The "Economic Impact Analysis of Station Revitalization" study was sponsored by the Great American Station Foundation. The Foundation is the non-profit corporation that promotes community economic development by preserving railroad stations and transforming them into improved centers of transportation and commerce. The Foundation forms financial and technical partnerships with communities to help them rebuild and revive the nation's railway stations into prosperous centers for economic activity and vital inter-modal transportation hubs.

For assistance with station revitalization projects or for information on the Foundation, please contact The Great American Station Foundation, 615 E. Lincoln Ave., Las Vegas, NM 87701. Telephone: 505-426-8055, Fax: 505-426-8057, Internet Web Site: www.stationfoundation.org.

Transportation Economics & Management Systems, Inc. (TEMS) performed the study. TEMS provides specialist management, planning, market research, economics and systems technology consulting services to the transportation management and development community.

Acknowledgments:
The original 1999 report was developed with assistance from Scott Hercik of Amtrak. We would like to thank the station managers and their colleagues who provided interviews and sent letters, newspaper clippings, pictures and other data documenting the community impact of their stations for the 1999 report that is incorporated into the current document. This 2001 update extends the 1999 analysis to smaller cities and towns and to rural corridors, building on research and station site visits conducted by Jonathan Warner and TEMS as part of the Midwest Regional Rail Initiative.
Executive Summary

Urban renewal and city center development for communities of all sizes have become urgent priorities throughout the country, as the disadvantages of suburban sprawl become more and more apparent. Communities throughout the country are considering, or being asked to consider, the redevelopment and/or relocation of railway stations to serve as community multimodal transportation centers. Revitalized stations and multimodal transportation centers can serve as critical anchors for urban redevelopment efforts, because a key potential benefit of an urban center location is its accessibility for regional employment and business exchanges.

Communities considering such options may be concerned with whether the project will be a financial success or a failure for the community, and if a success, how much benefit they can expect from a station renewal project. The specific answer varies by community, by different transportation modes that are combined in a multimodal transportation center, and by the types of non-transportation uses that are provided or encouraged in the station and its vicinity.

Rail station revitalization can, in fact, provide a significant economic benefit to the surrounding community. Station development projects that improve multimodal accessibility and increase passenger usage of transportation services can produce increases in jobs, household income, property values, and property taxes in the community. Station improvements also may increase community cohesion and opportunities for social interaction. To be successful, these transportation centers should bring together intercity rail and intercity bus and serve as a transfer point for local transportation such as commuter rail, subway, light rail, local bus, auto, and taxi services.

Transportation Economics & Management Systems, Inc. (TEMS) conducted this study using an Economic Rent\(^1\) model that predicts a range of economic impacts that are possible through station improvement projects as measured in terms of increased employment, income, and property values.

Initial impact estimates were developed in the first analytical phase of the study, based on economic analyses of proposed station improvements at a series of stations throughout the country. The second study phase consisted of interviews with managers of station revitalization projects; these interviews were conducted to validate the results of the economic model. Estimates were refined during the third phase of the study to include towns and very small cities, as well as rural corridors, and to exclude cities with populations greater than two million. The refined estimates and predictions are supported by the data and anecdotal information gathered during the second phase interviews.

The range of impact varies by the type of transportation project and by the demographics of city size, as well as by corridor and population density. Table 1 shows the model’s predicted range of economic benefit in these categories.

\(^1\) Detailed information on the Economic Rent model used in this analysis is provided in appendix A.
### Table 1. Predictions of Economic Benefits

<table>
<thead>
<tr>
<th>City Size</th>
<th>Increased Employment</th>
<th>Increased Household Income</th>
<th>Increased Property Values (in millions)</th>
<th>Increased Property Tax (in millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Town</td>
<td>45-325</td>
<td>$80-$345</td>
<td>$5-$60</td>
<td>$.25-$3.0</td>
</tr>
<tr>
<td>Very Small City</td>
<td>115-825</td>
<td>$85-$460</td>
<td>$10-$65</td>
<td>$.5-$3.25</td>
</tr>
<tr>
<td>Small City</td>
<td>170-975</td>
<td>$140-$575</td>
<td>$15-$90</td>
<td>$.75-$4.5</td>
</tr>
<tr>
<td>Medium City</td>
<td>190-1,025</td>
<td>$155-$870</td>
<td>$15-$150</td>
<td>$.75-$7.5</td>
</tr>
<tr>
<td>Large City</td>
<td>260-1,435</td>
<td>$175-$1,055</td>
<td>$25-$205</td>
<td>$1.25-$10.25</td>
</tr>
</tbody>
</table>

Cities sizes are defined as follows:
- Town (less than 50,000 population)
- Very small city (50,000 to 100,000 population)
- Small city (100,000 to 250,000 population)
- Medium city (250,000 to 500,000 population)
- Large city (500,000 to two million population).

Cities with population exceeding two million were excluded from the analysis.

This report provides an evaluation of what station revitalization can mean to a community in economic terms. It is designed to help station planners and community representatives describe and quantify the economic benefits of such projects.

**Chapter 1** outlines the project purpose and various aspects that influence the economic value of a station revitalization project.

**Chapter 2** explains the study process, including both the quantitative (economic modeling) and the qualitative (interviews and data collection) processes used to produce the estimated impacts of station development.

**Chapter 3** provides the model analysis and the prediction of economic impacts, as well as the validation process of the analysis.

**Chapter 4** provides a summary of conclusions from the study, including how communities can use the estimates produced by the economic model in developing forecasts based on their own unique circumstances.

**Appendix A** provides detailed information on the Economic Rent model used to conduct the study.

**Appendix B** provides a useful bibliography for further reading.
Chapter 1. Project Purpose

1.1 Study Purpose

The purpose of this report is to augment the Great American Station Foundation’s *Guidebook on Train Station Revitalization* with information on the types of economic benefits that station revitalization projects can proffer and to provide a guide to estimate those benefits for a new project. The Foundation’s *Guidebook* provides clear direction on assessing, organizing, designing, financing, and implementing a station rehabilitation project, complete with case studies. The sections describe potential project stakeholders and how to enlist key partners. It also outlines how to budget for both construction and ongoing operation and to identify financial implications of the project. Financial return represents an accounting approach, for example, where direct costs of a project may be compared to direct revenues generated from station leases.

This supplemental report is intended to provide an evaluation of what station revitalization can mean to a community in economic terms. Its objective is to help station planners and community representatives describe and quantify the economic benefits of such projects. For this report, a study was conducted to explicitly model and quantify the transportation and demographic factors that affect the economic value of station revitalization to the community. The implicit social and cultural factors were also considered and are discussed in this report.

1.2 Definition of Station Revitalization

Station revitalization projects can generate a range of economic impacts on the community. This study focuses specifically on the impacts of projects that directly improve the transportation system. Changes that improve a transportation system’s connectivity for the public also decrease travel time and cost and will produce economic benefit impacts that ripple across the community. As a result, direct economic benefits begin with savings to travelers in terms of time and money.

- In mid-size and large cities, passengers will require less time for their intercity travel because of improved transfer times between modes (car to bus, bus to train, etc.). Former users of other modes, such as auto, may switch to rail or bus because of the enhanced convenience of the service, saving driving, parking, and possibly toll costs.

- For smaller cities and towns, the increased convenience and visibility of alternative modes of transportation, in addition to the ability to transfer among modes, will likely increase usage and community benefits.

Time and money savings are reinvested in the community through areas such as increased productivity, greater disposable income, and increased leisure and/or work time. Increases in income multiply in value to the community, as increased income is used to buy additional goods and services. Additional community benefits of reduced highway congestion and reduced air pollution will result from shifts in travel modes, from auto to public transportation. Reduced congestion saves time, and reduced air pollution improves health for the general community.
Economic Impact of Rail Station Revitalization

Every station is unique, and every group or coalition that sets out to restore, renovate, or build a new station imprints its own vision and desires on an existing building or development site. Other types of improvements (such as changes to the appearance or primary purpose of the station to some non-transportation use) may also produce benefits to the community. However, the passenger, employment, income, property value, and property tax benefits described in this report relate to significant station development projects that also improve the transportation system. The following are some concrete examples of the types of revitalizations that create the level of impacts presented in this report.

✦ Wilmington, DE (large city, high density). The station area is being promoted as the "gateway" to the city. Riverfront development is taking place. The Amtrak commuter rail station is now located across the park/plaza from the local bus terminal and transfer point. A streetscape park has replaced the King Street Viaduct, which had presented a significant access barrier to the station. Station access has been improved through better signage to direct buses, taxis, and private vehicles to the station.

✦ Bellingham, WA (small city, light density). The Port of Bellingham restored the historic Pacific American Fisheries building to serve Amtrak, Greyhound, transit bus, and taxi operations. The adjacent, fully integrated Bellingham Cruise Terminal hosts tour bus, regional ferry services, sightseeing and dinner cruises, and long-distance ferry service to Alaska. Pedestrian and bicycle traffic is encouraged, and highway access is also convenient. Complementing the transportation uses are retail and office facilities and a substation of the local police department.

✦ Davis, CA (small city, high density). The station was transformed into an intermodal center with Greyhound, Baylink, and Amtrak sharing the terminal. Students from University of California, Davis, commuting home and professors commuting between Berkeley and Davis form a large portion of the market. The ready availability of mode choices helps keep travel economical for these travelers.

✦ Meridian, MS (town, low density). Meridian's renovated station serves Amtrak passengers from the Crescent Line, 17 daily Greyhound buses, and the Meridian Transit System, including special service to the Naval Air Station in Meridian. Taxi service is also available. Meridian has designed its transportation center to also serve as a community center, with extensive meeting rooms and planned community activities.

1.3 Economic Factors Studied
Key economic factors that influence the value of a multimodal transportation center to a community include the transportation, demographic, and social and cultural aspects of the project and the community.
1.3.1 Transportation Aspects
Transportation aspects of a station redevelopment project that influence passenger volumes and economic value include:
\begin{itemize}
  \item Types of transportation modes that use the facility
  \item Frequency of service provided by those modes
  \item Accessibility of the station to the community and community activity generators (e.g., medical facilities, shopping, and educational facilities)
  \item Transportation services offering connectivity to regional modal networks (highways, bus routes, rail lines, and other transportation services)
  \item Increased attractiveness and competitiveness of the community over other areas (e.g., suburban centers) resulting from station accessibility to activity centers.
\end{itemize}

1.3.2 Demographic Characteristics
The demographic characteristics of the area that impact the economic value of a project include:
\begin{itemize}
  \item Total population
  \item Employment opportunities, types of businesses, and heightened business activity (e.g., mix of retail, service, and manufacturing jobs)
  \item Household income levels
  \item Population density
  \item Density of residential development and other land uses near the station.
\end{itemize}

1.3.3 Social and Cultural Factors
The social and cultural factors that influence the economic value of the project include:
\begin{itemize}
  \item Safety and quality of life, such as perceived security to move about a given neighborhood when one chooses
  \item Community cohesion, evidenced in the ability to gather a diverse group of people for festivals, fairs, concerts, markets, rallies, public meetings, and other events, that builds the sense of neighborliness and civilized interaction in the community.
\end{itemize}
Chapter 2. Study Process

The economic evaluation guidelines provided in this report are the result of a three-phase study. The first phase involved the development of a general economic model capable of measuring the economic benefits of station development directly for communities. The second phase was concerned with validating those results by means of direct interviews with managers of improved stations around the country. The third phase expanded and refined the analysis to examine towns and very small cities, and to examine the issues of rural- and light-density corridors. The steps of the study process are shown in Exhibit 1.

Exhibit 1: Study Process Overview

Develop Database

Phase 1: Develop, Calibrate Economic Rents Model
Phase 2: Conduct Field Interviews for Model Validation

Develop Station Assessment Outputs

Quantitative Model Outputs
Qualitative Characteristics

Guidelines to Assess Economic Benefits From Station Improvements—Very Large Cities to Small Cities

Phase 3: Expand Database for Smaller Cities, Towns

Re-Calibrate Model, Analyze
Revise Station Assessment Outputs
Quantitative Model Outputs

Guidelines to Assess Economic Benefits From Station Improvements—Large Cities to Small Towns
2.1 Gathering and Classifying Input Data

The first phase of the study process evaluated station improvements from an economic modeling perspective, e.g., examining how improvements in transportation efficiency, as measured by increased accessibility, will generate changes in passenger volumes, community property values, employment, and household income. The analysis quantified these economic impacts by two key variables: city size and corridor population density. These are two of the most important factors in determining the level of use of transit and rail systems in any corridor. Experience worldwide has shown that rail and transit use will vary directly with these two factors for any given set of transportation policies or investments. In the development of the economic model for the first phase, three ranges of city size demographics were evaluated:

- Small (less than 250,000 population)
- Medium (250,000 to one million population)
- Large (greater than one million population).

The second phase of the study identified the actual impacts of station development projects in various communities across the country. The process consisted of interviews with station managers who have completed or are in the process of renovating stations, plus an analysis of station data from third-party sources. This was done in order to identify quantitative and qualitative impacts that have been generated from developed projects and to provide validation for the results of the economic modeling analysis.

Interview locations include Bellingham (WA), Boston South Station (MA), Danville (VA), Davis (CA), Lafayette (IN), Los Angeles (CA), Meridian (MS), Washington (DC) Union Station, and Wilmington (DE). Stations that are included as examples, but for whom data was extracted from third party sources, include Centralia (WA), Flint (MI), Florence (SC), Holland (MI), Longview (WA), Olympia (WA), Pittsburgh (PA), Tampa (FL), and Toledo (OH).

In the third phase of the study, the database was expanded and redefined to measure the impact on small communities more directly. For this purpose, five ranges of city size demographics were evaluated:

- Town (less than 50,000 population)
- Very small city (50,000 to 100,000 population)
- Small city (100,000 to 250,000 population)
- Medium city (250,000 to 500,000 population)
- Large city (500,000 to two million population).

Cities with populations above two million were excluded from the analysis. For this analysis, city size was defined using the relevant county populations. The data were derived from 2000 Census data sources.

The second classification variable used in the analysis was corridor density. This was evaluated based on the transportation corridor of which each station is a part. Corridors were defined by the following rules:
High Density: A corridor with a large city at each end of the corridor segment with at least one large or medium city in between.

Examples: Chicago, IL, to Detroit, MI, with Ann Arbor, MI, between; Chicago, IL, to Cleveland, OH, with Toledo, OH, between.

Exception: Milwaukee, WI, to Madison, WI, is included as a high-density corridor even though Madison (Dane County) falls just below the threshold for large city designation.

Medium Density: A corridor with a large city at one end and at least two medium-sized cities along the corridor or terminating the corridor.

Examples: Michigan branch from Chicago to Port Huron, MI, via Battle Creek, MI; Milwaukee, WI, to Green Bay, WI.

Light Density: A corridor with a large city at each end of the corridor with all small cities along the corridor (excluding exurban areas).

Examples: Chicago, IL, to St. Louis, MO, with Joliet, IL, and Upper Alton, IL, as exurban areas; St. Louis, MO, to Kansas City, MO; Madison, WI, to St. Paul, MN.

Rural Density: A corridor with a large or medium city at one end, and mostly small cities and towns along the route.

Examples: Chicago, IL, to Quincy, IL; Chicago, IL, to Carbondale, IL; Princeton, IL, to Omaha, NE.

Maps displaying population density along the existing and planned passenger rail corridors for the Midwest, New England, and Virginia were used in the first step in defining corridor densities. In each case, the overall corridor population was identified and the density calculated. This process was then refined by a numerical analysis of stations’ areas of influence along the corridors, which led to slight refinements of the corridor density definitions. Maps illustrating the corridors, and the population densities of each county through which the rail systems run, are provided as Exhibits 2, 3, and 4.
Exhibit 2: Midwest Population Densities and Existing/Proposed Rail Routes

Exhibit 3: Virginia Population Densities and Intercity Rail Routes
Exhibit 4: Massachusetts, New Hampshire, and Maine Population Densities and Proposed Rail Route

The second input to the economic model was to estimate the impact of a revitalized station on the relative transportation efficiency or “generalized cost” of a typical intercity corridor traveler. This was measured by using the transportation model output of recent rail studies on the following intercity corridors:

- Chicago, IL – Cleveland, OH
- Chicago, IL – Detroit, MI
- Princeton, IL – Omaha, NE
- Milwaukee, WI – Madison, WI
- Chicago, IL – Quincy, IL
- Chicago, IL – Cincinnati, OH
- Boston, MA – Portland, ME
- Milwaukee, WI – Green Bay, WI
- Chicago, IL – St. Louis, MO
- Madison, WI – St. Paul, MN
- St. Louis, MO – Kansas City, MO
- Chicago, IL – Carbondale, IL
- Washington, D.C. – Richmond, VA
- Washington, D.C. – Bristol, VA
- Richmond, VA – Bristol, VA
Model Calibration

TEMS' economic rent model, RENTS© was calibrated using the socioeconomic and generalized cost input data. The model identifies economic impact in terms of employment and per capita income. Detail on the model development and calibration, including measures of statistical reliability, model coefficients, and stations used in the analysis are provided in the appendix A. Property value impacts were estimated by interpolation from data that showed the impact on property values for the same socioeconomic and demographic conditions. This analysis was based on more than 70 station site visits and interviews conducted throughout the Midwest for the Midwest Regional Rail Initiative study.

Model Output

Quantitative and qualitative information derived from the interviews and data collection process was used to make predictions using the economic model and to validate its findings. The results of the analysis, in terms of impacts from station improvements, are organized by major categories of improvement, namely:

- Changes in employment
- Changes in income
- Changes in property values and property taxes
- Changes in social and safety issues.

Model results with field validation examples are provided in Chapter 3.
Chapter 3. Model Prediction and Validation of Economic Impacts

This analysis explicitly quantified the transportation factors that impact the value of a station revitalization project, based on increased accessibility and intermodal connections. Demographic factors that influence the value of a station project are quantified and evaluated by means of a matrix of two key demographic variables: population and population density. The output of the economic assessment quantifies certain critical economic factors, namely:

- Employment
- Household income
- Property values
- Property taxes.

For this study, it was not possible to quantify the full range of the economic factors that could be considered in evaluating the potential for a revitalized transportation center. Most communities have not collected data on many types of economic benefits in a manner that is readily available for analysis (e.g., changes over time in neighborhood crime statistics). Therefore, characteristics of safety and community spirit are implicitly recognized and presented on a qualitative basis.

Table 2 shows the demographic framework for the analysis of transportation impacts. The demographic matrix consists of rural-, light-, medium-, and high-density corridors, and towns, and very small, small, medium, and large cities. Impacts are presented in terms of employment, household income, and property values. Economic impacts are most dramatic in the immediate vicinity of the station and taper off with distance. In general, the impacts reported are anticipated to occur within walking distance of the station. As illustrated in the table, the impact of transportation improvement increases, in absolute terms, with the increase in corridor and population density and with the size of city. However, the impact of a station revitalization project may be more dramatic in a smaller city (for example, in terms of a percentage increase) than in a larger city. This is because the smaller city, with its smaller economic base, shows a more dramatic increase in employment, income, and property values.

Table 2 also presents the range of quantifiable impacts that may be anticipated from a station revitalization project that improves the transportation system. As illustrated in the examples in Chapter 1, such progress should include intermodal improvements, such as making it easier for patrons to transfer from bus to train or from car to train, through the development of multimodal terminals and related facilities, parking, and access improvements. It may also include changes in ticketing or baggage handling facilities or procedures, or in scheduling different and more frequent service, to reduce waiting times for passengers. Trip generation from compatible mixed uses of the station by commercial and transportation users can also increase benefits to the community.
The estimates are based on changes in \textit{generalized cost}\footnote{Generalized cost is the theoretical full cost of a trip including fares, tolls, travel time, and waiting time. See the Appendix for more detail.} for an average trip, and are derived from various station evaluations carried out across the country. The range of values (for employment, income, and property values) represents a 50-percent plus or minus range around the average values identified in the analysis, with the lowest values as the low range in a rural-density corridor and the highest values as the upper range in a high-density corridor.

\begin{table}[h]
\centering
\caption{Model Predictions of Economic Benefits}
\begin{tabular}{|c|c|c|c|c|c|}
\hline
\textbf{Population Density} & \textbf{City Size} & \textbf{Increase in Employment (# of Jobs)} & \textbf{Increase in Annual Household Income} & \textbf{Increase in Property Value (millions)} & \textbf{Increase in Property Tax (millions)} \\
\hline
\hline
\textit{Rural} & \textit{Town} & 45-135 & $80-$235 & $5-$10 & $.25-$5.5 \\
 & \textit{Very} & 115-350 & $85-$250 & $10-$35 & $5-$1.75 \\
 & \textit{Small} & 170-510 & $140-$425 & $15-$40 & $7.5-$2.0 \\
 & \textit{Medium} & 190-575 & $155-$465 & $15-$45 & $7.5-$2.25 \\
 & \textit{Large} & 260-775 & $175-$520 & $25-$80 & $1.25-$4.0 \\
\hline
\textit{Light} & \textit{Town} & 100-290 & $100-$310 & $10-$20 & $5-$1.0 \\
 & \textit{Very} & 145-435 & $115-$340 & $15-$45 & $7.5-$2.25 \\
 & \textit{Small} & 280-835 & $160-$475 & $20-$55 & $1.0-$2.75 \\
 & \textit{Medium} & 310-925 & $175-$520 & $25-$70 & $1.25-$3.5 \\
 & \textit{Large} & 375-1,130 & $230-$695 & $30-$90 & $1.5-$4.5 \\
\hline
\textit{Medium} & \textit{Town} & 100-305 & $110-$330 & $10-$25 & $5-$1.25 \\
 & \textit{Very} & 190-570 & $135-$400 & $15-$50 & $7.5-$2.5 \\
 & \textit{Small} & 320-950 & $180-$530 & $25-$70 & $1.25-$3.5 \\
 & \textit{Medium} & 335-1,000 & $195-$585 & $35-$110 & $1.75-$5.5 \\
 & \textit{Large} & 450-1,345 & $250-$755 & $55-$160 & $2.75-$8.0 \\
\hline
\textit{High} & \textit{Town} & 110-325 & $115-$345 & $20-$60 & $1.0-$3.0 \\
 & \textit{Very} & 275-825 & $150-$460 & $25-$65 & $1.25-$3.25 \\
 & \textit{Small} & 325-975 & $190-$575 & $30-$90 & $1.5-$4.5 \\
 & \textit{Medium} & 340-1,025 & $290-$870 & $50-$150 & $2.5-$7.5 \\
 & \textit{Large} & 480-1,435 & $350-$1,055 & $70-$205 & $3.5-$10.25 \\
\hline
\end{tabular}
\end{table}

Table 2 Notes: Corridor densities are defined as follows:

- \textbf{High Density}: A corridor with a large city at both ends of the corridor segment with at least one large or medium city in between.
Medium Density: A corridor with a large city at only one end with at least two medium cities along the corridor or terminating corridor.

Light Density: A corridor with a large city at both ends of the corridor with all small and very small cities and towns along the corridor (excluding exurban areas).

Rural Density: A corridor with a large or medium city at only one end and mostly small cities and towns along the route.

Cities sizes are defined as follows:
- Town (less than 50,000 population)
- Very small city (50,000 to 100,000 population)
- Small city (100,000 to 250,000 population)
- Medium city (250,000 to 500,000 population)
- Large city (500,000 to two million population).

Cities with population exceeding two million were excluded from the analysis. City definitions are based on 1990 U.S. Census definitions of urbanized areas where appropriate. Property tax is assumed at five percent of the value of the property increase. This will vary by jurisdiction.

3.1 Increases in Jobs: Direct and Indirect Employment

As shown in Table 2, the number of jobs that may be anticipated from a station improvement project range from 45 to 325 jobs in a town; 115 to 825 jobs in a very small city; 170 to 975 jobs in a small city; 190 to 1,025 jobs in a medium city; and 260 to 1,435 jobs in a large city. The range for each city depends on the type and size of improvement, the population density of the city, and the location of the city with respect to other cities (corridor density). The employment impact includes direct employment from initial station construction and annual operations, as well as indirect employment from the “ripple effect” of increased jobs at or near the station, attracted by the enhanced accessibility and economic activity.

3.1.1 Direct Employment: Construction

Direct employment from construction and renovation can be particularly helpful to the local economy because, in many cases, most of the funding comes from external sources. With federal grants and private investment efforts, the local government’s share for construction can be as little as 10 percent of the project cost. Although such construction jobs are temporary, they nevertheless support the economy through additional purchases of goods and services.

Costs for renovation projects depend on the size and condition of the station and the intended uses. The current trend is for communities to construct multimodal transportation centers that combine transportation uses with mixed-use occupancy such as office, retail, residential, and institutional purposes. The ultimate cost for renovation or construction will vary widely depending on these choices. As a general “rule of thumb,” however, $1 million of construction translates into 20 direct jobs and 10 indirect jobs. This
Economic Impact of Rail Station Revitalization

assumes an average wage and benefits package of $50,000 per year and assumes that most construction materials and supplies are locally purchased. Using this guideline, the direct, indirect, and total construction impact of a sample of station revitalization projects is shown in Table 3.

<table>
<thead>
<tr>
<th>City Size</th>
<th>City</th>
<th>Project Cost</th>
<th>Local Share</th>
<th>Direct Jobs</th>
<th>Indirect Jobs</th>
<th>Total Jobs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large</td>
<td>Portland, OR 3 (in development)</td>
<td>$21.9 million (+ $251 million development)</td>
<td>Not available</td>
<td>438</td>
<td>219</td>
<td>657</td>
</tr>
<tr>
<td>Large</td>
<td>Wilmington, DE</td>
<td>$19.6 million</td>
<td>City: $2.25 million State: $9.4 million</td>
<td>392</td>
<td>196</td>
<td>588</td>
</tr>
<tr>
<td>Medium</td>
<td>Bellingham, WA</td>
<td>$3.85 million</td>
<td>$1.15 million</td>
<td>77</td>
<td>38</td>
<td>115</td>
</tr>
<tr>
<td>Medium</td>
<td>Lafayette, IN</td>
<td>$8.14 million</td>
<td>$1.62 million</td>
<td>163</td>
<td>81</td>
<td>244</td>
</tr>
<tr>
<td>Town</td>
<td>Meridian, MS</td>
<td>$6.88 million</td>
<td>$1.3 million</td>
<td>138</td>
<td>69</td>
<td>207</td>
</tr>
</tbody>
</table>

3.1.2 Direct Employment: Annual Operations

Direct employment associated with a station depends on the level and type of activities at the station. Direct operating jobs in the station are likely to include at a minimum custodial services, security, landscaping/gardenskeeping, and project management and administration. Station attendants, customer service representatives, bus dispatchers or supervisors, and other transportation-related functions may also be required, depending on the type of operation. Retail employment for coffee shops, restaurants, and stores that may be present in an active center will add to the job count. A mixed-use facility will achieve the greatest increase in employment due to the significant number of professional, office, and retail jobs associated with the station.

A small-city station, with basic security, custodial, and administrative services, may have an operating budget starting at about $500,000 and representing about 14 to 20 jobs. A town or very small city may be able to scale this back and/or pool resources with other city functions. A general “rule of thumb” for basic operations (security, custodial, and project management) is to estimate approximately one job per $25,000 to $30,000 in the operating budget. As services and functions are added (e.g., transportation supervision and retail services), small-city station employment may increase to 120 to 160 jobs, with operations ranging up to $4 million per year. Note that most stations are open 18 to 24 hours a day, and thus many functions may require four or more persons for full staffing. If the station is also the headquarters for the local transit company or other significant permanent functions, the

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3 2000 PMSA population 1.9 million excluding Salem, OR
4 Including contribution of site
employee count could go even higher. A medium-sized city station may provide 50 to 500 direct jobs, with operations ranging from $1.5 million to $20 million or more, again depending on the types of activities and associated functions. A large-city station may provide 100 to 1,000 jobs or more, with combined operating, retail, and professional payrolls ranging from $3 million to $50 million, with the potential to generate even more. Generally, employment increases depend on the project’s ability to bring together transportation users and mixed-use tenants in a mutually beneficial facility.

3.1.3 Indirect Employment
Indirect employment is derived from the economic ripple effect of new activity. As new jobs are created, employees spend money on food, clothing, and other services. This increased spending likewise generates additional economic activity. A general “rule of thumb” multiplier for the local impact of a new job is 1.5; that is, every two new direct jobs generate approximately one new indirect job in the full ripple effect. Therefore, the indirect employment effect for stations in small cities range from about 7 to 80 jobs. For medium cities the impact ranges from about 25 to 250 indirect jobs, and for large cities the indirect impact ranges from 50 to 500 jobs. Again, employment and economic impacts will be most significant where transportation and commercial users achieve a balanced and mutually beneficial affiliation.

3.1.4 Case Study Examples
The following examples demonstrate the employment aspects of station development.

❖ Large city, high density: Anecdotal evidence supports the model prediction of 480 to 1,435 jobs for a rail or integrated bus-rail project in a large, high-density city such as Wilmington, DE. The synergies created between the transportation center and other users, such as the new baseball stadium and theaters, have complemented Wilmington’s success. Office buildings that had not been filled since the 1980s are now at full occupancy, and credit card and other business operations find Amtrak train services to be a business and employment asset in their regular interactions with New York City banking centers.

❖ Town, rural density: The model predicts that 45 to 135 jobs would be created in a town with a rural density. This estimate is validated by a study performed in Kremmling, Colorado, by Transystems and Transportation Economics & Management Systems, Inc. (TEMS), indicating that 19 to 23 direct jobs and 5 to 10 indirect jobs would be created in the base year from the creation of a multimodal hub. This small city near the Colorado ski resort areas is on the passenger rail line from Denver and is served by bus. However, the train did not stop because there was no station, and bus services did not coordinate with either the train schedule or the nearby Steamboat Springs airport flight schedules. The study showed that creating a station and coordinating transportation services for the tourist industry—the mainstay of the town—would provide significant impacts in the community. The benefits would increase over time as the tourist market increased, to 35-42 direct jobs and 42-57 direct and indirect jobs by the year 2020. This would represent a major boost to a community with a permanent population of only 1,280—and to the surrounding smaller communities.
3.2 Changes in Property Values and Property Taxes

Stations can become an anchor for development in the neighborhood. A solid investment by the community or a public/private partnership can reassure neighboring property owners that an upgrade to their own property is a sound investment. It also may attract new investors who are looking for undervalued properties to renovate and redevelop. An intermodal station improvement provides greater added value than many other types of property investments because it also reduces travel time and costs to commuters, employees, and visitors and improves the efficiency of the entire transportation system.

A station improvement also returns value to the community in the form of increased property tax assessments. For this analysis, the property tax value is assumed to equal five percent of the projected change in property value. This amount will vary depending on the local tax rate and on the types of investments; for example, some types of projects may be exempt from property taxes, which would change the potential return. Table 4 summarizes the property values for the case study examples that follow.

<table>
<thead>
<tr>
<th>Model Prediction of Change in Property Value</th>
<th>City</th>
<th>Change in Annual Property Value</th>
<th>$ Value Reported</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large/High density</td>
<td>Wilmington, DE</td>
<td>$70-$205</td>
<td>N/A</td>
<td>Office occupancy increased; private developer plans not yet finalized</td>
</tr>
<tr>
<td>Small/Light density</td>
<td>Lafayette, IN</td>
<td>$20-$55</td>
<td>$36m</td>
<td>Retail, dining, entertainment, housing, offices in the latest announced projects</td>
</tr>
<tr>
<td>Town/Rural density</td>
<td>Meridian, MS</td>
<td>$5-$10</td>
<td>&gt;$8m in first 2 years</td>
<td>Restaurant, computer training center, office, residential, and retail projects</td>
</tr>
<tr>
<td>Town/Rural density</td>
<td>Danville, VA</td>
<td>$5-$10</td>
<td>N/A</td>
<td>Retail and residential rezoning for active real estate market</td>
</tr>
</tbody>
</table>

Large city, high density: The model predicts a $70 to $205 million increase in property values for a large city in a high-density corridor. Although specific information on investment values was not available, it was reported that office occupancy rates have increased markedly in Wilmington, DE, near the renovated station. Since land is available near the restored scenic waterfront, a park was developed very recently, but private developers have not yet identified their plans associated with the third phase of station development.

Small city, light density: The station and pedestrian bridge project in Lafayette, IN, with relocation of freight railroad tracks, has led to the revitalization of downtown...
Lafayette. "New development and redevelopment continues to flourish, with the latest being a $36 million development at the other end of the bridge. The city of West Lafayette is converting unused space to a retail, dining, entertainment, and housing center." The model appears to be validated through this example of at least $3.4 million in development, as the model predicts $20 million to $55 million in development for a small, light-density city.

✧ Town, rural density: The Meridian, MS, experience appears to validate the model, which would predict $5 to $10 million for a rural-density town. Adjacent property values doubled even before station construction was completed, and over $8 million in private investment was attracted within the first two years. Additionally, a restaurant has been built in a restored brick warehouse next to the station, a $4.5 million computer training center is being built near the station, and two older, nearby hotels are being converted into apartments. Several turn-of-the-century buildings are also being converted into first-floor commercial and upper-story residential uses, starting one block west of the station.

✧ Town, rural density: In Danville, VA, the Farmer's Market/Tobacco Warehouse area near the renovated station was rezoned (from light industrial) to permit residential and retail uses. Danville developers are opening new retail outlets on lower floors and adding residential units to upper floors. A novelty warehouse will be opening soon, and other retail businesses are looking at space in the area. No details on actual property values are available, but growth in the area appears to validate the model findings.

3.3 Changes in Household Income

Increases in household income due to station revitalization also vary with city size and population density, as well as the type of station improvement. Household income increases are projected to occur within walking distance of the station. The model predicts that increases in household income near the station will range from $80 to $345 per household per year in a town; $85 to $460 in a very small city; $140 to $575 in a small city; $155 to $870 in a medium city; and $175 to $1,055 in a large city. Again, the ranges depend on the type and level of improvement, mixed uses, and the density of the corridor. It is more difficult to objectively track and define changes in household income than changes in employment and property values; however, surrogates can be developed such as increases in commercial activity and changes in jobs.

Three major types of commercial and revenue-generating activities that improve household income were identified in the interviews: concessions on retail space; long-term joint development (as in office space over Boston South Station); and short-term leases or rentals of space, such as meeting rooms or party facilities. The case studies are organized by these three categories. Table 5 provides a consolidated summary by station of the various contributors to household income.

5 Quote from Ms. Patty Payne, Manager, Lafayette Railroad Relocation Project
Table 5: Summary Examples of Anticipated Changes in Annual Household Income for Station Vicinity

<table>
<thead>
<tr>
<th>City Size/Density</th>
<th>City</th>
<th>Change in Annual Household Income</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large/High density</td>
<td>Wilmington, DE</td>
<td>$350-$1,055</td>
<td>Restaurant, other services; busy station with high-end customer base.</td>
</tr>
<tr>
<td>Small/Light density</td>
<td>Lafayette, IN</td>
<td>$160-$475</td>
<td>Space leased to business offices, benefit from related developments</td>
</tr>
<tr>
<td>Small/Light density</td>
<td>Madison, WI</td>
<td>$160-$475</td>
<td>Long-term business tenants, other activities to eliminate operating deficit</td>
</tr>
<tr>
<td>Town/Rural density</td>
<td>Meridian, MS</td>
<td>$80-$235</td>
<td>Extensive business and social function activity in meeting rooms</td>
</tr>
<tr>
<td>Town/Rural density</td>
<td>Danville, VA</td>
<td>$80-$235</td>
<td>Retail and residential rezoning for active real estate market</td>
</tr>
</tbody>
</table>

Although beyond the scope of this study, station-related development can also have a significant impact on household income. Transit-oriented developments have the potential to provide residents with improved quality of life and reduced household transportation expenses while providing the region with stable mixed-income neighborhoods that reduce environmental impacts and provide real alternatives to traffic congestion. New research clearly shows that this kind of development can reduce household transportation costs, thereby making housing more affordable. For more information about this subject, visit Transit Oriented Development in the Programs and Grants section of the Station Foundation’s website.

3.3.1 Commercial Space and Concessions
Retail commercial space and concessions provide a service to travelers and can also generate additional traffic and income for the center. Generally, owners consider information on retail activity confidential and proprietary; however, the proliferation of a variety of services is an indicator of activity and success.

✦ Large city, high density: Wilmington’s station includes a restaurant with about three-years’ tenure. The station is now a very busy place, the ninth busiest station in the Northeast region, serving a high-end customer base consisting mostly of business people.

✦ Town, rural density: Smaller scale stations may be directed to a specific market. For example, Danville, VA’s Science Center gift shop (developed as a mixed use with the station) generates sales of $500 to $600 per month for the non-profit organization, while the museum generates entry fees of approximately $3,000 per month.
3.3.2 Joint Use Development
Joint use development that may involve office space or institutional uses can provide a stable source of income to the property manager or owner.

✦ Small city, light density: The relocated station in Lafayette, IN, houses a processing center for a local bank and offices of the local business development authority. The station also contains a meeting room.

✦ Small city, light density: The major long-term tenants of Bellingham, WA, are Amtrak, Burlington Northern Santa Fe, and Greyhound.

3.3.3 Meeting Room Rental
Renting meeting rooms for business or social purposes and renting out all or part of a facility (such as the main hall) for special occasions can provide additional income. Such rentals can also meet objectives to increase community involvement, generate high levels of activity and retail interchange, and promote recognition of the station center.

✦ Town, rural density: Meridian, MS deliberately keeps rental rates low to encourage activity. Meridian designed the building with flexible-size meeting rooms and facilities. The station has become a popular place for business meetings as well as social functions ranging from family and class reunions to community quilting. Office space is also rented at the facility.

3.4 Safety and Community Spirit
Station improvements may well engender positive benefits such as increased community interaction and enhanced safety in the neighborhood. Such impacts may be difficult to quantify, but they definitely contribute to the value of the project.

3.4.1 Safety and Security
Various projects have demonstrated the important connection between providing an initial atmosphere of safety and fostering increasing station activity. Increasing activity in turn increases the perception of security, which further builds activity levels. Although the communities have not collected direct crime statistics related to the station development projects, most have identified the positive impressions and perceptions of security that can be fostered by a well-maintained station.

✦ Large city, high density: Wilmington, DE, provides staffing 18 hours a day. The staff are responsible for clean-up but are also equipped with two-way radios and provide a physical presence that is deterrent to criminal activity.

✦ Town, rural density: Meridian, MS, has focused its efforts on providing clean, safe, and welcoming facilities and surroundings. It used materials in its building design that are designed to withstand 24-hour-a-day use. Janitorial services are provided 16 hours a day, and security services are provided 24 hours a day, 365 days a year. The high level of activity at the station creates an atmosphere of welcome and a sense of security. For example, a recent invitation to honor area retirees attracted more than
400 senior citizens to an evening function at the station in an area of town that would have been considered deserted, if not dangerous, just two years before.

Meridian Police Chief Gregg Lewis states that the station has “spurred revitalization in the area. Five years ago the area was a place for hobos, vagrants, assaults, thefts, drunkenness, and graffiti. Now there is traffic 24 hours a day, and nothing bad is happening there, except for occasional incidents with passengers being removed from the train or the bus. Five or six city blocks are now prospering—the station has been a big deal for our city and an anchor for revitalization.”

✦ Town, rural density: Danville, VA, provides extensive lighting as well as security services to increase the perception of activity, especially late at night when the trains are arriving and departing. Amtrak’s Crescent train stops at midnight (southbound) and at 4:30 am (northbound).

3.4.2 Community Spirit
In addition to the examples above, non-traditional station plans and uses have generated significant community support, which may not be easily quantifiable in an economic model. Through station development projects, small cities in particular have been successful in creating community centers that sustain the project and increase interest in transportation.

✦ Small city, light density: The Lafayette, IN, station and the adjacent plaza and pedestrian building have become a true community center. In addition to monthly festivals, the plaza, depot, and pedestrian bridge have been the sites for weddings, basketball tournaments, public rallies, video shoots, and numerous other activities.

✦ Town, rural density: The Danville, VA, Station and Science Museum have generated support from schools, educators, businesses, and other community groups. The elderly population welcomed the idea of preserving the historic train site, while educators and others welcomed the science museum and raised funds to create and operate it.
Chapter 4. Summary and Conclusions

This study confirms that station revitalization can provide significant economic benefits to the community. Station improvements that increase multimodal accessibility increase the number of passengers using the service, as well as increase jobs, household income, property values, and taxes in the community. Station improvements also may increase community cohesion and opportunities for social interaction. The study also predicts ranges of economic impacts from station improvements in terms of increased jobs, income and property values. Ranges of impacts vary by the type of transportation project, by the demographics of city size and by corridor density, and are summarized in Table 6.

<table>
<thead>
<tr>
<th>Type</th>
<th>Increased Employment (jobs)</th>
<th>Increased Household Income ($ in millions)</th>
<th>Increased Property Values (in millions)</th>
<th>Property Tax (in millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Town</td>
<td>45-325</td>
<td>$80-$345</td>
<td>$5-$60</td>
<td>$25-$3.0</td>
</tr>
<tr>
<td>Very Small City</td>
<td>115-825</td>
<td>$85-$460</td>
<td>$10-$65</td>
<td>$5-$3.25</td>
</tr>
<tr>
<td>Small City</td>
<td>170-975</td>
<td>$140-$575</td>
<td>$15-$90</td>
<td>$75-$4.5</td>
</tr>
<tr>
<td>Medium City</td>
<td>190-1,025</td>
<td>$155-$870</td>
<td>$15-$150</td>
<td>$75-$7.5</td>
</tr>
<tr>
<td>Large City</td>
<td>260-1,435</td>
<td>$175-$1,055</td>
<td>$25-$205</td>
<td>$125-$10.25</td>
</tr>
</tbody>
</table>

The range of values for employment, income, property values, and property taxes represents a 50-percent plus or minus range around the average values identified in the analysis, with the lowest values as the low range in a rural-density corridor, and the high values the upper range in a high-density corridor.

Initial impact estimates were developed in the first analytical phase of the study based on economic analyses of proposed station improvements at a series of stations throughout the country. The second study phase consisted of interviews with managers of station revitalization projects throughout the country. Estimates were refined during the third phase of the study to include towns and very small cities, and rural corridors and to exclude cities with populations greater than two million. The refined estimates and predictions are supported by the data and anecdotal information gathered during the second phase interviews.
Chapter 5. How to Apply this Study to Your Community

Communities that are contemplating station revitalizations can estimate the likely passenger increases and economic benefits of an improvement based on the values in Table 2 (page 13). The steps are as follows:

1. Identify the basic proposal for station improvement, using the Great American Station Foundation’s Guidebook on Train Station Revitalization. This document can be accessed at the Foundation’s website: www.stationfoundation.org.

2. Select the appropriate category for the particular community for city size and city density based on the corridor definitions and population ranges provided (e.g., town, rural-density corridor; small city, high-density corridor; large city, medium-density corridor, etc.).

3. Verify that the proposed station improvement meets the criteria for improvement, in terms of increasing station accessibility, providing a new or improved intermodal connection, improving frequency and ease of connections, and otherwise reducing travel or wait times and/or reducing overall travel cost. Also factor in the potential for mixed uses at the facility and the suitability of the surrounding area for economic development.

4. Identify the travel mode(s) involved in the improvement. If it is acceptable to present a range of values for anticipated changes in economic factors, select the appropriate range based on city size from Table 2.

5. If a single value is preferred for each factor, compare the specific city characteristics to the range of values (e.g., is it closer in size to the top of the range or the bottom of the range), and use judgment as to the vitality and resourcefulness of the city compared to the examples in the model. Tables A-7 through A-10 in appendix A provide the average values from the study from which the ranges are derived. Note that range values are rounded slightly for clarity of presentation.

6. To estimate the breakdown between direct and indirect jobs for a community, the approach adopted by TEMS has been to estimate station joint development construction costs and then, if each $1 million of construction costs translates into 20 direct (construction) and 10 indirect (permanent) jobs, the level of temporary direct construction jobs can be estimated. This can then be subtracted from the total number of jobs forecast by the model to provide the estimate of construction versus permanent job estimates.

This study effort has identified the types of benefits that a community may expect to achieve from revitalizing a station into an intermodal center for the town or city. It is clear that the benefits will vary based on the size of the community and on its location with respect to other population centers. Benefits will also vary based on the type of improvements, and on the energy and character of the community itself. Each community may decide whether or
not the potential benefits from a station improvement are worth the investment, using this guide and other resources to make their informed decisions.
Appendix A: Economic Rent Model

1. Introduction

The purpose of developing the economic model is to establish a tool or guideline for communities to use in assessing the value and benefits that will accrue from revitalizing their rail stations. The value each community achieves will depend on a number of social, demographic, and economic factors. For example, a large city that is close to other large cities will naturally receive a greater economic impact (in absolute terms) than a small town that is isolated and rural.

The critical element in determining the level of economic impact is the degree of interchange that can or will happen at any given station location. Larger cities and more dense locations can expect a higher level of interchange. This does not mean that the degree of interchange achieved in a small town is any less important; indeed it could be more important to the economy of the area. For instance, 50 jobs in a small town may be more important than 600 jobs in a city. However, in absolute terms, the impact is bigger in a city.

As a first step, therefore, the study began by classifying towns and cities in terms of their size (population), density (population/square mile), and income (household income). Once this classification was made, the second step was to develop a model that would show how a revitalized station would impact economic development. The key factor in this improved economic welfare can be broadly measured in terms of jobs, income, and property values assuming that some other economic factors such as general prices, the quality of products and services, and quality of life within towns and cities are reasonably ubiquitous across various regions of America.

In reality there are some marked differences between regions in terms of these factors, and thus in some areas the results may be slightly overstated or understated depending on the degree of difference of any given region from the areas that were modeled, namely, upper New England, the Midwest, and the Mid-Atlantic. For example, we would expect the model
to slightly understate the benefits to New York and slightly overstate the benefits to New Mexico. With this exception, it is considered that the economic model is reliable in forecasting the value of station revitalization to towns or cities.

The way in which a transportation project affects economic growth can be measured in terms of how the project improves market accessibility. If station revitalization makes it easier or more pleasant to travel, then the transportation network becomes more efficient at providing accessibility to required markets. Such efficiencies can generate more jobs, raise income and taxes, and make properties more valuable, as well as add passengers. These increases are due to improved efficiency of the system and reflect real gains to the economy. Just as the design of a better “mouse trap” can cause economic growth, so the development of an improved transportation network will cause more growth. Transportation is a key element in the economy, particularly in urban networks. Transportation has long been recognized as a condition or precondition for economic growth. The economic concept that underlies such arguments is known as Economic Rent. The concept of Economic Rent is defined from basic Ricardian Economic Theory as a means of explaining how the values of resources such as land, labor, and capital change depending on how and where they are used.

Transportation projects change the interrelationship of goods and their markets in terms of two critical elements: the cost of delivery and the time of delivery. In general, building or improving a transportation facility will reduce the cost and the time of delivery of a product to the market and will therefore increase economic efficiency. The extent to which the increase in economic efficiency increases economic welfare (jobs, income, property value, etc.) will depend on the responsiveness of the market to this new opportunity. Economic Rent measures this level of impact at any location, and Economic Rent elasticity shows how responsive the economy is to transportation. In some areas it could be very responsive; in other areas it may be unresponsive. By measuring the sensitivity or relationship between Economic Rent and travel cost (time and cost), the effect of any improvement can be measured.

If a new transport facility (e.g., highway, station, and railroad) is built, the impact may be substantial if there is a significant amount of freight and/or passenger traffic and interaction.
A high level of interaction reflects a high Economic Rent. If there is not much traffic, showing a low Economic Rent, then the impact will be smaller.

Typically, we can calculate the level of Economic Rent as follows:

\[
\text{Economic Rent (ER)} = f(I, E, P, C, T) \tag{1.1}
\]

where,

- \( I \) is a measure of Industrial structure in year \( t \)
- \( E \) is a measure of Education level in year \( t \)
- \( P \) is a measure of Population structure in year \( t \)
- \( C \) is a measure of Cultural type in year \( t \)
- \( T \) is a measure of Transportation efficiency in year \( t \)

**Industrial:** It is recognized that the nature of the industrial structure defines the potential Economic Rent profile of a region, i.e., degree of service, manufacturing, commercial, agricultural, and residential and social facilities. The higher the value added by industry, the higher the region’s Economic Rent profile.

**Education:** It is recognized that educational levels can have a dramatic impact on the Economic Rent potential of a region, e.g., percentage of Ph.D. or other advanced degrees. Typically, a higher education level will increase the wealth generated by the population.

**Population:** It is recognized that a population structure can positively or negatively affect the economic potential of a region (e.g., a high proportion of population over 64+ would tend to have a negative effect, depending on income). The more productive adults, the higher the Economic Rent profiles.

**Cultural:** Differences in cultural and ethnic characteristics of a region can impact its economic potential.
Transportation: The efficiency of the transportation system can greatly affect the economic potential of a region. The better the transportation system, the more capability there is to generate wealth.

2. Economic Rent Profile Changes
While many of the factors affecting a regional economy change slowly, e.g., industrial structure, it is possible for them to change over time to dramatically affect the Economic Rent profile of a city. A.E. Metcalf documented the collapse of metal manufacturing in Buffalo, New York, creating a major loss of Economic Rent with the resultant collapse of the Central Business District (CBD), as compared to Toronto which did not experience a collapse of its CBD because the growth of the service industry more than replaced lost metal manufacturing jobs. The proportion of metal manufacturing jobs lost in both cities was similar, and there is little doubt that Toronto would have faced a problem similar to that of Buffalo, except for the rapid growth over 10 years of service industry jobs.

Equally, education, population structure, and cultural ethics can and do change over time. However, these are not factors that typically change very rapidly unless an area experiences a significant dislocation or migration change associated with rapid and dramatic population and industrial base shifts. For example, the influx of Hong Kong residents to Vancouver dramatically changed the Economic Rent profile of several areas of the city’s downtown, and the retirement of “Baby Boomers” in the future will result in a significant reduction in the work force.

In the short term (less than 10 years) and in the absence of a major dislocation, we can assume that Industrial Structure (I), Education (E), Population (P), and Cultural Ethics (C) remain unchanged. The one characteristic that frequently changes rapidly in the short term is transportation efficiency. Major transportation infrastructure projects can dramatically change the accessibility of markets and the opportunity for economic growth. This can include the improved movement of freight and passenger traffic by highway, train, air, and water transportation. It is the Economic Rent generated by transportation improvements
that has driven the desire of the business community and government to move products more quickly and cost-effectively over time.

As a result, our Economic Rent model reduces to:

\[ ER = f_0(T_r) \]  
(Equation 2.1)

By using socioeconomic proxies \((SE_i)\) for Economic Rent, and generalized cost as a proxy for transportation efficiency (given that it measures the time and cost of travel), the Economic Rent equation can be rewritten as:

\[ SE_i = \beta_0 \times C_i^{\beta_1} \]  
(Equation 2.2)

where

\( SE_i = \) Socioeconomic indicators for employment, income, property value of county \(i \)
\( GC_i = \) Weighted generalized cost of travel by all modes from county \(i \) to major cities of the region.
\( \beta_0, \beta_1 = \) Calibration parameters

For the public modes, the generalized cost of travel includes all aspects of travel time (access/egress time and in-vehicle time), travel cost (fares, tolls, parking charges), and service frequency.

The generalized cost of travel is typically defined in travel time rather than dollars. Costs are converted to time by applying appropriate conversion factors as shown in Equation 2.3. The generalized cost of travel between zones \(i\) and \(j\) for mode \(m\) and purpose \(p\) is calculated as follows:
\[ GC_{jmp} = TT_{jim} + \frac{TC_{jim}}{VOT_{mp}} + \frac{VOF_{mp} \times OH}{VOT_{mp} \times F_{jim}} \]  

(Equation 2.3)

where

\( TT_{jm} = \) Travel time between zones i and j for mode m (in-vehicle time + waiting time + delay time + connect time + access/egress time + interchange penalty), with waiting, delay, connect and access/egress time multiplied by two to account for additional disutility felt by travelers for these activities.

\( TC_{jim} = \) travel cost between zones i and j for mode m and purpose p (fare + access/egress cost for public modes, operating cost for auto)

\( VOT_{mp} = \) Value of Time for mode m and purpose p

\( VOF_{mp} = \) Value of Frequency for mode m and purpose p

\( F_{jim} = \) Frequency in departures per week between zones i and j for mode m

\( OH = \) Operating Hours per week

3. The Study Definition

The increased Economic Rent due to a revitalized station is measured in terms of an improvement in travel utility (savings in time and cost) and thus can be directly estimated in generalized cost terms. The requirement, therefore, is to find where station revitalization is being or planned to be carried out, and to measure the benefits in terms of improvement in key economic factors (e.g., jobs, income, property values, taxes, and passengers) when compared to the improvement in travel efficiency generated by the station revitalization.

To achieve this objective the following analysis was made. First, Economic Rent elasticities were measured for jobs, income, and property values in a series of corridors in the Midwest region and along the East Coast (Massachusetts-Maine and Washington, DC-Virginia). This
provided a measure of the responsiveness of Economic Rent in a wide range of situations including:

- Five types of city sizes: Town, Very Small, Small, Medium, and Large
- Four types of rail corridor densities: Rural, Light, Medium, and High.

In general, the cities are classified by the population of the major county where they are located. In cases where a metropolitan statistical area (MSA) or Primary Metropolitan Statistical Area (PMSA) is recognized by the U.S. Bureau of the Census as overlapping multiple counties, that definition is used and noted. The analysis categories and population definitions are as follows:

- Towns: population of less than 50,000
- Very small cities: 50,000-100,000
- Small cities: 100,000-250,000
- Medium cities: 250,000-500,000
- Large cities: 500,000-2,000,000.

Very large cities (greater than 2,000,000 population) were not included for this analysis. Corridors are further classified according to population and transportation density and were defined and analyzed as follows.

**High Density**: A corridor with a large city at both ends of the corridor segment with at least one large or medium city in between.

*Examples*: Chicago, IL to Detroit, MI, with Ann Arbor, MI between; and Chicago to Cleveland, OH with Toledo, OH between.

*Exception*: Milwaukee, WI to Madison, WI is included as a high-density corridor because of Madison’s proximity to Milwaukee, even though Madison (Dane County) falls just below the threshold for large city designation.

**Medium Density**: A corridor with a large city at only one end with at least two medium cities along the corridor or terminating the corridor.
Economic Impact of Rail Station Revitalization

*Examples:* Michigan branch from Chicago to Port Huron, MI via Battle Creek, MI; Milwaukee, WI to Green Bay, WI; and Boston, MA to Portland, ME.

**Light Density:** A corridor with a large city at both ends of the corridor with all small cities along the corridor (excluding exurban areas).

*Examples:* Chicago to St. Louis, MO with Joliet, IL and Upper Alton, IL as exurban areas; St. Louis, MO to Kansas City, MO; Madison, WI to St. Paul, MN.

**Rural Density:** A corridor with a large or medium city at only one end, and mostly small cities and towns along the route.

*Examples:* Chicago to Quincy, IL; Chicago to Carbondale, IL; Princeton, IL to Omaha, NE; Alexandria, VA to Bristol, VA; and Richmond, VA to Bristol, VA.

Maps illustrating the population density for the Midwest, upper Northeast coast, and Virginia, with an overlay of the respective rail corridors, are provided on pages A-13 and A-14.

Using this information, a matrix of economic elasticities with respect to generalized cost was derived.

The next step in the study was to estimate the impact of a revitalized station on the relative transportation efficiency or generalized cost of a typical traveler. This was measured by using the output of rail studies on the following corridors: Chicago-Cleveland, Chicago-Detroit, Princeton-Omaha, Milwaukee-Madison, Chicago-Quincy, Chicago-Cincinnati, Boston-Portland, Milwaukee-Green Bay, Chicago-St. Louis, Madison-St. Paul, St. Louis-Kansas City, Chicago-Carbondale, and the Washington, DC to Richmond, VA, Washington, DC to Bristol, VA, and Richmond, VA to Bristol, VA.

Improvement in overall generalized travel cost caused by the revitalization of a station will vary between rail-only corridors and corridors with an integrated rail/bus network for two
reasons. First, terminals are a very critical component in making journeys, and considerable time can be wasted waiting for connections and changing to other modes of travel. Typically, wait time increases with trip length due to the generally lower trip frequencies and greater travel uncertainties. Second, time spent in terminals not traveling has a higher value to passengers than time spent traveling, due to the frustration of waiting. Improved terminal facilities (shops, restaurants, etc.) reduce this frustration.

4. Study Process

The key to this study was the evaluation of existing travel patterns between city pairs in the study areas and estimating how these travel patterns will change and grow in the future, with and without the improved accessibility generated through station improvements. To evaluate the nature of existing travel patterns, a comprehensive database was developed including zone-to-zone (origin-to-destination) travel movements by trip purpose for each study area and corridor. The Great American Station Foundation Guidebook on Train Station Revitalization has demonstrated that revitalization of stations can increase ridership between 20 and 30 percent.

4.1 Model and Data Base

The data for socioeconomic variables were derived from existing periodicals and publications from the state departments of transportation, federal agencies, and independent research agencies. The variables required for TEMS’ COMPASS® and RENTS® models are population, employment, household income, and property value. The base year for the data is 1996, although 2000 population data were used to classify cities and corridors.

4.2 Origin and Destination Data

The origin-destination data used for this study were readily available from the state DOTs and relevant agencies. The traffic volumes between zone or city pairs for each mode and each trip purpose were gathered from these sources. The data were checked for consistency and processed to fit the COMPASS® model’s zonal system requirements.
4.3 Specific Models
The economic analysis for the station revitalization was carried out using the output of the COMPASS\textsuperscript{®} and RENTS\textsuperscript{®} models, and consisted of two evaluations:

1. An assessment of user benefits, which measured potential improvements in travel times and costs to rail, air, bus, and auto travelers in the cities studied.

2. An assessment of community benefits, which measured improvements in economic welfare (household income, employment, tax base, property values, passengers) that would accrue to the inhabitants of the cities.

A total of 43 stations were analyzed for the purpose of obtaining the economic benefits related to the station improvements. Some stations were used in the analysis more than once as they are integral parts of different corridors. Cities with populations above two million were excluded from the analysis.

The list of stations used as data points in this study is shown below.

<table>
<thead>
<tr>
<th>Alexandria, VA</th>
<th>Kalamazoo, MI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alton, IL</td>
<td>Kansas City, MO</td>
</tr>
<tr>
<td>Bloomington, IL</td>
<td>La Crosse, WI</td>
</tr>
<tr>
<td>Boston, MA</td>
<td>Macomb, IL</td>
</tr>
<tr>
<td>Brookfield, WI</td>
<td>Madison, WI</td>
</tr>
<tr>
<td>Bryan, OH</td>
<td>Marion, VA</td>
</tr>
<tr>
<td>Carbondale, IL</td>
<td>Mendota, IL</td>
</tr>
<tr>
<td>Centralia, IL</td>
<td>Milwaukee, WI</td>
</tr>
<tr>
<td>Cleveland, OH</td>
<td>Naperville, IL</td>
</tr>
<tr>
<td>Durand, MI</td>
<td>Neenah, WI</td>
</tr>
<tr>
<td>Elkhart, IN</td>
<td>Oshkosh, WI</td>
</tr>
<tr>
<td>Elyria, OH</td>
<td>Pontiac, MI</td>
</tr>
<tr>
<td>Exeter, NH</td>
<td>Portage, IN</td>
</tr>
<tr>
<td>Farmville, VA</td>
<td>Portland, ME</td>
</tr>
<tr>
<td>Fond Du Lac, WI</td>
<td>Princeton, IL</td>
</tr>
</tbody>
</table>

The Great American Station Foundation
5. Results

The results of the Economic Rent calibration are shown in Tables A-1 through A-6. In all the options analyzed, both socioeconomic variables (employment and income), regressed against generalized cost, were found to be significant with correct signs on the coefficients and good t-Stat and R² values. The t-Statistics indicate the significance of the parameters; that is the likelihood that coefficients are not zero, and R² indicates the model's goodness of fit to the observed data or characteristics. In general, it can be seen that the size of the coefficient rises for smaller cities and that accessibility improvements are even more important in generating economic well being.

The following tables show the Economic Rent coefficients for different city sizes within each corridor density designation (Tables A-1, A-2, A-3, and A-4).
### Table A-1: Economic Rent Coefficients for High Density Corridors

<table>
<thead>
<tr>
<th>City Size</th>
<th>Employment</th>
<th>t-Stat</th>
<th>R squared</th>
<th>Income</th>
<th>t-stat</th>
<th>R squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large</td>
<td>-0.174</td>
<td>3.62</td>
<td>0.47</td>
<td>-0.246</td>
<td>5.83</td>
<td>0.47</td>
</tr>
<tr>
<td>Medium</td>
<td>-0.269</td>
<td>6.26</td>
<td>0.51</td>
<td>-0.25</td>
<td>3.56</td>
<td>0.48</td>
</tr>
<tr>
<td>Small</td>
<td>-0.21</td>
<td>3.71</td>
<td>0.45</td>
<td>-0.232</td>
<td>4.65</td>
<td>0.52</td>
</tr>
<tr>
<td>Very Small</td>
<td>-0.161</td>
<td>3.36</td>
<td>0.4</td>
<td>-0.211</td>
<td>3.56</td>
<td>0.51</td>
</tr>
<tr>
<td>Town</td>
<td>-0.191</td>
<td>4.76</td>
<td>0.46</td>
<td>-0.331</td>
<td>4.98</td>
<td>0.46</td>
</tr>
</tbody>
</table>

### Table A-2: Economic Rent Coefficients for Medium Density Corridors

<table>
<thead>
<tr>
<th>City Size</th>
<th>Employment</th>
<th>t-Stat</th>
<th>R squared</th>
<th>Income</th>
<th>t-stat</th>
<th>R squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large</td>
<td>-0.301</td>
<td>3.89</td>
<td>0.57</td>
<td>-0.191</td>
<td>5.67</td>
<td>0.54</td>
</tr>
<tr>
<td>Medium</td>
<td>-0.197</td>
<td>5.77</td>
<td>0.52</td>
<td>-0.194</td>
<td>3.38</td>
<td>0.47</td>
</tr>
<tr>
<td>Small</td>
<td>-0.2</td>
<td>3.36</td>
<td>0.48</td>
<td>-0.176</td>
<td>3.3</td>
<td>0.48</td>
</tr>
<tr>
<td>Very Small</td>
<td>-0.156</td>
<td>4.47</td>
<td>0.47</td>
<td>-0.222</td>
<td>4.13</td>
<td>0.47</td>
</tr>
<tr>
<td>Town</td>
<td>-0.125</td>
<td>2.98</td>
<td>0.5</td>
<td>-0.207</td>
<td>3.73</td>
<td>0.45</td>
</tr>
</tbody>
</table>
Table A-3: Economic Rent Coefficients for Light Density Corridors

<table>
<thead>
<tr>
<th>City Size</th>
<th>Employment</th>
<th>t-Stat</th>
<th>R squared</th>
<th>Income</th>
<th>t-stat</th>
<th>R squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large</td>
<td>-0.241</td>
<td>5.12</td>
<td>0.55</td>
<td>-0.236</td>
<td>5.15</td>
<td>0.51</td>
</tr>
<tr>
<td>Medium</td>
<td>-0.12</td>
<td>9.08</td>
<td>0.61</td>
<td>-0.316</td>
<td>4.71</td>
<td>0.46</td>
</tr>
<tr>
<td>Small</td>
<td>(-0.21)</td>
<td>5.16</td>
<td>0.55</td>
<td>(-0.21)</td>
<td>4.21</td>
<td>0.47</td>
</tr>
<tr>
<td>Very Small</td>
<td>-0.195</td>
<td>4.46</td>
<td>0.47</td>
<td>-0.21</td>
<td>3.7</td>
<td>0.48</td>
</tr>
<tr>
<td>Town</td>
<td>-0.189</td>
<td>4.78</td>
<td>0.43</td>
<td>-0.161</td>
<td>3.47</td>
<td>0.45</td>
</tr>
</tbody>
</table>

() numbers in parenthesis are estimates rather than directly derived from the model.

Table A-4: Economic Rent Coefficients for Rural Density Corridors

<table>
<thead>
<tr>
<th>City Size</th>
<th>Employment</th>
<th>t-Stat</th>
<th>R squared</th>
<th>Income</th>
<th>t-stat</th>
<th>R squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large</td>
<td>-0.237</td>
<td>3.36</td>
<td>0.63</td>
<td>-0.391</td>
<td>3.02</td>
<td>0.53</td>
</tr>
<tr>
<td>Medium</td>
<td>-0.183</td>
<td>3.14</td>
<td>0.47</td>
<td>-0.28</td>
<td>2.97</td>
<td>0.41</td>
</tr>
<tr>
<td>Small</td>
<td>-0.216</td>
<td>4.25</td>
<td>0.63</td>
<td>-0.249</td>
<td>3.72</td>
<td>0.49</td>
</tr>
<tr>
<td>Very Small</td>
<td>-0.181</td>
<td>3.7</td>
<td>0.5</td>
<td>-0.268</td>
<td>3.79</td>
<td>0.5</td>
</tr>
<tr>
<td>Town</td>
<td>-0.206</td>
<td>3.91</td>
<td>0.45</td>
<td>-0.239</td>
<td>3.68</td>
<td>0.45</td>
</tr>
</tbody>
</table>

Tables A-5 and A-6 show the summarized Economic Rent coefficients for employment and income based on the city size and corridor density.
Table A-5: Economic Rent Coefficients for Employment

<table>
<thead>
<tr>
<th>DENSITY</th>
<th>CITY SIZE</th>
<th>Large</th>
<th>Medium</th>
<th>Small</th>
<th>Very Small</th>
<th>Town</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Density</td>
<td></td>
<td>-0.174</td>
<td>-0.269</td>
<td>-0.21</td>
<td>-0.161</td>
<td>-0.191</td>
</tr>
<tr>
<td>Medium Density</td>
<td></td>
<td>-0.301</td>
<td>-0.197</td>
<td>-0.2</td>
<td>-0.156</td>
<td>-0.125</td>
</tr>
<tr>
<td>Light Density</td>
<td></td>
<td>-0.241</td>
<td>-0.12</td>
<td>(-0.21)</td>
<td>-0.195</td>
<td>-0.189</td>
</tr>
<tr>
<td>Rural Density</td>
<td></td>
<td>-0.237</td>
<td>-0.183</td>
<td>-0.216</td>
<td>-0.181</td>
<td>-0.206</td>
</tr>
</tbody>
</table>

() number in parenthesis is an estimate

Table A-6 Economic Rent Coefficients for Income

<table>
<thead>
<tr>
<th>DENSITY</th>
<th>CITY SIZE</th>
<th>Large</th>
<th>Medium</th>
<th>Small</th>
<th>Very Small</th>
<th>Town</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Density</td>
<td></td>
<td>-0.246</td>
<td>-0.25</td>
<td>-0.232</td>
<td>-0.211</td>
<td>-0.331</td>
</tr>
<tr>
<td>Medium Density</td>
<td></td>
<td>-0.191</td>
<td>-0.194</td>
<td>-0.176</td>
<td>-0.222</td>
<td>-0.207</td>
</tr>
<tr>
<td>Light Density</td>
<td></td>
<td>-0.236</td>
<td>-0.316</td>
<td>(-0.21)</td>
<td>-0.21</td>
<td>-0.161</td>
</tr>
<tr>
<td>Rural Density</td>
<td></td>
<td>-0.391</td>
<td>-0.28</td>
<td>-0.249</td>
<td>-0.268</td>
<td>-0.239</td>
</tr>
</tbody>
</table>

() number in parenthesis is an estimate

As can be seen from the above tables, the increase in the Economic Rent (employment, income, and property value) varies markedly depending on the city size and the population density of the corridor. The size of the impact of any improvement in accessibility depends on the transportation Economic Rent function in the region. In addition, the changes in value are directly associated with the improved travel times and the accessibility generated from the project.
Using the concept of Economic Rent in terms of generalized cost, it was found that the larger the improvement in generalized cost, the larger the economic benefit for any city on any corridor type. It was also found that the distribution of benefits at the transportation zone level varies with the city size and the population density.

The direct economic impact of station revitalization for integrated rail/bus options for cities with existing rail service is presented in Tables A-7 through A-10, arranged by corridor density and city size. These values, derived from the analysis, are the central data points for the range of values (plus or minus 50 percent) presented in the body of the report.

These tables provide the economic impact results of improvements in accessibility generated by the integrated rail/bus option in terms of the city size and the corridor density. It can also be seen that the size of the impact that any improvement in accessibility generates depends on the elasticity of a region. Elasticity measures the extent to which the area responds to accessibility impact and varies by population and corridor density. Therefore, the smaller cities that are located in a lower corridor density area have the lowest elasticity and the smallest benefits in all scenarios.

### Table A-7 Economic Impact of Station Revitalization for HighDensity Corridor

<table>
<thead>
<tr>
<th>City Size</th>
<th>Employment Created (# of Jobs)</th>
<th>Average Household Income Created ($)</th>
<th>Increased Property Value (millions of $)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large</td>
<td>958</td>
<td>703</td>
<td>138</td>
</tr>
<tr>
<td>Medium</td>
<td>684</td>
<td>581</td>
<td>101</td>
</tr>
<tr>
<td>Small</td>
<td>650</td>
<td>383</td>
<td>59</td>
</tr>
<tr>
<td>Very Small</td>
<td>550</td>
<td>308</td>
<td>44</td>
</tr>
<tr>
<td>Town</td>
<td>217</td>
<td>229</td>
<td>40</td>
</tr>
</tbody>
</table>
## Economic Impact of Rail Station Revitalization

### Table A-8 Economic Impact of Station
Revitalization for Medium Density Corridor

<table>
<thead>
<tr>
<th>City Size</th>
<th>Employment Created (# of Jobs)</th>
<th>Average Household Income Created ($)</th>
<th>Increased Property Value (millions of $)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large</td>
<td>895</td>
<td>503</td>
<td>108</td>
</tr>
<tr>
<td>Medium</td>
<td>665</td>
<td>389</td>
<td>74</td>
</tr>
<tr>
<td>Small</td>
<td>633</td>
<td>353</td>
<td>48</td>
</tr>
<tr>
<td>Very Small</td>
<td>380</td>
<td>268</td>
<td>32</td>
</tr>
<tr>
<td>Town</td>
<td>204</td>
<td>219</td>
<td>15</td>
</tr>
</tbody>
</table>

### Table A-9 Economic Impact of Station
Revitalization for Light Density Corridor

<table>
<thead>
<tr>
<th>City Size</th>
<th>Employment Created (# of Jobs)</th>
<th>Average Household Income Created ($)</th>
<th>Increased Property Value (millions of $)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large</td>
<td>753</td>
<td>463</td>
<td>61</td>
</tr>
<tr>
<td>Medium</td>
<td>617</td>
<td>345</td>
<td>45</td>
</tr>
<tr>
<td>Small</td>
<td>558</td>
<td>315</td>
<td>37</td>
</tr>
<tr>
<td>Very Small</td>
<td>290</td>
<td>225</td>
<td>29</td>
</tr>
<tr>
<td>Town</td>
<td>194</td>
<td>205</td>
<td>13</td>
</tr>
</tbody>
</table>
Table A-10 Economic Impact of Station
Revitalization for Rural Density Corridor

<table>
<thead>
<tr>
<th>Rural Density Corridors</th>
<th>Employment Created (# of Jobs)</th>
<th>Average Household Income Created ($)</th>
<th>Increased Property Value (millions of $)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large</td>
<td>518</td>
<td>348</td>
<td>52</td>
</tr>
<tr>
<td>Medium</td>
<td>384</td>
<td>309</td>
<td>31</td>
</tr>
<tr>
<td>Small</td>
<td>338</td>
<td>282</td>
<td>28</td>
</tr>
<tr>
<td>Very Small</td>
<td>232</td>
<td>168</td>
<td>23.5</td>
</tr>
<tr>
<td>Town</td>
<td>89</td>
<td>157</td>
<td>8</td>
</tr>
</tbody>
</table>

Higher density corridors are projected to accrue the highest benefits from station improvement. For instance, station improvements are projected to create between 89 permanent jobs in towns within rural-density corridors and 958 jobs in the larger cities within the high-density corridors.

Each area is unique in the net benefits it would receive from the different options. In absolute terms, benefits increase with increase in city size and density. However, in all cases, when measured in terms of percentage increase, the smaller cities are projected to benefit from these transportation improvements relatively more than larger cities. One reason is that the small cities start from a much smaller base, and frequently lack adequate access links to the main corridors, where public transport has its highest operations and frequencies. Therefore the small cities enjoy a rapid increase in number of journeys as a result of access improvements. The other reason is that the scale of the generalized cost is significantly different for smaller versus bigger cities, and thus one would not expect the same responses to the same level of improvements.

The study suggests that the size of the economic benefit of improvements depends on the city size and the corridor density. Exhibits A-1 and A-2 show the linear increase in economic
benefit (number of jobs and average household income) with the increase in improvement reflected in generalized cost.

Exhibit A-1. Annual Increase of Number of Jobs

Exhibit A-2. Annual Increase in Average Household Income
This economic research has identified the potential role that transportation investments can have to enhance the performance of the economy in the region. The implication of this study and its calibration process is that improving transportation facilities such as stations in any given corridor will have a significant impact on the income, employment, property values, taxes, passengers, and the economic activities of the region. The size of the impact will vary based on city size, population density, and the type and level of transportation improvement.

Exhibit A-3: Midwest Population Densities and Existing and Proposed Rail Routes
Exhibit A-4: Virginia Population Densities and Intercity Rail Routes
Exhibit A-5: Massachusetts, New Hampshire, and Maine
Population Densities and Proposed Rail Routes
Appendix B:  
Selected Bibliography


Economic Impact of Station Revitalization

Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Nebraska, Ohio and Wisconsin Departments of Transportation. *Midwest regional rail initiative*. Frederick, MD: TEMS, Inc.


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