0.0333 - 0.014
Santa Barbara-Santa Maria-Goleta, CA	-	-	0.0485 - 0.0471	0.133 - 0.0558
Santa Cruz-Watsonville, CA	-	-	0.0081 - 0.0079	0.0222 - 0.0093
Santa Fe, NM	-	-	0.0802 - 0.078	0.22 - 0.0923
Santa Rosa-Petaluma, CA	-	-	0.2233 - 0.2172	0.6127 - 0.2573
Savannah, GA	-	-	0.0142 - 0.0138	0.0388 - 0.0163
Scranton--Wilkes-Barre, PA	-	-	0.113 - 0.11	0.3101 - 0.1302
Seattle-Tacoma-Bellevue, WA	-	-	0.0476 - 0.0463	0.1305 - 0.0548
Sebastian-Vero Beach, FL	-	-	0.0219 - 0.0213	0.06 - 0.0252
Sheboygan, WI	-	-	0.0367 - 0.0357	0.1006 - 0.0422
Sherman-Denison, TX	-	-	0.0225 - 0.0218	0.0616 - 0.0259
Shreveport-Bossier City, LA	-	-	0.017 - 0.0165	0.0467 - 0.0196
Sioux City, IA-NE-SD	-	-	0.0417 - 0.0406	0.1145 - 0.0481
Sioux Falls, SD	-	-	0.0097 - 0.0094	0.0265 - 0.0111
South Bend-Mishawaka, IN-MI	-	-	0.1494 - 0.1453	0.4099 - 0.1721
Spartanburg, SC	-	-	0.0164 - 0.016	0.0451 - 0.0189

Spokane, WA	-	-	0.6256 - 0.6086	1.7166 - 0.7207
Springfield, IL	-	-	0.033 - 0.0321	0.0905 - 0.038
Springfield, MO	-	-	0.0465 - 0.0453	0.1277 - 0.0536
Springfield, OH	-	-	0.0689 - 0.067	0.1891 - 0.0794
St. Cloud, MN	-	-	0.0369 - 0.0359	0.1013 - 0.0425
St. George, UT	-	-	0.0497 - 0.0483	0.1363 - 0.0572
St. Joseph, MO-KS	-	-	0.0555 - 0.054	0.1524 - 0.064
St. Louis, MO-IL	0.0131 - 0.0372	0.0361 - 0.0441	0.0027 - 0.0026	0.0074 - 0.0031
State College, PA	-	-	0.0308 - 0.0299	0.0844 - 0.0354
Stockton, CA	-	-	0.0053 - 0.0051	0.0145 - 0.0061
Sumter, SC	-	-	0.0105 - 0.0102	0.0289 - 0.0121
Syracuse, NY	-	-	0.0101 - 0.0098	0.0276 - 0.0116
Tallahassee, FL	0.0751 - 0.2126	0.206 - 0.2518	0.0121 - 0.0118	0.0333 - 0.014
Tampa-St. Petersburg-Clearwater, FL	-	-	0.0485 - 0.0471	0.133 - 0.0558
Terre Haute, IN	-	-	0.0081 - 0.0079	0.0222 - 0.0093
Texarkana, TX-Texarkana, AR	-	-	0.0802 - 0.078	0.22 - 0.0923
Topeka, KS	-	-	0.2233 - 0.2172	0.6127 - 0.2573
Tucson, AZ	-	-	0.0142 - 0.0138	0.0388 - 0.0163
Tulsa, OK	-	-	0.113 - 0.11	0.3101 - 0.1302
Tuscaloosa, AL	-	-	0.0476 - 0.0463	0.1305 - 0.0548
Tyler, TX	-	-	0.0219 - 0.0213	0.06 - 0.0252
Utica-Rome, NY	-	-	0.0367 - 0.0357	0.1006 - 0.0422
Vallejo-Fairfield, CA	-	-	0.0225 - 0.0218	0.0616 - 0.0259
Victoria, TX	-	-	0.017 - 0.0165	0.0467 - 0.0196
Virginia Beach-Norfolk-Newport News, VA-NC	-	-	0.0417 - 0.0406	0.1145 - 0.0481
Visalia-Porterville, CA	-	-	0.0097 - 0.0094	0.0265 - 0.0111
Waco, TX	-	-	0.1494 - 0.1453	0.4099 - 0.1721
Washington-Arlington-Alexandria, DC-VA-MD-WV	-	-	0.0164 - 0.016	0.0451 - 0.0189

Waterloo-Cedar Falls, IA	-	-	0.6256 - 0.6086	1.7166 - 0.7207
Wausau, WI	-	-	0.033 - 0.0321	0.0905 - 0.038
Weirton-Steubenville, WV-OH	-	-	0.0465 - 0.0453	0.1277 - 0.0536
Wenatchee, WA	-	-	0.0689 - 0.067	0.1891 - 0.0794
Wheeling, WV-OH	-	-	0.0369 - 0.0359	0.1013 - 0.0425
Wichita Falls, TX	-	-	0.0497 - 0.0483	0.1363 - 0.0572
Wichita, KS	-	-	0.0555 - 0.054	0.1524 - 0.064
Williamsport, PA	0.0131 - 0.0372	0.0361 - 0.0441	0.0027 - 0.0026	0.0074 - 0.0031
Winchester, VA-WV	-	-	0.0308 - 0.0299	0.0844 - 0.0354
Yakima, WA	-	-	0.0053 - 0.0051	0.0145 - 0.0061
York-Hanover, PA	-	-	0.0105 - 0.0102	0.0289 - 0.0121
Youngstown-Warren-Boardman, OH-PA	-	-	0.0101 - 0.0098	0.0276 - 0.0116
Yuba City, CA	0.0751 - 0.2126	0.206 - 0.2518	0.0121 - 0.0118	0.0333 - 0.014
Yuma, AZ	-	-	0.0485 - 0.0471	0.133 - 0.0558

APPENDIX G: MARGINAL PRODUCTIVITY CHANGES (FOR A 1% INCREASE IN TRANSIT INVESTMENT)

TABLE G 1 Average change per 1% change in track miles/track miles per capita

	Average wage changes						Average GDP per capita changes					
MSA name	OLS-emp	OLS-pop	OLS-total	IV-emp	IV-pop	IV-total	OLS-emp	OLS-pop	OLS-total	IV-emp	IV-pop	IV-total
Albuquerque, NM	$0.71	$70.09	$70.80	$5.01	$126.11	$131.11	$3.06	$159.47	$162.53	$9.29	$363.54	$372.83
Atlanta-Sandy Springs-Marietta, GA	$0.86	$2.55	$3.41	$6.05	$4.59	$10.65	$3.98	$6.26	$10.24	$12.11	$14.27	$26.38
Baltimore-Towson, MD	$1.29	$22.25	$23.54	$9.09	$40.03	$49.12	$5.06	$46.13	$51.19	$15.37	$105.16	$120.53
Buffalo-Niagara Falls, NY	$0.11	$6.07	$6.18	$0.75	$10.93	$11.68	$0.46	$14.03	$14.49	$1.41	$31.98	$33.39
Charlotte-Gastonia-Concord, NC-SC	$0.62	$4.89	$5.50	$4.33	$8.80	$13.13	$3.79	$15.95	$19.75	$11.53	$36.37	$47.90
Chicago-Naperville-Joliet, IL-IN-WI	$10.16	$12.69	$22.85	$71.56	$22.83	$94.39	$46.32	$30.61	$76.93	$140.76	$69.78	$210.55
Cleveland-Elyria-Mentor, OH	$0.60	$10.88	$11.48	$4.22	$19.58	$23.80	$2.84	$27.23	$30.06	$8.62	$62.07	$70.68
Dallas-Fort Worth-Arlington, TX	$2.14	$3.36	$5.50	$15.08	$6.05	$21.13	$10.94	$9.09	$20.03	$33.25	$20.72	$53.96
Denver-Aurora, CO	$0.63	$8.71	$9.34	$4.41	$15.68	$20.08	$2.93	$21.58	$24.51	$8.89	$49.19	$58.09
Houston-Baytown-Sugar Land, TX	$0.31	$0.76	$1.07	$2.18	$1.38	$3.55	$1.75	$2.29	$4.04	$5.32	$5.22	$10.54
Little Rock-North Little Rock, AR	$0.08	$9.19	$9.28	$0.57	$16.54	$17.11	$0.35	$21.19	$21.54	$1.07	$48.30	$49.37
Los Angeles-Long Beach-Santa Ana, CA	$6.39	$4.67	$11.06	$45.00	$8.40	$53.40	$31.07	$12.01	$43.08	$94.43	$27.38	$121.82
Memphis, TN-MS-AR	$0.18	$5.48	$5.66	$1.27	$9.86	$11.13	$0.86	$13.93	$14.79	$2.63	$31.75	$34.38
Miami-Fort Lauderdale-Miami Beach, FL	$1.22	$4.26	$5.48	$8.59	$7.67	$16.26	$5.94	$10.99	$16.92	$18.04	$25.05	$43.09
Minneapolis-St. Paul-Bloomington, MN-WI	$0.21	$1.89	$2.10	$1.51	$3.39	$4.90	$0.92	$4.32	$5.24	$2.81	$9.84	$12.65
Nashville-Davidson--Murfreesboro, TN	$0.90	$17.96	$18.86	$6.35	$32.31	$38.67	$4.22	$44.47	$48.69	$12.83	$101.37	$114.20
New Orleans-Metairie-Kenner, LA	$0.26	$13.18	$13.44	$1.81	$23.72	$25.53	$1.57	$42.56	$44.14	$4.77	$97.03	$101.80
New York-Northern New Jersey-Long Island, NY-NJ-PA	$8.96	$7.32	$16.28	$63.12	$13.17	$76.29	$40.26	$17.40	$57.66	$122.35	$39.67	$162.02
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	$3.87	$15.52	$19.39	$27.26	$27.93	$55.19	$18.72	$39.73	$58.44	$56.88	$90.56	$147.44
Pittsburgh, PA	$0.23	$5.43	$5.66	$1.59	$9.77	$11.36	$1.10	$14.02	$15.12	$3.34	$31.97	$35.31
Portland-Vancouver-Beaverton, OR-WA	$0.80	$14.34	$15.14	$5.67	$25.80	$31.47	$3.74	$35.30	$39.05	$11.37	$80.48	$91.86
Providence-New Bedford-Fall River, RI-MA	$0.11	$3.49	$3.60	$0.76	$6.29	$7.05	$0.49	$8.27	$8.75	$1.48	$18.85	$20.32
Sacramento--Arden-Arcade--Roseville, CA	$0.73	$11.79	$12.52	$5.17	$21.21	$26.38	$2.81	$23.90	$26.71	$8.55	$54.48	$63.03

St. Louis, MO-IL	$0.67	$8.23	$8.90	$4.71	$14.80	$19.51	$2.89	$18.80	$21.69	$8.78	$42.87	$51.64
Salt Lake City, UT	$0.22	$20.17	$20.39	$1.55	$36.29	$37.84	$1.02	$49.49	$50.51	$3.11	$112.81	$115.92
San Diego-Carlsbad-San Marcos, CA	$1.73	$15.19	$16.92	$12.20	$27.33	$39.53	$7.81	$36.23	$44.04	$23.74	$82.59	$106.33
San Francisco-Oakland-Fremont, CA	$2.78	$21.01	$23.80	$19.60	$37.81	$57.41	$12.40	$49.57	$61.98	$37.70	$113.01	$150.71
San Jose-Sunnyvale-Santa Clara, CA	$4.00	$123.39	$127.39	$28.20	$222.02	$250.21	$16.44	$268.09	$284.53	$49.95	$611.15	$661.11
Seattle-Tacoma-Bellevue, WA	$1.30	$13.30	$14.60	$9.17	$23.92	$33.10	$5.83	$31.48	$37.31	$17.71	$71.77	$89.48
Tampa-St. Petersburg-Clearwater, FL	$0.04	$0.41	$0.45	$0.26	$0.74	$1.00	$0.17	$0.98	$1.15	$0.51	$2.23	$2.74
Trenton-Ewing, NJ	$0.13	$94.13	$94.26	$0.94	$169.36	$170.30	$0.50	$185.19	$185.68	$1.51	$422.16	$423.67
Washington-Arlington-Alexandria, DC-VA-MD-WV	$3.45	$20.82	$24.26	$24.28	$37.45	$61.73	$13.76	$43.98	$57.74	$41.83	$100.25	$142.08

TABLE **G 2 Average change per 1 mile change in track miles/track miles per capita**

		Average wage changes						**Average GDP per capita changes**					
MSA name	percent associated with 1 mile change	OLS-emp	OLS-pop	OLS-total	IV-emp	IV-pop	IV-total	OLS-emp	OLS-pop	OLS-total	IV-emp	IV-pop	IV-total
Albuquerque, NM	2.38%	$1.69	$166.87	$168.56	$11.92	$300.25	$312.17	$7.28	$379.70	$386.98	$22.12	$865.58	$887.70
Atlanta-Sandy Springs-Marietta, GA	2.02%	$1.74	$5.16	$6.89	$12.23	$9.28	$21.51	$8.05	$12.65	$20.69	$24.46	$28.83	$53.29
Baltimore-Towson, MD	0.93%	$1.21	$20.79	$22.00	$8.50	$37.41	$45.90	$4.73	$43.11	$47.84	$14.36	$98.28	$112.65
Buffalo-Niagara Falls, NY	15.63%	$1.66	$94.89	$96.56	$11.72	$170.74	$182.46	$7.26	$219.17	$226.43	$22.07	$499.63	$521.70
Charlotte-Gastonia-Concord, NC-SC	10.42%	$6.41	$50.93	$57.34	$45.14	$91.63	$136.78	$39.52	$166.18	$205.71	$120.12	$378.84	$498.96
Chicago-Naperville-Joliet, IL-IN-WI	0.14%	$1.47	$1.84	$3.31	$10.35	$3.30	$13.65	$6.70	$4.43	$11.13	$20.36	$10.09	$30.46
Cleveland-Elyria-Mentor, OH	2.90%	$1.74	$31.54	$33.27	$12.24	$56.74	$68.99	$8.22	$78.92	$87.14	$24.98	$179.90	$204.88
Dallas-Fort Worth-Arlington, TX	1.18%	$2.53	$3.97	$6.51	$17.83	$7.15	$24.98	$12.93	$10.74	$23.67	$39.30	$24.49	$63.79
Denver-Aurora, CO	2.89%	$1.81	$25.19	$26.99	$12.73	$45.32	$58.05	$8.46	$62.37	$70.82	$25.71	$142.17	$167.88
Houston-Baytown-Sugar Land, TX	6.99%	$2.16	$5.35	$7.51	$15.22	$9.62	$24.84	$12.24	$16.02	$28.26	$37.19	$36.53	$73.72
Little Rock-North Little Rock, AR	29.41%	$2.37	$270.44	$272.81	$16.71	$486.60	$503.31	$10.33	$623.14	$633.47	$31.40	$1,420.53	$1,451.93
Los Angeles-Long Beach-Santa Ana, CA	0.21%	$1.33	$0.97	$2.30	$9.35	$1.75	$11.10	$6.46	$2.50	$8.95	$19.62	$5.69	$25.31
Memphis, TN-MS-AR	14.29%	$2.57	$78.32	$80.89	$18.11	$140.92	$159.03	$12.34	$198.99	$211.33	$37.52	$453.62	$491.14
Miami-Fort Lauderdale-Miami Beach, FL	1.04%	$1.27	$4.45	$5.73	$8.97	$8.01	$16.98	$6.20	$11.47	$17.67	$18.83	$26.14	$44.98
Minneapolis-St. Paul-Bloomington, MN-WI	8.26%	$1.77	$15.59	$17.36	$12.44	$28.05	$40.50	$7.64	$35.67	$43.31	$23.21	$81.33	$104.54
Nashville-Davidson--Murfreesboro, TN	3.13%	$2.82	$56.12	$58.94	$19.86	$100.98	$120.84	$13.19	$138.96	$152.15	$40.09	$316.78	$356.86
New Orleans-Metairie-Kenner, LA	7.75%	$2.00	$102.19	$104.19	$14.05	$183.88	$197.93	$12.17	$329.96	$342.13	$37.00	$752.19	$789.19
New York-Northern New Jersey-Long Island, NY-NJ-PA	0.08%	$0.72	$0.59	$1.31	$5.08	$1.06	$6.14	$3.24	$1.40	$4.64	$9.84	$3.19	$13.03
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	0.30%	$1.15	$4.62	$5.77	$8.11	$8.31	$16.41	$5.57	$11.82	$17.38	$16.92	$26.94	$43.86
Pittsburgh, PA	4.55%	$1.02	$24.68	$25.71	$7.21	$44.41	$51.62	$4.99	$63.74	$68.74	$15.18	$145.31	$160.49
Portland-Vancouver-Beaverton, OR-WA	2.07%	$1.66	$29.63	$31.29	$11.71	$53.31	$65.02	$7.73	$72.94	$80.68	$23.50	$166.28	$189.78
Providence-New Bedford-Fall River, RI-MA	14.71%	$1.60	$51.37	$52.97	$11.24	$92.43	$103.67	$7.14	$121.60	$128.74	$21.70	$277.20	$298.89

Sacramento--Arden-Arcade--Roseville, CA	2.71%	$1.99	$31.94	$33.93	$14.02	$57.47	$71.49	$7.63	$64.76	$72.39	$23.18	$147.64	$170.82
St. Louis, MO-IL	2.18%	$1.46	$17.92	$19.38	$10.26	$32.25	$42.51	$6.29	$40.97	$47.26	$19.12	$93.39	$112.51
Salt Lake City, UT	5.26%	$1.16	$106.15	$107.31	$8.17	$190.99	$199.16	$5.38	$260.45	$265.83	$16.35	$593.73	$610.08
San Diego-Carlsbad-San Marcos, CA	1.08%	$1.87	$16.35	$18.21	$13.14	$29.42	$42.55	$8.41	$39.00	$47.41	$25.55	$88.90	$114.45
San Francisco-Oakland-Fremont, CA	0.54%	$1.49	$11.27	$12.76	$10.51	$20.27	$30.78	$6.65	$26.58	$33.23	$20.21	$60.59	$80.81
San Jose-Sunnyvale-Santa Clara, CA	0.63%	$2.53	$77.90	$80.43	$17.80	$140.16	$157.96	$10.38	$169.25	$179.63	$31.54	$385.83	$417.36
Seattle-Tacoma-Bellevue, WA	1.15%	$1.50	$15.32	$16.82	$10.57	$27.56	$38.13	$6.71	$36.27	$42.98	$20.41	$82.68	$103.09
Tampa-St. Petersburg-Clearwater, FL	41.67%	$1.55	$17.07	$18.61	$10.88	$30.71	$41.59	$6.98	$40.80	$47.78	$21.21	$93.01	$114.22
Trenton-Ewing, NJ	14.49%	$1.93	$1,364.14	$1,366.07	$13.61	$2,454.49	$2,468.10	$7.18	$2,683.88	$2,691.06	$21.83	$6,118.29	$6,140.12
Washington-Arlington-Alexandria, DC-VA-MD-WV	0.31%	$1.05	$6.37	$7.42	$7.43	$11.45	$18.88	$4.21	$13.45	$17.66	$12.79	$30.66	$43.45

TABLE **G 3 Average change per 1% change in rail revenue miles**

	Average wage changes						**Average GDP per capita changes**					
MSA name	OLS-emp	OLS-pop	OLS-total	IV-emp	IV-pop	IV-total	OLS-emp	OLS-pop	OLS-total	IV-emp	IV-pop	IV-total
Atlanta-Sandy Springs-Marietta, GA	$2.35	$5.70	$8.05	$8.00	$13.06	$21.06	$10.86	$26.42	$37.29	$16.00	$26.10	$42.10
Baltimore-Towson, MD	$1.33	$9.31	$10.63	$4.52	$21.30	$25.82	$5.19	$36.45	$41.65	$7.65	$36.01	$43.66
Buffalo-Niagara Falls, NY	$0.20	$1.91	$2.10	$0.67	$4.36	$5.03	$0.85	$8.31	$9.17	$1.26	$8.21	$9.47
Charlotte-Gastonia-Concord, NC-SC	$0.69	$1.43	$2.12	$2.36	$3.26	$5.63	$4.26	$8.79	$13.06	$6.28	$8.69	$14.97
Chicago-Naperville-Joliet, IL-IN-WI	$18.79	$33.97	$52.77	$64.14	$77.75	$141.89	$85.66	$154.83	$240.49	$126.17	$152.95	$279.12
Cleveland-Elyria-Mentor, OH	$1.06	$6.14	$7.20	$3.63	$14.06	$17.68	$5.03	$29.03	$34.06	$7.40	$28.68	$36.08
Dallas-Fort Worth-Arlington, TX	$2.41	$3.63	$6.05	$8.24	$8.31	$16.55	$12.33	$18.54	$30.87	$18.15	$18.32	$36.47
Denver-Aurora, CO	$2.07	$10.98	$13.06	$7.07	$25.14	$32.21	$9.70	$51.38	$61.08	$14.28	$50.76	$65.04
Houston-Baytown-Sugar Land, TX	$0.52	$1.11	$1.63	$1.76	$2.55	$4.31	$2.93	$6.31	$9.23	$4.31	$6.23	$10.54
Little Rock-North Little Rock, AR	$0.04	$0.46	$0.50	$0.13	$1.05	$1.18	$0.17	$1.99	$2.16	$0.25	$1.97	$2.22
Los Angeles-Long Beach-Santa Ana, CA	$13.10	$18.59	$31.70	$44.72	$42.55	$87.27	$63.71	$90.38	$154.09	$93.83	$89.29	$183.12
Memphis, TN-MS-AR	$0.36	$2.15	$2.51	$1.22	$4.92	$6.14	$1.71	$10.31	$12.03	$2.53	$10.19	$12.71
Miami-Fort Lauderdale-Miami Beach, FL	$0.90	$2.63	$3.53	$3.07	$6.02	$9.09	$4.37	$12.80	$17.17	$6.44	$12.64	$19.09
Minneapolis-St. Paul-Bloomington, MN-WI	$0.57	$2.49	$3.07	$1.96	$5.71	$7.67	$2.48	$10.78	$13.26	$3.65	$10.65	$14.30
Nashville-Davidson--Murfreesboro, TN	$0.08	$0.39	$0.48	$0.29	$0.90	$1.19	$0.39	$1.85	$2.24	$0.58	$1.82	$2.40

New Orleans-Metairie-Kenner, LA	$0.47	$4.27	$4.74	$1.60	$9.77	$11.37	$2.86	$26.02	$28.88	$4.21	$25.71	$29.92
New York-Northern New Jersey-Long Island, NY-NJ-PA	$15.73	$37.07	$52.80	$53.68	$84.84	$138.52	$70.65	$166.47	$237.12	$104.06	$164.45	$268.51
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	$5.22	$18.90	$24.12	$17.80	$43.27	$61.07	$25.22	$91.40	$116.62	$37.15	$90.29	$127.44
Pittsburgh, PA	$0.39	$3.34	$3.73	$1.32	$7.65	$8.97	$1.89	$16.30	$18.19	$2.78	$16.10	$18.88
Portland-Vancouver-Beaverton, OR-WA	$1.98	$11.83	$13.81	$6.76	$27.08	$33.84	$9.21	$55.02	$64.24	$13.57	$54.36	$67.92
Sacramento--Arden-Arcade--Roseville, CA	$0.99	$5.10	$6.10	$3.40	$11.68	$15.07	$3.81	$19.54	$23.35	$5.61	$19.30	$24.92
St. Louis, MO-IL	$1.53	$8.07	$9.60	$5.22	$18.46	$23.68	$6.60	$34.84	$41.44	$9.73	$34.41	$44.14
Salt Lake City, UT	$0.59	$9.06	$9.64	$2.00	$20.73	$22.73	$2.72	$41.99	$44.70	$4.00	$41.48	$45.48
San Diego-Carlsbad-San Marcos, CA	$2.12	$8.53	$10.65	$7.24	$19.53	$26.77	$9.55	$38.46	$48.01	$14.07	$37.99	$52.06
San Francisco-Oakland-Fremont, CA	$15.42	$75.46	$90.88	$52.63	$172.72	$225.35	$68.73	$336.30	$405.03	$101.23	$332.23	$433.45
San Jose-Sunnyvale-Santa Clara, CA	$1.66	$14.06	$15.71	$5.65	$32.18	$37.83	$6.80	$57.70	$64.50	$10.01	$57.00	$67.01
Seattle-Tacoma-Bellevue, WA	$0.16	$0.83	$0.99	$0.54	$1.90	$2.45	$0.71	$3.72	$4.44	$1.05	$3.68	$4.73
Tampa-St. Petersburg-Clearwater, FL	$0.04	$0.18	$0.22	$0.13	$0.41	$0.55	$0.18	$0.81	$0.99	$0.26	$0.80	$1.06
Washington-Arlington-Alexandria, DC-VA-MD-WV	$5.33	$26.34	$31.68	$18.20	$60.30	$78.50	$21.29	$105.14	$126.43	$31.36	$103.87	$135.22

TABLE **G 4 Average change per 1% change in total revenue miles**

	Average wage changes						Average GDP per capita changes					
name	OLS-emp	OLS-pop	OLS-total	IV-emp	IV-pop	IV-total	OLS-emp	OLS-pop	OLS-total	IV-emp	IV-pop	IV-total
Abilene, TX	$0.16	$2.72	$2.88	$0.65	$5.62	$6.27	$0.64	$10.74	$11.38	$1.10	$9.57	$10.67
Albany, GA	$0.25	$3.29	$3.53	$0.99	$6.78	$7.77	$1.01	$13.55	$14.56	$1.76	$12.07	$13.83
Albany-Schenectady-Troy, NY	$0.92	$11.42	$12.34	$3.71	$23.57	$27.28	$3.62	$44.81	$48.43	$6.28	$39.93	$46.20
Albuquerque, NM	$1.00	$7.27	$8.27	$4.02	$15.01	$19.03	$4.30	$31.25	$35.55	$7.45	$27.85	$35.30
Alexandria, LA	$0.15	$3.56	$3.71	$0.61	$7.35	$7.96	$0.64	$15.04	$15.68	$1.11	$13.40	$14.51
Allentown-Bethlehem-Easton, PA-NJ	$0.49	$4.07	$4.56	$1.96	$8.41	$10.37	$2.03	$16.94	$18.97	$3.52	$15.09	$18.61
Altoona, PA	$0.06	$3.68	$3.74	$0.26	$7.59	$7.85	$0.28	$16.09	$16.37	$0.49	$14.34	$14.83
Amarillo, TX	$0.23	$3.12	$3.35	$0.92	$6.44	$7.36	$1.00	$13.61	$14.61	$1.74	$12.12	$13.86
Ames, IA	$0.25	$13.16	$13.41	$1.01	$27.17	$28.18	$1.04	$54.31	$55.35	$1.80	$48.39	$50.19
Anchorage, AK	$0.97	$10.48	$11.45	$3.89	$21.64	$25.52	$4.75	$51.47	$56.22	$8.24	$45.87	$54.10
Anderson, IN	$0.17	$2.24	$2.41	$0.69	$4.62	$5.31	$0.85	$11.05	$11.90	$1.47	$9.85	$11.32
Ann Arbor, MI	$0.55	$15.96	$16.50	$2.19	$32.94	$35.13	$1.68	$49.24	$50.92	$2.92	$43.88	$46.79
Appleton, WI	$0.18	$5.92	$6.10	$0.71	$12.22	$12.93	$0.73	$24.59	$25.32	$1.27	$21.91	$23.18
Athens-Clarke County, GA	$0.31	$4.23	$4.54	$1.23	$8.74	$9.97	$1.08	$14.88	$15.96	$1.87	$13.26	$15.13
Atlanta-Sandy Springs-Marietta, GA	$8.18	$11.40	$19.57	$32.85	$23.52	$56.38	$37.88	$52.78	$90.66	$65.69	$47.03	$112.72
Auburn-Opelika, AL	$0.03	$0.54	$0.57	$0.12	$1.12	$1.24	$0.11	$2.06	$2.17	$0.20	$1.84	$2.03
Augusta-Richmond County, GA-SC	$0.32	$1.26	$1.58	$1.30	$2.60	$3.90	$1.12	$4.36	$5.48	$1.94	$3.89	$5.82
Bakersfield, CA	$0.93	$5.54	$6.47	$3.73	$11.44	$15.17	$4.17	$24.91	$29.08	$7.23	$22.19	$29.42
Bangor, ME	$0.13	$3.99	$4.12	$0.51	$8.23	$8.75	$0.50	$15.70	$16.20	$0.87	$13.99	$14.86
Baton Rouge, LA	$0.58	$3.92	$4.50	$2.33	$8.09	$10.42	$2.92	$19.75	$22.66	$5.06	$17.60	$22.65
Battle Creek, MI	$0.16	$3.71	$3.87	$0.66	$7.65	$8.31	$0.69	$15.70	$16.40	$1.20	$13.99	$15.20
Bay City, MI	$0.33	$11.66	$12.00	$1.34	$24.08	$25.42	$1.24	$43.27	$44.51	$2.15	$38.56	$40.71
Beaumont-Port Arthur, TX	$0.40	$3.40	$3.79	$1.60	$7.01	$8.61	$1.68	$14.34	$16.01	$2.91	$12.78	$15.68
Bellingham, WA	$0.48	$11.80	$12.28	$1.93	$24.35	$26.28	$2.03	$49.92	$51.95	$3.53	$44.48	$48.01
Bend, OR	$0.05	$1.37	$1.43	$0.22	$2.84	$3.06	$0.26	$6.47	$6.73	$0.44	$5.77	$6.21
Billings, MT	$0.17	$4.41	$4.58	$0.68	$9.11	$9.79	$0.75	$19.44	$20.18	$1.29	$17.32	$18.61
Binghamton, NY	$0.27	$9.26	$9.54	$1.10	$19.12	$20.22	$0.91	$30.90	$31.81	$1.58	$27.53	$29.11

Birmingham-Hoover, AL	$0.93	$3.45	$4.38	$3.74	$7.12	$10.86	$4.43	$16.40	$20.83	$7.68	$14.62	$22.30
Bismarck, ND	$0.07	$3.37	$3.44	$0.26	$6.96	$7.22	$0.25	$12.67	$12.92	$0.43	$11.29	$11.72
Blacksburg-Christiansburg-Radford, VA	$0.26	$4.94	$5.20	$1.06	$10.19	$11.25	$0.99	$18.48	$19.47	$1.72	$16.47	$18.19
Bloomington, IN	$0.20	$5.63	$5.83	$0.79	$11.62	$12.42	$0.75	$21.34	$22.09	$1.30	$19.01	$20.31
Bloomington-Normal, IL	$0.30	$8.96	$9.26	$1.21	$18.50	$19.70	$1.36	$40.61	$41.97	$2.36	$36.19	$38.55
Boise City-Nampa, ID	$0.33	$2.83	$3.15	$1.31	$5.83	$7.15	$1.39	$11.98	$13.37	$2.40	$10.68	$13.08
Bradenton-Sarasota-Venice, FL	$0.67	$6.04	$6.71	$2.69	$12.48	$15.17	$3.08	$27.81	$30.89	$5.34	$24.78	$30.12
Bremerton-Silverdale, WA	$0.61	$11.20	$11.81	$2.46	$23.13	$25.59	$1.88	$34.29	$36.16	$3.26	$30.55	$33.81
Brownsville-Harlingen, TX	$0.18	$1.61	$1.79	$0.73	$3.32	$4.05	$0.72	$6.40	$7.13	$1.26	$5.71	$6.96
Brunswick, GA	$2.31	$98.80	$101.11	$9.29	$203.97	$213.25	$8.95	$382.35	$391.29	$15.52	$340.69	$356.21
Canton-Massillon, OH	$0.76	$6.79	$7.54	$3.03	$14.01	$17.04	$3.37	$30.29	$33.67	$5.85	$26.99	$32.84
Cape Coral-Fort Myers, FL	$1.18	$5.71	$6.90	$4.76	$11.79	$16.55	$6.04	$29.15	$35.19	$10.48	$25.97	$36.46
Casper, WY	$0.09	$3.88	$3.98	$0.37	$8.02	$8.39	$0.69	$28.91	$29.61	$1.20	$25.76	$26.97
Cedar Rapids, IA	$0.29	$5.43	$5.72	$1.18	$11.21	$12.39	$1.34	$24.81	$26.15	$2.32	$22.11	$24.42
Champaign-Urbana, IL	$0.67	$17.45	$18.12	$2.68	$36.03	$38.71	$2.42	$63.39	$65.81	$4.20	$56.48	$60.68
Charleston, WV	$0.48	$9.90	$10.37	$1.91	$20.43	$22.35	$2.36	$48.95	$51.30	$4.09	$43.62	$47.70
Charleston-North Charleston, SC	$0.85	$4.97	$5.82	$3.42	$10.26	$13.68	$3.46	$20.20	$23.66	$6.00	$18.00	$24.00
Charlotte-Gastonia-Concord, NC-SC	$9.04	$10.68	$19.72	$36.32	$22.04	$58.36	$55.72	$65.82	$121.54	$96.63	$58.65	$155.28
Chattanooga, TN-GA	$0.63	$4.33	$4.95	$2.52	$8.93	$11.45	$2.90	$19.99	$22.89	$5.02	$17.81	$22.84
Cheyenne, WY	$0.10	$4.95	$5.04	$0.39	$10.21	$10.60	$0.38	$19.29	$19.68	$0.66	$17.19	$17.85
Chicago-Naperville-Joliet, IL-IN-WI	$22.78	$23.59	$46.37	$91.53	$48.69	$140.22	$103.82	$107.50	$211.32	$180.05	$95.79	$275.84
Chico, CA	$0.26	$4.72	$4.98	$1.04	$9.75	$10.79	$1.10	$20.10	$21.20	$1.90	$17.91	$19.82
Cincinnati-Middletown, OH-KY-IN	$2.95	$9.26	$12.21	$11.86	$19.12	$30.97	$13.19	$41.39	$54.58	$22.88	$36.88	$59.76
Clarksville, TN-KY	$0.58	$3.07	$3.65	$2.35	$6.33	$8.68	$1.93	$10.14	$12.07	$3.35	$9.03	$12.38
Cleveland-Elyria-Mentor, OH	$5.47	$18.11	$23.58	$21.98	$37.38	$59.36	$25.86	$85.59	$111.45	$44.85	$76.26	$121.11
College Station-Bryan, TX	$0.70	$9.09	$9.80	$2.82	$18.77	$21.59	$2.44	$31.59	$34.03	$4.23	$28.15	$32.38
Columbia, MO	$0.17	$3.88	$4.04	$0.67	$8.00	$8.68	$0.53	$12.31	$12.84	$0.92	$10.97	$11.89
Columbia, SC	$0.31	$2.50	$2.81	$1.23	$5.17	$6.39	$1.20	$9.80	$11.00	$2.08	$8.73	$10.81
Columbus, GA-AL	$0.36	$3.58	$3.94	$1.46	$7.39	$8.84	$1.29	$12.71	$14.00	$2.24	$11.32	$13.56
Columbus, OH	$1.89	$6.08	$7.97	$7.60	$12.55	$20.15	$8.16	$26.22	$34.38	$14.16	$23.37	$37.52
Corpus Christi, TX	$0.93	$7.80	$8.73	$3.75	$16.09	$19.85	$4.08	$34.01	$38.09	$7.07	$30.30	$37.37

Cumberland, MD-WV	$0.07	$2.61	$2.68	$0.27	$5.39	$5.65	$0.25	$9.64	$9.89	$0.43	$8.59	$9.02
Dallas-Fort Worth-Arlington, TX	$10.77	$9.28	$20.05	$43.27	$19.16	$62.43	$54.99	$47.39	$102.38	$95.36	$42.23	$137.59
Davenport-Moline-Rock Island, IA-IL	$1.02	$10.87	$11.89	$4.12	$22.43	$26.55	$4.67	$49.54	$54.21	$8.10	$44.15	$52.25
Dayton, OH	$1.50	$8.85	$10.35	$6.04	$18.27	$24.30	$6.12	$36.05	$42.17	$10.61	$32.12	$42.74
Decatur, AL	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Decatur, IL	$0.39	$11.01	$11.40	$1.56	$22.72	$24.29	$2.01	$56.88	$58.90	$3.49	$50.69	$54.18
Deltona-Daytona Beach-Ormond Beach, FL	$1.02	$4.84	$5.86	$4.09	$9.99	$14.08	$4.89	$23.25	$28.14	$8.47	$20.72	$29.19
Denver-Aurora, CO	$9.67	$29.35	$39.02	$38.85	$60.59	$99.45	$45.23	$137.30	$182.53	$78.45	$122.34	$200.79
Des Moines, IA	$0.54	$5.91	$6.44	$2.16	$12.19	$14.35	$2.71	$29.76	$32.46	$4.69	$26.52	$31.21
Detroit-Warren-Livonia, MI	$6.90	$9.40	$16.29	$27.71	$19.40	$47.11	$31.20	$42.53	$73.73	$54.11	$37.90	$92.01
Dothan, AL	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Dubuque, IA	$0.08	$3.65	$3.73	$0.31	$7.54	$7.86	$0.39	$18.17	$18.56	$0.67	$16.19	$16.86
Duluth, MN-WI	$0.58	$7.38	$7.97	$2.34	$15.25	$17.59	$2.36	$29.91	$32.27	$4.09	$26.65	$30.74
Eau Claire, WI	$0.17	$4.82	$4.99	$0.69	$9.95	$10.64	$0.69	$19.59	$20.28	$1.20	$17.45	$18.66
El Centro, CA	$0.11	$3.56	$3.67	$0.46	$7.35	$7.81	$0.46	$14.49	$14.96	$0.81	$12.91	$13.72
El Paso, TX	$1.22	$8.23	$9.46	$4.92	$17.00	$21.92	$6.49	$43.61	$50.10	$11.25	$38.86	$50.11
Elkhart-Goshen, IN	$0.11	$2.37	$2.48	$0.44	$4.89	$5.32	$0.55	$11.89	$12.44	$0.95	$10.60	$11.55
Elmira, NY	$0.12	$9.30	$9.42	$0.47	$19.21	$19.68	$0.45	$35.79	$36.25	$0.78	$31.89	$32.68
Erie, PA	$0.25	$6.61	$6.86	$1.02	$13.64	$14.66	$1.09	$28.31	$29.40	$1.89	$25.23	$27.12
Eugene-Springfield, OR	$0.76	$10.62	$11.38	$3.07	$21.92	$24.99	$3.00	$41.68	$44.68	$5.20	$37.14	$42.34
Evansville, IN-KY	$0.26	$4.08	$4.34	$1.04	$8.43	$9.47	$1.38	$21.85	$23.24	$2.40	$19.47	$21.87
Fairbanks, AK	$0.19	$5.68	$5.87	$0.76	$11.73	$12.49	$0.60	$18.00	$18.59	$1.03	$16.04	$17.07
Fayetteville-Springdale-Rogers, AR-MO	$0.23	$1.71	$1.94	$0.93	$3.54	$4.47	$1.00	$7.42	$8.42	$1.74	$6.61	$8.35
Flagstaff, AZ	$0.18	$5.41	$5.59	$0.73	$11.17	$11.89	$0.61	$18.28	$18.89	$1.06	$16.28	$17.34
Flint, MI	$0.99	$9.22	$10.21	$3.96	$19.03	$23.00	$3.65	$34.15	$37.80	$6.34	$30.43	$36.77
Florence, SC	$0.06	$0.84	$0.89	$0.23	$1.73	$1.96	$0.23	$3.27	$3.50	$0.39	$2.92	$3.31
Fond du Lac, WI	$0.03	$1.94	$1.98	$0.14	$4.01	$4.15	$0.16	$8.93	$9.08	$0.27	$7.95	$8.23
Fort Collins-Loveland, CO	$0.30	$3.94	$4.24	$1.21	$8.13	$9.34	$1.08	$14.11	$15.19	$1.87	$12.57	$14.44
Fort Smith, AR-OK	$0.07	$1.03	$1.10	$0.29	$2.12	$2.40	$0.34	$4.92	$5.26	$0.59	$4.39	$4.98
Fort Walton Beach-Crestview-Destin, FL	$0.11	$2.69	$2.80	$0.44	$5.55	$5.99	$0.48	$11.69	$12.17	$0.83	$10.42	$11.25
Fort Wayne, IN	$0.55	$4.47	$5.01	$2.20	$9.22	$11.42	$2.50	$20.43	$22.93	$4.34	$18.20	$22.54

Fresno, CA	$1.08	$6.17	$7.25	$4.33	$12.74	$17.07	$4.50	$25.75	$30.24	$7.80	$22.94	$30.74
Gainesville, FL	$0.94	$12.28	$13.22	$3.78	$25.36	$29.14	$3.12	$40.65	$43.77	$5.40	$36.22	$41.63
Glens Falls, NY	$0.04	$2.68	$2.71	$0.14	$5.53	$5.67	$0.13	$9.74	$9.87	$0.23	$8.68	$8.91
Grand Forks, ND-MN	$0.08	$3.95	$4.04	$0.34	$8.16	$8.50	$0.31	$14.43	$14.74	$0.53	$12.86	$13.39
Grand Junction, CO	$0.29	$6.32	$6.62	$1.18	$13.06	$14.24	$1.13	$24.35	$25.48	$1.96	$21.70	$23.66
Grand Rapids-Wyoming, MI	$0.78	$6.83	$7.60	$3.12	$14.09	$17.21	$3.54	$31.06	$34.59	$6.13	$27.67	$33.80
Great Falls, MT	$0.11	$5.25	$5.36	$0.46	$10.83	$11.29	$0.43	$20.11	$20.54	$0.75	$17.92	$18.67
Greeley, CO	$0.11	$2.03	$2.14	$0.45	$4.19	$4.64	$0.43	$7.76	$8.19	$0.75	$6.91	$7.66
Green Bay, WI	$0.42	$5.68	$6.10	$1.69	$11.72	$13.41	$1.86	$25.11	$26.97	$3.22	$22.37	$25.59
Greenville, SC	$0.13	$1.11	$1.24	$0.52	$2.30	$2.82	$0.54	$4.63	$5.16	$0.93	$4.12	$5.05
Hagerstown-Martinsburg, MD-WV	$0.08	$1.71	$1.79	$0.32	$3.53	$3.85	$0.33	$7.22	$7.55	$0.58	$6.43	$7.01
Hanford-Corcoran, CA	$0.30	$5.76	$6.06	$1.21	$11.89	$13.11	$1.07	$20.39	$21.46	$1.86	$18.17	$20.03
Harrisburg-Carlisle, PA	$0.14	$4.32	$4.46	$0.55	$8.92	$9.47	$0.56	$17.52	$18.08	$0.96	$15.61	$16.58
Holland-Grand Haven, MI	$0.07	$1.41	$1.49	$0.30	$2.92	$3.21	$0.35	$6.76	$7.12	$0.61	$6.02	$6.64
Honolulu, HI	$2.38	$25.74	$28.12	$9.56	$53.14	$62.70	$9.79	$105.90	$115.69	$16.98	$94.37	$111.34
Houston-Baytown-Sugar Land, TX	$10.25	$12.65	$22.90	$41.19	$26.12	$67.31	$58.03	$71.64	$129.67	$100.64	$63.83	$164.48
Huntington-Ashland, WV-KY-OH	$0.16	$3.15	$3.31	$0.66	$6.50	$7.16	$0.73	$14.00	$14.73	$1.26	$12.47	$13.73
Huntsville, AL	$0.33	$2.18	$2.51	$1.32	$4.50	$5.82	$1.18	$7.83	$9.01	$2.04	$6.98	$9.02
Indianapolis, IN	$2.01	$5.57	$7.59	$8.09	$11.50	$19.60	$10.37	$28.68	$39.05	$17.98	$25.55	$43.53
Iowa City, IA	$0.28	$11.32	$11.60	$1.13	$23.36	$24.49	$0.99	$39.87	$40.87	$1.72	$35.53	$37.25
Ithaca, NY	$0.21	$18.32	$18.53	$0.86	$37.82	$38.68	$0.86	$73.54	$74.40	$1.49	$65.53	$67.02
Jackson, MI	$0.06	$2.79	$2.85	$0.23	$5.77	$6.00	$0.24	$11.52	$11.76	$0.41	$10.27	$10.68
Jackson, MS	$0.32	$2.09	$2.40	$1.27	$4.31	$5.58	$1.43	$9.42	$10.85	$2.48	$8.39	$10.87
Jackson, TN	$0.18	$5.52	$5.70	$0.72	$11.40	$12.12	$0.74	$22.74	$23.47	$1.28	$20.26	$21.54
Jacksonville, FL	$3.45	$9.87	$13.31	$13.84	$20.37	$34.21	$15.37	$44.01	$59.38	$26.65	$39.21	$65.87
Janesville, WI	$0.42	$9.48	$9.90	$1.69	$19.57	$21.26	$1.66	$37.32	$38.98	$2.87	$33.26	$36.13
Jefferson City, MO	$0.09	$2.95	$3.03	$0.34	$6.08	$6.42	$0.28	$9.55	$9.82	$0.48	$8.51	$8.99
Johnson City, TN	$0.14	$2.11	$2.25	$0.58	$4.36	$4.93	$0.61	$8.92	$9.53	$1.06	$7.95	$9.01
Johnstown, PA	$0.10	$4.73	$4.83	$0.40	$9.76	$10.16	$0.40	$18.69	$19.09	$0.69	$16.65	$17.34
Kalamazoo-Portage, MI	$0.49	$5.86	$6.36	$1.98	$12.11	$14.09	$2.12	$25.27	$27.39	$3.69	$22.51	$26.20
Kankakee-Bradley, IL	$0.17	$6.06	$6.24	$0.70	$12.51	$13.21	$0.74	$25.87	$26.61	$1.29	$23.05	$24.34

Kansas City, MO-KS	$3.43	$6.72	$10.15	$13.76	$13.87	$27.64	$15.28	$29.97	$45.24	$26.49	$26.70	$53.19
Kennewick-Richland-Pasco, WA	$1.46	$15.22	$16.67	$5.85	$31.41	$37.26	$5.66	$59.20	$64.87	$9.82	$52.75	$62.58
Killeen-Temple-Fort Hood, TX	$0.34	$2.25	$2.59	$1.36	$4.64	$6.00	$0.87	$5.82	$6.69	$1.51	$5.18	$6.69
Knoxville, TN	$0.77	$4.79	$5.56	$3.10	$9.89	$12.99	$3.30	$20.56	$23.86	$5.73	$18.32	$24.05
Kokomo, IN	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
La Crosse, WI-MN	$0.14	$6.15	$6.29	$0.55	$12.70	$13.25	$0.57	$25.56	$26.12	$0.98	$22.77	$23.75
Lafayette, IN	$0.32	$9.03	$9.35	$1.30	$18.65	$19.94	$1.30	$36.40	$37.70	$2.26	$32.43	$34.69
Lafayette, LA	$0.16	$3.15	$3.31	$0.64	$6.50	$7.15	$1.03	$20.27	$21.30	$1.79	$18.06	$19.85
Lakeland, FL	$0.58	$4.10	$4.68	$2.34	$8.47	$10.81	$2.51	$17.61	$20.12	$4.35	$15.69	$20.04
Lancaster, PA	$0.12	$3.53	$3.65	$0.48	$7.29	$7.77	$0.54	$15.89	$16.43	$0.93	$14.16	$15.09
Lansing-East Lansing, MI	$0.46	$8.58	$9.04	$1.84	$17.71	$19.55	$1.73	$32.27	$33.99	$2.99	$28.75	$31.75
Laredo, TX	$0.35	$5.78	$6.13	$1.39	$11.93	$13.32	$1.61	$26.95	$28.56	$2.79	$24.01	$26.80
Las Cruces, NM	$0.12	$1.99	$2.11	$0.46	$4.12	$4.58	$0.47	$8.07	$8.53	$0.81	$7.19	$8.00
Las Vegas-Paradise, NV	$1.96	$11.38	$13.35	$7.89	$23.50	$31.39	$10.73	$62.25	$72.98	$18.62	$55.46	$74.08
Lawrence, KS	$0.12	$5.16	$5.28	$0.50	$10.65	$11.15	$0.48	$20.04	$20.52	$0.83	$17.85	$18.69
Lawton, OK	$0.46	$4.96	$5.43	$1.87	$10.25	$12.12	$1.38	$14.71	$16.08	$2.39	$13.10	$15.49
Lebanon, PA	$0.08	$3.64	$3.72	$0.33	$7.51	$7.84	$0.34	$15.29	$15.63	$0.60	$13.62	$14.22
Lewiston-Auburn, ME	$0.05	$2.25	$2.30	$0.22	$4.64	$4.86	$0.23	$9.33	$9.56	$0.39	$8.31	$8.70
Lexington-Fayette, KY	$0.48	$5.81	$6.29	$1.94	$11.99	$13.93	$2.14	$25.86	$28.00	$3.72	$23.04	$26.76
Lincoln, NE	$0.35	$5.75	$6.11	$1.42	$11.87	$13.30	$1.48	$23.97	$25.45	$2.56	$21.36	$23.92
Little Rock-North Little Rock, AR	$0.64	$4.31	$4.95	$2.58	$8.90	$11.48	$2.80	$18.77	$21.57	$4.85	$16.73	$21.58
Logan, UT-ID	$0.17	$6.65	$6.82	$0.67	$13.73	$14.41	$0.56	$22.34	$22.90	$0.98	$19.90	$20.88
Longview, WA	$0.07	$2.69	$2.76	$0.27	$5.55	$5.82	$0.25	$10.27	$10.52	$0.44	$9.15	$9.59
Los Angeles-Long Beach-Santa Ana, CA	$34.19	$27.79	$61.98	$137.39	$57.37	$194.76	$166.23	$135.10	$301.33	$288.27	$120.38	$408.66
Louisville, KY-IN	$2.54	$7.74	$10.27	$10.19	$15.97	$26.16	$12.35	$37.66	$50.02	$21.42	$33.56	$54.98
Lubbock, TX	$0.37	$5.81	$6.19	$1.49	$12.00	$13.49	$1.55	$24.29	$25.84	$2.69	$21.65	$24.33
Lynchburg, VA	$0.42	$5.23	$5.66	$1.70	$10.81	$12.50	$1.78	$22.04	$23.82	$3.08	$19.64	$22.72
Macon, GA	$0.38	$5.34	$5.72	$1.52	$11.03	$12.54	$1.46	$20.64	$22.10	$2.53	$18.39	$20.92
Madison, WI	$0.73	$11.43	$12.16	$2.93	$23.59	$26.52	$3.07	$48.08	$51.14	$5.32	$42.84	$48.16
Mansfield, OH	$0.08	$1.95	$2.02	$0.31	$4.02	$4.33	$0.33	$8.19	$8.51	$0.57	$7.30	$7.86
McAllen-Edinburg-Pharr, TX	$0.26	$1.30	$1.56	$1.04	$2.68	$3.72	$1.02	$5.13	$6.14	$1.77	$4.57	$6.33

Medford, OR	$0.12	$3.12	$3.24	$0.47	$6.45	$6.92	$0.46	$12.37	$12.83	$0.80	$11.02	$11.82
Memphis, TN-MS-AR	$1.99	$6.87	$8.87	$8.01	$14.19	$22.21	$9.57	$32.99	$42.57	$16.60	$29.40	$46.00
Merced, CA	$0.64	$12.06	$12.71	$2.58	$24.90	$27.49	$3.14	$58.94	$62.08	$5.45	$52.52	$57.97
Miami-Fort Lauderdale-Miami Beach, FL	$8.96	$15.02	$23.98	$36.01	$31.01	$67.02	$43.61	$73.10	$116.71	$75.63	$65.14	$140.77
Milwaukee-Waukesha-West Allis, WI	$3.28	$16.98	$20.26	$13.18	$35.06	$48.24	$15.31	$79.28	$94.59	$26.56	$70.64	$97.20
Minneapolis-St. Paul-Bloomington, MN-WI	$6.53	$16.25	$22.78	$26.22	$33.54	$59.77	$28.21	$70.23	$98.44	$48.92	$62.58	$111.50
Missoula, MT	$0.15	$5.78	$5.93	$0.60	$11.93	$12.53	$0.70	$26.97	$27.67	$1.21	$24.03	$25.24
Mobile, AL	$0.52	$3.71	$4.22	$2.08	$7.65	$9.73	$2.17	$15.55	$17.72	$3.77	$13.86	$17.62
Modesto, CA	$0.46	$4.70	$5.16	$1.85	$9.70	$11.56	$2.10	$21.43	$23.54	$3.65	$19.10	$22.75
Monroe, LA	$0.14	$3.72	$3.87	$0.58	$7.69	$8.26	$0.71	$18.49	$19.20	$1.24	$16.48	$17.71
Morgantown, WV	$0.30	$8.85	$9.15	$1.21	$18.26	$19.48	$1.36	$39.75	$41.11	$2.36	$35.42	$37.77
Muncie, IN	$0.25	$7.56	$7.80	$0.99	$15.60	$16.59	$0.97	$29.72	$30.69	$1.68	$26.48	$28.16
Muskegon-Norton Shores, MI	$0.17	$2.72	$2.89	$0.67	$5.62	$6.29	$0.67	$10.98	$11.65	$1.16	$9.79	$10.95
Myrtle Beach-Conway-North Myrtle Beach, SC	$0.17	$2.68	$2.85	$0.69	$5.53	$6.22	$1.00	$15.54	$16.54	$1.73	$13.84	$15.58
Naples-Marco Island, FL	$0.37	$4.79	$5.16	$1.48	$9.89	$11.37	$1.93	$25.21	$27.15	$3.36	$22.47	$25.82
Nashville-Davidson--Murfreesboro, TN	$1.47	$3.97	$5.44	$5.91	$8.20	$14.11	$6.88	$18.57	$25.45	$11.93	$16.55	$28.48
New Orleans-Metairie-Kenner, LA	$1.19	$6.22	$7.42	$4.79	$12.85	$17.64	$7.28	$37.95	$45.23	$12.62	$33.82	$46.44
New York-Northern New Jersey-Long Island, NY-NJ-PA	$34.61	$46.73	$81.34	$139.08	$96.46	$235.54	$155.45	$209.84	$365.29	$269.58	$186.98	$456.56
Niles-Benton Harbor, MI	$0.02	$0.40	$0.42	$0.09	$0.82	$0.92	$0.10	$1.75	$1.85	$0.18	$1.56	$1.74
Odessa, TX	$0.28	$8.02	$8.30	$1.12	$16.56	$17.68	$1.28	$37.03	$38.31	$2.22	$32.99	$35.22
Oklahoma City, OK	$0.92	$3.22	$4.14	$3.68	$6.65	$10.33	$4.21	$14.78	$18.99	$7.29	$13.17	$20.46
Olympia, WA	$0.40	$11.88	$12.28	$1.62	$24.52	$26.14	$1.40	$41.27	$42.67	$2.43	$36.77	$39.20
Omaha-Council Bluffs, NE-IA	$1.00	$6.42	$7.41	$4.01	$13.25	$17.26	$4.65	$29.87	$34.52	$8.06	$26.62	$34.68
Orlando, FL	$2.57	$9.25	$11.82	$10.32	$19.10	$29.41	$14.19	$51.11	$65.30	$24.60	$45.55	$70.15
Oshkosh-Neenah, WI	$0.14	$4.89	$5.03	$0.57	$10.09	$10.66	$0.56	$19.32	$19.89	$0.98	$17.22	$18.20
Oxnard-Thousand Oaks-Ventura, CA	$1.17	$5.99	$7.16	$4.71	$12.36	$17.07	$5.01	$25.62	$30.63	$8.70	$22.83	$31.52
Palm Bay-Melbourne-Titusville, FL	$0.77	$3.18	$3.95	$3.10	$6.56	$9.67	$2.96	$12.21	$15.17	$5.14	$10.88	$16.02
Panama City-Lynn Haven, FL	$0.29	$6.47	$6.76	$1.17	$13.36	$14.53	$1.23	$27.17	$28.40	$2.13	$24.21	$26.34
Pensacola-Ferry Pass-Brent, FL	$0.35	$4.98	$5.34	$1.43	$10.29	$11.71	$1.32	$18.57	$19.89	$2.29	$16.54	$18.84
Peoria, IL	$0.59	$7.17	$7.76	$2.36	$14.80	$17.16	$2.57	$31.45	$34.02	$4.46	$28.02	$32.49
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	$8.13	$16.88	$25.01	$32.66	$34.84	$67.51	$39.31	$81.60	$120.90	$68.17	$72.71	$140.87

Phoenix-Mesa-Scottsdale, AZ	$8.27	$12.44	$20.71	$33.21	$25.69	$58.90	$39.34	$59.21	$98.55	$68.22	$52.76	$120.98
Pittsburgh, PA	$3.32	$16.41	$19.73	$13.32	$33.88	$47.21	$16.18	$80.07	$96.24	$28.06	$71.34	$99.40
Pocatello, ID	$0.09	$3.26	$3.35	$0.37	$6.73	$7.10	$0.34	$11.82	$12.15	$0.59	$10.53	$11.11
Port St. Lucie-Fort Pierce, FL	$0.32	$0.65	$0.97	$1.29	$1.34	$2.63	$1.48	$3.00	$4.48	$2.57	$2.67	$5.24
Portland-Vancouver-Beaverton, OR-WA	$6.12	$20.95	$27.07	$24.60	$43.25	$67.85	$28.47	$97.44	$125.91	$49.37	$86.82	$136.20
Poughkeepsie-Newburgh-Middletown, NY	$0.62	$5.27	$5.89	$2.50	$10.88	$13.38	$2.18	$18.52	$20.70	$3.79	$16.50	$20.29
Providence-New Bedford-Fall River, RI-MA	$1.72	$7.73	$9.45	$6.92	$15.96	$22.88	$7.71	$34.56	$42.26	$13.36	$30.79	$44.16
Pueblo, CO	$0.16	$3.65	$3.81	$0.66	$7.53	$8.19	$0.61	$13.54	$14.15	$1.06	$12.06	$13.12
Punta Gorda, FL	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Racine, WI	$0.28	$8.01	$8.29	$1.13	$16.53	$17.66	$1.29	$36.83	$38.12	$2.24	$32.82	$35.05
Rapid City, SD	$0.07	$1.82	$1.89	$0.26	$3.77	$4.03	$0.27	$7.58	$7.85	$0.47	$6.75	$7.22
Reading, PA	$0.21	$4.96	$5.16	$0.83	$10.23	$11.06	$0.85	$20.36	$21.21	$1.47	$18.14	$19.62
Redding, CA	$0.30	$4.27	$4.57	$1.21	$8.81	$10.03	$1.21	$17.14	$18.35	$2.10	$15.27	$17.37
Reno-Sparks, NV	$1.90	$22.57	$24.47	$7.62	$46.60	$54.22	$8.80	$104.78	$113.58	$15.26	$93.36	$108.63
Richmond, VA	$0.09	$0.50	$0.58	$0.35	$1.03	$1.38	$0.37	$2.13	$2.50	$0.64	$1.90	$2.54
Riverside-San Bernardino-Ontario, CA	$3.28	$3.32	$6.60	$13.17	$6.86	$20.03	$14.30	$14.50	$28.80	$24.80	$12.92	$37.72
Roanoke, VA	$0.74	$11.87	$12.61	$2.99	$24.50	$27.49	$3.13	$49.91	$53.04	$5.43	$44.47	$49.90
Rochester, MN	$0.28	$7.63	$7.91	$1.13	$15.76	$16.88	$1.10	$30.08	$31.18	$1.92	$26.80	$28.72
Rochester, NY	$0.62	$6.57	$7.19	$2.51	$13.56	$16.07	$2.79	$29.34	$32.13	$4.83	$26.14	$30.98
Rockford, IL	$0.39	$4.57	$4.96	$1.55	$9.44	$10.98	$1.67	$19.75	$21.42	$2.89	$17.60	$20.49
Rome, GA	$0.18	$5.24	$5.42	$0.71	$10.82	$11.54	$0.73	$21.54	$22.27	$1.26	$19.20	$20.46
Sacramento--Arden-Arcade--Roseville, CA	$4.20	$12.34	$16.53	$16.87	$25.47	$42.34	$16.08	$47.25	$63.33	$27.89	$42.10	$69.99
Saginaw-Saginaw Township North, MI	$0.21	$4.10	$4.31	$0.85	$8.46	$9.32	$0.87	$16.89	$17.76	$1.51	$15.05	$16.56
Salem, OR	$0.44	$5.86	$6.30	$1.77	$12.09	$13.86	$1.68	$22.31	$23.98	$2.91	$19.88	$22.78
Salt Lake City, UT	$2.49	$22.05	$24.53	$10.00	$45.51	$55.51	$11.53	$102.19	$113.72	$20.00	$91.05	$111.05
San Angelo, TX	$0.17	$3.30	$3.47	$0.68	$6.82	$7.49	$0.68	$13.31	$13.99	$1.17	$11.86	$13.03
San Antonio, TX	$4.93	$11.87	$16.80	$19.82	$24.51	$44.33	$21.05	$50.65	$71.70	$36.50	$45.13	$81.63
San Diego-Carlsbad-San Marcos, CA	$6.59	$15.19	$21.77	$26.46	$31.35	$57.82	$29.68	$68.44	$98.12	$51.47	$60.98	$112.45
San Francisco-Oakland-Fremont, CA	$18.43	$51.67	$70.10	$74.06	$106.66	$180.72	$82.14	$230.25	$312.39	$142.44	$205.17	$347.61
San Jose-Sunnyvale-Santa Clara, CA	$6.80	$33.08	$39.89	$27.34	$68.30	$95.64	$27.93	$135.79	$163.72	$48.43	$121.00	$169.43
San Luis Obispo-Paso Robles, CA	$0.09	$1.67	$1.76	$0.38	$3.44	$3.82	$0.44	$7.76	$8.20	$0.76	$6.91	$7.67

Sandusky, OH	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Santa Barbara-Santa Maria-Goleta, CA	$1.57	$23.37	$24.94	$6.33	$48.25	$54.57	$6.69	$99.32	$106.01	$11.60	$88.50	$100.11
Santa Cruz-Watsonville, CA	$1.26	$34.67	$35.93	$5.07	$71.58	$76.65	$5.14	$141.39	$146.54	$8.92	$125.99	$134.91
Santa Fe, NM	$0.25	$7.01	$7.26	$0.99	$14.47	$15.46	$1.14	$32.43	$33.57	$1.98	$28.90	$30.88
Santa Rosa-Petaluma, CA	$1.65	$16.75	$18.41	$6.64	$34.59	$41.23	$6.95	$70.41	$77.36	$12.05	$62.74	$74.80
Savannah, GA	$0.60	$8.91	$9.51	$2.41	$18.39	$20.79	$2.44	$36.21	$38.65	$4.23	$32.26	$36.49
Scranton--Wilkes-Barre, PA	$0.31	$4.05	$4.36	$1.23	$8.36	$9.59	$1.40	$18.50	$19.90	$2.42	$16.48	$18.91
Seattle-Tacoma-Bellevue, WA	$10.60	$31.64	$42.24	$42.59	$65.32	$107.91	$47.41	$141.52	$188.93	$82.21	$126.10	$208.32
Sebastian-Vero Beach, FL	$0.14	$2.57	$2.71	$0.56	$5.31	$5.87	$0.67	$12.18	$12.84	$1.15	$10.85	$12.00
Sheboygan, WI	$0.17	$6.12	$6.29	$0.67	$12.64	$13.31	$0.80	$29.48	$30.28	$1.39	$26.27	$27.66
Sherman-Denison, TX	$0.12	$2.13	$2.24	$0.47	$4.39	$4.86	$0.47	$8.61	$9.08	$0.82	$7.67	$8.49
Shreveport-Bossier City, LA	$1.00	$6.74	$7.75	$4.03	$13.92	$17.95	$6.79	$45.66	$52.45	$11.78	$40.69	$52.47
Sioux City, IA-NE-SD	$0.19	$3.90	$4.09	$0.77	$8.05	$8.82	$0.99	$20.24	$21.23	$1.72	$18.03	$19.75
Sioux Falls, SD	$0.17	$3.68	$3.85	$0.67	$7.61	$8.27	$0.98	$21.71	$22.68	$1.70	$19.34	$21.04
South Bend-Mishawaka, IN-MI	$0.55	$6.44	$7.00	$2.23	$13.30	$15.53	$2.90	$33.66	$36.56	$5.03	$30.00	$35.03
Spartanburg, SC	$0.09	$1.22	$1.31	$0.37	$2.51	$2.88	$0.38	$5.08	$5.45	$0.66	$4.52	$5.18
Spokane, WA	$1.17	$15.24	$16.41	$4.70	$31.45	$36.16	$4.68	$60.86	$65.53	$8.11	$54.23	$62.34
Springfield, IL	$0.28	$6.84	$7.12	$1.12	$14.12	$15.24	$1.01	$24.88	$25.89	$1.75	$22.17	$23.92
Springfield, MO	$0.23	$2.63	$2.86	$0.93	$5.44	$6.36	$0.96	$10.90	$11.85	$1.66	$9.71	$11.37
Springfield, OH	$0.08	$1.77	$1.84	$0.31	$3.64	$3.96	$0.31	$7.10	$7.41	$0.54	$6.32	$6.86
St. Cloud, MN	$0.23	$6.52	$6.75	$0.94	$13.46	$14.40	$0.96	$26.76	$27.72	$1.66	$23.84	$25.50
St. Joseph, MO-KS	$0.26	$6.71	$6.96	$1.03	$13.85	$14.87	$1.04	$27.27	$28.30	$1.80	$24.30	$26.10
St. Louis, MO-IL	$4.07	$12.31	$16.39	$16.37	$25.42	$41.79	$17.59	$53.16	$70.76	$30.51	$47.37	$77.88
State College, PA	$0.23	$9.57	$9.80	$0.91	$19.75	$20.67	$0.63	$26.37	$27.00	$1.08	$23.50	$24.58
Stockton, CA	#REF!	$7.54	#REF!	#REF!	$15.57	#REF!	#REF!	$33.01	#REF!	#REF!	$29.42	#REF!
Sumter, SC	$0.23	$5.09	$5.32	$0.93	$10.50	$11.43	$0.81	$17.97	$18.78	$1.41	$16.01	$17.42
Syracuse, NY	$0.69	$11.89	$12.57	$2.76	$24.54	$27.30	$3.03	$52.30	$55.33	$5.25	$46.60	$51.85
Tallahassee, FL	$0.41	$5.95	$6.36	$1.65	$12.28	$13.92	$1.33	$19.36	$20.69	$2.31	$17.25	$19.56
Tampa-St. Petersburg-Clearwater, FL	$3.24	$8.52	$11.76	$13.02	$17.58	$30.61	$14.64	$38.46	$53.10	$25.39	$34.27	$59.66
Terre Haute, IN	$0.14	$2.62	$2.76	$0.57	$5.41	$5.98	$0.62	$11.42	$12.04	$1.07	$10.18	$11.25
Toledo, OH	$1.07	$6.66	$7.72	$4.28	$13.74	$18.02	$4.58	$28.61	$33.19	$7.95	$25.49	$33.44

Topeka, KS	$0.27	$4.95	$5.22	$1.08	$10.22	$11.30	$1.03	$18.90	$19.93	$1.78	$16.84	$18.62
Tucson, AZ	$2.02	$9.00	$11.01	$8.10	$18.58	$26.68	$7.69	$34.31	$41.99	$13.33	$30.57	$43.90
Tulsa, OK	$0.67	$3.91	$4.58	$2.68	$8.08	$10.76	$3.23	$18.96	$22.20	$5.61	$16.90	$22.50
Tuscaloosa, AL	$0.10	$1.35	$1.44	$0.38	$2.78	$3.16	$0.40	$5.63	$6.03	$0.70	$5.02	$5.71
Utica-Rome, NY	$0.23	$3.95	$4.18	$0.90	$8.16	$9.06	$0.79	$13.80	$14.59	$1.36	$12.30	$13.66
Victoria, TX	$0.29	$3.93	$4.22	$1.16	$8.12	$9.28	$1.54	$21.00	$22.54	$2.67	$18.71	$21.38
Virginia Beach-Norfolk-Newport News, VA-NC	$3.72	$8.59	$12.30	$14.93	$17.73	$32.66	$15.24	$35.21	$50.45	$26.43	$31.37	$57.81
Visalia-Porterville, CA	$0.39	$3.82	$4.21	$1.56	$7.88	$9.44	$1.66	$16.23	$17.89	$2.87	$14.46	$17.34
Waco, TX	$0.21	$3.53	$3.75	$0.86	$7.30	$8.16	$0.94	$15.51	$16.45	$1.63	$13.82	$15.45
Washington-Arlington-Alexandria, DC-VA-MD-WV	$14.74	$41.71	$56.46	$59.24	$86.12	$145.36	$58.84	$166.49	$225.33	$102.05	$148.35	$250.40
Waterloo-Cedar Falls, IA	$0.24	$4.45	$4.69	$0.95	$9.19	$10.13	$1.11	$20.95	$22.06	$1.93	$18.67	$20.60
Wausau, WI	$0.12	$5.21	$5.33	$0.48	$10.76	$11.24	$0.51	$22.38	$22.89	$0.88	$19.94	$20.82
Wenatchee, WA	$0.43	$17.86	$18.28	$1.71	$36.86	$38.58	$1.70	$71.11	$72.81	$2.94	$63.36	$66.30
Wheeling, WV-OH	$0.13	$4.69	$4.82	$0.51	$9.69	$10.20	$0.61	$22.47	$23.08	$1.06	$20.02	$21.08
Wichita, KS	$0.53	$3.54	$4.07	$2.12	$7.31	$9.43	$2.39	$16.01	$18.39	$4.14	$14.26	$18.40
Williamsport, PA	$0.12	$7.04	$7.16	$0.48	$14.53	$15.01	$0.52	$30.65	$31.17	$0.90	$27.32	$28.22
Yakima, WA	$0.24	$3.89	$4.13	$0.97	$8.03	$8.99	$1.06	$17.10	$18.16	$1.83	$15.24	$17.07
York-Hanover, PA	$0.14	$3.91	$4.05	$0.56	$8.07	$8.63	$0.63	$17.52	$18.15	$1.09	$15.61	$16.70
Youngstown-Warren-Boardman, OH-PA	$0.23	$1.33	$1.56	$0.93	$2.75	$3.68	$1.00	$5.75	$6.76	$1.74	$5.13	$6.87
Yuba City, CA	$0.30	$5.50	$5.80	$1.21	$11.35	$12.56	$1.14	$20.80	$21.94	$1.97	$18.54	$20.51
Yuma, AZ	$0.17	$2.69	$2.85	$0.67	$5.55	$6.22	$0.70	$11.28	$11.98	$1.22	$10.05	$11.27

TABLE **G 5 Average change per 1% change in rail seat capacity per capita**

	Average wage changes						**Average GDP per capita changes**					
name	OLS-emp	OLS-pop	OLS-total	IV-emp	IV-pop	IV-total	OLS-emp	OLS-pop	OLS-total	IV-emp	IV-pop	IV-total
Atlanta-Sandy Springs-Marietta, GA	$1.95	$5.88	$7.83	$10.32	$16.65	$26.97	$9.05	$27.24	$36.28	$20.64	$33.29	$53.93
Baltimore-Towson, MD	$3.85	$33.47	$37.32	$20.37	$94.77	$115.13	$15.09	$131.11	$146.20	$34.43	$160.23	$194.66
Buffalo-Niagara Falls, NY	$0.65	$7.80	$8.44	$3.42	$22.08	$25.50	$2.82	$34.02	$36.84	$6.43	$41.58	$48.01
Chicago-Naperville-Joliet, IL-IN-WI	$12.53	$28.02	$40.55	$66.23	$79.35	$145.58	$57.10	$127.73	$184.82	$130.28	$156.09	$286.37
Cleveland-Elyria-Mentor, OH	$2.26	$16.19	$18.45	$11.97	$45.83	$57.80	$10.70	$76.52	$87.22	$24.42	$93.52	$117.94
Dallas-Fort Worth-Arlington, TX	$1.80	$3.36	$5.16	$9.54	$9.51	$19.05	$9.21	$17.16	$26.37	$21.02	$20.97	$41.99
Denver-Aurora, CO	$1.38	$9.05	$10.43	$7.30	$25.62	$32.92	$6.45	$42.33	$48.78	$14.73	$51.73	$66.46
Houston-Baytown-Sugar Land, TX	$0.18	$0.48	$0.65	$0.94	$1.35	$2.29	$1.01	$2.70	$3.71	$2.31	$3.29	$5.60
Little Rock-North Little Rock, AR	$0.25	$3.61	$3.86	$1.32	$10.21	$11.53	$1.08	$15.70	$16.78	$2.47	$19.19	$21.66
Los Angeles-Long Beach-Santa Ana, CA	$1.25	$2.19	$3.43	$6.58	$6.19	$12.77	$6.05	$10.63	$16.68	$13.81	$12.99	$26.80
Memphis, TN-MS-AR	$0.43	$3.17	$3.59	$2.25	$8.96	$11.21	$2.04	$15.19	$17.23	$4.66	$18.57	$23.22
Miami-Fort Lauderdale-Miami Beach, FL	$1.03	$3.72	$4.75	$5.44	$10.54	$15.98	$5.00	$18.12	$23.12	$11.42	$22.14	$33.56
Minneapolis-St. Paul-Bloomington, MN-WI	$0.31	$1.68	$1.99	$1.65	$4.75	$6.40	$1.35	$7.25	$8.60	$3.08	$8.86	$11.94
Nashville-Davidson--Murfreesboro, TN	$0.62	$3.60	$4.22	$3.27	$10.20	$13.46	$2.89	$16.85	$19.74	$6.59	$20.59	$27.18
New Orleans-Metairie-Kenner, LA	$1.04	$11.71	$12.75	$5.50	$33.16	$38.65	$6.34	$71.43	$77.77	$14.47	$87.29	$101.76
New York-Northern New Jersey-Long Island, NY-NJ-PA	$7.34	$21.41	$28.75	$38.81	$60.61	$99.42	$32.96	$96.14	$129.10	$75.22	$117.49	$192.71
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	$5.03	$22.54	$27.56	$26.57	$63.82	$90.39	$24.30	$108.98	$133.27	$55.44	$133.18	$188.62
Pittsburgh, PA	$0.61	$6.49	$7.10	$3.21	$18.38	$21.59	$2.96	$31.66	$34.62	$6.76	$38.70	$45.45
Portland-South Portland-Biddeford, ME	$0.58	$16.96	$17.55	$3.08	$48.03	$51.11	$2.57	$74.79	$77.35	$5.86	$91.40	$97.26
Portland-Vancouver-Beaverton, OR-WA	$1.82	$13.42	$15.24	$9.60	$38.01	$47.61	$8.44	$62.44	$70.88	$19.27	$76.31	$95.57
Sacramento--Arden-Arcade--Roseville, CA	$1.48	$9.40	$10.89	$7.83	$26.63	$34.46	$5.68	$36.02	$41.69	$12.95	$44.02	$56.97
Salt Lake City, UT	$1.18	$22.63	$23.82	$6.25	$64.08	$70.34	$5.48	$104.91	$110.39	$12.51	$128.21	$140.71
San Diego-Carlsbad-San Marcos, CA	$2.52	$12.54	$15.06	$13.31	$35.52	$48.83	$11.35	$56.53	$67.87	$25.89	$69.08	$94.97
San Francisco-Oakland-Fremont, CA	$7.88	$47.75	$55.63	$41.68	$135.19	$176.87	$35.13	$212.78	$247.91	$80.17	$260.04	$340.21
San Jose-Sunnyvale-Santa Clara, CA	$3.18	$33.37	$36.55	$16.80	$94.50	$111.30	$13.04	$136.99	$150.03	$29.75	$167.41	$197.17
Seattle-Tacoma-Bellevue, WA	$0.81	$5.23	$6.04	$4.29	$14.82	$19.11	$3.63	$23.41	$27.04	$8.28	$28.61	$36.89
St. Louis, MO-IL	$1.03	$6.74	$7.77	$5.46	$19.09	$24.54	$4.46	$29.11	$33.57	$10.17	$35.57	$45.74

Tampa-St. Petersburg-Clearwater, FL	$0.09	$0.49	$0.57	$0.45	$1.38	$1.83	$0.39	$2.20	$2.59	$0.88	$2.69	$3.57
Washington-Arlington-Alexandria, DC-VA-MD-WV	$7.65	$46.76	$54.40	$40.44	$132.39	$172.82	$30.53	$186.61	$217.14	$69.66	$228.06	$297.71

TABLE **G 6 Average change per 1% change in motor bus seat capacity per capita**

	Average wage changes						**Average GDP per capita changes**					
Name	OLS-emp	OLS-pop	OLS-total	IV-emp	IV-pop	IV-total	OLS-emp	OLS-pop	OLS-total	IV-emp	IV-pop	IV-total
Abilene, TX	$2.60	$14.36	$16.96	$5.01	$13.97	$18.98	$10.25	$56.67	$66.92	$8.53	$23.79	$32.32
Akron, OH	$3.62	$8.46	$12.08	$6.97	$8.23	$15.21	$15.07	$35.28	$50.34	$12.54	$14.81	$27.35
Albany, GA	$2.51	$10.97	$13.47	$4.84	$10.67	$15.50	$10.34	$45.22	$55.56	$8.61	$18.98	$27.59
Albany-Schenectady-Troy, NY	$2.19	$8.85	$11.03	$4.22	$8.61	$12.82	$8.58	$34.72	$43.30	$7.14	$14.58	$21.72
Albuquerque, NM	$2.56	$6.08	$8.64	$4.93	$5.92	$10.85	$11.00	$26.14	$37.14	$9.15	$10.98	$20.13
Alexandria, LA	$1.68	$12.90	$14.58	$3.23	$12.55	$15.79	$7.09	$54.51	$61.60	$5.90	$22.89	$28.78
Allentown-Bethlehem-Easton, PA-NJ	$1.46	$3.97	$5.43	$2.81	$3.86	$6.67	$6.05	$16.52	$22.57	$5.04	$6.94	$11.97
Altoona, PA	$2.45	$45.69	$48.14	$4.73	$44.44	$49.17	$10.74	$199.97	$210.71	$8.94	$83.96	$92.89
Amarillo, TX	$1.27	$5.61	$6.88	$2.44	$5.46	$7.90	$5.52	$24.47	$29.99	$4.59	$10.28	$14.87
Ames, IA	$11.21	$191.18	$202.39	$21.61	$185.97	$207.58	$46.25	$789.01	$835.26	$38.49	$331.27	$369.76
Anchorage, AK	$4.89	$17.32	$22.21	$9.43	$16.85	$26.28	$24.02	$85.08	$109.10	$19.99	$35.72	$55.71
Anderson, IN	$3.20	$13.66	$16.85	$6.17	$13.28	$19.45	$15.79	$67.43	$83.22	$13.14	$28.31	$41.45
Ann Arbor, MI	$3.53	$33.80	$37.33	$6.81	$32.88	$39.69	$10.90	$104.30	$115.20	$9.07	$43.79	$52.86
Anniston-Oxford, AL	$1.99	$10.87	$12.86	$3.83	$10.57	$14.41	$7.82	$42.77	$50.59	$6.51	$17.96	$24.47
Appleton, WI	$1.70	$18.57	$20.27	$3.27	$18.06	$21.34	$7.05	$77.11	$84.16	$5.87	$32.38	$38.24
Athens-Clarke County, GA	$3.77	$17.04	$20.82	$7.28	$16.58	$23.86	$13.27	$59.91	$73.18	$11.04	$25.15	$36.20
Atlanta-Sandy Springs-Marietta, GA	$2.64	$1.20	$3.85	$5.10	$1.17	$6.27	$12.25	$5.58	$17.83	$10.20	$2.34	$12.54
Auburn-Opelika, AL	$1.39	$8.19	$9.57	$2.68	$7.96	$10.64	$5.29	$31.21	$36.50	$4.40	$13.10	$17.51
Augusta-Richmond County, GA-SC	$1.44	$1.84	$3.28	$2.78	$1.79	$4.57	$5.00	$6.37	$11.37	$4.16	$2.68	$6.84
Austin-Round Rock, TX	$3.52	$4.70	$8.21	$6.78	$4.57	$11.35	$14.04	$18.77	$32.81	$11.69	$7.88	$19.57
Bakersfield, CA	$1.95	$3.81	$5.76	$3.76	$3.71	$7.47	$8.77	$17.13	$25.90	$7.30	$7.19	$14.49
Baltimore-Towson, MD	$4.11	$5.41	$9.52	$7.93	$5.26	$13.20	$16.12	$21.19	$37.31	$13.42	$8.90	$22.31
Bangor, ME	$1.54	$15.71	$17.25	$2.97	$15.28	$18.25	$6.06	$61.83	$67.89	$5.04	$25.96	$31.00
Baton Rouge, LA	$1.41	$3.12	$4.53	$2.72	$3.04	$5.76	$7.11	$15.74	$22.85	$5.92	$6.61	$12.53
Battle Creek, MI	$4.27	$31.63	$35.90	$8.24	$30.77	$39.01	$18.10	$133.97	$152.07	$15.07	$56.25	$71.31
Bay City, MI	$7.06	$80.60	$87.66	$13.61	$78.41	$92.02	$26.19	$299.08	$325.27	$21.80	$125.57	$147.37
Beaumont-Port Arthur, TX	$2.10	$5.86	$7.96	$4.04	$5.70	$9.75	$8.85	$24.75	$33.60	$7.37	$10.39	$17.76

Bellingham, WA	$5.06	$40.63	$45.70	$9.77	$39.53	$49.29	$21.43	$171.97	$193.40	$17.84	$72.20	$90.04
Bend, OR	$0.85	$7.04	$7.89	$1.64	$6.85	$8.49	$4.01	$33.15	$37.16	$3.34	$13.92	$17.26
Billings, MT	$3.16	$26.96	$30.12	$6.10	$26.23	$32.32	$13.93	$118.75	$132.67	$11.59	$49.86	$61.45
Binghamton, NY	$1.93	$21.40	$23.34	$3.73	$20.82	$24.55	$6.45	$71.38	$77.83	$5.37	$29.97	$35.34
Birmingham-Hoover, AL	$1.68	$2.03	$3.71	$3.23	$1.98	$5.21	$7.98	$9.66	$17.64	$6.64	$4.06	$10.70
Bismarck, ND	$2.19	$36.73	$38.92	$4.22	$35.73	$39.95	$8.23	$138.11	$146.34	$6.85	$57.99	$64.84
Blacksburg-Christiansburg-Radford, VA	$15.30	$93.42	$108.72	$29.51	$90.87	$120.38	$57.29	$349.76	$407.05	$47.68	$146.85	$194.53
Bloomington, IN	$2.55	$23.78	$26.33	$4.92	$23.13	$28.05	$9.67	$90.09	$99.77	$8.05	$37.82	$45.88
Bloomington-Normal, IL	$2.69	$26.23	$28.92	$5.19	$25.51	$30.70	$12.19	$118.89	$131.08	$10.15	$49.92	$60.06
Boise City-Nampa, ID	$0.89	$2.52	$3.41	$1.72	$2.45	$4.17	$3.78	$10.69	$14.47	$3.15	$4.49	$7.64
Bradenton-Sarasota-Venice, FL	$1.47	$4.34	$5.81	$2.84	$4.22	$7.06	$6.77	$19.97	$26.74	$5.63	$8.39	$14.02
Bremerton-Silverdale, WA	$8.78	$52.40	$61.18	$16.93	$50.97	$67.90	$26.87	$160.40	$187.27	$22.36	$67.34	$89.71
Brownsville-Harlingen, TX	$0.96	$2.77	$3.72	$1.85	$2.69	$4.54	$3.82	$11.02	$14.84	$3.18	$4.63	$7.80
Buffalo-Niagara Falls, NY	$4.93	$8.99	$13.92	$9.50	$8.75	$18.25	$21.49	$39.25	$60.74	$17.89	$16.48	$34.36
Burlington-South Burlington, VT	$3.75	$38.41	$42.17	$7.24	$37.37	$44.61	$14.16	$144.90	$159.07	$11.79	$60.84	$72.63
Canton-Massillon, OH	$2.56	$7.53	$10.09	$4.94	$7.32	$12.27	$11.44	$33.62	$45.06	$9.52	$14.11	$23.64
Cape Coral-Fort Myers, FL	$2.23	$3.52	$5.75	$4.30	$3.42	$7.72	$11.38	$17.94	$29.33	$9.47	$7.53	$17.01
Carson City, NV	$2.15	$42.85	$45.00	$4.15	$41.68	$45.84	$8.21	$163.30	$171.51	$6.83	$68.56	$75.40
Casper, WY	$1.96	$26.69	$28.64	$3.77	$25.96	$29.73	$14.57	$198.68	$213.25	$12.13	$83.41	$95.54
Cedar Rapids, IA	$3.47	$21.04	$24.51	$6.69	$20.47	$27.16	$15.84	$96.11	$111.95	$13.19	$40.35	$53.54
Champaign-Urbana, IL	$5.55	$47.51	$53.06	$10.71	$46.21	$56.92	$20.17	$172.55	$192.72	$16.79	$72.45	$89.23
Charleston, WV	$2.04	$13.86	$15.90	$3.94	$13.48	$17.42	$10.09	$68.54	$78.63	$8.40	$28.78	$37.17
Charleston-North Charleston, SC	$2.39	$4.56	$6.95	$4.61	$4.43	$9.04	$9.71	$18.53	$28.24	$8.08	$7.78	$15.86
Charlotte-Gastonia-Concord, NC-SC	$10.46	$4.04	$14.50	$20.17	$3.93	$24.10	$64.48	$24.90	$89.39	$53.67	$10.46	$64.13
Charlottesville, VA	$4.80	$58.01	$62.81	$9.26	$56.42	$65.68	$16.16	$195.22	$211.38	$13.45	$81.96	$95.41
Chattanooga, TN-GA	$2.77	$6.26	$9.03	$5.35	$6.09	$11.43	$12.80	$28.90	$41.70	$10.66	$12.13	$22.79
Cheyenne, WY	$2.76	$45.69	$48.45	$5.33	$44.44	$49.77	$10.79	$178.24	$189.03	$8.98	$74.83	$83.81
Chicago-Naperville-Joliet, IL-IN-WI	$4.04	$1.37	$5.41	$7.79	$1.33	$9.13	$18.42	$6.24	$24.66	$15.33	$2.62	$17.95
Chico, CA	$2.40	$14.37	$16.77	$4.63	$13.98	$18.60	$10.21	$61.14	$71.35	$8.50	$25.67	$34.17
Cincinnati-Middletown, OH-KY-IN	$3.82	$3.91	$7.73	$7.36	$3.81	$11.16	$17.05	$17.49	$34.54	$14.19	$7.34	$21.54
Clarksville, TN-KY	$2.46	$4.22	$6.67	$4.74	$4.10	$8.84	$8.13	$13.94	$22.07	$6.77	$5.85	$12.62

Cleveland-Elyria-Mentor, OH	$4.70	$5.08	$9.78	$9.05	$4.94	$14.00	$22.20	$24.02	$46.21	$18.47	$10.08	$28.56
College Station-Bryan, TX	$3.22	$13.66	$16.88	$6.22	$13.29	$19.50	$11.20	$47.45	$58.65	$9.32	$19.92	$29.24
Colorado Springs, CO	$3.39	$7.84	$11.23	$6.53	$7.62	$14.16	$11.28	$26.10	$37.38	$9.39	$10.96	$20.34
Columbia, MO	$2.89	$21.85	$24.75	$5.58	$21.26	$26.84	$9.19	$69.38	$78.57	$7.65	$29.13	$36.78
Columbia, SC	$0.88	$2.35	$3.23	$1.69	$2.29	$3.98	$3.44	$9.20	$12.64	$2.86	$3.86	$6.73
Columbus, GA-AL	$2.73	$8.81	$11.54	$5.27	$8.57	$13.84	$9.71	$31.29	$41.00	$8.08	$13.14	$21.22
Columbus, IN	$0.80	$13.44	$14.24	$1.54	$13.07	$14.61	$3.58	$60.51	$64.09	$2.98	$25.40	$28.39
Columbus, OH	$2.36	$2.48	$4.85	$4.56	$2.42	$6.98	$10.20	$10.72	$20.92	$8.49	$4.50	$12.99
Corpus Christi, TX	$4.16	$11.35	$15.51	$8.02	$11.04	$19.06	$18.15	$49.50	$67.66	$15.11	$20.78	$35.89
Corvallis, OR	$2.07	$41.97	$44.04	$3.99	$40.83	$44.82	$7.73	$156.71	$164.45	$6.43	$65.80	$72.23
Cumberland, MD-WV	$0.69	$8.79	$9.48	$1.33	$8.55	$9.88	$2.55	$32.48	$35.03	$2.12	$13.64	$15.76
Dallas-Fort Worth-Arlington, TX	$3.30	$0.93	$4.23	$6.37	$0.90	$7.27	$16.86	$4.75	$21.61	$14.03	$1.99	$16.02
Danville, IL	$3.54	$41.04	$44.58	$6.83	$39.92	$46.75	$13.53	$156.70	$170.23	$11.26	$65.79	$77.05
Davenport-Moline-Rock Island, IA-IL	$5.14	$17.82	$22.96	$9.91	$17.33	$27.24	$23.43	$81.24	$104.67	$19.50	$34.11	$53.61
Dayton, OH	$2.53	$4.88	$7.41	$4.89	$4.75	$9.63	$10.32	$19.88	$30.20	$8.59	$8.35	$16.94
Decatur, IL	$5.41	$49.95	$55.36	$10.42	$48.59	$59.01	$27.94	$258.17	$286.11	$23.25	$108.39	$131.65
Deltona-Daytona Beach-Ormond Beach, FL	$2.75	$4.27	$7.02	$5.30	$4.15	$9.45	$13.19	$20.52	$33.71	$10.98	$8.61	$19.59
Denver-Aurora, CO	$7.30	$7.24	$14.53	$14.07	$7.04	$21.11	$34.13	$33.86	$67.99	$28.40	$14.22	$42.62
Des Moines, IA	$3.88	$13.96	$17.84	$7.49	$13.58	$21.07	$19.57	$70.35	$89.92	$16.29	$29.54	$45.83
Detroit-Warren-Livonia, MI	$3.53	$1.57	$5.10	$6.81	$1.53	$8.34	$15.98	$7.12	$23.10	$13.30	$2.99	$16.29
Dubuque, IA	$2.42	$37.21	$39.63	$4.67	$36.19	$40.86	$12.04	$185.03	$197.07	$10.02	$77.68	$87.70
Duluth, MN-WI	$6.24	$25.86	$32.10	$12.03	$25.16	$37.19	$25.27	$104.74	$130.01	$21.03	$43.97	$65.01
Eau Claire, WI	$1.94	$17.87	$19.81	$3.74	$17.38	$21.12	$7.88	$72.61	$80.49	$6.55	$30.49	$37.04
El Centro, CA	$1.48	$15.09	$16.57	$2.85	$14.67	$17.53	$6.03	$61.43	$67.46	$5.02	$25.79	$30.81
El Paso, TX	$2.88	$6.34	$9.22	$5.56	$6.16	$11.72	$15.27	$33.57	$48.85	$12.71	$14.09	$26.81
Elkhart-Goshen, IN	$0.60	$4.24	$4.84	$1.15	$4.13	$5.28	$3.00	$21.31	$24.31	$2.50	$8.95	$11.44
Elmira, NY	$2.11	$54.53	$56.64	$4.07	$53.05	$57.11	$8.11	$209.80	$217.91	$6.75	$88.08	$94.83
Erie, PA	$2.26	$19.18	$21.44	$4.35	$18.66	$23.01	$9.67	$82.17	$91.84	$8.05	$34.50	$42.55
Eugene-Springfield, OR	$5.70	$25.94	$31.64	$11.00	$25.23	$36.23	$22.39	$101.82	$124.21	$18.64	$42.75	$61.39
Evansville, IN-KY	$1.27	$6.54	$7.80	$2.44	$6.36	$8.80	$6.78	$34.98	$41.76	$5.64	$14.69	$20.33
Fairbanks, AK	$2.70	$26.64	$29.34	$5.21	$25.91	$31.12	$8.55	$84.34	$92.90	$7.12	$35.41	$42.53

Fargo, ND-MN	$1.54	$16.11	$17.66	$2.98	$15.67	$18.65	$7.57	$78.93	$86.50	$6.30	$33.14	$39.44
Farmington, NM	$0.47	$5.01	$5.48	$0.92	$4.87	$5.79	$3.10	$32.73	$35.83	$2.58	$13.74	$16.32
Fayetteville-Springdale-Rogers, AR-MO	$2.26	$5.46	$7.71	$4.35	$5.31	$9.66	$9.78	$23.63	$33.41	$8.14	$9.92	$18.06
Flagstaff, AZ	$1.32	$12.87	$14.19	$2.54	$12.52	$15.06	$4.44	$43.50	$47.94	$3.70	$18.26	$21.96
Flint, MI	$7.30	$22.31	$29.62	$14.08	$21.71	$35.79	$27.05	$82.66	$109.71	$22.51	$34.70	$57.22
Florence, SC	$0.72	$3.39	$4.11	$1.38	$3.30	$4.68	$2.80	$13.27	$16.07	$2.33	$5.57	$7.90
Fond du Lac, WI	$0.96	$17.73	$18.69	$1.84	$17.25	$19.09	$4.39	$81.45	$85.85	$3.66	$34.20	$37.86
Fort Collins-Loveland, CO	$2.41	$10.31	$12.72	$4.65	$10.03	$14.68	$8.64	$36.94	$45.58	$7.19	$15.51	$22.70
Fort Smith, AR-OK	$0.66	$3.12	$3.79	$1.28	$3.04	$4.32	$3.19	$14.97	$18.16	$2.65	$6.29	$8.94
Fort Walton Beach-Crestview-Destin, FL	$0.75	$5.98	$6.73	$1.45	$5.82	$7.26	$3.27	$26.00	$29.27	$2.72	$10.92	$13.64
Fort Wayne, IN	$1.81	$4.83	$6.64	$3.49	$4.70	$8.19	$8.28	$22.09	$30.37	$6.89	$9.27	$16.16
Fresno, CA	$2.51	$4.69	$7.20	$4.83	$4.56	$9.40	$10.46	$19.57	$30.03	$8.70	$8.22	$16.92
Gadsden, AL	$1.53	$8.93	$10.46	$2.94	$8.69	$11.63	$6.69	$39.20	$45.89	$5.57	$16.46	$22.03
Gainesville, FL	$10.70	$45.65	$56.36	$20.64	$44.41	$65.05	$35.43	$151.10	$186.53	$29.49	$63.44	$92.93
Gainesville, GA	$0.32	$2.04	$2.36	$0.61	$1.99	$2.60	$1.38	$8.92	$10.30	$1.15	$3.74	$4.90
Glens Falls, NY	$0.75	$18.23	$18.98	$1.44	$17.73	$19.17	$2.71	$66.30	$69.01	$2.26	$27.83	$30.09
Grand Forks, ND-MN	$1.25	$19.08	$20.32	$2.40	$18.56	$20.96	$4.55	$69.62	$74.17	$3.78	$29.23	$33.02
Grand Junction, CO	$2.47	$17.41	$19.88	$4.76	$16.94	$21.70	$9.51	$67.05	$76.56	$7.92	$28.15	$36.07
Grand Rapids-Wyoming, MI	$2.00	$5.73	$7.73	$3.85	$5.58	$9.43	$9.09	$26.09	$35.18	$7.56	$10.95	$18.52
Great Falls, MT	$3.88	$58.65	$62.53	$7.48	$57.06	$64.53	$14.86	$224.82	$239.68	$12.37	$94.39	$106.76
Greeley, CO	$0.84	$4.95	$5.79	$1.62	$4.81	$6.43	$3.21	$18.91	$22.12	$2.67	$7.94	$10.61
Green Bay, WI	$2.84	$12.55	$15.39	$5.47	$12.21	$17.68	$12.55	$55.51	$68.05	$10.44	$23.30	$33.75
Greenville, SC	$0.37	$1.04	$1.41	$0.71	$1.02	$1.73	$1.54	$4.33	$5.87	$1.28	$1.82	$3.10
Gulfport-Biloxi, MS	$1.64	$6.10	$7.75	$3.17	$5.94	$9.11	$6.32	$23.48	$29.81	$5.26	$9.86	$15.12
Hagerstown-Martinsburg, MD-WV	$0.83	$5.88	$6.72	$1.61	$5.72	$7.33	$3.52	$24.82	$28.34	$2.93	$10.42	$13.35
Hanford-Corcoran, CA	$3.04	$18.92	$21.96	$5.86	$18.41	$24.27	$10.76	$67.01	$77.77	$8.96	$28.13	$37.09
Harrisburg-Carlisle, PA	$0.75	$7.69	$8.43	$1.44	$7.48	$8.92	$3.03	$31.16	$34.19	$2.52	$13.08	$15.60
Hattiesburg, MS	$0.46	$4.21	$4.68	$0.89	$4.10	$4.99	$1.93	$17.61	$19.54	$1.60	$7.39	$9.00
Holland-Grand Haven, MI	$0.84	$5.27	$6.12	$1.63	$5.13	$6.76	$4.04	$25.24	$29.28	$3.36	$10.60	$13.96
Honolulu, HI	$6.36	$22.48	$28.84	$12.26	$21.87	$34.13	$26.16	$92.52	$118.68	$21.77	$38.84	$60.62
Hot Springs, AR	$1.39	$11.05	$12.44	$2.68	$10.75	$13.43	$6.05	$48.04	$54.09	$5.04	$20.17	$25.21

Houston-Baytown-Sugar Land, TX	$4.72	$1.90	$6.62	$9.10	$1.85	$10.95	$26.70	$10.78	$37.48	$22.23	$4.52	$26.75
Huntington-Ashland, WV-KY-OH	$1.61	$10.15	$11.76	$3.10	$9.87	$12.98	$7.16	$45.12	$52.28	$5.96	$18.94	$24.90
Huntsville, AL	$1.19	$2.59	$3.78	$2.30	$2.52	$4.82	$4.28	$9.30	$13.58	$3.56	$3.91	$7.47
Idaho Falls, ID	$0.90	$11.63	$12.53	$1.74	$11.31	$13.06	$3.13	$40.32	$43.45	$2.60	$16.93	$19.53
Indianapolis, IN	$1.87	$1.69	$3.56	$3.61	$1.65	$5.25	$9.63	$8.71	$18.34	$8.02	$3.66	$11.67
Iowa City, IA	$5.97	$78.35	$84.32	$11.52	$76.21	$87.73	$21.05	$276.09	$297.14	$17.52	$115.92	$133.44
Ithaca, NY	$5.70	$159.05	$164.75	$10.99	$154.71	$165.70	$22.88	$638.51	$661.39	$19.05	$268.08	$287.13
Jackson, MI	$0.64	$10.29	$10.94	$1.24	$10.01	$11.26	$2.66	$42.45	$45.11	$2.21	$17.82	$20.04
Jackson, MS	$1.14	$2.47	$3.61	$2.21	$2.40	$4.61	$5.16	$11.12	$16.29	$4.30	$4.67	$8.97
Jackson, TN	$2.15	$21.76	$23.91	$4.16	$21.16	$25.32	$8.87	$89.60	$98.47	$7.39	$37.62	$45.00
Jacksonville, FL	$3.76	$3.52	$7.29	$7.26	$3.43	$10.68	$16.79	$15.71	$32.50	$13.97	$6.60	$20.57
Janesville, WI	$4.21	$31.06	$35.27	$8.13	$30.21	$38.34	$16.59	$122.31	$138.91	$13.81	$51.35	$65.16
Jefferson City, MO	$1.59	$18.00	$19.59	$3.07	$17.50	$20.58	$5.17	$58.31	$63.47	$4.30	$24.48	$28.78
Johnson City, TN	$1.57	$7.50	$9.07	$3.02	$7.30	$10.32	$6.62	$31.72	$38.34	$5.51	$13.32	$18.83
Johnstown, PA	$2.43	$37.22	$39.64	$4.68	$36.20	$40.88	$9.59	$147.13	$156.72	$7.98	$61.77	$69.76
Jonesboro, AR	$0.62	$3.59	$4.21	$1.20	$3.49	$4.69	$2.86	$16.45	$19.31	$2.38	$6.91	$9.29
Kalamazoo-Portage, MI	$2.61	$10.16	$12.77	$5.04	$9.88	$14.92	$11.26	$43.75	$55.00	$9.37	$18.37	$27.74
Kankakee-Bradley, IL	$2.02	$23.04	$25.06	$3.90	$22.41	$26.31	$8.64	$98.31	$106.95	$7.19	$41.28	$48.46
Kansas City, MO-KS	$3.60	$2.31	$5.91	$6.94	$2.25	$9.19	$16.06	$10.30	$26.36	$13.37	$4.32	$17.69
Kennewick-Richland-Pasco, WA	$11.70	$39.96	$51.65	$22.55	$38.87	$61.42	$45.51	$155.48	$200.99	$37.88	$65.28	$103.16
Killeen-Temple-Fort Hood, TX	$1.11	$2.41	$3.52	$2.13	$2.35	$4.48	$2.86	$6.24	$9.10	$2.38	$2.62	$5.00
Kingsport-Bristol-Bristol, TN-VA	$1.44	$3.89	$5.34	$2.78	$3.79	$6.57	$6.05	$16.33	$22.39	$5.04	$6.86	$11.90
Kingston, NY	$3.44	$32.68	$36.12	$6.63	$31.79	$38.43	$12.14	$115.33	$127.46	$10.10	$48.42	$58.52
Knoxville, TN	$2.29	$4.66	$6.95	$4.42	$4.53	$8.95	$9.83	$19.99	$29.82	$8.18	$8.39	$16.57
La Crosse, WI-MN	$2.17	$32.07	$34.25	$4.19	$31.20	$35.39	$9.02	$133.22	$142.24	$7.51	$55.93	$63.44
Lafayette, IN	$5.20	$47.62	$52.82	$10.04	$46.32	$56.36	$20.97	$191.91	$212.88	$17.46	$80.57	$98.03
Lafayette, LA	$1.53	$9.85	$11.38	$2.96	$9.58	$12.53	$9.86	$63.34	$73.20	$8.21	$26.59	$34.80
Lake Charles, LA	$0.81	$5.12	$5.94	$1.57	$4.98	$6.56	$6.20	$38.99	$45.19	$5.16	$16.37	$21.53
Lakeland, FL	$1.79	$4.10	$5.89	$3.45	$3.99	$7.44	$7.67	$17.63	$25.30	$6.39	$7.40	$13.79
Lancaster, PA	$0.41	$4.00	$4.41	$0.80	$3.89	$4.69	$1.86	$18.00	$19.86	$1.55	$7.56	$9.11
Lansing-East Lansing, MI	$2.25	$13.76	$16.01	$4.34	$13.38	$17.72	$8.47	$51.76	$60.23	$7.05	$21.73	$28.78

Laredo, TX	$3.17	$17.34	$20.51	$6.11	$16.87	$22.98	$14.77	$80.83	$95.60	$12.29	$33.94	$46.23
Las Cruces, NM	$1.35	$7.64	$8.99	$2.60	$7.43	$10.03	$5.47	$30.90	$36.37	$4.55	$12.97	$17.52
Las Vegas-Paradise, NV	$2.34	$4.44	$6.79	$4.52	$4.32	$8.84	$12.82	$24.30	$37.12	$10.67	$10.20	$20.87
Lawrence, KS	$1.46	$19.89	$21.35	$2.82	$19.34	$22.16	$5.68	$77.22	$82.90	$4.72	$32.42	$37.15
Lawton, OK	$3.90	$13.63	$17.53	$7.52	$13.26	$20.78	$11.55	$40.37	$51.92	$9.62	$16.95	$26.57
Lebanon, PA	$0.93	$13.51	$14.44	$1.80	$13.15	$14.94	$3.91	$56.78	$60.69	$3.26	$23.84	$27.09
Lewiston, ID-WA	$0.41	$6.90	$7.32	$0.80	$6.72	$7.52	$1.50	$24.93	$26.43	$1.25	$10.47	$11.71
Lewiston-Auburn, ME	$1.28	$17.32	$18.61	$2.47	$16.85	$19.32	$5.32	$71.91	$77.23	$4.43	$30.19	$34.62
Lexington-Fayette, KY	$1.65	$6.51	$8.16	$3.18	$6.33	$9.51	$7.35	$28.96	$36.31	$6.11	$12.16	$18.27
Lima, OH	$1.17	$14.53	$15.70	$2.25	$14.14	$16.39	$5.32	$66.15	$71.47	$4.43	$27.77	$32.20
Lincoln, NE	$3.11	$16.48	$19.58	$5.99	$16.03	$22.02	$12.95	$68.67	$81.62	$10.78	$28.83	$39.61
Little Rock-North Little Rock, AR	$1.55	$3.39	$4.93	$2.98	$3.30	$6.28	$6.73	$14.76	$21.48	$5.60	$6.20	$11.79
Logan, UT-ID	$4.50	$58.47	$62.98	$8.68	$56.88	$65.56	$15.12	$196.31	$211.43	$12.58	$82.42	$95.00
Longview, TX	$0.62	$3.08	$3.70	$1.20	$3.00	$4.20	$3.23	$16.05	$19.28	$2.69	$6.74	$9.42
Longview, WA	$1.40	$18.40	$19.79	$2.69	$17.90	$20.59	$5.33	$70.27	$75.60	$4.44	$29.50	$33.94
Los Angeles-Long Beach-Santa Ana, CA	$4.76	$1.26	$6.02	$9.18	$1.23	$10.41	$23.13	$6.15	$29.28	$19.25	$2.58	$21.83
Louisville, KY-IN	$4.88	$4.87	$9.75	$9.42	$4.74	$14.15	$23.78	$23.70	$47.48	$19.79	$9.95	$29.74
Lubbock, TX	$3.93	$20.16	$24.09	$7.58	$19.61	$27.19	$16.42	$84.20	$100.62	$13.67	$35.35	$49.02
Lynchburg, VA	$14.80	$59.94	$74.74	$28.54	$58.30	$86.84	$62.31	$252.32	$314.63	$51.86	$105.94	$157.80
Macon, GA	$1.92	$8.89	$10.81	$3.70	$8.65	$12.35	$7.42	$34.36	$41.78	$6.18	$14.43	$20.60
Madera, CA	$1.27	$7.35	$8.62	$2.45	$7.15	$9.60	$4.85	$28.08	$32.93	$4.04	$11.79	$15.83
Madison, WI	$4.32	$22.17	$26.50	$8.34	$21.57	$29.91	$18.19	$93.29	$111.49	$15.14	$39.17	$54.31
Mansfield, OH	$1.52	$12.46	$13.98	$2.93	$12.12	$15.05	$6.38	$52.39	$58.77	$5.31	$21.99	$27.31
McAllen-Edinburg-Pharr, TX	$0.39	$0.65	$1.04	$0.76	$0.63	$1.39	$1.55	$2.55	$4.11	$1.29	$1.07	$2.36
Medford, OR	$1.60	$14.00	$15.60	$3.08	$13.62	$16.70	$6.33	$55.42	$61.75	$5.27	$23.27	$28.53
Memphis, TN-MS-AR	$2.39	$2.69	$5.08	$4.60	$2.62	$7.22	$11.46	$12.91	$24.37	$9.54	$5.42	$14.96
Merced, CA	$2.86	$17.53	$20.39	$5.51	$17.05	$22.56	$13.97	$85.63	$99.60	$11.63	$35.95	$47.58
Miami-Fort Lauderdale-Miami Beach, FL	$3.06	$1.68	$4.74	$5.91	$1.63	$7.54	$14.91	$8.17	$23.08	$12.41	$3.43	$15.84
Michigan City-La Porte, IN	$1.01	$9.43	$10.44	$1.95	$9.18	$11.12	$4.27	$39.89	$44.15	$3.55	$16.75	$20.30
Milwaukee-Waukesha-West Allis, WI	$4.68	$7.93	$12.61	$9.03	$7.71	$16.74	$21.86	$37.00	$58.87	$18.20	$15.54	$33.73
Minneapolis-St. Paul-Bloomington, MN-WI	$6.75	$5.49	$12.24	$13.02	$5.34	$18.36	$29.18	$23.75	$52.92	$24.29	$9.97	$34.26

Missoula, MT	$2.62	$33.10	$35.73	$5.06	$32.20	$37.26	$12.25	$154.53	$166.78	$10.19	$64.88	$75.07
Mobile, AL	$2.05	$4.79	$6.84	$3.95	$4.66	$8.61	$8.59	$20.11	$28.70	$7.15	$8.44	$15.59
Modesto, CA	$1.93	$6.44	$8.37	$3.73	$6.26	$9.99	$8.81	$29.36	$38.17	$7.34	$12.32	$19.66
Monroe, LA	$1.60	$13.51	$15.11	$3.08	$13.14	$16.22	$7.93	$67.11	$75.03	$6.60	$28.17	$34.77
Montgomery, AL	$1.38	$3.98	$5.36	$2.66	$3.87	$6.53	$5.50	$15.85	$21.35	$4.58	$6.65	$11.23
Morgantown, WV	$3.53	$33.78	$37.31	$6.81	$32.86	$39.67	$15.86	$151.77	$167.63	$13.20	$63.72	$76.92
Mount Vernon-Anacortes, WA	$4.77	$39.20	$43.97	$9.20	$38.13	$47.33	$22.19	$182.41	$204.60	$18.47	$76.59	$95.06
Muncie, IN	$4.87	$48.76	$53.63	$9.40	$47.43	$56.83	$19.17	$191.74	$210.91	$15.95	$80.50	$96.46
Muskegon-Norton Shores, MI	$2.86	$15.37	$18.24	$5.52	$14.96	$20.48	$11.56	$62.03	$73.59	$9.62	$26.04	$35.66
Myrtle Beach-Conway-North Myrtle Beach, SC	$0.76	$3.87	$4.63	$1.47	$3.76	$5.23	$4.42	$22.46	$26.88	$3.68	$9.43	$13.11
Napa, CA	$4.24	$46.97	$51.21	$8.17	$45.69	$53.86	$19.00	$210.62	$229.61	$15.81	$88.43	$104.24
Naples-Marco Island, FL	$0.82	$3.50	$4.32	$1.58	$3.41	$4.99	$4.32	$18.42	$22.74	$3.60	$7.73	$11.33
Nashville-Davidson--Murfreesboro, TN	$2.28	$2.01	$4.28	$4.39	$1.95	$6.34	$10.64	$9.39	$20.04	$8.86	$3.94	$12.80
New Orleans-Metairie-Kenner, LA	$3.38	$5.75	$9.13	$6.51	$5.60	$12.11	$20.59	$35.10	$55.68	$17.14	$14.74	$31.87
New York-Northern New Jersey-Long Island, NY-NJ-PA	$4.12	$1.82	$5.93	$7.94	$1.77	$9.71	$18.49	$8.16	$26.65	$15.39	$3.43	$18.82
Niles-Benton Harbor, MI	$0.24	$1.35	$1.59	$0.47	$1.31	$1.78	$1.07	$5.93	$7.00	$0.89	$2.49	$3.38
Ocala, FL	$0.80	$2.70	$3.51	$1.55	$2.63	$4.18	$3.26	$10.95	$14.21	$2.71	$4.60	$7.31
Odessa, TX	$2.44	$23.06	$25.51	$4.71	$22.44	$27.15	$11.28	$106.47	$117.75	$9.39	$44.70	$54.09
Oklahoma City, OK	$1.58	$1.82	$3.40	$3.05	$1.77	$4.82	$7.27	$8.35	$15.62	$6.05	$3.51	$9.56
Olympia, WA	$3.30	$31.74	$35.04	$6.36	$30.88	$37.23	$11.45	$110.28	$121.74	$9.53	$46.30	$55.84
Omaha-Council Bluffs, NE-IA	$3.26	$6.86	$10.12	$6.29	$6.67	$12.97	$15.20	$31.93	$47.12	$12.65	$13.40	$26.05
Orlando, FL	$1.81	$2.14	$3.95	$3.50	$2.08	$5.58	$10.02	$11.81	$21.83	$8.34	$4.96	$13.30
Oshkosh-Neenah, WI	$2.00	$22.36	$24.35	$3.85	$21.75	$25.60	$7.91	$88.42	$96.32	$6.58	$37.12	$43.70
Owensboro, KY	$0.88	$10.34	$11.22	$1.69	$10.06	$11.75	$4.08	$48.10	$52.18	$3.40	$20.19	$23.59
Oxnard-Thousand Oaks-Ventura, CA	$3.49	$5.82	$9.31	$6.73	$5.67	$12.39	$14.92	$24.92	$39.84	$12.42	$10.46	$22.88
Palm Bay-Melbourne-Titusville, FL	$1.76	$2.37	$4.12	$3.39	$2.30	$5.69	$6.75	$9.08	$15.83	$5.62	$3.81	$9.43
Panama City-Lynn Haven, FL	$1.14	$8.25	$9.39	$2.20	$8.03	$10.23	$4.78	$34.66	$39.44	$3.98	$14.55	$18.53
Parkersburg-Marietta, WV-OH	$0.86	$6.80	$7.66	$1.66	$6.61	$8.27	$3.97	$31.30	$35.27	$3.30	$13.14	$16.44
Pensacola-Ferry Pass-Brent, FL	$0.99	$4.53	$5.51	$1.90	$4.40	$6.31	$3.68	$16.87	$20.54	$3.06	$7.08	$10.14
Peoria, IL	$2.90	$11.60	$14.50	$5.60	$11.28	$16.88	$12.73	$50.86	$63.59	$10.60	$21.35	$31.95
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	$2.82	$1.92	$4.74	$5.44	$1.86	$7.31	$13.65	$9.26	$22.91	$11.36	$3.89	$15.25

Phoenix-Mesa-Scottsdale, AZ	$2.93	$1.44	$4.37	$5.64	$1.40	$7.04	$13.92	$6.85	$20.78	$11.59	$2.88	$14.47
Pine Bluff, AR	$2.06	$12.82	$14.88	$3.97	$12.47	$16.44	$8.25	$51.43	$59.68	$6.87	$21.59	$28.46
Pittsburgh, PA	$3.68	$5.95	$9.63	$7.10	$5.79	$12.89	$17.95	$29.04	$46.99	$14.94	$12.19	$27.14
Pocatello, ID	$2.35	$26.89	$29.24	$4.53	$26.15	$30.68	$8.52	$97.46	$105.97	$7.09	$40.92	$48.01
Port St. Lucie-Fort Pierce, FL	$1.68	$1.11	$2.79	$3.24	$1.08	$4.32	$7.74	$5.13	$12.87	$6.44	$2.15	$8.60
Portland-South Portland-Biddeford, ME	$0.94	$4.16	$5.11	$1.82	$4.05	$5.87	$4.16	$18.35	$22.51	$3.46	$7.70	$11.17
Portland-Vancouver-Beaverton, OR-WA	$4.88	$5.46	$10.34	$9.41	$5.31	$14.72	$22.69	$25.39	$48.08	$18.89	$10.66	$29.54
Poughkeepsie-Newburgh-Middletown, NY	$2.10	$5.83	$7.93	$4.05	$5.67	$9.72	$7.38	$20.46	$27.84	$6.14	$8.59	$14.73
Providence-New Bedford-Fall River, RI-MA	$3.21	$4.71	$7.92	$6.19	$4.58	$10.77	$14.35	$21.05	$35.40	$11.95	$8.84	$20.78
Pueblo, CO	$2.01	$14.63	$16.64	$3.88	$14.23	$18.11	$7.48	$54.32	$61.80	$6.22	$22.81	$29.03
Racine, WI	$2.74	$25.56	$28.30	$5.28	$24.87	$30.15	$12.60	$117.56	$130.16	$10.49	$49.36	$59.84
Rapid City, SD	$1.17	$10.74	$11.92	$2.26	$10.45	$12.72	$4.88	$44.64	$49.52	$4.06	$18.74	$22.80
Reading, PA	$1.28	$10.01	$11.29	$2.46	$9.74	$12.20	$5.25	$41.12	$46.37	$4.37	$17.27	$21.63
Redding, CA	$2.90	$13.44	$16.34	$5.60	$13.07	$18.67	$11.66	$53.94	$65.60	$9.70	$22.65	$32.35
Reno-Sparks, NV	$3.82	$14.86	$18.67	$7.36	$14.45	$21.81	$17.71	$68.95	$86.67	$14.74	$28.95	$43.70
Richmond, VA	$2.52	$4.78	$7.31	$4.87	$4.65	$9.52	$10.79	$20.44	$31.23	$8.98	$8.58	$17.56
Riverside-San Bernardino-Ontario, CA	$2.02	$0.67	$2.69	$3.89	$0.65	$4.54	$8.81	$2.92	$11.73	$7.33	$1.23	$8.56
Roanoke, VA	$3.91	$20.36	$24.27	$7.53	$19.81	$27.34	$16.43	$85.65	$102.08	$13.68	$35.96	$49.63
Rochester, NY	$2.44	$8.39	$10.83	$4.70	$8.17	$12.87	$10.90	$37.50	$48.40	$9.07	$15.74	$24.81
Rockford, IL	$1.86	$7.22	$9.09	$3.60	$7.03	$10.62	$8.06	$31.22	$39.28	$6.71	$13.11	$19.81
Rome, GA	$11.60	$112.17	$123.77	$22.37	$109.12	$131.48	$47.66	$460.93	$508.59	$39.67	$193.52	$233.19
Sacramento--Arden-Arcade--Roseville, CA	$3.60	$3.46	$7.06	$6.94	$3.36	$10.30	$13.79	$13.24	$27.03	$11.48	$5.56	$17.03
Saginaw-Saginaw Township North, MI	$3.41	$21.53	$24.94	$6.57	$20.94	$27.51	$14.03	$88.67	$102.71	$11.68	$37.23	$48.91
Salem, OR	$2.59	$11.25	$13.84	$4.99	$10.95	$15.94	$9.85	$42.86	$52.71	$8.20	$17.99	$26.19
Salinas, CA	$2.72	$15.90	$18.61	$5.24	$15.46	$20.70	$12.94	$75.69	$88.63	$10.77	$31.78	$42.55
Salisbury, MD	$1.71	$23.17	$24.87	$3.29	$22.53	$25.83	$6.65	$90.25	$96.91	$5.54	$37.89	$43.43
Salt Lake City, UT	$4.46	$12.90	$17.36	$8.59	$12.55	$21.14	$20.65	$59.81	$80.46	$17.19	$25.11	$42.30
San Angelo, TX	$0.84	$5.39	$6.23	$1.62	$5.24	$6.86	$3.38	$21.72	$25.10	$2.81	$9.12	$11.93
San Antonio, TX	$3.92	$3.08	$7.00	$7.55	$3.00	$10.55	$16.71	$13.14	$29.85	$13.90	$5.52	$19.42
San Diego-Carlsbad-San Marcos, CA	$3.82	$2.88	$6.71	$7.37	$2.80	$10.18	$17.23	$12.99	$30.22	$14.34	$5.45	$19.79
San Francisco-Oakland-Fremont, CA	$6.99	$6.41	$13.40	$13.48	$6.23	$19.71	$31.15	$28.55	$59.70	$25.93	$11.99	$37.92

San Jose-Sunnyvale-Santa Clara, CA	$7.10	$11.29	$18.40	$13.70	$10.99	$24.69	$29.16	$46.35	$75.51	$24.27	$19.46	$43.73
San Luis Obispo-Paso Robles, CA	$2.57	$14.89	$17.46	$4.96	$14.48	$19.44	$11.98	$69.29	$81.27	$9.97	$29.09	$39.06
Santa Barbara-Santa Maria-Goleta, CA	$5.68	$27.56	$33.24	$10.95	$26.81	$37.76	$24.14	$117.13	$141.26	$20.09	$49.18	$69.27
Santa Cruz-Watsonville, CA	$5.67	$50.98	$56.65	$10.94	$49.59	$60.53	$23.14	$207.89	$231.03	$19.26	$87.28	$106.54
Santa Fe, NM	$2.90	$26.94	$29.84	$5.58	$26.21	$31.79	$13.40	$124.66	$138.05	$11.15	$52.34	$63.49
Santa Rosa-Petaluma, CA	$4.09	$13.53	$17.62	$7.88	$13.16	$21.04	$17.17	$56.87	$74.04	$14.29	$23.88	$38.17
Savannah, GA	$2.43	$11.80	$14.23	$4.69	$11.48	$16.16	$9.88	$47.98	$57.86	$8.22	$20.14	$28.37
Scranton--Wilkes-Barre, PA	$1.46	$6.33	$7.80	$2.82	$6.16	$8.99	$6.69	$28.92	$35.61	$5.57	$12.14	$17.71
Seattle-Tacoma-Bellevue, WA	$8.89	$8.67	$17.56	$17.14	$8.44	$25.58	$39.76	$38.80	$78.56	$33.09	$16.29	$49.38
Sebastian-Vero Beach, FL	$1.58	$9.47	$11.06	$3.05	$9.21	$12.27	$7.49	$44.85	$52.34	$6.24	$18.83	$25.07
Sheboygan, WI	$3.27	$39.33	$42.60	$6.31	$38.26	$44.57	$15.75	$189.45	$205.20	$13.11	$79.54	$92.65
Sherman-Denison, TX	$0.93	$5.53	$6.46	$1.78	$5.38	$7.17	$3.75	$22.38	$26.13	$3.12	$9.40	$12.51
Shreveport-Bossier City, LA	$3.79	$8.34	$12.13	$7.31	$8.11	$15.42	$25.68	$56.45	$82.12	$21.37	$23.70	$45.07
Sioux City, IA-NE-SD	$3.47	$23.17	$26.64	$6.70	$22.54	$29.24	$18.03	$120.29	$138.32	$15.01	$50.50	$65.51
Sioux Falls, SD	$1.56	$11.35	$12.92	$3.02	$11.04	$14.06	$9.21	$66.88	$76.09	$7.67	$28.08	$35.75
South Bend-Mishawaka, IN-MI	$3.25	$12.34	$15.60	$6.27	$12.01	$18.28	$17.01	$64.52	$81.53	$14.15	$27.09	$41.24
Spartanburg, SC	$0.88	$3.83	$4.71	$1.69	$3.73	$5.42	$3.66	$15.98	$19.64	$3.04	$6.71	$9.75
Spokane, WA	$5.21	$22.16	$27.37	$10.04	$21.56	$31.60	$20.81	$88.52	$109.33	$17.32	$37.17	$54.49
Springfield, IL	$3.71	$29.79	$33.50	$7.14	$28.98	$36.13	$13.47	$108.36	$121.83	$11.22	$45.49	$56.71
Springfield, MO	$0.61	$2.29	$2.91	$1.19	$2.23	$3.42	$2.55	$9.49	$12.04	$2.12	$3.99	$6.10
Springfield, OH	$1.79	$13.32	$15.11	$3.45	$12.96	$16.41	$7.19	$53.56	$60.76	$5.99	$22.49	$28.48
St. Cloud, MN	$2.47	$22.62	$25.09	$4.77	$22.00	$26.77	$10.15	$92.82	$102.97	$8.44	$38.97	$47.42
St. George, UT	$0.47	$4.21	$4.67	$0.90	$4.09	$4.99	$1.96	$17.65	$19.61	$1.63	$7.41	$9.04
St. Joseph, MO-KS	$2.49	$21.38	$23.87	$4.80	$20.80	$25.60	$10.13	$86.92	$97.05	$8.43	$36.50	$44.92
St. Louis, MO-IL	$2.06	$2.03	$4.09	$3.97	$1.98	$5.95	$8.89	$8.78	$17.67	$7.40	$3.69	$11.08
State College, PA	$4.25	$58.68	$62.94	$8.20	$57.08	$65.29	$11.73	$161.75	$173.48	$9.76	$67.91	$77.67
Stockton, CA	$3.34	$8.51	$11.86	$6.44	$8.28	$14.73	$14.63	$37.27	$51.90	$12.18	$15.65	$27.83
Sumter, SC	$5.45	$39.29	$44.73	$10.50	$38.22	$48.72	$19.23	$138.73	$157.96	$16.01	$58.25	$74.25
Syracuse, NY	$2.75	$15.52	$18.26	$5.30	$15.09	$20.39	$12.08	$68.28	$80.36	$10.06	$28.67	$38.72
Tallahassee, FL	$2.59	$12.28	$14.87	$4.99	$11.95	$16.94	$8.43	$39.99	$48.41	$7.01	$16.79	$23.80
Tampa-St. Petersburg-Clearwater, FL	$1.90	$1.63	$3.54	$3.67	$1.59	$5.26	$8.59	$7.38	$15.97	$7.15	$3.10	$10.25

Terre Haute, IN	$0.90	$5.42	$6.31	$1.73	$5.27	$7.00	$3.91	$23.62	$27.53	$3.25	$9.92	$13.17
Texarkana, TX-Texarkana, AR	$0.77	$5.09	$5.85	$1.48	$4.95	$6.43	$3.10	$20.51	$23.61	$2.58	$8.61	$11.19
Topeka, KS	$2.94	$17.65	$20.59	$5.67	$17.17	$22.84	$11.22	$67.38	$78.60	$9.34	$28.29	$37.63
Tucson, AZ	$4.16	$6.07	$10.24	$8.03	$5.91	$13.94	$15.88	$23.16	$39.03	$13.21	$9.72	$22.94
Tulsa, OK	$1.05	$2.02	$3.07	$2.03	$1.96	$4.00	$5.10	$9.79	$14.89	$4.25	$4.11	$8.36
Tuscaloosa, AL	$1.13	$5.19	$6.33	$2.18	$5.05	$7.23	$4.73	$21.73	$26.47	$3.94	$9.12	$13.07
Tyler, TX	$0.57	$3.90	$4.47	$1.10	$3.79	$4.89	$2.52	$17.26	$19.78	$2.10	$7.24	$9.34
Utica-Rome, NY	$2.03	$11.65	$13.68	$3.92	$11.33	$15.25	$7.10	$40.70	$47.80	$5.91	$17.09	$23.00
Vallejo-Fairfield, CA	$10.82	$28.98	$39.80	$20.86	$28.19	$49.05	$45.94	$123.10	$169.05	$38.24	$51.68	$89.92
Victoria, TX	$3.88	$17.29	$21.17	$7.49	$16.82	$24.30	$20.72	$92.30	$113.03	$17.25	$38.75	$56.00
Virginia Beach-Norfolk-Newport News, VA-NC	$5.33	$4.02	$9.35	$10.27	$3.91	$14.18	$21.84	$16.49	$38.34	$18.18	$6.93	$25.10
Visalia-Porterville, CA	$2.04	$6.55	$8.59	$3.94	$6.37	$10.31	$8.69	$27.85	$36.55	$7.23	$11.69	$18.93
Waco, TX	$1.73	$9.36	$11.09	$3.34	$9.10	$12.44	$7.61	$41.07	$48.69	$6.34	$17.24	$23.58
Washington-Arlington-Alexandria, DC-VA-MD-WV	$5.70	$5.27	$10.96	$10.98	$5.12	$16.11	$22.73	$21.03	$43.76	$18.92	$8.83	$27.75
Waterloo-Cedar Falls, IA	$2.27	$13.95	$16.22	$4.37	$13.57	$17.94	$10.67	$65.69	$76.36	$8.88	$27.58	$36.46
Wausau, WI	$3.43	$49.38	$52.81	$6.61	$48.04	$54.65	$14.72	$212.04	$226.76	$12.25	$89.02	$101.28
Weirton-Steubenville, WV-OH	$1.62	$9.49	$11.10	$3.12	$9.23	$12.34	$8.21	$48.18	$56.38	$6.83	$20.23	$27.06
Wenatchee, WA	$5.36	$73.42	$78.79	$10.34	$71.42	$81.77	$21.36	$292.41	$313.76	$17.78	$122.77	$140.54
Wheeling, WV-OH	$1.33	$16.00	$17.32	$2.56	$15.56	$18.12	$6.35	$76.61	$82.96	$5.29	$32.16	$37.45
Wichita Falls, TX	$1.89	$9.99	$11.88	$3.64	$9.72	$13.35	$8.47	$44.87	$53.34	$7.05	$18.84	$25.89
Wichita, KS	$1.84	$4.04	$5.89	$3.56	$3.93	$7.49	$8.34	$18.27	$26.61	$6.94	$7.67	$14.61
Williamsport, PA	$2.41	$46.37	$48.77	$4.64	$45.10	$49.74	$10.48	$202.00	$212.48	$8.72	$84.81	$93.54
Winchester, VA-WV	$2.34	$50.34	$52.69	$4.52	$48.97	$53.49	$10.27	$220.69	$230.96	$8.55	$92.65	$101.21
Yakima, WA	$2.06	$10.89	$12.95	$3.97	$10.60	$14.57	$9.06	$47.93	$56.99	$7.54	$20.12	$27.66
York-Hanover, PA	$0.48	$4.35	$4.82	$0.92	$4.23	$5.15	$2.13	$19.48	$21.60	$1.77	$8.18	$9.95
Youngstown-Warren-Boardman, OH-PA	$1.90	$3.56	$5.46	$3.66	$3.46	$7.13	$8.22	$15.40	$23.62	$6.84	$6.47	$13.30
Yuba City, CA	$4.66	$27.91	$32.57	$8.99	$27.15	$36.14	$17.64	$105.62	$123.26	$14.68	$44.34	$59.03
Yuma, AZ	$1.09	$5.69	$6.78	$2.09	$5.54	$7.63	$4.55	$23.87	$28.43	$3.79	$10.02	$13.81

APPENDIX H: MARGINAL CHANGES IN TOTAL WAGES AND GDP

TABLE **H 1 Marginal change in total payroll for a 1% increase in track mileage**

	Employment density model based on total track miles, Population model based on track miles per capita					
MSA name	WAGES-OLS	Percent due to employment density change	Percent due to population change	WAGES-IV	Percent due to employment density change	Percent due to population change
Albuquerque, NM	$33,991,645	1.07%	98.93%	$54,077,252	4.75%	95.25%
Atlanta-Sandy Springs-Marietta, GA	$9,287,398	29.96%	70.04%	$29,554,280	66.28%	33.72%
Baltimore-Towson, MD	$39,100,410	5.65%	94.35%	$72,064,169	21.59%	78.41%
Buffalo-Niagara Falls, NY	$3,598,341	1.95%	98.05%	$5,898,381	8.38%	91.62%
Charlotte-Gastonia-Concord, NC-SC	$4,786,750	14.29%	85.71%	$11,101,410	43.39%	56.61%
Chicago-Naperville-Joliet, IL-IN-WI	$148,945,106	39.42%	60.58%	$551,621,709	74.94%	25.06%
Cleveland-Elyria-Mentor, OH	$13,761,642	5.74%	94.26%	$25,432,050	21.87%	78.13%
Dallas-Fort Worth-Arlington, TX	$24,130,052	35.63%	64.37%	$84,330,923	71.79%	28.21%
Denver-Aurora, CO	$22,266,386	4.78%	95.22%	$39,973,326	18.76%	81.24%
Houston-Baytown-Sugar Land, TX	$4,111,935	26.22%	73.78%	$12,237,727	62.02%	37.98%
Little Rock-North Little Rock, AR	$3,442,277	1.02%	98.98%	$5,466,692	4.53%	95.47%
Los Angeles-Long Beach-Santa Ana, CA	$128,052,642	39.05%	60.95%	$471,630,807	74.65%	25.35%
Memphis, TN-MS-AR	$4,303,294	3.43%	96.57%	$7,404,392	14.03%	85.97%
Miami-Fort Lauderdale-Miami Beach, FL	$24,928,344	16.02%	83.98%	$60,187,210	46.72%	53.28%
Minneapolis-St. Paul-Bloomington, MN-WI	$4,732,561	10.33%	89.67%	$9,942,037	34.62%	65.38%
Nashville-Davidson--Murfreesboro, TN	$16,236,196	5.77%	94.23%	$30,033,476	21.97%	78.03%
New Orleans-Metairie-Kenner, LA	$9,782,702	1.87%	98.13%	$15,992,353	8.05%	91.95%
New York-Northern New Jersey-Long Island, NY-NJ-PA	$239,922,529	41.72%	58.28%	$919,047,805	76.70%	23.30%
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	$65,657,218	20.83%	79.17%	$175,919,501	54.74%	45.26%
Pittsburgh, PA	$5,982,045	5.47%	94.53%	$10,965,662	21.01%	78.99%
Portland-Vancouver-Beaverton, OR-WA	$26,970,381	4.14%	95.86%	$47,466,618	16.57%	83.43%
Providence-New Bedford-Fall River, RI-MA	$2,461,640	3.93%	96.07%	$4,303,392	15.82%	84.18%

Sacramento--Arden-Arcade--Roseville, CA	$20,919,011	4.31%	95.69%	$37,010,488	17.15%	82.85%
St. Louis, MO-IL	$13,650,355	8.49%	91.51%	$27,290,744	29.88%	70.12%
Salt Lake City, UT	$23,028,380	0.80%	99.20%	$36,287,753	3.57%	96.43%
San Diego-Carlsbad-San Marcos, CA	$37,266,491	8.93%	91.07%	$75,420,278	31.07%	68.93%
San Francisco-Oakland-Fremont, CA	$106,951,042	7.42%	92.58%	$207,521,142	26.91%	73.09%
San Jose-Sunnyvale-Santa Clara, CA	$268,942,069	1.80%	98.20%	$438,625,573	7.77%	92.23%
Seattle-Tacoma-Bellevue, WA	$33,391,174	9.00%	91.00%	$67,705,044	31.25%	68.75%
Tampa-St. Petersburg-Clearwater, FL	$639,029	9.15%	90.85%	$1,300,981	31.64%	68.36%
Trenton-Ewing, NJ	$23,033,425	0.16%	99.84%	$35,482,726	0.72%	99.28%
Washington-Arlington-Alexandria, DC-VA-MD-WV	$106,168,437	12.68%	87.32%	$236,797,624	40.03%	59.97%

TABLE H 2 Marginal change in total GDP for a 1% increase in track mileage

	Employment density model based on total track miles, Population model based on track miles per capita					
MSA name	GDP-OLS	Percent due to employment density change	Percent due to population change	GDP-IV	Percent due to employment density change	Percent due to population change
Albuquerque, NM	$78,082,482	2.01%	97.99%	$153,257,118	3.11%	96.89%
Atlanta-Sandy Springs-Marietta, GA	$28,838,588	44.69%	55.31%	$70,122,943	55.85%	44.15%
Baltimore-Towson, MD	$85,152,535	10.16%	89.84%	$174,761,250	15.05%	84.95%
Buffalo-Niagara Falls, NY	$8,454,953	3.62%	96.38%	$16,744,783	5.56%	94.44%
Charlotte-Gastonia-Concord, NC-SC	$17,605,163	23.95%	76.05%	$38,798,839	33.03%	66.97%
Chicago-Naperville-Joliet, IL-IN-WI	$485,286,573	55.14%	44.86%	$1,235,725,062	65.81%	34.19%
Cleveland-Elyria-Mentor, OH	$36,194,691	10.32%	89.68%	$74,345,075	15.27%	84.73%
Dallas-Fort Worth-Arlington, TX	$85,888,738	51.12%	48.88%	$214,909,584	62.09%	37.91%
Denver-Aurora, CO	$57,480,771	8.66%	91.34%	$117,024,029	12.94%	87.06%
Houston-Baytown-Sugar Land, TX	$15,194,890	40.16%	59.84%	$36,192,233	51.25%	48.75%
Little Rock-North Little Rock, AR	$8,003,666	1.91%	98.09%	$15,700,999	2.97%	97.03%
Los Angeles-Long Beach-Santa Ana, CA	$443,934,479	54.75%	45.25%	$1,128,549,916	65.46%	34.54%
Memphis, TN-MS-AR	$11,266,756	6.28%	93.72%	$22,643,118	9.50%	90.50%
Miami-Fort Lauderdale-Miami Beach, FL	$73,361,806	26.49%	73.51%	$163,720,316	36.07%	63.93%
Minneapolis-St. Paul-Bloomington, MN-WI	$11,822,754	17.87%	82.13%	$25,265,005	25.41%	74.59%
Nashville-Davidson--Murfreesboro, TN	$42,262,930	10.37%	89.63%	$86,834,592	15.34%	84.66%
New Orleans-Metairie-Kenner, LA	$32,111,059	3.47%	96.53%	$63,543,119	5.33%	94.67%
New York-Northern New Jersey-Long Island, NY-NJ-PA	$781,950,804	57.49%	42.51%	$2,011,359,930	67.93%	32.07%
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	$199,162,452	33.20%	66.80%	$459,145,804	43.77%	56.23%
Pittsburgh, PA	$16,199,213	9.85%	90.15%	$33,190,991	14.61%	85.39%
Portland-Vancouver-Beaverton, OR-WA	$68,845,843	7.55%	92.45%	$139,315,687	11.33%	88.67%

Providence-New Bedford-Fall River, RI-MA	$6,030,444	7.17%	92.83%	$12,178,221	10.79%	89.21%
Sacramento--Arden-Arcade--Roseville, CA	$44,039,379	7.84%	92.16%	$89,260,482	11.76%	88.24%
St. Louis, MO-IL	$33,555,921	14.90%	85.10%	$70,615,868	21.53%	78.47%
Salt Lake City, UT	$56,905,320	1.50%	98.50%	$111,372,836	2.33%	97.67%
San Diego-Carlsbad-San Marcos, CA	$95,951,935	15.63%	84.37%	$202,687,453	22.49%	77.51%
San Francisco-Oakland-Fremont, CA	$268,939,794	13.14%	86.86%	$560,755,972	19.16%	80.84%
San Jose-Sunnyvale-Santa Clara, CA	$593,682,535	3.35%	96.65%	$1,173,982,610	5.14%	94.86%
Seattle-Tacoma-Bellevue, WA	$85,387,014	15.74%	84.26%	$180,475,745	22.64%	77.36%
Tampa-St. Petersburg-Clearwater, FL	$1,651,899	15.98%	84.02%	$3,495,877	22.95%	77.05%
Trenton-Ewing, NJ	$45,380,901	0.30%	99.70%	$88,219,532	0.47%	99.53%
Washington-Arlington-Alexandria, DC-VA-MD-WV	$249,594,338	21.53%	78.47%	$543,408,118	30.05%	69.95%

TABLE **H 3 Marginal change in total payroll for a 1 mile increase in track mileage**

		Employment density model based on total track miles, Population model based on track miles per capita					
MSA name	Percent change in track miles	WAGES-OLS	Percent due to employment density change	Percent due to population change	WAGES-IV	Percent due to employment density change	Percent due to population change
Albuquerque, NM	2.38%	$86,472,671	1.00%	99.00%	$160,142,862	3.82%	96.18%
Atlanta-Sandy Springs-Marietta, GA	2.02%	$22,307,107	25.20%	74.80%	$69,599,386	56.86%	43.14%
Baltimore-Towson, MD	0.93%	$37,640,530	5.48%	94.52%	$78,549,156	18.51%	81.49%
Buffalo-Niagara Falls, NY	15.63%	$63,604,786	1.72%	98.28%	$120,190,345	6.42%	93.58%
Charlotte-Gastonia-Concord, NC-SC	10.42%	$63,731,060	11.18%	88.82%	$152,027,143	33.01%	66.99%
Chicago-Naperville-Joliet, IL-IN-WI	0.14%	$19,096,510	44.47%	55.53%	$78,880,073	75.81%	24.19%
Cleveland-Elyria-Mentor, OH	2.90%	$43,813,617	5.23%	94.77%	$90,836,641	17.75%	82.25%
Dallas-Fort Worth-Arlington, TX	1.18%	$26,112,657	38.92%	61.08%	$100,257,612	71.37%	28.63%
Denver-Aurora, CO	2.89%	$45,939,589	6.70%	93.30%	$98,790,335	21.93%	78.07%
Houston-Baytown-Sugar Land, TX	6.99%	$26,181,930	28.79%	71.21%	$86,625,122	61.28%	38.72%
Little Rock-North Little Rock, AR	29.41%	$118,974,647	0.87%	99.13%	$219,496,910	3.32%	96.68%
Los Angeles-Long Beach-Santa Ana, CA	0.21%	$17,976,104	57.79%	42.21%	$86,802,485	84.27%	15.73%
Memphis, TN-MS-AR	14.29%	$66,279,838	3.18%	96.82%	$130,303,706	11.39%	88.61%
Miami-Fort Lauderdale-Miami Beach, FL	1.04%	$18,740,639	22.24%	77.76%	$55,572,073	52.82%	47.18%
Minneapolis-St. Paul-Bloomington, MN-WI	8.26%	$39,679,135	10.18%	89.82%	$92,568,735	30.73%	69.27%
Nashville-Davidson--Murfreesboro, TN	3.13%	$61,214,695	4.78%	95.22%	$125,495,300	16.43%	83.57%
New Orleans-Metairie-Kenner, LA	7.75%	$74,000,307	1.92%	98.08%	$140,579,235	7.10%	92.90%
New York-Northern New Jersey-Long Island, NY-NJ-PA	0.08%	$14,627,364	55.05%	44.95%	$68,529,442	82.74%	17.26%
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	0.30%	$20,378,041	19.96%	80.04%	$57,989,468	49.39%	50.61%
Pittsburgh, PA	4.55%	$37,340,437	3.98%	96.02%	$74,982,004	13.97%	86.03%
Portland-Vancouver-Beaverton, OR-WA	2.07%	$43,432,592	5.31%	94.69%	$90,245,900	18.01%	81.99%

Providence-New Bedford-Fall River, RI-MA	14.71%	$47,176,904	3.01%	96.99%	$92,338,961	10.84%	89.16%
Sacramento-Arden-Arcade-Roseville, CA	2.71%	$41,638,274	5.87%	94.13%	$87,727,581	19.61%	80.39%
St. Louis, MO-IL	2.18%	$33,565,940	7.52%	92.48%	$73,623,076	24.13%	75.87%
Salt Lake City, UT	5.26%	$89,516,432	1.08%	98.92%	$166,141,969	4.10%	95.90%
San Diego-Carlsbad-San Marcos, CA	1.08%	$34,975,938	10.24%	89.76%	$81,711,600	30.87%	69.13%
San Francisco-Oakland-Fremont, CA	0.54%	$36,359,316	11.70%	88.30%	$87,713,333	34.14%	65.86%
San Jose-Sunnyvale-Santa Clara, CA	0.63%	$97,209,419	3.14%	96.86%	$190,926,807	11.27%	88.73%
Seattle-Tacoma-Bellevue, WA	1.15%	$38,792,883	8.92%	91.08%	$87,949,001	27.72%	72.28%
Tampa-St. Petersburg-Clearwater, FL	41.67%	$29,335,742	8.30%	91.70%	$65,554,205	26.17%	73.83%
Trenton-Ewing, NJ	14.49%	$373,370,860	0.14%	99.86%	$674,573,285	0.55%	99.45%
Washington-Arlington-Alexandria, DC-VA-MD-WV	0.31%	$28,968,290	14.21%	85.79%	$73,703,681	39.33%	60.67%

TABLE **H 4 Marginal change in total GDP for a 1 mile increase in track mileage**

		Employment density model based on total track miles, Population model based on track miles per capita					
MSA name	Percent change in track miles	GDP-OLS	Percent due to employment density change	Percent due to population change	GDP-IV	Percent due to employment density change	Percent due to population change
Albuquerque, NM	2.38%	$198,516,791	1.88%	98.12%	$455,383,344	2.49%	97.51%
Atlanta-Sandy Springs-Marietta, GA	2.02%	$66,951,597	38.89%	61.11%	$172,399,371	45.90%	54.10%
Baltimore-Towson, MD	0.93%	$81,858,842	9.88%	90.12%	$192,751,680	12.75%	87.25%
Buffalo-Niagara Falls, NY	15.63%	$149,155,458	3.21%	96.79%	$343,654,232	4.23%	95.77%
Charlotte-Gastonia-Concord, NC-SC	10.42%	$228,645,304	19.21%	80.79%	$554,595,417	24.07%	75.93%
Chicago-Naperville-Joliet, IL-IN-WI	0.14%	$64,290,247	60.21%	39.79%	$175,957,629	66.86%	33.14%
Cleveland-Elyria-Mentor, OH	2.90%	$114,733,569	9.43%	90.57%	$269,772,907	12.19%	87.81%
Dallas-Fort Worth-Arlington, TX	1.18%	$95,009,209	54.62%	45.38%	$256,001,771	61.61%	38.39%
Denver-Aurora, CO	2.89%	$120,531,826	11.94%	88.06%	$285,702,973	15.31%	84.69%
Houston-Baytown-Sugar Land, TX	6.99%	$98,547,580	43.30%	56.70%	$257,066,372	50.45%	49.55%
Little Rock-North Little Rock, AR	29.41%	$276,257,476	1.63%	98.37%	$633,191,163	2.16%	97.84%
Los Angeles-Long Beach-Santa Ana, CA	0.21%	$70,029,302	72.12%	27.88%	$198,000,049	77.52%	22.48%
Memphis, TN-MS-AR	14.29%	$173,159,880	5.84%	94.16%	$402,425,070	7.64%	92.36%
Miami-Fort Lauderdale-Miami Beach, FL	1.04%	$57,823,257	35.08%	64.92%	$147,223,691	41.88%	58.12%
Minneapolis-St. Paul-Bloomington, MN-WI	8.26%	$99,006,181	17.63%	82.37%	$238,959,534	22.21%	77.79%
Nashville-Davidson--Murfreesboro, TN	3.13%	$158,011,105	8.67%	91.33%	$370,612,948	11.23%	88.77%
New Orleans-Metairie-Kenner, LA	7.75%	$242,999,463	3.56%	96.44%	$560,519,361	4.69%	95.31%
New York-Northern New Jersey-Long Island, NY-NJ-PA	0.08%	$51,792,905	69.82%	30.18%	$145,534,856	75.52%	24.48%
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	0.30%	$61,411,763	32.03%	67.97%	$154,934,481	38.58%	61.42%
Pittsburgh, PA	4.55%	$99,842,426	7.27%	92.73%	$233,115,300	9.46%	90.54%
Portland-Vancouver-Beaverton, OR-WA	2.07%	$111,982,325	9.59%	90.41%	$263,432,198	12.38%	87.62%

Providence-New Bedford-Fall River, RI-MA	14.71%	$114,665,052	5.55%	94.45%	$266,224,825	7.26%	92.74%
Sacramento--Arden-Arcade--Roseville, CA	2.71%	$88,827,731	10.54%	89.46%	$209,603,489	13.57%	86.43%
St. Louis, MO-IL	2.18%	$81,853,446	13.31%	86.69%	$194,872,744	16.99%	83.01%
Salt Lake City, UT	5.26%	$221,755,815	2.02%	97.98%	$508,933,112	2.68%	97.32%
San Diego-Carlsbad-San Marcos, CA	1.08%	$91,027,595	17.73%	82.27%	$219,771,474	22.32%	77.68%
San Francisco-Oakland-Fremont, CA	0.54%	$94,693,615	20.01%	79.99%	$230,261,684	25.01%	74.99%
San Jose-Sunnyvale-Santa Clara, CA	0.63%	$217,110,470	5.78%	94.22%	$504,460,609	7.56%	92.44%
Seattle-Tacoma-Bellevue, WA	1.15%	$99,138,776	15.62%	84.38%	$237,762,884	19.79%	80.21%
Tampa-St. Petersburg-Clearwater, FL	41.67%	$75,306,377	14.61%	85.39%	$180,027,652	18.57%	81.43%
Trenton-Ewing, NJ	14.49%	$735,513,043	0.27%	99.73%	$1,678,199,587	0.36%	99.64%
Washington-Arlington-Alexandria, DC-VA-MD-WV	0.31%	$68,935,803	23.84%	76.16%	$169,628,886	29.44%	70.56%

TABLE **H 5 Marginal change in total payroll for a 1% increase in rail revenue miles**

MSA name	WAGES-OLS	Percent due to employment density change	Percent due to population change	WAGES-IV	Percent due to employment density change	Percent due to population change
Atlanta-Sandy Springs-Marietta, GA	$26,042,083	29.13%	70.87%	$68,130,757	38.00%	62.00%
Baltimore-Towson, MD	$18,191,884	12.47%	87.53%	$44,186,842	17.52%	82.48%
Buffalo-Niagara Falls, NY	$1,383,711	9.30%	90.70%	$3,311,679	13.26%	86.74%
Charlotte-Gastonia-Concord, NC-SC	$2,354,229	32.66%	67.34%	$6,252,320	41.96%	58.04%
Chicago-Naperville-Joliet, IL-IN-WI	$304,841,090	35.62%	64.38%	$819,739,008	45.20%	54.80%
Cleveland-Elyria-Mentor, OH	$9,486,575	14.76%	85.24%	$23,285,906	20.51%	79.49%
Dallas-Fort Worth-Arlington, TX	$24,262,381	39.93%	60.07%	$66,417,951	49.77%	50.23%
Denver-Aurora, CO	$22,221,228	15.88%	84.12%	$54,824,795	21.96%	78.04%
Houston-Baytown-Sugar Land, TX	$5,686,135	31.70%	68.30%	$15,039,900	40.90%	59.10%
Little Rock-North Little Rock, AR	$216,489	7.86%	92.14%	$514,633	11.29%	88.71%
Los Angeles-Long Beach-Santa Ana, CA	$247,961,604	41.34%	58.66%	$682,737,774	51.24%	48.76%
Memphis, TN-MS-AR	$2,053,363	14.25%	85.75%	$5,028,643	19.86%	80.14%
Miami-Fort Lauderdale-Miami Beach, FL	$11,550,388	25.47%	74.53%	$29,742,760	33.76%	66.24%
Minneapolis-St. Paul-Bloomington, MN-WI	$7,011,804	18.71%	81.29%	$17,522,581	25.54%	74.46%
Nashville-Davidson--Murfreesboro, TN	$497,080	17.51%	82.49%	$1,235,505	24.04%	75.96%
New Orleans-Metairie-Kenner, LA	$3,363,330	9.90%	90.10%	$8,072,123	14.07%	85.93%
New York-Northern New Jersey-Long Island, NY-NJ-PA	$589,594,879	29.79%	70.21%	$1,546,867,660	38.75%	61.25%
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	$85,213,469	21.63%	78.37%	$215,747,077	29.15%	70.85%
Pittsburgh, PA	$5,414,659	10.37%	89.63%	$13,024,351	14.72%	85.28%
Portland-Vancouver-Beaverton, OR-WA	$19,170,952	14.34%	85.66%	$46,967,556	19.97%	80.03%
Sacramento--Arden-Arcade--Roseville, CA	$7,480,432	16.32%	83.68%	$18,493,054	22.53%	77.47%
St. Louis, MO-IL	$16,621,241	15.94%	84.06%	$41,019,293	22.04%	77.96%
Salt Lake City, UT	$8,045,613	6.07%	93.93%	$18,963,941	8.79%	91.21%
San Diego-Carlsbad-San Marcos, CA	$20,458,408	19.90%	80.10%	$51,400,279	27.03%	72.97%

San Francisco-Oakland-Fremont, CA	$258,978,768	16.97%	83.03%	$642,134,240	23.35%	76.65%
San Jose-Sunnyvale-Santa Clara, CA	$18,993,817	10.54%	89.46%	$45,722,892	14.94%	85.06%
Seattle-Tacoma-Bellevue, WA	$2,287,447	16.10%	83.90%	$5,649,379	22.25%	77.75%
Tampa-St. Petersburg-Clearwater, FL	$345,670	17.90%	82.10%	$860,711	24.54%	75.46%
Washington-Arlington-Alexandria, DC-VA-MD-WV	$123,670,183	16.84%	83.16%	$306,458,098	23.19%	76.81%

TABLE **H 6 Marginal change in total GDP for a 1% increase in rail revenue miles**

MSA name	GDP-OLS	Percent due to employment density change	Percent due to population change	GDP-IV	Percent due to employment density change	Percent due to population change
Atlanta-Sandy Springs-Marietta, GA	$120,631,840	29.13%	70.87%	$136,214,879	38.00%	62.00%
Baltimore-Towson, MD	$71,262,646	12.47%	87.53%	$74,708,895	17.52%	82.48%
Buffalo-Niagara Falls, NY	$6,037,309	9.30%	90.70%	$6,236,508	13.26%	86.74%
Charlotte-Gastonia-Concord, NC-SC	$14,512,806	32.66%	67.34%	$16,635,617	41.96%	58.04%
Chicago-Naperville-Joliet, IL-IN-WI	$1,389,369,258	35.62%	64.38%	$1,612,556,257	45.20%	54.80%
Cleveland-Elyria-Mentor, OH	$44,845,568	14.76%	85.24%	$47,511,454	20.51%	79.49%
Dallas-Fort Worth-Arlington, TX	$123,893,919	39.93%	60.07%	$146,385,192	49.77%	50.23%
Denver-Aurora, CO	$103,946,980	15.88%	84.12%	$110,691,922	21.96%	78.04%
Houston-Baytown-Sugar Land, TX	$32,190,687	31.70%	68.30%	$36,749,641	40.90%	59.10%
Little Rock-North Little Rock, AR	$942,327	7.86%	92.14%	$966,850	11.29%	88.71%
Los Angeles-Long Beach-Santa Ana, CA	$1,205,446,794	41.34%	58.66%	$1,432,559,389	51.24%	48.76%
Memphis, TN-MS-AR	$9,855,499	14.25%	85.75%	$10,417,386	19.86%	80.14%
Miami-Fort Lauderdale-Miami Beach, FL	$56,207,721	25.47%	74.53%	$62,470,613	33.76%	66.24%
Minneapolis-St. Paul-Bloomington, MN-WI	$30,307,784	18.71%	81.29%	$32,690,200	25.54%	74.46%
Nashville-Davidson--Murfreesboro, TN	$2,324,988	17.51%	82.49%	$2,494,216	24.04%	75.96%
New Orleans-Metairie-Kenner, LA	$20,514,468	9.90%	90.10%	$21,250,720	14.07%	85.93%
New York-Northern New Jersey-Long Island, NY-NJ-PA	$2,647,823,347	29.79%	70.21%	$2,998,358,502	38.75%	61.25%
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	$412,001,883	21.63%	78.37%	$450,226,413	29.15%	70.85%
Pittsburgh, PA	$26,414,861	10.37%	89.63%	$27,423,851	14.72%	85.28%
Portland-Vancouver-Beaverton, OR-WA	$89,162,731	14.34%	85.66%	$94,282,858	19.97%	80.03%
Sacramento--Arden-Arcade--Roseville, CA	$28,651,630	16.32%	83.68%	$30,572,179	22.53%	77.47%
St. Louis, MO-IL	$71,772,064	15.94%	84.06%	$76,449,606	22.04%	77.96%

Salt Lake City, UT	$37,293,079	6.07%	93.93%	$37,939,605	8.79%	91.21%
San Diego-Carlsbad-San Marcos, CA	$92,188,682	19.90%	80.10%	$99,969,229	27.03%	72.97%
San Francisco-Oakland-Fremont, CA	$1,154,139,859	16.97%	83.03%	$1,235,137,198	23.35%	76.65%
San Jose-Sunnyvale-Santa Clara, CA	$77,959,092	10.54%	89.46%	$80,999,682	14.94%	85.06%
Seattle-Tacoma-Bellevue, WA	$10,231,363	16.10%	83.90%	$10,906,322	22.25%	77.75%
Tampa-St. Petersburg-Clearwater, FL	$1,561,034	17.90%	82.10%	$1,677,657	24.54%	75.46%
Washington-Arlington-Alexandria, DC-VA-MD-WV	$493,588,144	16.84%	83.16%	$527,917,323	23.19%	76.81%

TABLE **H 7 Marginal change in total GDP for a 1% increase in total revenue miles**

name	WAGES-OLS	Percent due to employment density change	Percent due to population change	WAGES-IV	Percent due to employment density change	Percent due to population change
Abilene, TX	$291,922	5.58%	94.42%	$634,495	10.32%	89.68%
Albany, GA	$290,464	6.96%	93.04%	$639,121	12.70%	87.30%
Albany-Schenectady-Troy, NY	$6,837,112	7.47%	92.53%	$15,113,081	13.58%	86.42%
Albuquerque, NM	$4,242,532	12.09%	87.91%	$9,760,519	21.11%	78.89%
Alexandria, LA	$318,704	4.08%	95.92%	$683,331	7.64%	92.36%
Allentown-Bethlehem-Easton, PA-NJ	$1,980,748	10.70%	89.30%	$4,503,158	18.91%	81.09%
Altoona, PA	$282,607	1.72%	98.28%	$592,957	3.30%	96.70%
Amarillo, TX	$529,240	6.87%	93.13%	$1,163,592	12.55%	87.45%
Ames, IA	$767,350	1.88%	98.12%	$1,612,358	3.60%	96.40%
Anchorage, AK	$2,704,765	8.45%	91.55%	$6,030,373	15.23%	84.77%
Anderson, IN	$128,853	7.11%	92.89%	$283,910	12.96%	87.04%
Ann Arbor, MI	$3,971,860	3.30%	96.70%	$8,456,085	6.23%	93.77%
Appleton, WI	$922,115	2.90%	97.10%	$1,955,950	5.50%	94.50%
Athens-Clarke County, GA	$526,148	6.75%	93.25%	$1,155,606	12.35%	87.65%
Atlanta-Sandy Springs-Marietta, GA	$63,321,683	41.78%	58.22%	$182,406,521	58.27%	41.73%
Auburn-Opelika, AL	$39,342	5.25%	94.75%	$85,257	9.74%	90.26%
Augusta-Richmond County, GA-SC	$484,059	20.41%	79.59%	$1,192,326	33.29%	66.71%
Bakersfield, CA	$2,398,611	14.34%	85.66%	$5,623,851	24.58%	75.42%
Bangor, ME	$393,778	3.11%	96.89%	$836,831	5.87%	94.13%
Baton Rouge, LA	$2,174,753	12.87%	87.13%	$5,036,366	22.32%	77.68%
Battle Creek, MI	$265,609	4.23%	95.77%	$570,297	7.92%	92.08%
Bay City, MI	$601,919	2.78%	97.22%	$1,275,373	5.28%	94.72%
Beaumont-Port Arthur, TX	$811,927	10.47%	89.53%	$1,842,208	18.53%	81.47%

Bellingham, WA	$1,426,129	3.91%	96.09%	$3,053,265	7.35%	92.65%
Bend, OR	$144,521	3.81%	96.19%	$309,106	7.15%	92.85%
Billings, MT	$506,593	3.69%	96.31%	$1,082,392	6.94%	93.06%
Binghamton, NY	$1,343,806	2.87%	97.13%	$2,849,574	5.44%	94.56%
Birmingham-Hoover, AL	$2,995,317	21.26%	78.74%	$7,427,722	34.45%	65.55%
Bismarck, ND	$274,214	1.91%	98.09%	$576,343	3.65%	96.35%
Blacksburg-Christiansburg-Radford, VA	$439,850	5.08%	94.92%	$951,731	9.44%	90.56%
Bloomington, IN	$613,030	3.39%	96.61%	$1,306,196	6.39%	93.61%
Bloomington-Normal, IL	$1,040,882	3.24%	96.76%	$2,214,826	6.12%	93.88%
Boise City-Nampa, ID	$1,194,558	10.36%	89.64%	$2,707,935	18.37%	81.63%
Bradenton-Sarasota-Venice, FL	$2,621,663	9.97%	90.03%	$5,922,904	17.73%	82.27%
Bremerton-Silverdale, WA	$1,537,388	5.19%	94.81%	$3,329,823	9.63%	90.37%
Brownsville-Harlingen, TX	$305,886	10.17%	89.83%	$692,248	18.05%	81.95%
Brunswick, GA	$6,064,858	2.29%	97.71%	$12,791,645	4.36%	95.64%
Canton-Massillon, OH	$1,695,525	10.01%	89.99%	$3,832,043	17.80%	82.20%
Cape Coral-Fort Myers, FL	$2,066,976	17.18%	82.82%	$4,960,750	28.75%	71.25%
Casper, WY	$222,389	2.34%	97.66%	$469,289	4.46%	95.54%
Cedar Rapids, IA	$1,008,027	5.11%	94.89%	$2,181,731	9.49%	90.51%
Champaign-Urbana, IL	$2,593,377	3.68%	96.32%	$5,540,406	6.92%	93.08%
Charleston, WV	$1,896,962	4.59%	95.41%	$4,086,404	8.57%	91.43%
Charleston-North Charleston, SC	$2,373,717	14.63%	85.37%	$5,578,848	25.01%	74.99%
Charlotte-Gastonia-Concord, NC-SC	$21,914,522	45.84%	54.16%	$64,867,708	62.23%	37.77%
Chattanooga, TN-GA	$1,591,460	12.65%	87.35%	$3,678,885	21.99%	78.01%
Cheyenne, WY	$320,127	1.94%	98.06%	$673,026	3.71%	96.29%
Chicago-Naperville-Joliet, IL-IN-WI	$267,871,408	49.13%	50.87%	$810,102,746	65.27%	34.73%
Chico, CA	$540,627	5.18%	94.82%	$1,170,773	9.60%	90.40%
Cincinnati-Middletown, OH-KY-IN	$15,988,468	24.17%	75.83%	$40,556,853	38.28%	61.72%
Clarksville, TN-KY	$537,114	16.01%	83.99%	$1,276,822	27.06%	72.94%
Cleveland-Elyria-Mentor, OH	$31,042,457	23.20%	76.80%	$78,157,608	37.03%	62.97%
College Station-Bryan, TX	$1,193,223	7.16%	92.84%	$2,630,311	13.05%	86.95%

Columbia, MO	$475,217	4.15%	95.85%	$1,019,603	7.77%	92.23%
Columbia, SC	$1,340,148	10.89%	89.11%	$3,051,848	19.22%	80.78%
Columbus, GA-AL	$686,598	9.21%	90.79%	$1,541,056	16.50%	83.50%
Columbus, OH	$9,546,009	23.74%	76.26%	$24,134,311	37.73%	62.27%
Corpus Christi, TX	$2,163,828	10.70%	89.30%	$4,919,628	18.92%	81.08%
Cumberland, MD-WV	$132,626	2.50%	97.50%	$280,286	4.76%	95.24%
Dallas-Fort Worth-Arlington, TX	$80,466,977	53.71%	46.29%	$250,548,849	69.31%	30.69%
Davenport-Moline-Rock Island, IA-IL	$2,830,835	8.61%	91.39%	$6,320,574	15.50%	84.50%
Dayton, OH	$5,103,956	14.51%	85.49%	$11,983,980	24.83%	75.17%
Decatur, IL	$0	0.00%	0.00%	$0	0.00%	0.00%
Deltona-Daytona Beach-Ormond Beach, FL	$773,983	3.42%	96.58%	$1,649,529	6.44%	93.56%
Denver-Aurora, CO	$1,264,089	17.37%	82.63%	$3,038,578	29.03%	70.97%
Des Moines, IA	$66,407,587	24.78%	75.22%	$169,245,579	39.07%	60.93%
Detroit-Warren-Livonia, MI	$2,634,021	8.34%	91.66%	$5,866,890	15.04%	84.96%
Dubuque, IA	$39,377,246	42.32%	57.68%	$113,846,324	58.81%	41.19%
Duluth, MN-WI	$0	0.00%	0.00%	$0	0.00%	0.00%
Eau Claire, WI	$251,457	2.08%	97.92%	$529,357	3.98%	96.02%
El Centro, CA	$1,316,041	7.31%	92.69%	$2,904,901	13.31%	86.69%
El Paso, TX	$534,424	3.42%	96.58%	$1,139,053	6.45%	93.55%
Elkhart-Goshen, IN	$260,097	3.11%	96.89%	$552,754	5.88%	94.12%
Elmira, NY	$3,618,059	12.95%	87.05%	$8,384,562	22.45%	77.55%
Erie, PA	$360,797	4.40%	95.60%	$775,856	8.22%	91.78%
Eugene-Springfield, OR	$468,696	1.25%	98.75%	$979,041	2.40%	97.60%
Evansville, IN-KY	$1,132,100	3.70%	96.30%	$2,419,096	6.96%	93.04%
Fairbanks, AK	$2,343,795	6.71%	93.29%	$5,145,814	12.28%	87.72%
Fayetteville-Springdale-Rogers, AR-MO	$920,566	5.96%	94.04%	$2,007,674	10.98%	89.02%
Flagstaff, AZ	$353,382	3.21%	96.79%	$751,697	6.06%	93.94%
Flint, MI	$518,803	11.92%	88.08%	$1,191,827	20.84%	79.16%
Florence, SC	$481,702	3.23%	96.77%	$1,024,878	6.10%	93.90%
Fond du Lac, WI	$2,035,516	9.66%	90.34%	$4,586,537	17.23%	82.77%

Fort Collins-Loveland, CO	$105,398	6.45%	93.55%	$230,867	11.83%	88.17%
Fort Smith, AR-OK	$120,452	1.73%	98.27%	$252,747	3.32%	96.68%
Fort Walton Beach-Crestview-Destin, FL	$829,453	7.11%	92.89%	$1,827,512	12.96%	87.04%
Fort Wayne, IN	$179,884	6.51%	93.49%	$394,240	11.93%	88.07%
Fresno, CA	$356,738	3.95%	96.05%	$763,981	7.40%	92.60%
Gainesville, FL	$1,310,907	10.91%	89.09%	$2,985,840	19.25%	80.75%
Glens Falls, NY	$3,262,745	14.87%	85.13%	$7,683,392	25.36%	74.64%
Grand Forks, ND-MN	$2,193,901	7.12%	92.88%	$4,834,380	12.98%	87.02%
Grand Junction, CO	$190,196	1.32%	98.68%	$397,559	2.54%	97.46%
Grand Rapids-Wyoming, MI	$285,903	2.09%	97.91%	$601,916	3.99%	96.01%
Great Falls, MT	$607,067	4.43%	95.57%	$1,305,841	8.28%	91.72%
Greeley, CO	$3,706,375	10.22%	89.78%	$8,391,856	18.14%	81.86%
Green Bay, WI	$280,275	2.11%	97.89%	$590,200	4.04%	95.96%
Greenville, SC	$257,859	5.25%	94.75%	$558,790	9.73%	90.27%
Hagerstown-Martinsburg, MD-WV	$1,275,112	6.88%	93.12%	$2,803,846	12.57%	87.43%
Hanford-Corcoran, CA	$499,089	10.40%	89.60%	$1,131,736	18.42%	81.58%
Harrisburg-Carlisle, PA	$227,183	4.43%	95.57%	$488,677	8.28%	91.72%
Holland-Grand Haven, MI	$351,427	4.99%	95.01%	$759,751	9.27%	90.73%
Honolulu, HI	$1,796,533	3.08%	96.92%	$3,816,914	5.82%	94.18%
Houston-Baytown-Sugar Land, TX	$207,212	4.97%	95.03%	$447,915	9.24%	90.76%
Huntington-Ashland, WV-KY-OH	$17,605,291	8.46%	91.54%	$39,255,747	15.25%	84.75%
Huntsville, AL	$79,870,435	44.76%	55.24%	$234,721,292	61.19%	38.81%
Indianapolis, IN	$487,019	4.93%	95.07%	$1,052,332	9.17%	90.83%
Iowa City, IA	$677,673	13.08%	86.92%	$1,572,214	22.66%	77.34%
Ithaca, NY	$8,575,161	26.56%	73.44%	$22,151,860	41.31%	58.69%
Jackson, MI	$1,338,018	2.43%	97.57%	$2,825,861	4.63%	95.37%
Jackson, MS	$1,265,157	1.16%	98.84%	$2,640,507	2.23%	97.77%
Jackson, TN	$213,423	2.01%	97.99%	$448,973	3.83%	96.17%
Jacksonville, FL	$823,975	13.18%	86.82%	$1,913,235	22.81%	77.19%
Janesville, WI	$441,304	3.14%	96.86%	$938,096	5.93%	94.07%

Jefferson City, MO	$11,003,673	25.88%	74.12%	$28,280,712	40.47%	59.53%
Johnson City, TN	$835,022	4.25%	95.75%	$1,793,151	7.95%	92.05%
Johnstown, PA	$310,476	2.81%	97.19%	$658,041	5.34%	94.66%
Kalamazoo-Portage, MI	$245,699	6.39%	93.61%	$537,895	11.72%	88.28%
Kankakee-Bradley, IL	$377,033	2.09%	97.91%	$793,742	3.98%	96.02%
Kansas City, MO-KS	$1,148,989	7.76%	92.24%	$2,546,191	14.07%	85.93%
Kennewick-Richland-Pasco, WA	$348,647	2.79%	97.21%	$738,790	5.29%	94.71%
Killeen-Temple-Fort Hood, TX	$13,381,476	33.76%	66.24%	$36,451,644	49.80%	50.20%
Knoxville, TN	$2,107,452	8.73%	91.27%	$4,710,313	15.70%	84.30%
La Crosse, WI-MN	$582,726	13.04%	86.96%	$1,351,467	22.59%	77.41%
Lafayette, IN	$2,544,684	13.85%	86.15%	$5,941,944	23.83%	76.17%
Lafayette, LA	$0	0.00%	0.00%	$0	0.00%	0.00%
Lakeland, FL	$597,443	2.17%	97.83%	$1,258,683	4.13%	95.87%
Lancaster, PA	$1,091,288	3.45%	96.55%	$2,326,477	6.50%	93.50%
Lansing-East Lansing, MI	$638,524	4.84%	95.16%	$1,378,627	9.01%	90.99%
Laredo, TX	$1,280,156	12.46%	87.54%	$2,954,360	21.69%	78.31%
Las Cruces, NM	$1,133,407	3.27%	96.73%	$2,412,239	6.17%	93.83%
Las Vegas-Paradise, NV	$2,558,467	5.08%	94.92%	$5,535,586	9.43%	90.57%
Lawrence, KS	$706,115	5.64%	94.36%	$1,535,506	10.41%	89.59%
Lawton, OK	$194,002	5.47%	94.53%	$421,226	10.11%	89.89%
Lebanon, PA	$15,554,063	14.71%	85.29%	$36,580,183	25.13%	74.87%
Lewiston-Auburn, ME	$347,499	2.35%	97.65%	$733,329	4.47%	95.53%
Lexington-Fayette, KY	$363,942	8.56%	91.44%	$812,177	15.40%	84.60%
Lincoln, NE	$238,174	2.20%	97.80%	$501,954	4.20%	95.80%
Little Rock-North Little Rock, AR	$151,485	2.36%	97.64%	$319,728	4.50%	95.50%
Logan, UT-ID	$2,039,403	7.66%	92.34%	$4,515,331	13.89%	86.11%
Longview, WA	$1,324,452	5.81%	94.19%	$2,884,496	10.71%	89.29%
Los Angeles-Long Beach-Santa Ana, CA	$2,160,798	12.97%	87.03%	$5,008,285	22.48%	77.52%
Louisville, KY-IN	$490,879	2.46%	97.54%	$1,036,953	4.67%	95.33%
Lubbock, TX	$133,207	2.42%	97.58%	$281,301	4.61%	95.39%

Lynchburg, VA	$484,901,200	55.16%	44.84%	$1,523,623,384	70.54%	29.46%
Macon, GA	$8,019,645	24.69%	75.31%	$20,425,163	38.96%	61.04%
Madison, WI	$1,057,660	5.99%	94.01%	$2,307,326	11.04%	88.96%
Mansfield, OH	$804,177	7.47%	92.53%	$1,777,544	13.58%	86.42%
McAllen-Edinburg-Pharr, TX	$781,329	6.59%	93.41%	$1,713,691	12.08%	87.92%
Medford, OR	$5,402,461	5.99%	94.01%	$11,785,789	11.04%	88.96%
Memphis, TN-MS-AR	$140,096	3.83%	96.17%	$299,710	7.20%	92.80%
Merced, CA	$477,021	16.58%	83.42%	$1,139,304	27.89%	72.11%
Miami-Fort Lauderdale-Miami Beach, FL	$389,316	3.60%	96.40%	$831,103	6.77%	93.23%
Milwaukee-Waukesha-West Allis, WI	$7,266,546	22.49%	77.51%	$18,194,212	36.09%	63.91%
Minneapolis-St. Paul-Bloomington, MN-WI	$1,185,723	5.06%	94.94%	$2,565,172	9.40%	90.60%
Missoula, MT	$78,505,938	37.37%	62.63%	$219,380,737	53.73%	46.27%
Mobile, AL	$20,811,367	16.19%	83.81%	$49,546,351	27.32%	72.68%
Modesto, CA	$52,060,749	28.66%	71.34%	$136,621,891	43.87%	56.13%
Monroe, LA	$466,503	2.53%	97.47%	$986,101	4.80%	95.20%
Morgantown, WV	$1,012,506	12.26%	87.74%	$2,332,717	21.37%	78.63%
Muncie, IN	$1,155,304	8.94%	91.06%	$2,586,837	16.04%	83.96%
Muskegon-Norton Shores, MI	$389,306	3.72%	96.28%	$831,996	6.99%	93.01%
Myrtle Beach-Conway-North Myrtle Beach, SC	$688,433	3.30%	96.70%	$1,465,689	6.24%	93.76%
Naples-Marco Island, FL	$491,366	3.16%	96.84%	$1,044,786	5.98%	94.02%
Nashville-Davidson--Murfreesboro, TN	$242,765	5.74%	94.26%	$528,408	10.60%	89.40%
New Orleans-Metairie-Kenner, LA	$441,590	6.04%	93.96%	$963,789	11.13%	88.87%
New York-Northern New Jersey-Long Island, NY-NJ-PA	$963,341	7.13%	92.87%	$2,122,903	12.99%	87.01%
Niles-Benton Harbor, MI	$5,651,823	27.03%	72.97%	$14,652,410	41.89%	58.11%
Odessa, TX	$5,267,090	16.09%	83.91%	$12,529,424	27.18%	72.82%
Oklahoma City, OK	$908,298,850	42.55%	57.45%	$2,630,245,695	59.05%	40.95%
Olympia, WA	$37,079	5.59%	94.41%	$80,601	10.34%	89.66%
Omaha-Council Bluffs, NE-IA	$667,142	3.35%	96.65%	$1,420,940	6.32%	93.68%
Orlando, FL	$3,218,221	22.15%	77.85%	$8,036,624	35.64%	64.36%
Oshkosh-Neenah, WI	$1,671,225	3.28%	96.72%	$3,557,402	6.20%	93.80%

Oxnard-Thousand Oaks-Ventura, CA	$4,351,030	13.46%	86.54%	$10,127,032	23.24%	76.76%
Palm Bay-Melbourne-Titusville, FL	$15,500,195	21.73%	78.27%	$38,578,275	35.07%	64.93%
Panama City-Lynn Haven, FL	$553,865	2.84%	97.16%	$1,174,166	5.38%	94.62%
Pensacola-Ferry Pass-Brent, FL	$3,157,073	16.37%	83.63%	$7,527,221	27.58%	72.42%
Peoria, IL	$1,111,335	19.54%	80.46%	$2,718,576	32.10%	67.90%
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	$688,359	4.32%	95.68%	$1,479,134	8.07%	91.93%
Phoenix-Mesa-Scottsdale, AZ	$1,230,483	6.65%	93.35%	$2,700,147	12.18%	87.82%
Pittsburgh, PA	$1,816,054	7.56%	92.44%	$4,017,573	13.74%	86.26%
Pocatello, ID	$88,342,048	32.51%	67.49%	$238,485,602	48.39%	51.61%
Port St. Lucie-Fort Pierce, FL	$49,331,664	39.92%	60.08%	$140,312,158	56.39%	43.61%
Portland-Vancouver-Beaverton, OR-WA	$28,655,527	16.81%	83.19%	$68,568,170	28.23%	71.77%
Poughkeepsie-Newburgh-Middletown, NY	$177,598	2.78%	97.22%	$376,284	5.27%	94.73%
Providence-New Bedford-Fall River, RI-MA	$183,373	33.04%	66.96%	$496,909	48.98%	51.02%
Pueblo, CO	$37,577,109	22.61%	77.39%	$94,175,677	36.25%	63.75%
Racine, WI	$2,008,316	10.54%	89.46%	$4,559,750	18.66%	81.34%
Rapid City, SD	$8,418,430	18.23%	81.77%	$20,377,808	30.26%	69.74%
Reading, PA	$294,441	4.31%	95.69%	$632,633	8.05%	91.95%
Redding, CA	$0	0.00%	0.00%	$0	0.00%	0.00%
Reno-Sparks, NV	$786,435	3.39%	96.61%	$1,675,589	6.38%	93.62%
Richmond, VA	$156,856	3.45%	96.55%	$334,396	6.50%	93.50%
Riverside-San Bernardino-Ontario, CA	$1,183,446	4.01%	95.99%	$2,535,786	7.51%	92.49%
Roanoke, VA	$427,505	6.60%	93.40%	$937,670	12.09%	87.91%
Rochester, MN	$6,880,296	7.75%	92.25%	$15,245,557	14.05%	85.95%
Rochester, NY	$458,174	14.71%	85.29%	$1,077,590	25.14%	74.86%
Rockford, IL	$11,513,063	49.65%	50.35%	$34,935,216	65.74%	34.26%
Rome, GA	$2,599,912	5.90%	94.10%	$5,667,184	10.88%	89.12%
Sacramento--Arden-Arcade--Roseville, CA	$1,049,519	3.54%	96.46%	$2,239,321	6.67%	93.33%
Saginaw-Saginaw Township North, MI	$4,572,029	8.68%	91.32%	$10,213,756	15.60%	84.40%
Salem, OR	$968,398	7.78%	92.22%	$2,146,445	14.11%	85.89%
Salt Lake City, UT	$295,061	3.27%	96.73%	$627,991	6.17%	93.83%

San Angelo, TX	$20,288,521	25.40%	74.60%	$51,950,736	39.85%	60.15%
San Antonio, TX	$462,601	4.92%	95.08%	$999,481	9.15%	90.85%
San Diego-Carlsbad-San Marcos, CA	$1,315,549	6.99%	93.01%	$2,895,549	12.76%	87.24%
San Francisco-Oakland-Fremont, CA	$20,466,149	10.14%	89.86%	$46,306,679	18.01%	81.99%
San Jose-Sunnyvale-Santa Clara, CA	$234,025	4.84%	95.16%	$505,264	9.01%	90.99%
San Luis Obispo-Paso Robles, CA	$19,934,576	29.36%	70.64%	$52,586,254	44.71%	55.29%
Santa Barbara-Santa Maria-Goleta, CA	$41,809,994	30.25%	69.75%	$111,021,914	45.77%	54.23%
Santa Cruz-Watsonville, CA	$199,744,927	26.29%	73.71%	$514,965,965	40.98%	59.02%
Santa Fe, NM	$48,212,181	17.06%	82.94%	$115,598,864	28.59%	71.41%
Santa Rosa-Petaluma, CA	$276,053	5.35%	94.65%	$598,755	9.91%	90.09%
Savannah, GA	$0	0.00%	0.00%	$0	0.00%	0.00%
Scranton--Wilkes-Barre, PA	$6,611,275	6.31%	93.69%	$14,464,014	11.59%	88.41%
Seattle-Tacoma-Bellevue, WA	$5,239,179	3.51%	96.49%	$11,175,504	6.61%	93.39%
Sebastian-Vero Beach, FL	$686,656	3.39%	96.61%	$1,463,118	6.40%	93.60%
Sheboygan, WI	$5,193,388	8.98%	91.02%	$11,633,126	16.12%	83.88%
Sherman-Denison, TX	$2,023,569	6.31%	93.69%	$4,426,901	11.58%	88.42%
Shreveport-Bossier City, LA	$1,404,435	7.03%	92.97%	$3,092,243	12.83%	87.17%
Sioux City, IA-NE-SD	$97,420,318	25.09%	74.91%	$248,875,545	39.47%	60.53%
Sioux Falls, SD	$187,221	5.18%	94.82%	$405,459	9.61%	90.39%
South Bend-Mishawaka, IN-MI	$498,022	2.65%	97.35%	$1,053,897	5.02%	94.98%
Spartanburg, SC	$133,650	5.19%	94.81%	$289,459	9.62%	90.38%
Spokane, WA	$1,858,990	12.95%	87.05%	$4,307,950	22.44%	77.56%
Springfield, IL	$388,948	4.67%	95.33%	$838,462	8.71%	91.29%
Springfield, MO	$680,338	4.31%	95.69%	$1,461,827	8.06%	91.94%
Springfield, OH	$1,216,191	7.93%	92.07%	$2,699,263	14.36%	85.64%
St. Cloud, MN	$206,490	6.96%	93.04%	$454,354	12.70%	87.30%
St. Joseph, MO-KS	$4,631,778	7.14%	92.86%	$10,207,816	13.01%	86.99%
St. Louis, MO-IL	$986,551	3.91%	96.09%	$2,111,994	7.33%	92.67%
State College, PA	$775,897	8.06%	91.94%	$1,723,978	14.57%	85.43%
Stockton, CA	$124,216	4.21%	95.79%	$266,647	7.87%	92.13%

Sumter, SC	$883,221	3.45%	96.55%	$1,882,912	6.50%	93.50%
Syracuse, NY	$532,216	3.67%	96.33%	$1,136,887	6.90%	93.10%
Tallahassee, FL	$28,379,824	24.86%	75.14%	$72,373,750	39.17%	60.83%
Tampa-St. Petersburg-Clearwater, FL	$1,081,064	2.32%	97.68%	$2,280,724	4.41%	95.59%
Terre Haute, IN	$2,461,039	11.37%	88.63%	$5,627,513	19.98%	80.02%
Toledo, OH	$294,003	4.34%	95.66%	$631,861	8.11%	91.89%
Topeka, KS	$4,894,852	5.47%	94.53%	$10,628,268	10.12%	89.88%
Tucson, AZ	$1,396,008	6.44%	93.56%	$3,057,761	11.82%	88.18%
Tulsa, OK	$18,531,438	27.57%	72.43%	$48,238,375	42.56%	57.44%
Tuscaloosa, AL	$249,065	5.13%	94.87%	$539,153	9.52%	90.48%
Utica-Rome, NY	$3,053,161	13.80%	86.20%	$7,126,495	23.76%	76.24%
Victoria, TX	$756,021	5.16%	94.84%	$1,637,037	9.58%	90.42%
Virginia Beach-Norfolk-Newport News, VA-NC	$5,732,550	18.31%	81.69%	$13,885,071	30.37%	69.63%
Visalia-Porterville, CA	$2,681,766	14.56%	85.44%	$6,299,363	24.91%	75.09%
Waco, TX	$175,194	6.65%	93.35%	$384,434	12.17%	87.83%
Washington-Arlington-Alexandria, DC-VA-MD-WV	$682,698	5.39%	94.61%	$1,481,333	9.99%	90.01%
Waterloo-Cedar Falls, IA	$297,982	6.84%	93.16%	$654,979	12.50%	87.50%
Wausau, WI	$12,870,935	30.21%	69.79%	$34,167,429	45.72%	54.28%
Wenatchee, WA	$808,952	9.26%	90.74%	$1,816,350	16.57%	83.43%
Wheeling, WV-OH	$517,725	5.71%	94.29%	$1,126,609	10.55%	89.45%
Wichita, KS	$220,412,058	26.11%	73.89%	$567,478,792	40.75%	59.25%
Williamsport, PA	$532,006	5.04%	94.96%	$1,150,723	9.37%	90.63%
Yakima, WA	$491,947	2.22%	97.78%	$1,036,938	4.23%	95.77%
York-Hanover, PA	$1,202,447	2.33%	97.67%	$2,537,206	4.44%	95.56%
Youngstown-Warren-Boardman, OH-PA	$406,562	2.64%	97.36%	$860,299	5.01%	94.99%
Yuba City, CA	$1,617,444	12.98%	87.02%	$3,749,407	22.50%	77.50%
Yuma, AZ	$494,372	1.67%	98.33%	$1,036,729	3.20%	96.80%

TABLE **H 8 Marginal change in total GDP for a 1% increase in total revenue miles**

name	GDP-OLS	Percent due to employment density change	Percent due to population change	GDP-IV	Percent due to employment density change	Percent due to population change
Abilene, TX	$1,151,836	5.58%	94.42%	$1,080,556	10.32%	89.68%
Albany, GA	$1,197,747	6.96%	93.04%	$1,137,500	12.70%	87.30%
Albany-Schenectady-Troy, NY	$26,828,592	7.47%	92.53%	$25,596,071	13.58%	86.42%
Albuquerque, NM	$18,236,255	12.09%	87.91%	$18,108,336	21.11%	78.89%
Alexandria, LA	$1,346,323	4.08%	95.92%	$1,245,915	7.64%	92.36%
Allentown-Bethlehem-Easton, PA-NJ	$8,236,931	10.70%	89.30%	$8,082,549	18.91%	81.09%
Altoona, PA	$1,236,929	1.72%	98.28%	$1,120,160	3.30%	96.70%
Amarillo, TX	$2,308,814	6.87%	93.13%	$2,190,947	12.55%	87.45%
Ames, IA	$3,166,865	1.88%	98.12%	$2,872,055	3.60%	96.40%
Anchorage, AK	$13,283,459	8.45%	91.55%	$12,782,651	15.23%	84.77%
Anderson, IN	$636,224	7.11%	92.89%	$605,050	12.96%	87.04%
Ann Arbor, MI	$12,257,101	3.30%	96.70%	$11,263,108	6.23%	93.77%
Appleton, WI	$3,829,493	2.90%	97.10%	$3,505,978	5.50%	94.50%
Athens-Clarke County, GA	$1,849,310	6.75%	93.25%	$1,753,100	12.35%	87.65%
Atlanta-Sandy Springs-Marietta, GA	$293,317,983	41.78%	58.22%	$364,688,186	58.27%	41.73%
Auburn-Opelika, AL	$149,988	5.25%	94.75%	$140,290	9.74%	90.26%
Augusta-Richmond County, GA-SC	$1,676,571	20.41%	79.59%	$1,782,438	33.29%	66.71%
Bakersfield, CA	$10,782,446	14.34%	85.66%	$10,911,548	24.58%	75.42%
Bangor, ME	$1,550,171	3.11%	96.89%	$1,421,874	5.87%	94.13%
Baton Rouge, LA	$10,959,292	12.87%	87.13%	$10,954,310	22.32%	77.68%
Battle Creek, MI	$1,125,049	4.23%	95.77%	$1,042,615	7.92%	92.08%
Bay City, MI	$2,233,370	2.78%	97.22%	$2,042,466	5.28%	94.72%
Beaumont-Port Arthur, TX	$3,427,860	10.47%	89.53%	$3,356,913	18.53%	81.47%

Bellingham, WA	$6,035,578	3.91%	96.09%	$5,577,242	7.35%	92.65%
Bend, OR	$680,734	3.81%	96.19%	$628,417	7.15%	92.85%
Billings, MT	$2,231,179	3.69%	96.31%	$2,057,571	6.94%	93.06%
Binghamton, NY	$4,481,954	2.87%	97.13%	$4,102,095	5.44%	94.56%
Birmingham-Hoover, AL	$14,249,669	21.26%	78.74%	$15,251,504	34.45%	65.55%
Bismarck, ND	$1,031,192	1.91%	98.09%	$935,462	3.65%	96.35%
Blacksburg-Christiansburg-Radford, VA	$1,646,787	5.08%	94.92%	$1,537,949	9.44%	90.56%
Bloomington, IN	$2,322,845	3.39%	96.61%	$2,136,201	6.39%	93.61%
Bloomington-Normal, IL	$4,718,097	3.24%	96.76%	$4,333,112	6.12%	93.88%
Boise City-Nampa, ID	$5,065,899	10.36%	89.64%	$4,956,586	18.37%	81.63%
Bradenton-Sarasota-Venice, FL	$12,060,755	9.97%	90.03%	$11,760,543	17.73%	82.27%
Bremerton-Silverdale, WA	$4,705,776	5.19%	94.81%	$4,399,103	9.63%	90.37%
Brownsville-Harlingen, TX	$1,218,714	10.17%	89.83%	$1,190,416	18.05%	81.95%
Brunswick, GA	$23,470,861	2.29%	97.71%	$21,366,329	4.36%	95.64%
Canton-Massillon, OH	$7,569,576	10.01%	89.99%	$7,384,018	17.80%	82.20%
Cape Coral-Fort Myers, FL	$10,547,122	17.18%	82.82%	$10,925,489	28.75%	71.25%
Casper, WY	$1,655,621	2.34%	97.66%	$1,507,940	4.46%	95.54%
Cedar Rapids, IA	$4,604,276	5.11%	94.89%	$4,301,160	9.49%	90.51%
Champaign-Urbana, IL	$9,419,828	3.68%	96.32%	$8,685,883	6.92%	93.08%
Charleston, WV	$9,380,568	4.59%	95.41%	$8,721,814	8.57%	91.43%
Charleston-North Charleston, SC	$9,650,477	14.63%	85.37%	$9,789,475	25.01%	74.99%
Charlotte-Gastonia-Concord, NC-SC	$135,093,553	45.84%	54.16%	$172,594,233	62.23%	37.77%
Chattanooga, TN-GA	$7,351,733	12.65%	87.35%	$7,335,088	21.99%	78.01%
Cheyenne, WY	$1,248,988	1.94%	98.06%	$1,133,345	3.71%	96.29%
Chicago-Naperville-Joliet, IL-IN-WI	$1,220,873,141	49.13%	50.87%	$1,593,600,205	65.27%	34.73%
Chico, CA	$2,300,688	5.18%	94.82%	$2,150,443	9.60%	90.40%
Cincinnati-Middletown, OH-KY-IN	$71,464,938	24.17%	75.83%	$78,243,001	38.28%	61.72%
Clarksville, TN-KY	$1,776,174	16.01%	83.99%	$1,822,402	27.06%	72.94%
Cleveland-Elyria-Mentor, OH	$146,745,964	23.20%	76.80%	$159,469,062	37.03%	62.97%
College Station-Bryan, TX	$4,145,460	7.16%	92.84%	$3,944,148	13.05%	86.95%

Columbia, MO	$1,508,754	4.15%	95.85%	$1,397,180	7.77%	92.23%
Columbia, SC	$5,248,046	10.89%	89.11%	$5,158,255	19.22%	80.78%
Columbus, GA-AL	$2,438,764	9.21%	90.79%	$2,362,550	16.50%	83.50%
Columbus, OH	$41,183,895	23.74%	76.26%	$44,940,257	37.73%	62.27%
Corpus Christi, TX	$9,439,934	10.70%	89.30%	$9,263,470	18.92%	81.08%
Cumberland, MD-WV	$489,991	2.50%	97.50%	$446,947	4.76%	95.24%
Dallas-Fort Worth-Arlington, TX	$410,898,222	53.71%	46.29%	$552,209,768	69.31%	30.69%
Davenport-Moline-Rock Island, IA-IL	$12,906,065	8.61%	91.39%	$12,437,439	15.50%	84.50%
Dayton, OH	$20,795,030	14.51%	85.49%	$21,074,091	24.83%	75.17%
Decatur, IL	$0	0.00%	0.00%	$0	0.00%	0.00%
Deltona-Daytona Beach-Ormond Beach, FL	$4,000,224	3.42%	96.58%	$3,679,661	6.44%	93.56%
Denver-Aurora, CO	$6,072,311	17.37%	82.63%	$6,300,018	29.03%	70.97%
Des Moines, IA	$310,642,960	24.78%	75.22%	$341,708,865	39.07%	60.93%
Detroit-Warren-Livonia, MI	$13,273,535	8.34%	91.66%	$12,760,578	15.04%	84.96%
Dubuque, IA	$178,187,649	42.32%	57.68%	$222,354,725	58.81%	41.19%
Duluth, MN-WI	$0	0.00%	0.00%	$0	0.00%	0.00%
Eau Claire, WI	$1,250,490	2.08%	97.92%	$1,136,216	3.98%	96.02%
El Centro, CA	$5,330,007	7.31%	92.69%	$5,077,908	13.31%	86.69%
El Paso, TX	$2,171,359	3.42%	96.58%	$1,997,490	6.45%	93.55%
Elkhart-Goshen, IN	$1,059,157	3.11%	96.89%	$971,521	5.88%	94.12%
Elmira, NY	$19,168,296	12.95%	87.05%	$19,172,704	22.45%	77.55%
Erie, PA	$1,812,760	4.40%	95.60%	$1,682,492	8.22%	91.78%
Eugene-Springfield, OR	$1,803,118	1.25%	98.75%	$1,625,656	2.40%	97.60%
Evansville, IN-KY	$4,849,867	3.70%	96.30%	$4,472,941	6.96%	93.04%
Fairbanks, AK	$9,201,410	6.71%	93.29%	$8,719,347	12.28%	87.72%
Fayetteville-Springdale-Rogers, AR-MO	$4,925,953	5.96%	94.04%	$4,636,853	10.98%	89.02%
Flagstaff, AZ	$1,118,927	3.21%	96.79%	$1,027,296	6.06%	93.94%
Flint, MI	$2,247,244	11.92%	88.08%	$2,228,209	20.84%	79.16%
Florence, SC	$1,627,441	3.23%	96.77%	$1,494,495	6.10%	93.90%
Fond du Lac, WI	$7,539,885	9.66%	90.34%	$7,332,808	17.23%	82.77%

Fort Collins-Loveland, CO	$412,313	6.45%	93.55%	$389,809	11.83%	88.17%
Fort Smith, AR-OK	$553,386	1.73%	98.27%	$501,184	3.32%	96.68%
Fort Walton Beach-Crestview-Destin, FL	$2,972,272	7.11%	92.89%	$2,826,520	12.96%	87.04%
Fort Wayne, IN	$863,178	6.51%	93.49%	$816,513	11.93%	88.07%
Fresno, CA	$1,551,708	3.95%	96.05%	$1,434,297	7.40%	92.60%
Gainesville, FL	$5,996,235	10.91%	89.09%	$5,894,791	19.25%	80.75%
Glens Falls, NY	$13,610,155	14.87%	85.13%	$13,833,370	25.36%	74.64%
Grand Forks, ND-MN	$7,261,252	7.12%	92.88%	$6,906,060	12.98%	87.02%
Grand Junction, CO	$691,682	1.32%	98.68%	$624,026	2.54%	97.46%
Grand Rapids-Wyoming, MI	$1,043,397	2.09%	97.91%	$948,116	3.99%	96.01%
Great Falls, MT	$2,337,578	4.43%	95.57%	$2,170,274	8.28%	91.72%
Greeley, CO	$16,864,412	10.22%	89.78%	$16,480,674	18.14%	81.86%
Green Bay, WI	$1,074,299	2.11%	97.89%	$976,415	4.04%	95.96%
Greenville, SC	$985,770	5.25%	94.75%	$922,014	9.73%	90.27%
Hagerstown-Martinsburg, MD-WV	$5,639,718	6.88%	93.12%	$5,352,520	12.57%	87.43%
Hanford-Corcoran, CA	$2,072,310	10.40%	89.60%	$2,028,229	18.42%	81.58%
Harrisburg-Carlisle, PA	$958,534	4.43%	95.57%	$889,915	8.28%	91.72%
Holland-Grand Haven, MI	$1,244,372	4.99%	95.01%	$1,161,133	9.27%	90.73%
Honolulu, HI	$7,283,279	3.08%	96.92%	$6,678,810	5.82%	94.18%
Houston-Baytown-Sugar Land, TX	$991,604	4.97%	95.03%	$925,152	9.24%	90.76%
Huntington-Ashland, WV-KY-OH	$72,440,135	8.46%	91.54%	$69,716,308	15.25%	84.75%
Huntsville, AL	$452,167,252	44.76%	55.24%	$573,535,937	61.19%	38.81%
Indianapolis, IN	$2,164,766	4.93%	95.07%	$2,018,892	9.17%	90.83%
Iowa City, IA	$2,433,633	13.08%	86.92%	$2,436,922	22.66%	77.34%
Ithaca, NY	$44,138,537	26.56%	73.44%	$49,213,128	41.31%	58.69%
Jackson, MI	$4,715,079	2.43%	97.57%	$4,298,066	4.63%	95.37%
Jackson, MS	$5,079,148	1.16%	98.84%	$4,575,399	2.23%	97.77%
Jackson, TN	$880,222	2.01%	97.99%	$799,221	3.83%	96.17%
Jacksonville, FL	$3,717,312	13.18%	86.82%	$3,725,449	22.81%	77.19%
Janesville, WI	$1,817,360	3.14%	96.86%	$1,667,423	5.93%	94.07%

Jefferson City, MO	$49,078,715	25.88%	74.12%	$54,442,861	40.47%	59.53%
Johnson City, TN	$3,288,211	4.25%	95.75%	$3,047,712	7.95%	92.05%
Johnstown, PA	$1,005,985	2.81%	97.19%	$920,262	5.34%	94.66%
Kalamazoo-Portage, MI	$1,038,847	6.39%	93.61%	$981,616	11.72%	88.28%
Kankakee-Bradley, IL	$1,490,540	2.09%	97.91%	$1,354,374	3.98%	96.02%
Kansas City, MO-KS	$4,950,018	7.76%	92.24%	$4,734,532	14.07%	85.93%
Kennewick-Richland-Pasco, WA	$1,487,871	2.79%	97.21%	$1,360,804	5.29%	94.71%
Killeen-Temple-Fort Hood, TX	$59,675,184	33.76%	66.24%	$70,161,999	49.80%	50.20%
Knoxville, TN	$8,200,275	8.73%	91.27%	$7,910,713	15.70%	84.30%
La Crosse, WI-MN	$1,506,091	13.04%	86.96%	$1,507,603	22.59%	77.41%
Lafayette, IN	$10,915,633	13.85%	86.15%	$11,001,166	23.83%	76.17%
Lafayette, LA	$0	0.00%	0.00%	$0	0.00%	0.00%
Lakeland, FL	$2,481,547	2.17%	97.83%	$2,256,513	4.13%	95.87%
Lancaster, PA	$4,397,881	3.45%	96.55%	$4,046,671	6.50%	93.50%
Lansing-East Lansing, MI	$4,107,209	4.84%	95.16%	$3,827,469	9.01%	90.99%
Laredo, TX	$5,497,537	12.46%	87.54%	$5,476,004	21.69%	78.31%
Las Cruces, NM	$5,100,306	3.27%	96.73%	$4,685,174	6.17%	93.83%
Las Vegas-Paradise, NV	$9,625,952	5.08%	94.92%	$8,989,233	9.43%	90.57%
Lawrence, KS	$3,291,888	5.64%	94.36%	$3,089,697	10.41%	89.59%
Lawton, OK	$784,995	5.47%	94.53%	$735,651	10.11%	89.89%
Lebanon, PA	$85,060,140	14.71%	85.29%	$86,342,223	25.13%	74.87%
Lewiston-Auburn, ME	$1,349,427	2.35%	97.65%	$1,229,109	4.47%	95.53%
Lexington-Fayette, KY	$1,078,148	8.56%	91.44%	$1,038,467	15.40%	84.60%
Lincoln, NE	$1,000,714	2.20%	97.80%	$910,282	4.20%	95.80%
Little Rock-North Little Rock, AR	$628,797	2.36%	97.64%	$572,817	4.50%	95.50%
Logan, UT-ID	$9,076,308	7.66%	92.34%	$8,673,432	13.89%	86.11%
Longview, WA	$5,520,550	5.81%	94.19%	$5,189,331	10.71%	89.29%
Los Angeles-Long Beach-Santa Ana, CA	$9,405,469	12.97%	87.03%	$9,409,150	22.48%	77.52%
Louisville, KY-IN	$1,648,063	2.46%	97.54%	$1,502,635	4.67%	95.33%
Lubbock, TX	$508,718	2.42%	97.58%	$463,680	4.61%	95.39%

Lynchburg, VA	$2,357,310,925	55.16%	44.84%	$3,196,953,600	70.54%	29.46%
Macon, GA	$39,045,019	24.69%	75.31%	$42,921,129	38.96%	61.04%
Madison, WI	$4,418,600	5.99%	94.01%	$4,160,474	11.04%	88.96%
Mansfield, OH	$3,385,473	7.47%	92.53%	$3,229,856	13.58%	86.42%
McAllen-Edinburg-Pharr, TX	$3,018,722	6.59%	93.41%	$2,857,701	12.08%	87.92%
Medford, OR	$22,730,314	5.99%	94.01%	$21,402,652	11.04%	88.96%
Memphis, TN-MS-AR	$589,115	3.83%	96.17%	$543,966	7.20%	92.80%
Merced, CA	$1,880,370	16.58%	83.42%	$1,938,388	27.89%	72.11%
Miami-Fort Lauderdale-Miami Beach, FL	$1,541,073	3.60%	96.40%	$1,419,945	6.77%	93.23%
Milwaukee-Waukesha-West Allis, WI	$34,877,140	22.49%	77.51%	$37,691,305	36.09%	63.91%
Minneapolis-St. Paul-Bloomington, MN-WI	$5,793,042	5.06%	94.94%	$5,409,225	9.40%	90.60%
Missoula, MT	$382,033,911	37.37%	62.63%	$460,779,331	53.73%	46.27%
Mobile, AL	$97,156,512	16.19%	83.81%	$99,833,908	27.32%	72.68%
Modesto, CA	$225,027,104	28.66%	71.34%	$254,882,378	43.87%	56.13%
Monroe, LA	$2,177,629	2.53%	97.47%	$1,986,763	4.80%	95.20%
Morgantown, WV	$4,247,599	12.26%	87.74%	$4,223,797	21.37%	78.63%
Muncie, IN	$5,269,076	8.94%	91.06%	$5,092,161	16.04%	83.96%
Muskegon-Norton Shores, MI	$1,933,510	3.72%	96.28%	$1,783,493	6.99%	93.01%
Myrtle Beach-Conway-North Myrtle Beach, SC	$3,093,130	3.30%	96.70%	$2,842,323	6.24%	93.76%
Naples-Marco Island, FL	$1,932,279	3.16%	96.84%	$1,773,321	5.98%	94.02%
Nashville-Davidson--Murfreesboro, TN	$979,510	5.74%	94.26%	$920,208	10.60%	89.40%
New Orleans-Metairie-Kenner, LA	$2,562,640	6.04%	93.96%	$2,414,045	11.13%	88.87%
New York-Northern New Jersey-Long Island, NY-NJ-PA	$5,067,689	7.13%	92.87%	$4,820,092	12.99%	87.01%
Niles-Benton Harbor, MI	$26,435,217	27.03%	72.97%	$29,580,023	41.89%	58.11%
Odessa, TX	$32,126,358	16.09%	83.91%	$32,985,039	27.18%	72.82%
Oklahoma City, OK	$4,079,097,339	42.55%	57.45%	$5,098,315,613	59.05%	40.95%
Olympia, WA	$162,935	5.59%	94.41%	$152,867	10.34%	89.66%
Omaha-Council Bluffs, NE-IA	$3,079,491	3.35%	96.65%	$2,830,945	6.32%	93.68%
Orlando, FL	$14,775,185	22.15%	77.85%	$15,925,231	35.64%	64.36%
Oshkosh-Neenah, WI	$5,806,727	3.28%	96.72%	$5,334,881	6.20%	93.80%

Oxnard-Thousand Oaks-Ventura, CA	$20,255,566	13.46%	86.54%	$20,348,368	23.24%	76.76%
Palm Bay-Melbourne-Titusville, FL	$85,652,200	21.73%	78.27%	$92,010,895	35.07%	64.93%
Panama City-Lynn Haven, FL	$2,190,625	2.84%	97.16%	$2,004,420	5.38%	94.62%
Pensacola-Ferry Pass-Brent, FL	$13,505,403	16.37%	83.63%	$13,898,011	27.58%	72.42%
Peoria, IL	$4,265,882	19.54%	80.46%	$4,504,020	32.10%	67.90%
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	$2,890,275	4.32%	95.68%	$2,680,569	8.07%	91.93%
Phoenix-Mesa-Scottsdale, AZ	$4,584,983	6.65%	93.35%	$4,342,547	12.18%	87.82%
Pittsburgh, PA	$7,964,151	7.56%	92.44%	$7,604,484	13.74%	86.26%
Pocatello, ID	$427,128,369	32.51%	67.49%	$497,677,737	48.39%	51.61%
Port St. Lucie-Fort Pierce, FL	$234,775,535	39.92%	60.08%	$288,215,592	56.39%	43.61%
Portland-Vancouver-Beaverton, OR-WA	$139,793,069	16.81%	83.19%	$144,375,965	28.23%	71.77%
Poughkeepsie-Newburgh-Middletown, NY	$643,770	2.78%	97.22%	$588,712	5.27%	94.73%
Providence-New Bedford-Fall River, RI-MA	$845,908	33.04%	66.96%	$989,372	48.98%	51.02%
Pueblo, CO	$174,768,456	22.61%	77.39%	$189,048,626	36.25%	63.75%
Racine, WI	$7,054,783	10.54%	89.46%	$6,913,337	18.66%	81.34%
Rapid City, SD	$37,644,482	18.23%	81.77%	$39,329,897	30.26%	69.74%
Reading, PA	$1,093,565	4.31%	95.69%	$1,014,127	8.05%	91.95%
Redding, CA	$0	0.00%	0.00%	$0	0.00%	0.00%
Reno-Sparks, NV	$3,616,709	3.39%	96.61%	$3,325,929	6.38%	93.62%
Richmond, VA	$651,665	3.45%	96.55%	$599,623	6.50%	93.50%
Riverside-San Bernardino-Ontario, CA	$4,862,260	4.01%	95.99%	$4,496,738	7.51%	92.49%
Roanoke, VA	$1,716,334	6.60%	93.40%	$1,624,823	12.09%	87.91%
Rochester, MN	$31,937,102	7.75%	92.25%	$30,544,062	14.05%	85.95%
Rochester, NY	$1,957,727	14.71%	85.29%	$1,987,333	25.14%	74.86%
Rockford, IL	$50,241,452	49.65%	50.35%	$65,800,598	65.74%	34.26%
Rome, GA	$10,934,287	5.90%	94.10%	$10,287,131	10.88%	89.12%
Sacramento--Arden-Arcade--Roseville, CA	$4,135,793	3.54%	96.46%	$3,808,728	6.67%	93.33%
Saginaw-Saginaw Township North, MI	$20,423,814	8.68%	91.32%	$19,692,842	15.60%	84.40%
Salem, OR	$4,185,277	7.78%	92.22%	$4,003,920	14.11%	85.89%
Salt Lake City, UT	$1,212,436	3.27%	96.73%	$1,113,771	6.17%	93.83%

San Angelo, TX	$77,709,311	25.40%	74.60%	$85,883,446	39.85%	60.15%
San Antonio, TX	$1,905,367	4.92%	95.08%	$1,776,812	9.15%	90.85%
San Diego-Carlsbad-San Marcos, CA	$5,009,636	6.99%	93.01%	$4,759,103	12.76%	87.24%
San Francisco-Oakland-Fremont, CA	$94,864,833	10.14%	89.86%	$92,641,983	18.01%	81.99%
San Jose-Sunnyvale-Santa Clara, CA	$942,915	4.84%	95.16%	$878,667	9.01%	90.99%
San Luis Obispo-Paso Robles, CA	$85,058,622	29.36%	70.64%	$96,845,327	44.71%	55.29%
Santa Barbara-Santa Maria-Goleta, CA	$188,402,159	30.25%	69.75%	$215,928,305	45.77%	54.23%
Santa Cruz-Watsonville, CA	$890,164,023	26.29%	73.71%	$990,530,607	40.98%	59.02%
Santa Fe, NM	$197,884,286	17.06%	82.94%	$204,787,379	28.59%	71.41%
Santa Rosa-Petaluma, CA	$1,284,975	5.35%	94.65%	$1,202,948	9.91%	90.09%
Savannah, GA	$0	0.00%	0.00%	$0	0.00%	0.00%
Scranton--Wilkes-Barre, PA	$28,097,289	6.31%	93.69%	$26,531,582	11.59%	88.41%
Seattle-Tacoma-Bellevue, WA	$21,365,099	3.51%	96.49%	$19,669,978	6.61%	93.39%
Sebastian-Vero Beach, FL	$3,176,862	3.39%	96.61%	$2,921,684	6.40%	93.60%
Sheboygan, WI	$21,827,333	8.98%	91.02%	$21,102,865	16.12%	83.88%
Sherman-Denison, TX	$8,227,311	6.31%	93.69%	$7,768,460	11.58%	88.42%
Shreveport-Bossier City, LA	$6,412,925	7.03%	92.97%	$6,094,292	12.83%	87.17%
Sioux City, IA-NE-SD	$435,744,626	25.09%	74.91%	$480,462,855	39.47%	60.53%
Sioux Falls, SD	$886,333	5.18%	94.82%	$828,485	9.61%	90.39%
South Bend-Mishawaka, IN-MI	$2,398,685	2.65%	97.35%	$2,190,875	5.02%	94.98%
Spartanburg, SC	$540,831	5.19%	94.81%	$505,561	9.62%	90.38%
Spokane, WA	$12,588,805	12.95%	87.05%	$12,591,371	22.44%	77.56%
Springfield, IL	$2,019,212	4.67%	95.33%	$1,878,749	8.71%	91.29%
Springfield, MO	$4,007,969	4.31%	95.69%	$3,716,984	8.06%	91.94%
Springfield, OH	$6,357,009	7.93%	92.07%	$6,089,635	14.36%	85.64%
St. Cloud, MN	$861,512	6.96%	93.04%	$818,185	12.70%	87.30%
St. Joseph, MO-KS	$18,501,573	7.14%	92.86%	$17,599,035	13.01%	86.99%
St. Louis, MO-IL	$3,587,987	3.91%	96.09%	$3,315,273	7.33%	92.67%
State College, PA	$3,211,979	8.06%	91.94%	$3,080,316	14.57%	85.43%
Stockton, CA	$499,332	4.21%	95.79%	$462,640	7.87%	92.13%

Sumter, SC	$3,624,889	3.45%	96.55%	$3,335,418	6.50%	93.50%
Syracuse, NY	$2,163,874	3.67%	96.33%	$1,995,064	6.90%	93.10%
Tallahassee, FL	$122,546,716	24.86%	75.14%	$134,886,396	39.17%	60.83%
Tampa-St. Petersburg-Clearwater, FL	$2,979,771	2.32%	97.68%	$2,713,311	4.41%	95.59%
Terre Haute, IN	$10,773,861	11.37%	88.63%	$10,633,212	19.98%	80.02%
Toledo, OH	$1,038,201	4.34%	95.66%	$963,046	8.11%	91.89%
Topeka, KS	$21,537,713	5.47%	94.53%	$20,184,482	10.12%	89.88%
Tucson, AZ	$4,544,354	6.44%	93.56%	$4,296,186	11.82%	88.18%
Tulsa, OK	$83,687,396	27.57%	72.43%	$94,023,992	42.56%	57.44%
Tuscaloosa, AL	$1,085,971	5.13%	94.87%	$1,014,640	9.52%	90.48%
Utica-Rome, NY	$13,123,295	13.80%	86.20%	$13,220,999	23.76%	76.24%
Victoria, TX	$2,886,272	5.16%	94.84%	$2,697,471	9.58%	90.42%
Virginia Beach-Norfolk-Newport News, VA-NC	$21,855,926	18.31%	81.69%	$22,848,862	30.37%	69.63%
Visalia-Porterville, CA	$12,992,276	14.56%	85.44%	$13,172,134	24.91%	75.09%
Waco, TX	$733,109	6.65%	93.35%	$694,332	12.17%	87.83%
Washington-Arlington-Alexandria, DC-VA-MD-WV	$2,385,398	5.39%	94.61%	$2,233,983	9.99%	90.01%
Waterloo-Cedar Falls, IA	$1,590,778	6.84%	93.16%	$1,509,185	12.50%	87.50%
Wausau, WI	$52,778,155	30.21%	69.79%	$60,471,605	45.72%	54.28%
Wenatchee, WA	$3,441,224	9.26%	90.74%	$3,334,916	16.57%	83.43%
Wheeling, WV-OH	$2,273,013	5.71%	94.29%	$2,134,866	10.55%	89.45%
Wichita, KS	$879,700,961	26.11%	73.89%	$977,562,304	40.75%	59.25%
Williamsport, PA	$2,504,839	5.04%	94.96%	$2,338,454	9.37%	90.63%
Yakima, WA	$2,112,379	2.22%	97.78%	$1,921,771	4.23%	95.77%
York-Hanover, PA	$4,788,604	2.33%	97.67%	$4,361,078	4.44%	95.56%
Youngstown-Warren-Boardman, OH-PA	$1,946,888	2.64%	97.36%	$1,778,109	5.01%	94.99%
Yuba City, CA	$7,314,315	12.98%	87.02%	$7,318,166	22.50%	77.50%
Yuma, AZ	$2,153,737	1.67%	98.33%	$1,949,390	3.20%	96.80%

TABLE **H 9 Marginal change in total payroll for a 1% increase in rail seat capacity per capita**

name	WAGES-OLS	Percent due to employment density change	Percent due to population change	WAGES-IV	Percent due to employment density change	Percent due to population change
Atlanta-Sandy Springs-Marietta, GA	$25,342,530	24.93%	75.07%	$87,270,157	38.28%	61.72%
Baltimore-Towson, MD	$63,862,566	10.32%	89.68%	$197,010,331	17.69%	82.31%
Buffalo-Niagara Falls, NY	$5,562,318	7.65%	92.35%	$16,794,625	13.40%	86.60%
Chicago-Naperville-Joliet, IL-IN-WI	$234,276,566	30.89%	69.11%	$841,035,603	45.49%	54.51%
Cleveland-Elyria-Mentor, OH	$24,294,695	12.27%	87.73%	$76,108,435	20.71%	79.29%
Dallas-Fort Worth-Arlington, TX	$20,724,820	34.94%	65.06%	$76,459,831	50.07%	49.93%
Denver-Aurora, CO	$17,748,019	13.23%	86.77%	$56,018,895	22.16%	77.84%
Houston-Baytown-Sugar Land, TX	$2,282,458	27.27%	72.73%	$7,990,962	41.18%	58.82%
Little Rock-North Little Rock, AR	$1,681,487	6.45%	93.55%	$5,027,450	11.41%	88.59%
Los Angeles-Long Beach-Santa Ana, CA	$26,847,711	36.29%	63.71%	$99,936,239	51.53%	48.47%
Memphis, TN-MS-AR	$2,942,043	11.84%	88.16%	$9,185,609	20.05%	79.95%
Miami-Fort Lauderdale-Miami Beach, FL	$15,551,221	21.64%	78.36%	$52,294,906	34.02%	65.98%
Minneapolis-St. Paul-Bloomington, MN-WI	$4,548,805	15.68%	84.32%	$14,630,668	25.77%	74.23%
Nashville-Davidson--Murfreesboro, TN	$4,382,477	14.64%	85.36%	$13,983,719	24.25%	75.75%
New Orleans-Metairie-Kenner, LA	$9,055,629	8.15%	91.85%	$27,453,456	14.22%	85.78%
New York-Northern New Jersey-Long Island, NY-NJ-PA	$321,017,756	25.53%	74.47%	$1,110,196,323	39.03%	60.97%
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	$97,380,542	18.23%	81.77%	$319,319,982	29.39%	70.61%
Pittsburgh, PA	$10,308,872	8.55%	91.45%	$31,354,072	14.87%	85.13%
Portland-South Portland-Biddeford, ME	$6,252,413	3.32%	96.68%	$18,213,160	6.02%	93.98%
Portland-Vancouver-Beaverton, OR-WA	$21,154,541	11.91%	88.09%	$66,086,131	20.16%	79.84%
Sacramento--Arden-Arcade--Roseville, CA	$13,357,296	13.61%	86.39%	$42,284,897	22.73%	77.27%

Salt Lake City, UT	$19,866,884	4.96%	95.04%	$58,674,523	8.89%	91.11%
San Diego-Carlsbad-San Marcos, CA	$28,922,025	16.72%	83.28%	$93,762,826	27.26%	72.74%
San Francisco-Oakland-Fremont, CA	$158,518,640	14.17%	85.83%	$503,997,386	23.56%	76.44%
San Jose-Sunnyvale-Santa Clara, CA	$44,179,719	8.69%	91.31%	$134,522,453	15.09%	84.91%
Seattle-Tacoma-Bellevue, WA	$13,941,170	13.42%	86.58%	$44,068,786	22.45%	77.55%
St. Louis, MO-IL	$13,462,908	13.28%	86.72%	$42,510,230	22.24%	77.76%
Tampa-St. Petersburg-Clearwater, FL	$902,519	14.98%	85.02%	$2,887,382	24.75%	75.25%
Washington-Arlington-Alexandria, DC-VA-MD-WV	$212,394,557	14.06%	85.94%	$674,707,368	23.40%	76.60%

TABLE **H 10 Marginal change in total GDP for a 1% increase in rail seat capacity per capita**

Name	GDP-OLS	Percent due to employment density change	Percent due to population change	GDP-IV	Percent due to employment density change	Percent due to population change
Atlanta-Sandy Springs-Marietta, GA	$117,391,379	24.93%	75.07%	$174,480,579	38.28%	61.72%
Baltimore-Towson, MD	$250,167,344	10.32%	89.68%	$333,095,180	17.69%	82.31%
Buffalo-Niagara Falls, NY	$24,269,119	7.65%	92.35%	$31,627,406	13.40%	86.60%
Chicago-Naperville-Joliet, IL-IN-WI	$1,067,758,480	30.89%	69.11%	$1,654,450,026	45.49%	54.51%
Cleveland-Elyria-Mentor, OH	$114,847,496	12.27%	87.73%	$155,288,026	20.71%	79.29%
Dallas-Fort Worth-Arlington, TX	$105,829,646	34.94%	65.06%	$168,517,500	50.07%	49.93%
Denver-Aurora, CO	$83,022,100	13.23%	86.77%	$113,102,825	22.16%	77.84%
Houston-Baytown-Sugar Land, TX	$12,921,588	27.27%	72.73%	$19,525,728	41.18%	58.82%
Little Rock-North Little Rock, AR	$7,319,137	6.45%	93.55%	$9,445,157	11.41%	88.59%
Los Angeles-Long Beach-Santa Ana, CA	$130,518,139	36.29%	63.71%	$209,691,924	51.53%	48.47%
Memphis, TN-MS-AR	$14,120,883	11.84%	88.16%	$19,028,998	20.05%	79.95%
Miami-Fort Lauderdale-Miami Beach, FL	$75,676,997	21.64%	78.36%	$109,838,321	34.02%	65.98%
Minneapolis-St. Paul-Bloomington, MN-WI	$19,661,729	15.68%	84.32%	$27,295,036	25.77%	74.23%
Nashville-Davidson--Murfreesboro, TN	$20,498,119	14.64%	85.36%	$28,230,083	24.25%	75.75%
New Orleans-Metairie-Kenner, LA	$55,234,372	8.15%	91.85%	$72,274,135	14.22%	85.78%
New York-Northern New Jersey-Long Island, NY-NJ-PA	$1,441,665,015	25.53%	74.47%	$2,151,940,124	39.03%	60.97%
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	$470,828,931	18.23%	81.77%	$666,364,950	29.39%	70.61%
Pittsburgh, PA	$50,290,784	8.55%	91.45%	$66,018,598	14.87%	85.13%
Portland-South Portland-Biddeford, ME	$27,563,920	3.32%	96.68%	$34,655,625	6.02%	93.98%
Portland-Vancouver-Beaverton, OR-WA	$98,388,260	11.91%	88.09%	$132,661,562	20.16%	79.84%
Sacramento--Arden-Arcade--Roseville, CA	$51,161,258	13.61%	86.39%	$69,904,162	22.73%	77.27%
Salt Lake City, UT	$92,087,116	4.96%	95.04%	$117,385,315	8.89%	91.11%
San Diego-Carlsbad-San Marcos, CA	$130,327,020	16.72%	83.28%	$182,360,828	27.26%	72.74%

San Francisco-Oakland-Fremont, CA	$706,438,918	14.17%	85.83%	$969,432,683	23.56%	76.44%
San Jose-Sunnyvale-Santa Clara, CA	$181,333,264	8.69%	91.31%	$238,311,170	15.09%	84.91%
Seattle-Tacoma-Bellevue, WA	$62,356,501	13.42%	86.58%	$85,076,316	22.45%	77.55%
St. Louis, MO-IL	$58,134,086	13.28%	86.72%	$79,228,336	22.24%	77.76%
Tampa-St. Petersburg-Clearwater, FL	$4,075,746	14.98%	85.02%	$5,627,951	24.75%	75.25%
Washington-Arlington-Alexandria, DC-VA-MD-WV	$847,701,790	14.06%	85.94%	$1,162,278,658	23.40%	76.60%

TABLE **H 11 Marginal change in total payroll for a 1% increase in bus seat capacity per capita**

name	WAGES-OLS	Percent due to employment density change	Percent due to population change	WAGES-IV	Percent due to employment density change	Percent due to population change
Abilene, TX	$1,716,852	15.31%	84.69%	$1,921,312	26.39%	73.61%
Akron, OH	$5,126,487	29.93%	70.07%	$6,453,059	45.85%	54.15%
Albany, GA	$1,108,189	18.61%	81.39%	$1,275,081	31.19%	68.81%
Albany-Schenectady-Troy, NY	$6,112,735	19.81%	80.19%	$7,103,359	32.87%	67.13%
Albuquerque, NM	$4,432,732	29.61%	70.39%	$5,566,242	45.47%	54.53%
Alexandria, LA	$1,252,166	11.50%	88.50%	$1,355,679	20.49%	79.51%
Allentown-Bethlehem-Easton, PA-NJ	$2,357,466	26.82%	73.18%	$2,897,402	42.08%	57.92%
Altoona, PA	$3,637,371	5.09%	94.91%	$3,715,333	9.62%	90.38%
Amarillo, TX	$1,086,529	18.40%	81.60%	$1,247,993	30.90%	69.10%
Ames, IA	$11,580,260	5.54%	94.46%	$11,877,380	10.41%	89.59%
Anchorage, AK	$5,248,322	22.02%	77.98%	$6,209,537	35.88%	64.12%
Anderson, IN	$901,169	18.97%	81.03%	$1,039,990	31.70%	68.30%
Ann Arbor, MI	$8,985,552	9.46%	90.54%	$9,553,004	17.16%	82.84%
Anniston-Oxford, AL	$857,153	15.46%	84.54%	$960,416	26.60%	73.40%
Appleton, WI	$3,065,001	8.38%	91.62%	$3,226,782	15.34%	84.66%
Athens-Clarke County, GA	$2,412,283	18.13%	81.87%	$2,764,494	30.51%	69.49%
Atlanta-Sandy Springs-Marietta, GA	$12,454,486	68.70%	31.30%	$20,292,146	81.31%	18.69%
Auburn-Opelika, AL	$660,547	14.50%	85.50%	$734,068	25.16%	74.84%
Augusta-Richmond County, GA-SC	$1,004,611	43.96%	56.04%	$1,399,276	60.86%	39.14%
Austin-Round Rock, TX	$8,740,041	42.80%	57.20%	$12,076,452	59.73%	40.27%
Bakersfield, CA	$2,136,664	33.87%	66.13%	$2,769,992	50.38%	49.62%
Baltimore-Towson, MD	$16,295,881	43.20%	56.80%	$22,580,049	60.13%	39.87%
Bangor, ME	$1,649,845	8.93%	91.07%	$1,745,639	16.27%	83.73%
Baton Rouge, LA	$2,192,461	31.12%	68.88%	$2,784,668	47.24%	52.76%
Battle Creek, MI	$2,463,396	11.91%	88.09%	$2,676,518	21.13%	78.87%
Bay City, MI	$4,398,498	8.05%	91.95%	$4,617,083	14.79%	85.21%

Beaumont-Port Arthur, TX	$1,703,661	26.34%	73.66%	$2,086,071	41.48%	58.52%
Bellingham, WA	$5,308,864	11.08%	88.92%	$5,726,366	19.81%	80.19%
Bend, OR	$798,286	10.80%	89.20%	$858,892	19.35%	80.65%
Billings, MT	$3,330,274	10.50%	89.50%	$3,573,592	18.86%	81.14%
Binghamton, NY	$3,288,206	8.29%	91.71%	$3,458,994	15.19%	84.81%
Birmingham-Hoover, AL	$2,536,222	45.23%	54.77%	$3,563,424	62.08%	37.92%
Bismarck, ND	$3,106,260	5.62%	94.38%	$3,188,529	10.56%	89.44%
Blacksburg-Christiansburg-Radford, VA	$9,194,247	14.07%	85.93%	$10,180,296	24.51%	75.49%
Bloomington, IN	$2,769,249	9.70%	90.30%	$2,950,382	17.55%	82.45%
Bloomington-Normal, IL	$3,250,481	9.30%	90.70%	$3,450,786	16.89%	83.11%
Boise City-Nampa, ID	$1,293,153	26.12%	73.88%	$1,580,739	41.21%	58.79%
Bradenton-Sarasota-Venice, FL	$2,269,581	25.30%	74.70%	$2,756,489	40.17%	59.83%
Bremerton-Silverdale, WA	$7,961,091	14.35%	85.65%	$8,835,693	24.93%	75.07%
Brownsville-Harlingen, TX	$636,832	25.72%	74.28%	$775,989	40.70%	59.30%
Buffalo-Niagara Falls, NY	$9,169,650	35.38%	64.62%	$12,020,473	52.05%	47.95%
Burlington-South Burlington, VT	$6,474,295	8.90%	91.10%	$6,848,748	16.23%	83.77%
Canton-Massillon, OH	$2,269,421	25.40%	74.60%	$2,758,340	40.29%	59.71%
Cape Coral-Fort Myers, FL	$1,722,440	38.81%	61.19%	$2,314,394	55.70%	44.30%
Carson City, NV	$1,898,259	4.79%	95.21%	$1,933,367	9.06%	90.94%
Casper, WY	$1,601,855	6.83%	93.17%	$1,662,807	12.70%	87.30%
Cedar Rapids, IA	$4,316,130	14.15%	85.85%	$4,782,173	24.63%	75.37%
Champaign-Urbana, IL	$7,594,799	10.46%	89.54%	$8,147,315	18.81%	81.19%
Charleston, WV	$2,907,263	12.83%	87.17%	$3,184,590	22.59%	77.41%
Charleston-North Charleston, SC	$2,833,180	34.39%	65.61%	$3,687,124	50.96%	49.04%
Charlotte-Gastonia-Concord, NC-SC	$16,116,971	72.14%	27.86%	$26,789,025	83.70%	16.30%
Charlottesville, VA	$8,589,960	7.65%	92.35%	$8,983,497	14.10%	85.90%
Chattanooga, TN-GA	$2,899,563	30.70%	69.30%	$3,671,357	46.76%	53.24%
Cheyenne, WY	$3,075,571	5.71%	94.29%	$3,159,445	10.71%	89.29%
Chicago-Naperville-Joliet, IL-IN-WI	$31,255,573	74.71%	25.29%	$52,719,640	85.42%	14.58%
Chico, CA	$1,819,444	14.31%	85.69%	$2,018,634	24.87%	75.13%

Cincinnati-Middletown, OH-KY-IN	$10,118,877	49.37%	50.63%	$14,616,978	65.90%	34.10%
Clarksville, TN-KY	$982,259	36.83%	63.17%	$1,301,201	53.61%	46.39%
Cleveland-Elyria-Mentor, OH	$12,871,692	48.03%	51.97%	$18,429,286	64.69%	35.31%
College Station-Bryan, TX	$2,056,492	19.09%	80.91%	$2,375,647	31.87%	68.13%
Colorado Springs, CO	$4,290,636	30.18%	69.82%	$5,411,042	46.14%	53.86%
Columbia, MO	$2,907,333	11.70%	88.30%	$3,153,053	20.80%	79.20%
Columbia, SC	$1,540,458	27.21%	72.79%	$1,899,112	42.57%	57.43%
Columbus, GA-AL	$2,011,158	23.69%	76.31%	$2,411,699	38.10%	61.90%
Columbus, IN	$793,876	5.59%	94.41%	$814,660	10.51%	89.49%
Columbus, OH	$5,807,337	48.78%	51.22%	$8,356,021	65.37%	34.63%
Corpus Christi, TX	$3,843,870	26.83%	73.17%	$4,724,680	42.09%	57.91%
Corvallis, OR	$2,473,915	4.70%	95.30%	$2,517,637	8.91%	91.09%
Cumberland, MD-WV	$469,997	7.28%	92.72%	$489,881	13.47%	86.53%
Dallas-Fort Worth-Arlington, TX	$16,980,539	78.02%	21.98%	$29,178,202	87.56%	12.44%
Danville, IL	$1,794,693	7.95%	92.05%	$1,882,089	14.61%	85.39%
Davenport-Moline-Rock Island, IA-IL	$5,465,430	22.38%	77.62%	$6,485,480	36.37%	63.63%
Dayton, OH	$3,655,572	34.18%	65.82%	$4,750,015	50.73%	49.27%
Decatur, IL	$3,759,841	9.76%	90.24%	$4,008,217	17.66%	82.34%
Deltona-Daytona Beach-Ormond Beach, FL	$1,514,434	39.13%	60.87%	$2,039,546	56.04%	43.96%
Denver-Aurora, CO	$24,734,362	50.19%	49.81%	$35,925,085	66.64%	33.36%
Des Moines, IA	$7,296,175	21.77%	78.23%	$8,615,096	35.55%	64.45%
Detroit-Warren-Livonia, MI	$12,334,147	69.18%	30.82%	$20,151,949	81.65%	18.35%
Dubuque, IA	$2,670,332	6.11%	93.89%	$2,753,448	11.43%	88.57%
Duluth, MN-WI	$5,302,395	19.44%	80.56%	$6,142,898	32.36%	67.64%
Eau Claire, WI	$2,120,680	9.78%	90.22%	$2,261,174	17.70%	82.30%
El Centro, CA	$1,173,175	8.93%	91.07%	$1,241,372	16.28%	83.72%
El Paso, TX	$3,527,410	31.27%	68.73%	$4,485,427	47.42%	52.58%
Elkhart-Goshen, IN	$705,011	12.34%	87.66%	$768,912	21.81%	78.19%
Elmira, NY	$2,817,794	3.72%	96.28%	$2,841,236	7.12%	92.88%

Erie, PA	$3,536,440	10.53%	89.47%	$3,795,791	18.91%	81.09%
Eugene-Springfield, OR	$6,516,425	18.03%	81.97%	$7,461,509	30.36%	69.64%
Evansville, IN-KY	$1,654,370	16.24%	83.76%	$1,866,028	27.76%	72.24%
Fairbanks, AK	$1,765,705	9.21%	90.79%	$1,872,928	16.74%	83.26%
Fargo, ND-MN	$2,691,321	8.75%	91.25%	$2,842,999	15.97%	84.03%
Farmington, NM	$370,479	8.66%	91.34%	$391,028	15.82%	84.18%
Fayetteville-Springdale-Rogers, AR-MO	$2,057,735	29.27%	70.73%	$2,577,248	45.07%	54.93%
Flagstaff, AZ	$1,222,797	9.27%	90.73%	$1,297,803	16.84%	83.16%
Flint, MI	$5,906,927	24.66%	75.34%	$7,137,719	39.35%	60.65%
Florence, SC	$484,222	17.41%	82.59%	$551,596	29.48%	70.52%
Fond du Lac, WI	$1,138,236	5.12%	94.88%	$1,162,888	9.66%	90.34%
Fort Collins-Loveland, CO	$2,489,033	18.96%	81.04%	$2,872,200	31.69%	68.31%
Fort Smith, AR-OK	$620,682	17.56%	82.44%	$707,912	29.69%	70.31%
Fort Walton Beach-Crestview-Destin, FL	$858,106	11.17%	88.83%	$926,285	19.95%	80.05%
Fort Wayne, IN	$1,736,278	27.26%	72.74%	$2,141,292	42.63%	57.37%
Fresno, CA	$3,239,595	34.82%	65.18%	$4,229,237	51.43%	48.57%
Gadsden, AL	$528,724	14.58%	85.42%	$588,002	25.29%	74.71%
Gainesville, FL	$9,350,199	18.99%	81.01%	$10,792,575	31.73%	68.27%
Gainesville, GA	$238,616	13.43%	86.57%	$262,741	23.52%	76.48%
Glens Falls, NY	$1,329,457	3.93%	96.07%	$1,343,172	7.50%	92.50%
Grand Forks, ND-MN	$1,438,560	6.13%	93.87%	$1,483,636	11.46%	88.54%
Grand Junction, CO	$1,823,824	12.42%	87.58%	$1,990,675	21.95%	78.05%
Grand Rapids-Wyoming, MI	$3,769,453	25.83%	74.17%	$4,597,284	40.85%	59.15%
Great Falls, MT	$3,270,118	6.20%	93.80%	$3,374,712	11.58%	88.42%
Greeley, CO	$696,698	14.49%	85.51%	$774,209	25.15%	74.85%
Green Bay, WI	$3,217,960	18.44%	81.56%	$3,697,252	30.95%	69.05%
Greenville, SC	$567,582	26.20%	73.80%	$694,218	41.31%	58.69%
Gulfport-Biloxi, MS	$1,178,703	21.22%	78.78%	$1,385,563	34.81%	65.19%
Hagerstown-Martinsburg, MD-WV	$852,348	12.42%	87.58%	$930,287	21.94%	78.06%

Hanford-Corcoran, CA	$1,273,257	13.84%	86.16%	$1,406,905	24.15%	75.85%
Harrisburg-Carlisle, PA	$3,398,101	8.85%	91.15%	$3,592,999	16.15%	83.85%
Hattiesburg, MS	$382,208	9.86%	90.14%	$407,794	17.82%	82.18%
Holland-Grand Haven, MI	$852,619	13.80%	86.20%	$941,818	24.09%	75.91%
Honolulu, HI	$18,059,315	22.04%	77.96%	$21,371,393	35.92%	64.08%
Hot Springs, AR	$674,117	11.19%	88.81%	$727,821	19.98%	80.02%
Houston-Baytown-Sugar Land, TX	$23,085,296	71.25%	28.75%	$38,174,909	83.09%	16.91%
Huntington-Ashland, WV-KY-OH	$1,729,051	13.69%	86.31%	$1,908,108	23.92%	76.08%
Huntsville, AL	$1,021,912	31.52%	68.48%	$1,301,927	47.72%	52.28%
Idaho Falls, ID	$924,831	7.20%	92.80%	$963,263	13.33%	86.67%
Indianapolis, IN	$4,026,989	52.52%	47.48%	$5,938,384	68.68%	31.32%
Iowa City, IA	$9,728,579	7.08%	92.92%	$10,121,978	13.13%	86.87%
Ithaca, NY	$11,246,855	3.46%	96.54%	$11,312,201	6.63%	93.37%
Jackson, MI	$818,642	5.90%	94.10%	$842,449	11.05%	88.95%
Jackson, MS	$1,236,900	31.71%	68.29%	$1,578,049	47.93%	52.07%
Jackson, TN	$1,851,320	9.01%	90.99%	$1,960,286	16.41%	83.59%
Jacksonville, FL	$6,022,569	51.65%	48.35%	$8,831,202	67.93%	32.07%
Janesville, WI	$2,975,808	11.95%	88.05%	$3,234,410	21.19%	78.81%
Jefferson City, MO	$2,006,363	8.14%	91.86%	$2,107,719	14.94%	85.06%
Johnson City, TN	$988,342	17.27%	82.73%	$1,124,496	29.27%	70.73%
Johnstown, PA	$3,095,742	6.12%	93.88%	$3,192,402	11.44%	88.56%
Jonesboro, AR	$277,417	14.79%	85.21%	$309,071	25.60%	74.40%
Kalamazoo-Portage, MI	$2,307,310	20.46%	79.54%	$2,695,628	33.78%	66.22%
Kankakee-Bradley, IL	$1,401,190	8.08%	91.92%	$1,471,152	14.83%	85.17%
Kansas City, MO-KS	$7,796,148	60.93%	39.07%	$12,122,940	75.56%	24.44%
Kennewick-Richland-Pasco, WA	$6,529,629	22.64%	77.36%	$7,764,583	36.72%	63.28%
Killeen-Temple-Fort Hood, TX	$792,951	31.45%	68.55%	$1,009,635	47.63%	52.37%
Kingsport-Bristol-Bristol, TN-VA	$883,231	27.04%	72.96%	$1,087,420	42.36%	57.64%
Kingston, NY	$3,217,608	9.52%	90.48%	$3,422,726	17.26%	82.74%
Knoxville, TN	$3,179,788	32.97%	67.03%	$4,094,906	49.37%	50.63%

La Crosse, WI-MN	$3,253,295	6.34%	93.66%	$3,361,810	11.84%	88.16%
Lafayette, IN	$6,162,813	9.85%	90.15%	$6,575,099	17.81%	82.19%
Lafayette, LA	$2,194,536	13.47%	86.53%	$2,417,249	23.58%	76.42%
Lake Charles, LA	$694,648	13.72%	86.28%	$766,790	23.97%	76.03%
Lakeland, FL	$1,610,005	30.33%	69.67%	$2,032,725	46.32%	53.68%
Lancaster, PA	$1,370,081	9.37%	90.63%	$1,455,362	17.00%	83.00%
Lansing-East Lansing, MI	$4,532,780	14.06%	85.94%	$5,018,195	24.49%	75.51%
Laredo, TX	$2,364,033	15.45%	84.55%	$2,648,616	26.59%	73.41%
Las Cruces, NM	$826,652	15.03%	84.97%	$922,846	25.96%	74.04%
Las Vegas-Paradise, NV	$7,912,084	34.53%	65.47%	$10,307,684	51.12%	48.88%
Lawrence, KS	$1,404,013	6.85%	93.15%	$1,457,604	12.72%	87.28%
Lawton, OK	$1,174,984	22.25%	77.75%	$1,392,825	36.20%	63.80%
Lebanon, PA	$924,558	6.45%	93.55%	$956,322	12.02%	87.98%
Lewiston, ID-WA	$263,769	5.66%	94.34%	$270,847	10.63%	89.37%
Lewiston-Auburn, ME	$1,224,367	6.89%	93.11%	$1,271,623	12.79%	87.21%
Lexington-Fayette, KY	$2,644,413	20.23%	79.77%	$3,083,623	33.46%	66.54%
Lima, OH	$1,055,630	7.44%	92.56%	$1,101,929	13.75%	86.25%
Lincoln, NE	$4,247,825	15.86%	84.14%	$4,775,958	27.21%	72.79%
Little Rock-North Little Rock, AR	$2,152,127	31.31%	68.69%	$2,737,379	47.47%	52.53%
Logan, UT-ID	$4,532,501	7.15%	92.85%	$4,718,642	13.24%	86.76%
Longview, TX	$497,982	16.75%	83.25%	$564,106	28.51%	71.49%
Longview, WA	$956,828	7.05%	92.95%	$995,246	13.08%	86.92%
Los Angeles-Long Beach-Santa Ana, CA	$47,115,855	79.01%	20.99%	$81,406,603	88.18%	11.82%
Louisville, KY-IN	$7,613,162	50.08%	49.92%	$11,049,148	66.54%	33.46%
Lubbock, TX	$4,118,357	16.32%	83.68%	$4,648,324	27.88%	72.12%
Lynchburg, VA	$10,624,190	19.80%	80.20%	$12,345,230	32.86%	67.14%
Macon, GA	$1,477,439	17.76%	82.24%	$1,687,947	29.98%	70.02%
Madera, CA	$518,997	14.74%	85.26%	$577,956	25.52%	74.48%
Madison, WI	$11,776,810	16.32%	83.68%	$13,292,584	27.88%	72.12%
Mansfield, OH	$966,971	10.86%	89.14%	$1,041,004	19.46%	80.54%

McAllen-Edinburg-Pharr, TX	$318,761	37.81%	62.19%	$425,254	54.65%	45.35%
Medford, OR	$1,873,383	10.25%	89.75%	$2,005,820	18.46%	81.54%
Memphis, TN-MS-AR	$4,159,483	47.02%	52.98%	$5,915,307	63.76%	36.24%
Merced, CA	$1,902,255	14.03%	85.97%	$2,105,379	24.44%	75.56%
Miami-Fort Lauderdale-Miami Beach, FL	$15,525,455	64.60%	35.40%	$24,687,334	78.35%	21.65%
Michigan City-La Porte, IN	$619,397	9.67%	90.33%	$659,728	17.50%	82.50%
Milwaukee-Waukesha-West Allis, WI	$12,951,431	37.14%	62.86%	$17,195,563	53.95%	46.05%
Minneapolis-St. Paul-Bloomington, MN-WI	$27,988,866	55.13%	44.87%	$41,972,239	70.89%	29.11%
Missoula, MT	$2,811,801	7.34%	92.66%	$2,932,508	13.58%	86.42%
Mobile, AL	$1,639,699	29.94%	70.06%	$2,064,121	45.86%	54.14%
Modesto, CA	$1,873,602	23.09%	76.91%	$2,236,027	37.32%	62.68%
Monroe, LA	$1,521,126	10.57%	89.43%	$1,633,274	18.98%	81.02%
Montgomery, AL	$1,261,385	25.77%	74.23%	$1,537,646	40.77%	59.23%
Morgantown, WV	$2,807,527	9.46%	90.54%	$2,984,912	17.16%	82.84%
Mount Vernon-Anacortes, WA	$2,994,956	10.85%	89.15%	$3,223,751	19.43%	80.57%
Muncie, IN	$3,377,075	9.09%	90.91%	$3,578,310	16.54%	83.46%
Muskegon-Norton Shores, MI	$1,533,127	15.70%	84.30%	$1,721,430	26.97%	73.03%
Myrtle Beach-Conway-North Myrtle Beach, SC	$717,738	16.44%	83.56%	$810,953	28.06%	71.94%
Napa, CA	$4,762,130	8.27%	91.73%	$5,008,829	15.17%	84.83%
Naples-Marco Island, FL	$807,017	19.01%	80.99%	$931,632	31.76%	68.24%
Nashville-Davidson--Murfreesboro, TN	$4,448,739	53.12%	46.88%	$6,585,898	69.20%	30.80%
New Orleans-Metairie-Kenner, LA	$6,484,189	36.97%	63.03%	$8,598,528	53.77%	46.23%
New York-Northern New Jersey-Long Island, NY-NJ-PA	$66,267,218	69.38%	30.62%	$108,400,208	81.79%	18.21%
Niles-Benton Harbor, MI	$140,154	15.34%	84.66%	$156,882	26.43%	73.57%
Ocala, FL	$507,643	22.93%	77.07%	$605,061	37.10%	62.90%
Odessa, TX	$2,050,577	9.58%	90.42%	$2,182,472	17.36%	82.64%
Oklahoma City, OK	$2,647,319	46.54%	53.46%	$3,752,533	63.31%	36.69%

Olympia, WA	$4,768,107	9.41%	90.59%	$5,066,853	17.07%	82.93%
Omaha-Council Bluffs, NE-IA	$5,939,889	32.25%	67.75%	$7,608,514	48.55%	51.45%
Orlando, FL	$5,182,261	45.92%	54.08%	$7,315,102	62.73%	37.27%
Oshkosh-Neenah, WI	$2,682,420	8.21%	91.79%	$2,819,688	15.06%	84.94%
Owensboro, KY	$742,423	7.82%	92.18%	$777,662	14.39%	85.61%
Oxnard-Thousand Oaks-Ventura, CA	$4,105,499	37.45%	62.55%	$5,462,935	54.27%	45.73%
Palm Bay-Melbourne-Titusville, FL	$1,159,584	42.63%	57.37%	$1,600,352	59.56%	40.44%
Panama City-Lynn Haven, FL	$955,899	12.12%	87.88%	$1,040,603	21.48%	78.52%
Parkersburg-Marietta, WV-OH	$699,745	11.25%	88.75%	$755,892	20.08%	79.92%
Pensacola-Ferry Pass-Brent, FL	$1,270,985	17.89%	82.11%	$1,453,663	30.17%	69.83%
Peoria, IL	$3,394,393	20.02%	79.98%	$3,951,367	33.17%	66.83%
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	$16,739,841	59.57%	40.43%	$25,813,718	74.50%	25.50%
Phoenix-Mesa-Scottsdale, AZ	$10,400,214	67.02%	32.98%	$16,778,087	80.11%	19.89%
Pine Bluff, AR	$714,760	13.83%	86.17%	$789,717	24.13%	75.87%
Pittsburgh, PA	$13,992,040	38.20%	61.80%	$18,718,427	55.06%	44.94%
Pocatello, ID	$1,548,637	8.04%	91.96%	$1,625,378	14.77%	85.23%
Port St. Lucie-Fort Pierce, FL	$527,175	60.14%	39.86%	$815,817	74.95%	25.05%
Portland-South Portland-Biddeford, ME	$1,819,461	18.49%	81.51%	$2,091,420	31.02%	68.98%
Portland-Vancouver-Beaverton, OR-WA	$14,348,085	47.20%	52.80%	$20,428,466	63.92%	36.08%
Poughkeepsie-Newburgh-Middletown, NY	$2,700,644	26.50%	73.50%	$3,310,937	41.68%	58.32%
Providence-New Bedford-Fall River, RI-MA	$7,051,423	40.55%	59.45%	$9,591,645	57.48%	42.52%
Pueblo, CO	$1,286,053	12.10%	87.90%	$1,399,691	21.44%	78.56%
Racine, WI	$2,685,314	9.68%	90.32%	$2,860,571	17.53%	82.47%
Rapid City, SD	$989,525	9.85%	90.15%	$1,055,721	17.81%	82.19%
Reading, PA	$2,587,460	11.32%	88.68%	$2,796,801	20.19%	79.81%
Redding, CA	$1,528,109	17.77%	82.23%	$1,745,930	29.99%	70.01%
Reno-Sparks, NV	$5,250,175	20.44%	79.56%	$6,132,610	33.74%	66.26%

Richmond, VA	$5,725,327	34.55%	65.45%	$7,459,411	51.13%	48.87%
Riverside-San Bernardino-Ontario, CA	$4,688,137	75.10%	24.90%	$7,925,160	85.67%	14.33%
Roanoke, VA	$5,003,616	16.10%	83.90%	$5,636,929	27.55%	72.45%
Rochester, NY	$6,887,120	22.52%	77.48%	$8,181,461	36.55%	63.45%
Rockford, IL	$1,775,744	20.52%	79.48%	$2,075,516	33.85%	66.15%
Rome, GA	$6,737,890	9.37%	90.63%	$7,157,616	17.01%	82.99%
Sacramento-Arden-Arcade-Roseville, CA	$8,658,808	51.01%	48.99%	$12,644,026	67.37%	32.63%
Saginaw-Saginaw Township North, MI	$2,675,381	13.66%	86.34%	$2,951,792	23.88%	76.12%
Salem, OR	$2,891,386	18.69%	81.31%	$3,329,053	31.31%	68.69%
Salinas, CA	$4,265,624	14.60%	85.40%	$4,744,603	25.32%	74.68%
Salisbury, MD	$1,765,253	6.87%	93.13%	$1,832,973	12.75%	87.25%
Salt Lake City, UT	$14,480,752	25.66%	74.34%	$17,637,709	40.63%	59.37%
San Angelo, TX	$419,961	13.46%	86.54%	$462,548	23.57%	76.43%
San Antonio, TX	$8,298,795	55.97%	44.03%	$12,511,429	71.59%	28.41%
San Diego-Carlsbad-San Marcos, CA	$12,876,358	57.02%	42.98%	$19,541,794	72.45%	27.55%
San Francisco-Oakland-Fremont, CA	$38,175,609	52.18%	47.82%	$56,172,337	68.39%	31.61%
San Jose-Sunnyvale-Santa Clara, CA	$22,236,945	38.62%	61.38%	$29,837,448	55.50%	44.50%
San Luis Obispo-Paso Robles, CA	$2,737,331	14.74%	85.26%	$3,048,358	25.53%	74.47%
Santa Barbara-Santa Maria-Goleta, CA	$8,809,596	17.09%	82.91%	$10,008,066	29.01%	70.99%
Santa Cruz-Watsonville, CA	$8,260,204	10.02%	89.98%	$8,825,729	18.08%	81.92%
Santa Fe, NM	$2,823,614	9.71%	90.29%	$3,008,539	17.57%	82.43%
Santa Rosa-Petaluma, CA	$4,970,477	23.19%	76.81%	$5,936,684	37.45%	62.55%
Savannah, GA	$3,029,450	17.07%	82.93%	$3,441,192	28.99%	71.01%
Scranton--Wilkes-Barre, PA	$2,513,832	18.78%	81.22%	$2,896,506	31.43%	68.57%
Seattle-Tacoma-Bellevue, WA	$40,506,669	50.61%	49.39%	$58,993,980	67.01%	32.99%
Sebastian-Vero Beach, FL	$763,039	14.32%	85.68%	$846,655	24.89%	75.11%
Sheboygan, WI	$3,374,643	7.68%	92.32%	$3,530,206	14.15%	85.85%
Sherman-Denison, TX	$384,509	14.33%	85.67%	$426,703	24.91%	75.09%
Shreveport-Bossier City, LA	$2,910,490	31.27%	68.73%	$3,700,792	47.42%	52.58%

Sioux City, IA-NE-SD	$2,534,180	13.03%	86.97%	$2,780,766	22.91%	77.09%
Sioux Falls, SD	$2,282,179	12.11%	87.89%	$2,484,101	21.46%	78.54%
South Bend-Mishawaka, IN-MI	$2,711,844	20.86%	79.14%	$3,178,508	34.32%	65.68%
Spartanburg, SC	$743,476	18.61%	81.39%	$855,460	31.19%	68.81%
Spokane, WA	$7,727,457	19.03%	80.97%	$8,922,243	31.78%	68.22%
Springfield, IL	$4,643,031	11.06%	88.94%	$5,007,226	19.78%	80.22%
Springfield, MO	$787,971	21.14%	78.86%	$925,719	34.71%	65.29%
Springfield, OH	$1,018,937	11.84%	88.16%	$1,106,463	21.03%	78.97%
St. Cloud, MN	$3,281,215	9.85%	90.15%	$3,500,749	17.81%	82.19%
St. George, UT	$347,493	10.00%	90.00%	$371,214	18.04%	81.96%
St. Joseph, MO-KS	$1,824,839	10.43%	89.57%	$1,957,060	18.76%	81.24%
St. Louis, MO-IL	$7,085,675	50.30%	49.70%	$10,298,900	66.74%	33.26%
State College, PA	$6,946,061	6.76%	93.24%	$7,205,472	12.57%	87.43%
Stockton, CA	$3,429,339	28.19%	71.81%	$4,259,675	43.76%	56.24%
Sumter, SC	$2,472,665	12.18%	87.82%	$2,692,971	21.56%	78.44%
Syracuse, NY	$7,109,605	15.04%	84.96%	$7,937,474	25.97%	74.03%
Tallahassee, FL	$3,266,411	17.40%	82.60%	$3,720,637	29.46%	70.54%
Tampa-St. Petersburg-Clearwater, FL	$5,574,033	53.80%	46.20%	$8,287,828	69.77%	30.23%
Terre Haute, IN	$569,694	14.20%	85.80%	$631,451	24.70%	75.30%
Texarkana, TX-Texarkana, AR	$441,207	13.12%	86.88%	$484,492	23.04%	76.96%
Topeka, KS	$2,982,118	14.28%	85.72%	$3,307,672	24.82%	75.18%
Tucson, AZ	$5,328,229	40.67%	59.33%	$7,254,111	57.61%	42.39%
Tulsa, OK	$1,798,873	34.27%	65.73%	$2,339,004	50.83%	49.17%
Tuscaloosa, AL	$768,796	17.89%	82.11%	$879,257	30.16%	69.84%
Tyler, TX	$588,891	12.75%	87.25%	$644,597	22.46%	77.54%
Utica-Rome, NY	$2,236,779	14.85%	85.15%	$2,493,190	25.69%	74.31%
Vallejo-Fairfield, CA	$6,912,256	27.18%	72.82%	$8,519,176	42.52%	57.48%
Victoria, TX	$1,494,418	18.34%	81.66%	$1,715,540	30.80%	69.20%
Virginia Beach-Norfolk-Newport News, VA-NC	$9,779,940	56.97%	43.03%	$14,838,221	72.41%	27.59%

Visalia-Porterville, CA	$1,652,766	23.78%	76.22%	$1,983,381	38.22%	61.78%
Waco, TX	$1,531,831	15.64%	84.36%	$1,718,974	26.87%	73.13%
Washington-Arlington-Alexandria, DC-VA-MD-WV	$42,804,405	51.95%	48.05%	$62,888,889	68.19%	31.81%
Waterloo-Cedar Falls, IA	$1,841,418	13.97%	86.03%	$2,037,152	24.36%	75.64%
Wausau, WI	$4,873,746	6.49%	93.51%	$5,043,259	12.10%	87.90%
Weirton-Steubenville, WV-OH	$649,504	14.56%	85.44%	$722,145	25.24%	74.76%
Wenatchee, WA	$5,182,129	6.81%	93.19%	$5,378,008	12.65%	87.35%
Wheeling, WV-OH	$1,461,572	7.66%	92.34%	$1,528,688	14.12%	85.88%
Wichita Falls, TX	$1,104,944	15.87%	84.13%	$1,242,460	27.23%	72.77%
Wichita, KS	$2,340,261	31.34%	68.66%	$2,977,357	47.50%	52.50%
Williamsport, PA	$3,369,611	4.93%	95.07%	$3,436,619	9.33%	90.67%
Winchester, VA-WV	$3,935,579	4.45%	95.55%	$3,995,631	8.45%	91.55%
Yakima, WA	$1,599,737	15.90%	84.10%	$1,799,245	27.27%	72.73%
York-Hanover, PA	$1,114,873	9.85%	90.15%	$1,189,428	17.80%	82.20%
Youngstown-Warren-Boardman, OH-PA	$1,634,763	34.79%	65.21%	$2,133,686	51.40%	48.60%
Yuba City, CA	$2,324,715	14.31%	85.69%	$2,579,309	24.87%	75.13%
Yuma, AZ	$559,557	16.02%	83.98%	$629,965	27.44%	72.56%

TABLE **H 12 Marginal change in total GDP for a 1% increase in bus seat capacity per capita**

	GDP-OLS	Percent due to employment density change	Percent due to population change	GDP-IV	Percent due to employment density change	Percent due to population change
Abilene, TX	$6,774,180	15.31%	84.69%	$3,272,028	26.39%	73.61%
Akron, OH	$21,365,346	29.93%	70.07%	$11,607,824	45.85%	54.15%
Albany, GA	$4,569,692	18.61%	81.39%	$2,269,374	31.19%	68.81%
Albany-Schenectady-Troy, NY	$23,986,160	19.81%	80.19%	$12,030,510	32.87%	67.13%
Albuquerque, NM	$19,053,819	29.61%	70.39%	$10,326,847	45.47%	54.53%
Alexandria, LA	$5,289,617	11.50%	88.50%	$2,471,804	20.49%	79.51%
Allentown-Bethlehem-Easton, PA-NJ	$9,803,508	26.82%	73.18%	$5,200,438	42.08%	57.92%
Altoona, PA	$15,920,220	5.09%	94.91%	$7,018,660	9.62%	90.38%
Amarillo, TX	$4,739,992	18.40%	81.60%	$2,349,868	30.90%	69.10%
Ames, IA	$47,791,929	5.54%	94.46%	$21,156,897	10.41%	89.59%
Anchorage, AK	$25,775,207	22.02%	77.98%	$13,162,428	35.88%	64.12%
Anderson, IN	$4,449,616	18.97%	81.03%	$2,216,360	31.70%	68.30%
Ann Arbor, MI	$27,729,277	9.46%	90.54%	$12,724,152	17.16%	82.84%
Anniston-Oxford, AL	$3,372,605	15.46%	84.54%	$1,631,027	26.60%	73.40%
Appleton, WI	$12,728,784	8.38%	91.62%	$5,783,903	15.34%	84.66%
Athens-Clarke County, GA	$8,478,716	18.13%	81.87%	$4,193,847	30.51%	69.49%
Atlanta-Sandy Springs-Marietta, GA	$57,691,531	68.70%	31.30%	$40,570,402	81.31%	18.69%
Auburn-Opelika, AL	$2,518,280	14.50%	85.50%	$1,207,902	25.16%	74.84%
Augusta-Richmond County, GA-SC	$3,479,542	43.96%	56.04%	$2,091,811	60.86%	39.14%
Austin-Round Rock, TX	$34,913,231	42.80%	57.20%	$20,821,453	59.73%	40.27%
Bakersfield, CA	$9,604,918	33.87%	66.13%	$5,374,413	50.38%	49.62%
Baltimore-Towson, MD	$63,835,475	43.20%	56.80%	$38,177,214	60.13%	39.87%
Bangor, ME	$6,494,881	8.93%	91.07%	$2,966,043	16.27%	83.73%
Baton Rouge, LA	$11,048,529	31.12%	68.88%	$6,056,771	47.24%	52.76%
Battle Creek, MI	$10,434,280	11.91%	88.09%	$4,893,207	21.13%	78.87%

Bay City, MI	$16,320,258	8.05%	91.95%	$7,394,101	14.79%	85.21%
Beaumont-Port Arthur, TX	$7,192,660	26.34%	73.66%	$3,801,285	41.48%	58.52%
Bellingham, WA	$22,467,851	11.08%	88.92%	$10,460,061	19.81%	80.19%
Bend, OR	$3,760,140	10.80%	89.20%	$1,746,140	19.35%	80.65%
Billings, MT	$14,667,467	10.50%	89.50%	$6,793,214	18.86%	81.14%
Binghamton, NY	$10,967,048	8.29%	91.71%	$4,979,384	15.19%	84.81%
Birmingham-Hoover, AL	$12,065,606	45.23%	54.77%	$7,316,856	62.08%	37.92%
Bismarck, ND	$11,681,215	5.62%	94.38%	$5,175,301	10.56%	89.44%
Blacksburg-Christiansburg-Radford, VA	$34,423,014	14.07%	85.93%	$16,450,847	24.51%	75.49%
Bloomington, IN	$10,493,020	9.70%	90.30%	$4,825,161	17.55%	82.45%
Bloomington-Normal, IL	$14,733,735	9.30%	90.70%	$6,751,160	16.89%	83.11%
Boise City-Nampa, ID	$5,484,021	26.12%	73.88%	$2,893,374	41.21%	58.79%
Bradenton-Sarasota-Venice, FL	$10,441,027	25.30%	74.70%	$5,473,295	40.17%	59.83%
Bremerton-Silverdale, WA	$24,368,034	14.35%	85.65%	$11,673,030	24.93%	75.07%
Brownsville-Harlingen, TX	$2,537,269	25.72%	74.28%	$1,334,420	40.70%	59.30%
Buffalo-Niagara Falls, NY	$40,008,377	35.38%	64.62%	$22,636,789	52.05%	47.95%
Burlington-South Burlington, VT	$24,422,088	8.90%	91.10%	$11,150,557	16.23%	83.77%
Canton-Massillon, OH	$10,131,702	25.40%	74.60%	$5,315,085	40.29%	59.71%
Cape Coral-Fort Myers, FL	$8,789,063	38.81%	61.19%	$5,097,191	55.70%	44.30%
Carson City, NV	$7,234,237	4.79%	95.21%	$3,180,142	9.06%	90.94%
Casper, WY	$11,925,369	6.83%	93.17%	$5,343,004	12.70%	87.30%
Cedar Rapids, IA	$19,714,407	14.15%	85.85%	$9,427,782	24.63%	75.37%
Champaign-Urbana, IL	$27,586,308	10.46%	89.54%	$12,772,822	18.81%	81.19%
Charleston, WV	$14,376,554	12.83%	87.17%	$6,797,028	22.59%	77.41%
Charleston-North Charleston, SC	$11,518,447	34.39%	65.61%	$6,469,975	50.96%	49.04%
Charlotte-Gastonia-Concord, NC-SC	$99,354,159	72.14%	27.86%	$71,277,857	83.70%	16.30%
Charlottesville, VA	$28,910,007	7.65%	92.35%	$13,049,611	14.10%	85.90%
Chattanooga, TN-GA	$13,394,503	30.70%	69.30%	$7,320,078	46.76%	53.24%
Cheyenne, WY	$11,999,448	5.71%	94.29%	$5,320,366	10.71%	89.29%
Chicago-Naperville-Joliet, IL-IN-WI	$142,453,013	74.71%	25.29%	$103,707,869	85.42%	14.58%

Chico, CA	$7,742,811	14.31%	85.69%	$3,707,769	24.87%	75.13%
Cincinnati-Middletown, OH-KY-IN	$45,229,155	49.37%	50.63%	$28,199,333	65.90%	34.10%
Clarksville, TN-KY	$3,248,214	36.83%	63.17%	$1,857,197	53.61%	46.39%
Cleveland-Elyria-Mentor, OH	$60,847,917	48.03%	51.97%	$37,602,238	64.69%	35.31%
College Station-Bryan, TX	$7,144,602	19.09%	80.91%	$3,562,281	31.87%	68.13%
Colorado Springs, CO	$14,285,093	30.18%	69.82%	$7,775,662	46.14%	53.86%
Columbia, MO	$9,230,411	11.70%	88.30%	$4,320,685	20.80%	79.20%
Columbia, SC	$6,032,463	27.21%	72.79%	$3,209,892	42.57%	57.43%
Columbus, GA-AL	$7,143,544	23.69%	76.31%	$3,697,309	38.10%	61.90%
Columbus, IN	$3,574,131	5.59%	94.41%	$1,583,031	10.51%	89.49%
Columbus, OH	$25,054,317	48.78%	51.22%	$15,559,662	65.37%	34.63%
Corpus Christi, TX	$16,769,300	26.83%	73.17%	$8,896,389	42.09%	57.91%
Corvallis, OR	$9,237,041	4.70%	95.30%	$4,057,293	8.91%	91.09%
Cumberland, MD-WV	$1,736,422	7.28%	92.72%	$781,171	13.47%	86.53%
Dallas-Fort Worth-Arlington, TX	$86,709,771	78.02%	21.98%	$64,308,770	87.56%	12.44%
Danville, IL	$6,852,766	7.95%	92.05%	$3,101,781	14.61%	85.39%
Davenport-Moline-Rock Island, IA-IL	$24,917,457	22.38%	77.62%	$12,761,936	36.37%	63.63%
Dayton, OH	$14,893,885	34.18%	65.82%	$8,353,005	50.73%	49.27%
Decatur, IL	$19,432,217	9.76%	90.24%	$8,941,269	17.66%	82.34%
Deltona-Daytona Beach-Ormond Beach, FL	$7,274,894	39.13%	60.87%	$4,228,681	56.04%	43.96%
Denver-Aurora, CO	$115,702,976	50.19%	49.81%	$72,533,180	66.64%	33.36%
Des Moines, IA	$36,767,368	21.77%	78.23%	$18,737,969	35.55%	64.45%
Detroit-Warren-Livonia, MI	$55,813,774	69.18%	30.82%	$39,359,032	81.65%	18.35%
Dubuque, IA	$13,279,515	6.11%	93.89%	$5,910,019	11.43%	88.57%
Duluth, MN-WI	$21,474,863	19.44%	80.56%	$10,738,082	32.36%	67.64%
Eau Claire, WI	$8,616,300	9.78%	90.22%	$3,965,288	17.70%	82.30%
El Centro, CA	$4,777,362	8.93%	91.07%	$2,181,837	16.28%	83.72%
El Paso, TX	$18,688,044	31.27%	68.73%	$10,256,679	47.42%	52.58%
Elkhart-Goshen, IN	$3,542,200	12.34%	87.66%	$1,667,436	21.81%	78.19%
Elmira, NY	$10,840,315	3.72%	96.28%	$4,717,752	7.12%	92.88%

Erie, PA	$15,149,955	10.53%	89.47%	$7,018,468	18.91%	81.09%
Eugene-Springfield, OR	$25,582,571	18.03%	81.97%	$12,643,186	30.36%	69.64%
Evansville, IN-KY	$8,852,535	16.24%	83.76%	$4,309,714	27.76%	72.24%
Fairbanks, AK	$5,590,822	9.21%	90.79%	$2,559,610	16.74%	83.26%
Fargo, ND-MN	$13,185,047	8.75%	91.25%	$6,011,572	15.97%	84.03%
Farmington, NM	$2,421,071	8.66%	91.34%	$1,102,929	15.82%	84.18%
Fayetteville-Springdale-Rogers, AR-MO	$8,913,266	29.27%	70.73%	$4,818,354	45.07%	54.93%
Flagstaff, AZ	$4,131,250	9.27%	90.73%	$1,892,479	16.84%	83.16%
Flint, MI	$21,880,232	24.66%	75.34%	$11,411,554	39.35%	60.65%
Florence, SC	$1,894,261	17.41%	82.59%	$931,348	29.48%	70.52%
Fond du Lac, WI	$5,229,347	5.12%	94.88%	$2,305,940	9.66%	90.34%
Fort Collins-Loveland, CO	$8,919,229	18.96%	81.04%	$4,442,284	31.69%	68.31%
Fort Smith, AR-OK	$2,978,352	17.56%	82.44%	$1,466,160	29.69%	70.31%
Fort Walton Beach-Crestview-Destin, FL	$3,732,521	11.17%	88.83%	$1,739,005	19.95%	80.05%
Fort Wayne, IN	$7,941,931	27.26%	72.74%	$4,227,443	42.63%	57.37%
Fresno, CA	$13,513,585	34.82%	65.18%	$7,614,422	51.43%	48.57%
Gadsden, AL	$2,319,675	14.58%	85.42%	$1,113,453	25.29%	74.71%
Gainesville, FL	$30,946,768	18.99%	81.01%	$15,417,523	31.73%	68.27%
Gainesville, GA	$1,041,068	13.43%	86.57%	$494,770	23.52%	76.48%
Glens Falls, NY	$4,834,821	3.93%	96.07%	$2,108,302	7.50%	92.50%
Grand Forks, ND-MN	$5,249,988	6.13%	93.87%	$2,336,968	11.46%	88.54%
Grand Junction, CO	$7,022,830	12.42%	87.58%	$3,308,450	21.95%	78.05%
Grand Rapids-Wyoming, MI	$17,151,424	25.83%	74.17%	$9,028,556	40.85%	59.15%
Great Falls, MT	$12,534,398	6.20%	93.80%	$5,583,053	11.58%	88.42%
Greeley, CO	$2,663,412	14.49%	85.51%	$1,277,460	25.15%	74.85%
Green Bay, WI	$14,232,779	18.44%	81.56%	$7,058,024	30.95%	69.05%
Greenville, SC	$2,356,707	26.20%	73.80%	$1,244,135	41.31%	58.69%
Gulfport-Biloxi, MS	$4,534,368	21.22%	78.78%	$2,300,561	34.81%	65.19%
Hagerstown-Martinsburg, MD-WV	$3,596,239	12.42%	87.58%	$1,694,116	21.94%	78.06%
Hanford-Corcoran, CA	$4,508,496	13.84%	86.16%	$2,150,184	24.15%	75.85%

Harrisburg-Carlisle, PA	$13,776,153	8.85%	91.15%	$6,287,006	16.15%	83.85%
Hattiesburg, MS	$1,597,235	9.86%	90.14%	$735,538	17.82%	82.18%
Holland-Grand Haven, MI	$4,080,168	13.80%	86.20%	$1,945,293	24.09%	75.91%
Honolulu, HI	$74,308,299	22.04%	77.96%	$37,954,561	35.92%	64.08%
Hot Springs, AR	$2,931,410	11.19%	88.81%	$1,366,032	19.98%	80.02%
Houston-Baytown-Sugar Land, TX	$130,691,848	71.25%	28.75%	$93,279,490	83.09%	16.91%
Huntington-Ashland, WV-KY-OH	$7,685,515	13.69%	86.31%	$3,660,692	23.92%	76.08%
Huntsville, AL	$3,669,852	31.52%	68.48%	$2,017,980	47.72%	52.28%
Idaho Falls, ID	$3,205,934	7.20%	92.80%	$1,441,227	13.33%	86.67%
Indianapolis, IN	$20,727,937	52.52%	47.48%	$13,192,863	68.68%	31.32%
Iowa City, IA	$34,282,819	7.08%	92.92%	$15,395,281	13.13%	86.87%
Ithaca, NY	$45,152,067	3.46%	96.54%	$19,601,475	6.63%	93.37%
Jackson, MI	$3,376,338	5.90%	94.10%	$1,499,652	11.05%	88.95%
Jackson, MS	$5,580,201	31.71%	68.29%	$3,072,776	47.93%	52.07%
Jackson, TN	$7,624,030	9.01%	90.99%	$3,484,317	16.41%	83.59%
Jacksonville, FL	$26,861,934	51.65%	48.35%	$17,000,842	67.93%	32.07%
Janesville, WI	$11,718,358	11.95%	88.05%	$5,497,334	21.19%	78.81%
Jefferson City, MO	$6,500,893	8.14%	91.86%	$2,947,618	14.94%	85.06%
Johnson City, TN	$4,178,844	17.27%	82.73%	$2,052,115	29.27%	70.73%
Johnstown, PA	$12,238,533	6.12%	93.88%	$5,447,249	11.44%	88.56%
Jonesboro, AR	$1,271,789	14.79%	85.21%	$611,554	25.60%	74.40%
Kalamazoo-Portage, MI	$9,940,243	20.46%	79.54%	$5,012,404	33.78%	66.22%
Kankakee-Bradley, IL	$5,979,661	8.08%	91.92%	$2,709,770	14.83%	85.17%
Kansas City, MO-KS	$34,767,209	60.93%	39.07%	$23,334,193	75.56%	24.44%
Kennewick-Richland-Pasco, WA	$25,407,345	22.64%	77.36%	$13,040,192	36.72%	63.28%
Killeen-Temple-Fort Hood, TX	$2,049,428	31.45%	68.55%	$1,126,279	47.63%	52.37%
Kingsport-Bristol-Bristol, TN-VA	$3,705,050	27.04%	72.96%	$1,968,847	42.36%	57.64%
Kingston, NY	$11,353,894	9.52%	90.48%	$5,212,894	17.26%	82.74%
Knoxville, TN	$13,639,965	32.97%	67.03%	$7,581,483	49.37%	50.63%
La Crosse, WI-MN	$13,512,942	6.34%	93.66%	$6,026,909	11.84%	88.16%

Lafayette, IN	$24,836,074	9.85%	90.15%	$11,436,716	17.81%	82.19%
Lafayette, LA	$14,116,029	13.47%	86.53%	$6,710,988	23.58%	76.42%
Lake Charles, LA	$5,285,251	13.72%	86.28%	$2,518,097	23.97%	76.03%
Lakeland, FL	$6,914,050	30.33%	69.67%	$3,767,722	46.32%	53.68%
Lancaster, PA	$6,165,336	9.37%	90.63%	$2,826,678	17.00%	83.00%
Lansing-East Lansing, MI	$17,054,090	14.06%	85.94%	$8,149,041	24.49%	75.51%
Laredo, TX	$11,021,048	15.45%	84.55%	$5,329,463	26.59%	73.41%
Las Cruces, NM	$3,344,908	15.03%	84.97%	$1,611,707	25.96%	74.04%
Las Vegas-Paradise, NV	$43,268,628	34.53%	65.47%	$24,329,795	51.12%	48.88%
Lawrence, KS	$5,452,143	6.85%	93.15%	$2,443,041	12.72%	87.28%
Lawton, OK	$3,480,797	22.25%	77.75%	$1,780,895	36.20%	63.80%
Lebanon, PA	$3,884,637	6.45%	93.55%	$1,734,266	12.02%	87.98%
Lewiston, ID-WA	$952,565	5.66%	94.34%	$422,173	10.63%	89.37%
Lewiston-Auburn, ME	$5,082,202	6.89%	93.11%	$2,278,210	12.79%	87.21%
Lexington-Fayette, KY	$11,768,891	20.23%	79.77%	$5,923,285	33.46%	66.54%
Lima, OH	$4,804,911	7.44%	92.56%	$2,164,821	13.75%	86.25%
Lincoln, NE	$17,705,689	15.86%	84.14%	$8,592,149	27.21%	72.79%
Little Rock-North Little Rock, AR	$9,367,727	31.31%	68.69%	$5,142,760	47.47%	52.53%
Logan, UT-ID	$15,217,297	7.15%	92.85%	$6,837,728	13.24%	86.76%
Longview, TX	$2,592,089	16.75%	83.25%	$1,267,337	28.51%	71.49%
Longview, WA	$3,654,143	7.05%	92.95%	$1,640,503	13.08%	86.92%
Los Angeles-Long Beach-Santa Ana, CA	$229,050,206	79.01%	20.99%	$170,811,983	88.18%	11.82%
Louisville, KY-IN	$37,065,988	50.08%	49.92%	$23,218,512	66.54%	33.46%
Lubbock, TX	$17,205,315	16.32%	83.68%	$8,381,662	27.88%	72.12%
Lynchburg, VA	$44,726,356	19.80%	80.20%	$22,431,689	32.86%	67.14%
Macon, GA	$5,708,195	17.76%	82.24%	$2,814,772	29.98%	70.02%
Madera, CA	$1,982,097	14.74%	85.26%	$952,687	25.52%	74.48%
Madison, WI	$49,549,753	16.32%	83.68%	$24,138,947	27.88%	72.12%
Mansfield, OH	$4,066,199	10.86%	89.14%	$1,889,396	19.46%	80.54%
McAllen-Edinburg-Pharr, TX	$1,256,523	37.81%	62.19%	$723,518	54.65%	45.35%

Medford, OR	$7,415,627	10.25%	89.75%	$3,426,956	18.46%	81.54%
Memphis, TN-MS-AR	$19,964,215	47.02%	52.98%	$12,254,207	63.76%	36.24%
Merced, CA	$9,293,775	14.03%	85.97%	$4,439,652	24.44%	75.56%
Miami-Fort Lauderdale-Miami Beach, FL	$75,551,612	64.60%	35.40%	$51,852,380	78.35%	21.65%
Michigan City-La Porte, IN	$2,618,921	9.67%	90.33%	$1,203,964	17.50%	82.50%
Milwaukee-Waukesha-West Allis, WI	$60,462,913	37.14%	62.86%	$34,648,370	53.95%	46.05%
Minneapolis-St. Paul-Bloomington, MN-WI	$120,978,927	55.13%	44.87%	$78,303,586	70.89%	29.11%
Missoula, MT	$13,125,446	7.34%	92.66%	$5,908,317	13.58%	86.42%
Mobile, AL	$6,878,757	29.94%	70.06%	$3,737,456	45.86%	54.14%
Modesto, CA	$8,545,066	23.09%	76.91%	$4,401,596	37.32%	62.68%
Monroe, LA	$7,554,749	10.57%	89.43%	$3,501,137	18.98%	81.02%
Montgomery, AL	$5,026,813	25.77%	74.23%	$2,644,823	40.77%	59.23%
Morgantown, WV	$12,614,219	9.46%	90.54%	$5,788,460	17.16%	82.84%
Mount Vernon-Anacortes, WA	$13,936,245	10.85%	89.15%	$6,474,583	19.43%	80.57%
Muncie, IN	$13,280,226	9.09%	90.91%	$6,073,484	16.54%	83.46%
Muskegon-Norton Shores, MI	$6,185,861	15.70%	84.30%	$2,997,826	26.97%	73.03%
Myrtle Beach-Conway-North Myrtle Beach, SC	$4,165,185	16.44%	83.56%	$2,031,230	28.06%	71.94%
Napa, CA	$21,352,896	8.27%	91.73%	$9,693,639	15.17%	84.83%
Naples-Marco Island, FL	$4,245,344	19.01%	80.99%	$2,115,289	31.76%	68.24%
Nashville-Davidson-Murfreesboro, TN	$20,808,045	53.12%	46.88%	$13,295,493	69.20%	30.80%
New Orleans-Metairie-Kenner, LA	$39,549,995	36.97%	63.03%	$22,636,537	53.77%	46.23%
New York-Northern New Jersey-Long Island, NY-NJ-PA	$297,600,766	69.38%	30.62%	$210,116,672	81.79%	18.21%
Niles-Benton Harbor, MI	$615,867	15.34%	84.66%	$297,542	26.43%	73.57%
Ocala, FL	$2,054,614	22.93%	77.07%	$1,056,977	37.10%	62.90%
Odessa, TX	$9,465,346	9.58%	90.42%	$4,348,147	17.36%	82.64%
Oklahoma City, OK	$12,154,112	46.54%	53.46%	$7,435,953	63.31%	36.69%
Olympia, WA	$16,566,954	9.41%	90.59%	$7,598,538	17.07%	82.93%
Omaha-Council Bluffs, NE-IA	$27,652,259	32.25%	67.75%	$15,287,878	48.55%	51.45%
Orlando, FL	$28,636,549	45.92%	54.08%	$17,446,842	62.73%	37.27%

Oshkosh-Neenah, WI	$10,609,399	8.21%	91.79%	$4,813,490	15.06%	84.94%
Owensboro, KY	$3,452,503	7.82%	92.18%	$1,560,878	14.39%	85.61%
Oxnard-Thousand Oaks-Ventura, CA	$17,562,602	37.45%	62.55%	$10,086,582	54.27%	45.73%
Palm Bay-Melbourne-Titusville, FL	$4,451,085	42.63%	57.37%	$2,651,394	59.56%	40.44%
Panama City-Lynn Haven, FL	$4,013,622	12.12%	87.88%	$1,885,839	21.48%	78.52%
Parkersburg-Marietta, WV-OH	$3,223,092	11.25%	88.75%	$1,502,752	20.08%	79.92%
Pensacola-Ferry Pass-Brent, FL	$4,735,899	17.89%	82.11%	$2,337,872	30.17%	69.83%
Peoria, IL	$14,885,829	20.02%	79.98%	$7,479,168	33.17%	66.83%
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	$80,936,103	59.57%	40.43%	$53,868,714	74.50%	25.50%
Phoenix-Mesa-Scottsdale, AZ	$49,495,912	67.02%	32.98%	$34,463,914	80.11%	19.89%
Pine Bluff, AR	$2,867,353	13.83%	86.17%	$1,367,375	24.13%	75.87%
Pittsburgh, PA	$68,258,741	38.20%	61.80%	$39,413,200	55.06%	44.94%
Pocatello, ID	$5,613,615	8.04%	91.96%	$2,542,977	14.77%	85.23%
Port St. Lucie-Fort Pierce, FL	$2,431,885	60.14%	39.86%	$1,624,335	74.95%	25.05%
Portland-South Portland-Biddeford, ME	$8,021,141	18.49%	81.51%	$3,979,511	31.02%	68.98%
Portland-Vancouver-Beaverton, OR-WA	$66,731,919	47.20%	52.80%	$41,008,183	63.92%	36.08%
Poughkeepsie-Newburgh-Middletown, NY	$9,486,780	26.50%	73.50%	$5,019,929	41.68%	58.32%
Providence-New Bedford-Fall River, RI-MA	$31,531,675	40.55%	59.45%	$18,512,216	57.48%	42.52%
Pueblo, CO	$4,776,441	12.10%	87.90%	$2,243,741	21.44%	78.56%
Racine, WI	$12,349,395	9.68%	90.32%	$5,678,039	17.53%	82.47%
Rapid City, SD	$4,111,019	9.85%	90.15%	$1,893,071	17.81%	82.19%
Reading, PA	$10,630,741	11.32%	88.68%	$4,959,599	20.19%	79.81%
Redding, CA	$6,135,013	17.77%	82.23%	$3,025,402	29.99%	70.01%
Reno-Sparks, NV	$24,370,372	20.44%	79.56%	$12,286,519	33.74%	66.26%
Richmond, VA	$24,463,720	34.55%	65.45%	$13,756,940	51.13%	48.87%
Riverside-San Bernardino-Ontario, CA	$20,458,399	75.10%	24.90%	$14,927,066	85.67%	14.33%
Roanoke, VA	$21,043,395	16.10%	83.90%	$10,232,212	27.55%	72.45%
Rochester, NY	$30,765,605	22.52%	77.48%	$15,774,434	36.55%	63.45%
Rockford, IL	$7,674,512	20.52%	79.48%	$3,871,610	33.85%	66.15%

Rome, GA	$27,686,710	9.37%	90.63%	$12,694,364	17.01%	82.99%
Sacramento--Arden-Arcade--Roseville, CA	$33,165,058	51.01%	48.99%	$20,902,735	67.37%	32.63%
Saginaw-Saginaw Township North, MI	$11,019,388	13.66%	86.34%	$5,247,502	23.88%	76.12%
Salem, OR	$11,010,455	18.69%	81.31%	$5,471,608	31.31%	68.69%
Salinas, CA	$20,310,671	14.60%	85.40%	$9,750,720	25.32%	74.68%
Salisbury, MD	$6,877,706	6.87%	93.13%	$3,082,391	12.75%	87.25%
Salt Lake City, UT	$67,121,280	25.66%	74.34%	$35,286,320	40.63%	59.37%
San Angelo, TX	$1,692,076	13.46%	86.54%	$804,383	23.57%	76.43%
San Antonio, TX	$35,410,039	55.97%	44.03%	$23,041,639	71.59%	28.41%
San Diego-Carlsbad-San Marcos, CA	$58,022,819	57.02%	42.98%	$38,007,149	72.45%	27.55%
San Francisco-Oakland-Fremont, CA	$170,129,748	52.18%	47.82%	$108,046,789	68.39%	31.61%
San Jose-Sunnyvale-Santa Clara, CA	$91,270,334	38.62%	61.38%	$52,858,069	55.50%	44.50%
San Luis Obispo-Paso Robles, CA	$12,741,786	14.74%	85.26%	$6,124,407	25.53%	74.47%
Santa Barbara-Santa Maria-Goleta, CA	$37,439,948	17.09%	82.91%	$18,357,963	29.01%	70.99%
Santa Cruz-Watsonville, CA	$33,684,680	10.02%	89.98%	$15,534,145	18.08%	81.92%
Santa Fe, NM	$13,063,643	9.71%	90.29%	$6,007,719	17.57%	82.43%
Santa Rosa-Petaluma, CA	$20,890,459	23.19%	76.81%	$10,769,336	37.45%	62.55%
Savannah, GA	$12,316,966	17.07%	82.93%	$6,038,708	28.99%	71.01%
Scranton--Wilkes-Barre, PA	$11,478,650	18.78%	81.22%	$5,708,527	31.43%	68.57%
Seattle-Tacoma-Bellevue, WA	$181,179,488	50.61%	49.39%	$113,889,921	67.01%	32.99%
Sebastian-Vero Beach, FL	$3,612,345	14.32%	85.68%	$1,729,992	24.89%	75.11%
Sheboygan, WI	$16,253,705	7.68%	92.32%	$7,338,710	14.15%	85.85%
Sherman-Denison, TX	$1,555,962	14.33%	85.67%	$745,269	24.91%	75.09%
Shreveport-Bossier City, LA	$19,709,401	31.27%	68.73%	$10,816,757	47.42%	52.58%
Sioux City, IA-NE-SD	$13,156,108	13.03%	86.97%	$6,230,882	22.91%	77.09%
Sioux Falls, SD	$13,444,646	12.11%	87.89%	$6,316,319	21.46%	78.54%
South Bend-Mishawaka, IN-MI	$14,174,762	20.86%	79.14%	$7,170,830	34.32%	65.68%
Spartanburg, SC	$3,101,907	18.61%	81.39%	$1,540,481	31.19%	68.81%
Spokane, WA	$30,867,221	19.03%	80.97%	$15,382,612	31.78%	68.22%
Springfield, IL	$16,886,241	11.06%	88.94%	$7,860,020	19.78%	80.22%

Springfield, MO	$3,261,959	21.14%	78.86%	$1,654,028	34.71%	65.29%
Springfield, OH	$4,095,991	11.84%	88.16%	$1,919,746	21.03%	78.97%
St. Cloud, MN	$13,466,659	9.85%	90.15%	$6,201,277	17.81%	82.19%
St. George, UT	$1,458,135	10.00%	90.00%	$672,312	18.04%	81.96%
St. Joseph, MO-KS	$7,419,401	10.43%	89.57%	$3,434,341	18.76%	81.24%
St. Louis, MO-IL	$30,596,605	50.30%	49.70%	$19,194,549	66.74%	33.26%
State College, PA	$19,145,655	6.76%	93.24%	$8,572,139	12.57%	87.43%
Stockton, CA	$15,012,858	28.19%	71.81%	$8,048,676	43.76%	56.24%
Sumter, SC	$8,731,631	12.18%	87.82%	$4,104,469	21.56%	78.44%
Syracuse, NY	$31,282,793	15.04%	84.96%	$15,074,310	25.97%	74.03%
Tallahassee, FL	$10,632,986	17.40%	82.60%	$5,227,533	29.46%	70.54%
Tampa-St. Petersburg-Clearwater, FL	$25,172,157	53.80%	46.20%	$16,154,249	69.77%	30.23%
Terre Haute, IN	$2,483,974	14.20%	85.80%	$1,188,337	24.70%	75.30%
Texarkana, TX-Texarkana, AR	$1,779,631	13.12%	86.88%	$843,470	23.04%	76.96%
Topeka, KS	$11,384,869	14.28%	85.72%	$5,450,305	24.82%	75.18%
Tucson, AZ	$20,314,412	40.67%	59.33%	$11,937,151	57.61%	42.39%
Tulsa, OK	$8,714,948	34.27%	65.73%	$4,890,918	50.83%	49.17%
Tuscaloosa, AL	$3,217,074	17.89%	82.11%	$1,588,037	30.16%	69.84%
Tyler, TX	$2,607,309	12.75%	87.25%	$1,231,802	22.46%	77.54%
Utica-Rome, NY	$7,815,472	14.85%	85.15%	$3,759,955	25.69%	74.31%
Vallejo-Fairfield, CA	$29,360,267	27.18%	72.82%	$15,618,268	42.52%	57.48%
Victoria, TX	$7,977,970	18.34%	81.66%	$3,952,903	30.80%	69.20%
Virginia Beach-Norfolk-Newport News, VA-NC	$40,103,318	56.97%	43.03%	$26,261,591	72.41%	27.59%
Visalia-Porterville, CA	$7,030,750	23.78%	76.22%	$3,641,594	38.22%	61.78%
Waco, TX	$6,725,324	15.64%	84.36%	$3,257,367	26.87%	73.13%
Washington-Arlington-Alexandria, DC-VA-MD-WV	$170,839,456	51.95%	48.05%	$108,334,986	68.19%	31.81%
Waterloo-Cedar Falls, IA	$8,669,924	13.97%	86.03%	$4,139,820	24.36%	75.64%
Wausau, WI	$20,927,459	6.49%	93.51%	$9,346,736	12.10%	87.90%
Weirton-Steubenville, WV-OH	$3,298,372	14.56%	85.44%	$1,582,841	25.24%	74.76%

Wenatchee, WA	$20,637,225	6.81%	93.19%	$9,243,992	12.65%	87.35%
Wheeling, WV-OH	$6,998,972	7.66%	92.34%	$3,159,570	14.12%	85.88%
Wichita Falls, TX	$4,962,517	15.87%	84.13%	$2,408,459	27.23%	72.77%
Wichita, KS	$10,583,001	31.34%	68.66%	$5,811,262	47.50%	52.50%
Williamsport, PA	$14,679,736	4.93%	95.07%	$6,461,971	9.33%	90.67%
Winchester, VA-WV	$17,252,500	4.45%	95.55%	$7,560,037	8.45%	91.55%
Yakima, WA	$7,037,644	15.90%	84.10%	$3,416,363	27.27%	72.73%
York-Hanover, PA	$4,994,569	9.85%	90.15%	$2,299,885	17.80%	82.20%
Youngstown-Warren-Boardman, OH-PA	$7,069,097	34.79%	65.21%	$3,982,308	51.40%	48.60%
Yuba City, CA	$8,796,550	14.31%	85.69%	$4,212,511	24.87%	75.13%
Yuma, AZ	$2,347,673	16.02%	83.98%	$1,140,789	27.44%	72.56%

APPENDIX I: GLOSSARY OF TERMS

Agglomeration effect: The economic gain that accumulates to firms by locating in a region with a large quantity of other firms.

Cross-sectional analysis: Regression analysis where observations are based on one year of data across a sample of observations (e.g., a cross-section of MSAs).

Deadweight loss: The economic inefficiency that is generated by a government intervention in the free market. Normally associated with the costs of tax policy.

Decadal census: The constitutionally-mandated counting of Americans that takes place in years ending in zero, i.e., every ten years.

Dependent variable: The object of a regression analysis, or the left-hand side of the regression equation.

Elasticity: A measure of how a change in a given variable (e.g. the independent variable) will affect another variable (e.g. the dependent variable). Often expressed as the percent change.

Endogeneity: In econometrics this refers to a parameter in a regression that is correlated with the model's error term. Practically speaking, it is a bidirectional cause-and-effect relationship between the dependent variable and one or more of the independent variables. For example, the productivity of an MSA may cause it to agglomerate, rather than agglomeration causing an MSA to be more productive.

Firm formation: The establishment of a new private enterprise.

GDP: Short for gross domestic product, GDP is the most widely cited statistic that measures economic activity. In this study, we use data provided by the Bureau of EconomicAnalysis. GDP is reported both overall and for each of the nineteen economic sectors as defined by the North American Industrial Classification System (NAICS). It is the sum of consumer purchases of new goods, capital investment, government expenditures, net exports (i.e. export value minus import value), and net change in business inventory. It can also be thought of as the monetary value of all contributions to the economy in a given year, commonly called "value added."

Independent variable: The variables on the right-hand side of a regression equation, i.e., those that are hypothesized to have an effect on the dependent variable.

Instrumental variable (IV): A variable that, instead of being directly inserted into a regression as an independent variable, that is used to estimate a predicted value of an independent variable in a regression. It should not be associated with the dependent variable that is the object of the regression. Regressions that include an instrumental variable are known as "two-stage least squares regressions" or, simply, "instrumental variable regressions." This is a technique that controls for endogeneity in a regression.

LEHD: Short for Longitudinal Employer-Household Dynamics, LEHD is a data set developed by the Census Bureau in conjunction with state governments. Using a variety of federal and state data sources, LEHD is able to impute, among other statistics, the number and characteristics of individuals employed within a given geographic area. These areas can be as minuscule as a census block, a level of spatial precision not previously available. LEHD statistics were the basis for computing employment density of metropolitan areas and principal cities from 2002 on.

Log-log specification: A regression model in which the dependent variable and one or more independent variables are "logged," i.e. the parameter specified in the model is the logarithm of the underlying model. The effect is to transform coefficients into estimates not of a one-unit change in a given independent variable, but a one-percent change, making computation of economic elasticities much easier.

Longitudinal analysis: Research in which data are collected at multiple points in time and are considered as separate observations. This can consist of cohort analysis, where a sample of individuals is tracked over time, or panel analysis, wherein a random sample is taken each time, i.e. repeated cross-sections.

Ordinary least squares (OLS): The most common form of linear regression analysis, which allows one to estimate how each independent variable is associated with the dependent variable.

Overidentification: A condition when, in an instrumental variable regression, there are more instruments than variables suspected of being endogenous.

Spline regression: A series of regression models wherein the relationships between the independent and dependent variables are assumed to change over the range of the dependent variable. In this study, it is at one point hypothesized that the relationship between transit infrastructure and employment density is different when metropolitan population is greater than two million.

Time lag: When two variables in a single cross-sectional observation are not measured at the same time. In this study, an independent variable is often lagged two or four years to assist in the establishment of causality and to reduce endogeneity.

Wages and salaries (payroll): As one would expect, this refers to income earned by employees as compensation for employment, including incidental earnings (bonuses, commissions, tips). Payroll data used herein were obtained from the Census Bureau's County Business Patterns, with these figures being aggregated to the metropolitan statistical area level such that previous years' figures correspond to current geographies. Payroll figures were divided by employee totals from the same data set to generate payroll per worker figures.

This is a gross measure, in that it includes money that is paid in income taxes and social insurance contributions, even if the funds are withheld by the firm and are never actually paid to the employee. It also includes the value of in-kind benefits, such as health insurance, that constitute non-monetary compensation. As computed by federal agencies, however, wages and salaries include only "covered" employment, i.e. individuals that are eligible for unemployment insurance. This includes 98% of workers in the United States, but does exclude "self-employed workers, most agricultural workers on small farms, all members of the Armed Forces, elected officials in most states, most employees of railroads, some domestic workers, most student workers at schools, and employees of certain small nonprofit organizations," according to the Bureau of Labor Statistics.

With respect to (w.r.t.): A phrase used to indicate that a rate of change is being calculated per unit of another variable, holding all other variables constant.

APPENDIX J: DOCUMENTATION AND RESULTS FOR TASK 6B

Description

The data set used here is a complete set of Dun & Bradstreet (D&B) reports for every firm that is or was located within the case study areas between 1990 and 2009. These areas are the three counties in each region served by light or commuter rail. Specifically, these are Collin, Dallas, and Tarrant Counties in Texas; and Clackamas, Multnomah, and Washington Counties in Oregon. D&B time-series used herein are the estimates of each firm's annual number of employees and the dollar value of its sales. These data may be directly reported by the firm or estimated based on economic census data or proprietary modeling by D&B or data vendor Walls & Associates, for every year that the company is located within the case study area. Along with these data are a geocode and a six-digit NAICS code, again updated annually, allowing the firm to be located both within the region and the national economy. After data cleaning, records showed that the set included 1,025,441 firms in the Dallas-Fort Worth area and 336,158 in the Portland area.

From there, geocodes were mapped using ArcGIS and spatially joined to the appropriate block, as defined by Census 2000. These data were then aggregated at the block level while being disaggregated by two-digit NAICS sector. The result was industry-specific employment and sales counts for each census block by year. From there, the distances from the centroid of each block to the central business district of the respective metropolitan area and to the nearest rail station that was open in the corresponding year were calculated for all blocks, of which there were 60,923 in the Dallas-Fort Worth area (meaning that, as the data is a 20-year panel in long form, there are 1,218,460 observations) and 28,270 (565,400 observations) in the Portland area. Using block-level data, four ratios were computed: employees per acre, employees per firm, sales per firm, and sales per employee. The first of these was computed for each NAICS sector as well as across all sectors, while the other three were only computed for all firms.

These ratios became the dependent variables in panel regressions. Fixed-effects and random-effects models were specified with independent variables consisting of dummy variables representing each year of the data (except 1990, the reference year) and rail station distance. With regard to the latter, six variables were specified, identifying blocks whose centroid is located: [1] within ¼ mile of a station situated in the central business district, [2] within ½ mile of a CBD station, [3] within one mile of a CBD station, [4] within ¼ mile of a non-CBD station, [5] within ½ mile of a non-CBD station, and [6] within one mile of a non-CBD station. (Naturally, the reference category is all blocks not within one mile of a rail station.) These terms are mutually exclusive, in that blocks are assigned to the "closest" range that applies to it and that only the station closest to the centroid is included in the analysis. Central business districts are defined according to the transit agencies themselves; Dallas Area Rapid Transit (DART) identifies a "Downtown Dallas" area on its route map, while Tri-Met designates a city center "Free Ride Zone" in Portland's urban core. Straight-line distance to the central business district in miles was also included in random-effects models only. A summary of findings is provided on the next page, followed by statistical outputs in the appendices.

Results

In the first set of analyses using the variables above, we specified a panel model that uses time-series econometric techniques to better compute correlations over the course of the study period. This was done first using what is known as a *fixed-effects model*, which imposes statistical constraints on the model by assuming the independent variables are non-random, and a *generalized least squares* or *random-effects model* that does not have this constraint. Using a *Hausman test*, it was determined that the data are in fact non-random in all cases and, therefore, that the fixed-effects model is more appropriate.

Results for Dallas and Portland contrast substantially. In Dallas, the presence of transit stations was found to be largely negatively correlated with three of the four dependent variables: employees per acre, employees per firm, and sales per firm. For instance, being located within a quarter mile of a CBD transit station in Dallas reduced the number of employees per acre by 20 and the sales per firm by over $900,000. Contrarily, however, there was a positive impact on sales per employee for businesses located within a quarter mile of a non-CBD rail station, increasing said value by $11,768, all else being equal. In Portland, however, results were far more ambiguous, with most coefficients found not to be statistically significant, though the positive effect on sales per employee persisted. Detailed output is available in Appendix 1.

From here, it was decided that sector-specific analysis would be appropriate, specifically as it pertained to employees per acre. Hence, the ratio was computed for workers employed in the 20 two-digit NAICS categories, again in both Dallas and Portland. There was indeed substantial variation across industries, as detailed below and in the regression outputs in Appendix 2. Clearly, there is no single decisive trend; overall, a majority of coefficients reported an absence of a statistically significant relationship. This was especially true in Portland, where none of the sectors indicated a strong correlation in either direction. (A correlation is considered to be "strong" if a majority of dummy variables indicate the same directional relationship.) Further, the only consistent finding across regions is that rail access has no impact on manufacturing employees per acre. Overall, it is difficult to ascertain any sort of conclusions from these data.

Table: Impacts of Rail Stations on Employees per Acre by Two-Digit NAICS Sector, 1990-2009

NAICS Sector	Dallas	Portland		NAICS Sector	Dallas	Portland
Agriculture	Ambiguous	Slightly Neg.		Real Estate	Positive	Slightly Neg.
Mining	Positive	None		Prof. Services	Positive	Slightly Neg.
Utilities	Negative	None		Management	Ambiguous	None
Construction	Positive	Slightly Neg.		Administration	Ambiguous	None
Manufacturing	None	None		Education	Ambiguous	None
Wh. Trade	Slightly Neg.	Slightly Pos.		Health Care	Positive	Ambiguous
Retail Trade	Slightly Neg.	Ambiguous		Arts & Ent.	Positive	None
Transportation	Slightly Neg.	None		Hotels/Dining	Positive	None
Information	Slightly Neg.	None		Other Services	Positive	None
Fin. & Ins.	Ambiguous	None		Public Admin.	Slightly Neg.	None

Finally, it was decided to do some regressions cross-sectionally, rather than as a panel, to measure change over time as a single phenomenon rather than a year-to-year one. Hence, the dependent variables of the ordinary least squares regressions were the change in each of the original measurements between 1996, the year Dallas inaugurated its rail system, and 2009, the most recent year in the data set; independent variables were the six rail dummies plus the straight-line distance to the central business district (in miles). Findings indicated that, in Dallas, presence of rail stations depressed (in increasing order of magnitude) employees per acre, employees per firm, and sales per firm. Across all three, however, being located within ¼ mile of a CBD rail station had strong negative impacts. There appeared to be no impact on sales per employee in Dallas. Meanwhile, in Portland, the effect on employees per acre was positive within ½ mile of CBD stations, while the effect on employees per firm was consistently negative and no impact was found with regard to sales. Again, no strong findings are to be found.

Non-Sector-Specific Panel Models

Fixed-Effects Models, Dallas

Dep. Variable	EmpPerAcre	EmpPerFirm	SalesPerFirm	SalesPerEmp
underqtrCBD	-20.365‡ (0.98)	-13.527‡ (0.74)	-913626‡ (173482)	9120 (7361)
underhalfCBD	-1.296 (1.07)	-0.422 (0.81)	-1488424 (213344)	8021 (9053)
underoneCBD	6.387‡ (0.86)	-5.421‡ (0.65)	-1240234‡ (147299)	2282 (6250)
underqtrelse	0.764 (0.48)	-2.423‡ (0.36)	-677369‡ (80364)	11769‡ (3410)
underhalfelse	-1.181† (0.37)	-0.416 (0.28)	-383930‡ (65395)	608 (2775)
underoneelse	-0.500* (0.24)	-0.568† (0.18)	-52101 (39794)	209 (1689)
R^2	0.000524	0.000587	0.00106	0.00257
ρ	0.839	0.621	0.625	0.606
N	1218460	1218460	673308	673308

Fixed-Effects Models, Portland

Dep. Variable	EmpPerAcre	EmpPerFirm	SalesPerFirm	SalesPerEmp
uhalfCBDrev	-1.813 (3.19)	1.023 (2.12)	-887958 (573592)	17146 (12024)
underoneCBD	-3.965† (1.26)	0.395 (0.84)	-308214 (261369)	2566 (5479)
underqtrelse	0.172 (0.47)	-0.104 (0.31)	90061 (100757)	11683‡ (2112)
underhalfelse	-0.528 (0.44)	0.794† (0.29)	23114 (97139)	4351* (2036)
underoneelse	-0.367 (0.34)	0.188 (0.23)	30361 (74171)	1265 (1555)
R^2	0.000896	0.000271	0.000568	0.00912
ρ	0.846	0.645	0.542	0.694
N	565400	565400	289064	289064

Note 1: All tables report coefficients with standard errors in parentheses. An asterisk denotes a finding of statistical significance at the 95% level; a dagger, 99%; a double dagger, 99.9%. For sake of presentation, coefficients and standard errors for annual dummy variables and the constant term have been omitted from panel results, though they were included in the model.

Note 2: The variable underqtrCBD was found to be collinear with other variables in the panel data for Portland. Therefore, underqtrCBD and underhalfCBD were combined into uhalfCBDrev, which is equal to one if either of its constituent variables is equal to one, and zero otherwise. This change did not appreciably alter the results.

Employees per Acre by Two-Digit NAICS Sector Results

Fixed-Effects Models, Dallas

Dep. Variable	EmpPerAcre11	EmpPerAcre21	EmpPerAcre22	EmpPerAcre23
underqtrCBD	-0.187‡ (0.01)	2.149‡ (0.19)	-4.118‡ (0.13)	-2.904‡ (0.12)
underhalfCBD	0.001 (0.01)	0.720‡ (0.21)	-4.899‡ (0.14)	0.152 (0.13)
underoneCBD	0.102‡ (0.01)	-0.219 (0.17)	-0.011 (0.11)	1.224‡ (0.10)
underqtrelse	-0.000 (0.01)	0.029 (0.10)	-0.077 (0.06)	0.149† (0.06)
underhalfelse	-0.015‡ (0.00)	0.305‡ (0.07)	-0.297‡ (0.05)	0.404‡ (0.04)
underoneelse	0.004 (0.00)	-0.096* (0.05)	0.010 (0.03)	0.023 (0.03)
R^2	0.000348	0.000143	0.00198	0.000921
ρ	0.435	0.546	0.534	0.713
N	1218460	1218460	1218460	1218460

Dep. Variable	EmpPerAcre31	EmpPerAcre42	EmpPerAcre44	EmpPerAcre48
underqtrCBD	0.470 (0.30)	-1.245‡ (0.11)	0.299 (0.38)	-0.347* (0.15)
underhalfCBD	0.063 (0.33)	0.191 (0.13)	0.094 (0.42)	-0.032 (0.16)
underoneCBD	0.049 (0.26)	-0.094 (0.10)	0.111 (0.34)	0.119 (0.13)
underqtrelse	0.070 (0.15)	0.062 (0.06)	-0.146 (0.19)	0.110 (0.07)
underhalfelse	-0.031 (0.11)	-0.231‡ (0.04)	-0.010 (0.15)	-0.804‡ (0.06)
underoneelse	0.049 (0.07)	-0.015 (0.03)	-0.986‡ (0.09)	0.022 (0.04)
R^2	0.0000525	0.000238	0.000137	0.000240
ρ	0.691	0.648	0.496	0.835
N	1218460	1218460	1218460	1218460

Dep. Variable	EmpPerAcre51	EmpPerAcre52	EmpPerAcre53	EmpPerAcre54
underqtrCBD	-5.746‡ (0.34)	-2.362‡ (0.26)	2.642‡ (0.14)	8.517‡ (0.21)
underhalfCBD	0.874* (0.37)	0.158 (0.29)	0.113 (0.15)	1.207‡ (0.24)
underoneCBD	0.431 (0.30)	1.102‡ (0.23)	0.405† (0.12)	0.828‡ (0.19)
underqtrelse	0.173 (0.17)	0.210 (0.13)	0.046 (0.07)	0.099 (0.11)
underhalfelse	0.044 (0.13)	0.015 (0.10)	0.022 (0.05)	-0.024 (0.08)
underoneelse	0.117 (0.08)	0.624‡ (0.06)	0.164‡ (0.03)	-0.176‡ (0.05)
R^2	0.000297	0.000252	0.000425	0.00162
ρ	0.698	0.735	0.487	0.754
N	1218460	1218460	1218460	1218460

NAICS Sector Code Key: 11 = Agriculture, 21 = Mining, 22 = Utilities, 23 = Construction, 31 = Manufacturing, 42 = Wholesale Trade, 44 = Retail Trade, 48 = Transportation and Warehousing, 51 = Information, 52 = Finance and Insurance, 53 = Real Estate, 54 = Professional Services.

Fixed-Effects Models, Dallas (cont'd)

Dep. Variable	EmpPerAcre55	EmpPerAcre56	EmpPerAcre61	EmpPerAcre62
underqtrCBD	0.222‡ (0.05)	-2.529‡ (0.11)	-5.189‡ (0.20)	1.660‡ (0.10)
underhalfCBD	-0.010 (0.05)	0.383† (0.12)	-0.145 (0.22)	0.274* (0.11)
underoneCBD	0.405‡ (0.04)	0.426‡ (0.10)	0.069 (0.17)	0.534‡ (0.09)
underqtrelse	0.033 (0.02)	0.183‡ (0.05)	0.307† (0.10)	0.169‡ (0.05)
underhalfelse	0.009 (0.02)	-0.258‡ (0.04)	0.053 (0.07)	0.235‡ (0.04)
underoneelse	-0.027* (0.01)	-0.068* (0.03)	-0.041 (0.05)	0.081† (0.03)
R^2	0.000127	0.000792	0.000631	0.000709
ρ	0.284	0.727	0.766	0.720
N	1218460	1218460	1218460	1218460

Dep. Variable	EmpPerAcre71	EmpPerAcre72	EmpPerAcre81	EmpPerAcre92
underqtrCBD	0.284‡ (0.02)	1.269‡ (0.06)	0.273 (0.14)	0.379 (0.25)
underhalfCBD	0.256‡ (0.03)	0.646‡ (0.07)	0.145 (0.15)	0.370 (0.27)
underoneCBD	0.601‡ (0.02)	0.781‡ (0.05)	0.734‡ (0.12)	0.054 (0.22)
underqtrelse	0.014 (0.01)	0.139‡ (0.03)	0.031 (0.07)	-0.505‡ (0.12)
underhalfelse	0.044‡ (0.01)	0.081‡ (0.02)	-0.032 (0.05)	-0.000 (0.09)
underoneelse	0.006 (0.01)	0.076‡ (0.02)	0.117‡ (0.03)	0.049 (0.06)
R^2	0.00121	0.00155	0.000207	0.0000399
ρ	0.731	0.744	0.637	0.567
N	1218460	1218460	1218460	1218460

NAICS Sector Code Key: 55 = Management, 56 = Administration, 61 = Educational Services, 62 = Health Care and Social Assistance, 71 = Arts and Entertainment, 72 = Accommodation and Food Services, 81 = Other Services, 92 = Public Administration.

Fixed-Effects Models, Portland

Dep. Variable	EmpPerAcre11	EmpPerAcre21	EmpPerAcre22	EmpPerAcre23
uhalfCBDrev	-0.019 (0.17)	0.000 (0.04)	-0.014 (0.52)	-0.020 (0.25)
underoneCBD	-0.017 (0.07)	0.000 (0.02)	-0.014 (0.21)	-0.174 (0.10)
underqtrelse	0.001 (0.03)	0.003 (0.01)	0.016 (0.08)	0.023 (0.04)
underhalfelse	-0.049* (0.02)	0.002 (0.01)	0.010 (0.07)	-0.097* (0.03)
underoneelse	-0.002 (0.02)	0.000 (0.00)	0.011 (0.06)	-0.025 (0.03)
R^2	0.0000347	0.0000545	0.0000409	0.00101
ρ	0.450	0.635	0.687	0.737
N	565400	565400	565400	565400

Dep. Variable	EmpPerAcre31	EmpPerAcre42	EmpPerAcre44	EmpPerAcre48
uhalfCBDrev	-0.329 (0.79)	-0.013 (0.37)	-0.760* (0.39)	-0.436 (2.03)
underoneCBD	-0.034 (0.31)	-0.146 (0.15)	-0.116 (0.15)	-0.604 (0.80)
underqtrelse	-0.151 (0.12)	-0.062 (0.06)	0.261‡ (0.06)	0.024 (0.30)
underhalfelse	-0.055 (0.11)	-0.069 (0.05)	-0.213‡ (0.05)	0.006 (0.28)
underoneelse	-0.132 (0.09)	0.130† (0.04)	-0.025 (0.04)	-0.015 (0.22)
R^2	0.000150	0.000332	0.00109	0.0000453
ρ	0.533	0.708	0.808	0.721
N	565400	565400	565400	565400

Dep. Variable	EmpPerAcre51	EmpPerAcre52	EmpPerAcre53	EmpPerAcre54
uhalfCBDrev	-0.022 (0.66)	0.178 (0.98)	-.0411* (0.21)	-0.516 (0.99)
underoneCBD	-0.013 (0.26)	0.073 (0.39)	-0.016 (0.08)	-1.674‡ (0.39)
underqtrelse	-0.102 (0.10)	0.246 (0.15)	0.020 (0.03)	-0.293* (0.15)
underhalfelse	-0.010 (0.09)	0.015 (0.13)	-0.041 (0.03)	0.008 (0.14)
underoneelse	-0.025 (0.07)	0.018 (0.11)	-0.007 (0.02)	-0.147 (0.11)
R^2	0.000115	0.0000443	0.000561	0.000463
ρ	0.639	0.631	0.714	0.678
N	565400	565400	565400	565400

NAICS Sector Code Key: 11 = Agriculture, 21 = Mining, 22 = Utilities, 23 = Construction, 31 = Manufacturing, 42 = Wholesale Trade, 44 = Retail Trade, 48 = Transportation and Warehousing, 51 = Information, 52 = Finance and Insurance, 53 = Real Estate, 54 = Professional Services.

Fixed-Effects Models, Portland (cont'd)

Dep. Variable	EmpPerAcre55	EmpPerAcre56	EmpPerAcre61	EmpPerAcre62
uhalfCBDrev	-0.000 (0.18)	-0.001 (0.82)	0.584 (0.50)	0.307 (0.67)
underoneCBD	-0.000 (0.07)	-0.083 (0.33)	-0.057 (0.20)	-1.927‡ (0.26)
underqtrelse	-0.009 (0.03)	-0.152 (0.12)	-0.057 (0.07)	0.213* (0.10)
underhalfelse	-0.016 (0.02)	-0.063 (0.11)	0.022 (0.07)	0.161 (0.09)
underoneelse	-0.011 (0.02)	-0.065 (0.09)	-0.033 (0.05)	-0.082 (0.07)
R^2	0.0000369	0.000296	0.000162	0.000503
ρ	0.453	0.451	0.903	0.771
N	565400	565400	565400	565400

Dep. Variable	EmpPerAcre71	EmpPerAcre72	EmpPerAcre81	EmpPerAcre92
uhalfCBDrev	0.042 (0.21)	0.079 (0.33)	-0.550 (0.29)	0.031 (0.65)
underoneCBD	-0.041 (0.08)	-0.013 (0.13)	-0.151 (0.11)	0.057 (0.26)
underqtrelse	0.021 (0.03)	0.037 (0.05)	-0.019 (0.04)	0.153 (0.10)
underhalfelse	-0.036 (0.03)	-0.037 (0.04)	-0.062 (0.04)	-0.045 (0.09)
underoneelse	-0.020 (0.02)	-0.004 (0.04)	-0.038 (0.03)	-0.042 (0.07)
R^2	0.000290	0.000793	0.000959	0.000163
ρ	0.757	0.754	0.714	0.746
N	565400	565400	565400	565400

NAICS Sector Code Key: 55 = Management, 56 = Administration, 61 = Educational Services, 62 = Health Care and Social Assistance, 71 = Arts and Entertainment, 72 = Accommodation and Food Services, 81 = Other Services, 92 = Public Administration.

Cross-Sectional Results

Results for Dallas, 1996-2009

Dep. Variable	ΔEmpPerAcre	ΔEmpPerFirm	ΔSalesPerFirm	ΔSalesPerEmp
underqtrCBD	-55.862‡ (4.43)	-20.693‡ (2.59)	-2525731‡ (663397)	51159 (28114)
underhalfCBD	-1.686 (4.85)	-3.980 (2.84)	-1795638* (799778)	11766 (33894)
underoneCBD	2.164 (4.08)	-3.827 (2.39)	-740483 (586785)	19266 (24868)
underqtrelse	0.620 (2.27)	-4.744‡ (1.33)	-962725‡ (326788)	13673 (13849)
underhalfelse	-2.228 (1.78)	-0.759 (1.04)	-584572* (268895)	2350 (11396)
underoneelse	-2.526* (1.18)	-1.294 (0.69)	-204780 (169212)	-3399 (7171)
Distance_CBD	-0.051 (0.03)	0.014 (0.02)	-821 (4429)	325 (188)
Constant	1.542* (0.63)	-0.809* (0.37)	-168318 (95409)	-8410* (4043)
R^2	0.003	0.001	0.001	0.000
F	23.313	12.650	4.855	1.052
N	60923	60923	26894	26894

Results for Portland, 1996-2009

Dep. Variable	ΔEmpPerAcre	ΔEmpPerFirm	ΔSalesPerFirm	ΔSalesPerEmp
underqtrCBD	32.427‡ (2.13)	-6.601‡ (1.76)	-570195 (581070)	7503 (13299)
underhalfCBD	13.931‡ (2.56)	-13.458‡ (2.12)	35840 (703536)	-28208 (16101)
underoneCBD	-1.104 (2.78)	-0.102 (2.30)	-258082 (804377)	9500 (18409)
underqtrelse	-0.878 (0.89)	-1.978† (0.74)	-508750 (276813)	9367 (6335)
underhalfelse	-1.236 (0.79)	-1.545* (0.66)	-393174 (253370)	4493 (5799)
underoneelse	-0.648 (0.61)	-1.437† (0.50)	-173461 (198498)	6733 (4543)
Distance_CBD	-0.034 (0.02)	0.010 (0.02)	-2141 (10654)	644† (244)
Constant	1.323‡ (0.33)	-0.224 (0.28)	-16642 (131520)	-5962* (3010)
R^2	0.010	0.003	0.001	0.001
F	39.956	10.401	0.894	1.940
N	28270	28270	12065	12065

APPENDIX K: MSA DATA REALLOCATION ASSUMPTIONS

2010-09-15

APTA Transit Mileage Error Checking and Adjustments

The following adjustments were made to data obtained from APTA used in the nationwide MSA analysis.

Albuquerque / Santa Fe

- Commuter rail opened in 2006
- Two segments
  - Phase 1 – Belem to Bernalillo
  - Phase 2 – Ext to Santa Fe
- Some service connects Belem to ABQ, other service ABQ to Santa Fe
  - Service patterns ABQ – Santa Fe include NB and SB trains in bot AM and PM
- Decisions
  - Service to Santa Fe didn't commence until mid-December 2008. Since the commuter rail really only served the ABQ area during the period of the dataset, all mileage for NM CR remains associated with ABQ for 2007 and 2008.

Anchorage

- 479 mile rail under ZZapta is intercity rail and should not be considered
- Remove from ZZapta to avoid misleading results if ZZapta is used in future analysis

Baltimore

- Light rail and metro okay
- MARC CR needs to be split between DC and Balt
- Service features by route:
  - Brunswick line – 100% to DC, no service to DC
  - Penn line – assume that Baltimore to Perryville serves Balt only, assume Balt to DC is split by service orientation. Approx 40% of trains serve commutes to Balt and 60% serve commutes to DC
  - Camden line – 6 of 9 daily RT are DC commute direction
- Mileage by line (from NTAD 2009 GIS shapefiles – total of 196.8 is slightly less than APTA number of 200.2 – possibly due to double-counting converged lines near union station by APTA)
  - Brunswick Line – 86.9 miles (2002 extension was on this line – branch line from points of rock to Frederick, md)
  - Penn Line – South of Balt – 39.1 miles
  - Penn Line – North of Balt – 36.1 miles
  - Camden Line – 34.7 miles

- Allocate Brunswick 100% to DC, Penn north of Baltimore 100% to Baltimore, Penn south of Baltimore and Camden to be split on the basis of commute direction train ratios
- Notes: Ideally would split based on ridership not train frequency, but ridership by station is not immediately available

Boston

- HR and LR seem okay
- CR mostly serves Boston area only, but one line serves Providence and has several runs that operate in Providence commute direction, however ridership from Providence is about 2k PAX / day, a very small number relative to MBTA system and lower than nearby MA stations (from MBTA 2009 Blue Book)
- Allocation – reduce Boston CR total by 6.8 miles, which is the distance from last MA station to Providence

Chattanooga, TN

- 1 mile tourist incline under ZZapta
- Serves tourists only and is appropriately excluded in the regression script (may want to exclude if future analysis includes ZZapta)

Chicago

- HR and CR look okay, CR does not appear to serve other CBSAs

Detroit

- Downtown people mover under ZZapta category is excluded in the regression script
- Decision – leave as is, but an argument could be made that this line serves a legitimate transit role
- Note Kenosha, WI, below

Eugene, OR

- 4 mi BRT opened in 2008, included within ZZapta and thus excluded from regression analysis

Galveston

- Concern: “Galveston, TX - 6.8 mi - service suspended”
- Response: This line is featured under the Houston CBSA. See explanation under Houston.

Houston

- Galveston Island Trolley was suspended after Hurricane Ike in late 2008, but that change does not show up in APTA figures as they appear to be reported for first full year after service changes (i.e. 2009 would be first year lacking service).

Irving, TX

- Concern: "1.4 mi automated system from urban - internal circulator for a development"
- Response: Doesn't seem to be included in Dallas figures (which is the appropriate CBSA), the system serves internal circulation during limited hours only, and in a development that is only partially built. Decision: do not add to dataset.

Jacksonville, FL

- Downtown people mover, included in ZZapta and thus excluded from regression analysis

Johnstown, PA

- Features 0.1 mile incline under ZZapta, used for both tourism and local commuting, excluded from regression analysis

Kenosha, WI

- Concern: "Kenosha, WI - 2 mile loop from Kenosha Metro station"
- Response: Kenosha is part of Chicago CBSA and Kenosha streetcar is already represented in Chicago APTA LR figures

Los Angeles

- Orange line BRT included in ZZapta / excluded from regression
- Concern: "San Pedro - Port of LA Waterfront Red Car"
- Response: The waterfront Red Car is operated on weekends only and as such cannot play a real transit role, not included (same rationale as Tucson)

Miami

- Busway included under ZZapta

Morgantown WV

- Concern: "8.2 mi PRT - 16k daily riders"
- Response: 8.2 miles should be added to ZZapta as it serves downtown in addition to campus. However, it will not be included in regression analysis as long as the script continues to remove ZZapta from allapta variable

Nashville TN

- Concern: "32 mi to Lebanon - Music City Star - morning into Nashville, evening from Nashville"
- Response: Should appear in 2007 and 2008 – 32 mi. (although ridership is approx. 1k only). Added to dataset.

New Haven, CT

- 50 mi CR –Shore Line East – OK to leave in New Haven, links into Metro North, but Metro North also serves New Haven and is remaining under 100% allocation to NYC CBSA (so balanced), also no data on Shore Line East's riders' final destinations, so any other split would be purely speculative.

Philadelphia

- Concern: "Check the following for Philadelphia: Girard Ave trolley accounts for change from 2004 to 2005? Of 8.5 miles"
- Response: This is correct. The Girard trolley was reactivated (after over a decade of bus operations). No alterations necessary
- NJ Transit RiverLine – Partial allocation switched from Trenton CBSA to Philadelphia CBSA

Phoenix

- Concern: Should Phoenix LRT be added to dataset?
- Response: No. The Phoenix LRT opened in December 2008. Unless a system is open for most or all of a given year APTA does not include that mileage for the opening year. In the case of Phoenix that mileage would appear for the first time in 2009 data.

Portland, ME

- Amtrak Downeaster is listed as commuter rail. This route runs 5 RT trains / day which are evenly distributed and not concentrated in commuting hours. Given that the total trip time is nearly 2.5 hours this service definitely seems to fall under intercity rail category
- Decision – Remove from data and replace with zero

Providence, RI

- Does not have own CR system, but is served by one line of the MBTA CR system, however ridership at 2k / day is very small compared to overall Boston CR system
- Allocation – 6.8mi CR (distance from last MA station to Providence)

San Francisco

- BART – Okay as is – 100% within SF/Oakland CBSA
- Caltrain
  - length 77.4 miles
  - According to Feb 2010 Caltrain annual counts (source: caltrain.com), approx. 60% of total boardings and deboardings occur at SF County and San Mateo County stations (i.e. in SF CBSA) and approx. 40% occur at Santa Clara County stations (i.e. in San Jose CBSA)
  - For lack of a better methodology follow ridership and apply 60% of mileage to SF CBSA and 40% to San Jose CBSA
- Amtrak Capital Corridor
  - Also functions somewhat like CR, but since it connects 3 CBSAs, and is neither metro or core-oriented CR, do not add to SF, San Jose, or Sacramento CBSAs

San Jose

- Caltrain – See SF description above
- ACE – Switch 100% allocation from Stockton, CA CBSA to San Jose CBSA

Savannah

- Concern: "Savannah 2009 street car"
- Response: The Savannah streetcar started operations after 2008 and it operates on a tourist-oriented weekends-schedule – not added to dataset

Stockton

- ACE
  - This commuter system is currently fully allocated to the Stockton CBSA
  - However service is oriented towards San Jose and all trips are for San Jose / Silicon Valley commutes
  - Decision: Fully allocate ACE mileage to San Jose CBSA

Tampa

- Concern: “Teco line - october 2002 - replica vehicles - serves tourists – ridership. MAYBE DELETE?”
- Response: Yes, mainly serves tourists, but the same is true of several other systems that remain in the dataset. Unless the system runs only on a limited schedule (i.e. Friday to Sunday) it may also serve as a functional local connector. New Orleans’ St Charles Ave streetcar and the Memphis historic streetcar routes are both tourist-oriented services that also play important local transit roles. Decision – leave this route in dataset

Trenton

- NJ Transit Riverline
  - Currently 100% allocated to Trenton
  - Only 5.25 miles are actually in Trenton CBSA (approx. 15% of total), the rest are in Philadelphia’s CBSA
  - 17% of system-wide boardings occur at Trenton (Avg boardings FY 2008) and more boardings are made in Camden than in Trenton
  - Decision: Allocate 20% of mileage to Trenton and 80% to Philadelphia, none to NYC (the difference for NYC would be negligible anyway, no non-arbitrary justification to allocate some share to NYC without info on RiverLine/NEC transfers)

Tucson AZ

- Concern: “1 mile on weekends - serving U of AZ - sports events?”
- Response: Dataset includes tourist trolleys that act as function transit, but a weekend only trolley does not fit that description, no rationale for inclusion.

Washington DC

- Partial reallocation of MARC route mileage from Baltimore to DC – see Baltimore for details

Bus Data Reallocation

Bus seating capacity data was reallocated for New Jersey to correspond to population for the New York-Newark, Trenton-Ewing, and Philadelphia MSAs. New Jersey is the only state to our knowledge that runs a statewide bus agency where this reallocation is needed.

APPENDIX L: AUTHORSHIP

The executive summary, synthesis and framework were written by Chatman, Noland, Rognlien, and Tulach with contributions from Graham and Ozbay. Data analysis sections 4 and 5 were written by Chatman, Noland, and Grady. The case studies were written by Chatman, Tulach, Desautels, Alexander, Rognlien, and Noland. Tulach and Grady conducted data processing and analysis throughout.

Appendix A was written by Chatman, Noland, Rognlien, Voorhoeve, Ozbay, and Bilton with contributions from Berechman, Deka, and Graham. Appendix B was written by Bilton, Noland, Rognlien, Chatman, and Deka. Appendix C was written by Noland, Chatman, Voorhoeve, Rognlien, and Ozbay with contributions from Graham.