Cost-Benefit Analysis of Rural and Small Urban Transit: Executive Summary

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May 2014

SURTC RESEARCH SUMMARY

Abstract

This research estimates the benefits of public transit systems in small urban and rural areas in the United States. A framework was developed which focuses on three main areas of transit benefits most relevant to rural and small urban areas: transportation cost savings, low-cost mobility benefits, and economic benefits from transit operations. This study estimates the cost savings from using transit in place of alternative modes and the significant costs that would result from trips foregone in the absence of transit. Estimated benefits are compared to the costs of providing service to derive benefit-to-cost ratios. With estimated benefit-cost ratios greater than 1, the results show that the benefits provided by transit services in rural and small urban areas are greater than the costs of providing those services.

Introduction

Transit systems in rural and small urban areas are often viewed as valuable community assets due to the increased mobility they provide to those without other means of travel. The value of those services, however, has been largely unmeasured, and there are often impacts that go unidentified. As transit systems compete for funding at local, state, and federal levels, it is important to identify and quantify, where possible, the impacts that the services have within local communities, as well throughout the state or country.

A few studies have attempted to measure the benefits associated with transit in rural and small urban areas, and results showed benefits exceeding the costs. This study analyzes the costs and benefits of fixed-route bus and demand-response service in small urban and rural areas across the United States, using National Transit Database (NTD) data for the year 2011. Unlike previous research that has focused on individual communities or states, this study analyzes data nationwide. The analysis includes rural systems that received FTA Section 5311 formula grants and urban systems serving areas with populations below 200,000.

Classification of Transit Benefits

The potential benefits of transit were categorized following previous research by HDR Decision Economics (2011). The three main benefits are transportation cost savings, low-cost mobility benefits, and economic impact benefits (Figure 1). If transit is not provided in a community, then transit riders would have to either use a different mode or forego the trip. Transportation cost savings are the savings that result when individuals are able to use transit in place of another mode, and affordable mobility benefits are the benefits that result when trips are made that would otherwise be foregone in the absence of transit. Economic benefits result from the economic activity generated by transit operations.

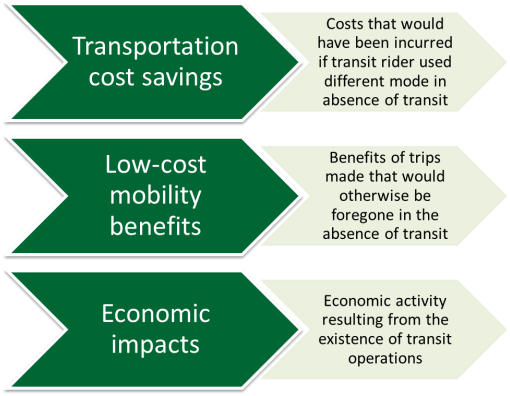

Figure 1. Benefits of Public Transportation

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A potential benefit of transit services is a reduction in transportation costs to those who use transit in place of another mode of travel. If the rider already owns and can operate an automobile, the cost of traveling by another mode includes fuel and other operating costs. Some who do not own a car may have to purchase one, incurring the costs of automobile ownership. If the rider were to get a ride from someone else, the cost would again include the operating costs plus the time and inconvenience required for someone to provide the ride. A trip by taxi, if available, would cost the taxi fare. Most of these alternatives will cost more to the user than the cost of transit.

In addition to out-of-pocket costs, there are other costs associated with travel, including the cost of time, safety costs resulting from crashes, and environmental costs resulting from emissions. Switching from transit to other modes would also affect each of these costs, so they need to be included in the analysis. In many cases, transit can reduce these costs, but sometimes the costs can be higher for transit. Figure 2 lists the transportation cost savings variables estimated in this study.

Figure 2. Transportation Cost Savings

For many, there may be no feasible alternative modes, or the costs are prohibitively expensive, so they will forego trips if transit is not available. The costs of those foregone trips can be substantial. A missed work trip, for example, means lost income. A missed health care trip means a person's health might not be properly managed and could result in a need for in-home care or a future emergency care. Lost educational trips could reduce a person's future earnings potential, and lost shopping trips mean less money is spent in the community. Providing trips that would otherwise not be made results in other intangible benefits, such as providing enjoyment and fulfillment and preventing social and physical isolation.

The last group of benefits refers to the economic benefits that result due to the existence of the transit operations, including direct and indirect spending and induced economic activity. The direct effect includes the jobs created directly by the transit system – drivers, dispatchers, mechanics, bookkeepers, program directors, etc. The indirect effects result from jobs and income spent in industries that supply inputs to public transit, such as fuel, repairs, insurance, etc. Induced economic activity results from the income generated through both the direct and indirect effects. These induced effects occur when people who work for the transit system or earn income by providing inputs to the transit agency spend their new income in the community. This spending supports additional jobs in the local economy.

Methodology

Estimating the benefits of transit first required an estimate of how transit users would respond if transit service was not available. Estimates were made regarding the percentage that would drive, get a ride from someone else, use a taxi, walk or bicycle, or not make the trip. Costs incurred on each alternative mode were estimated, as well as the value of foregone trips, taking into consideration trip purpose.

The value of missed medical trips was estimated based on the impact that missing such trips would have on quality of life and the future need for more costly care. These estimates were based on research by Hughes-Cromwick et al. (2005) that showed the provision of non-emergency medical transportation has net societal benefits. The value of providing work trips to those without other transportation options was estimated based on the impact is has on reducing spending through the Temporary Assistance for Needy Families (TANF) program and the Supplemental Nutrition Assistance Program (SNAP).

To estimate the economic impacts of spending on transit, this study used a tool developed by Chu (2013) and applied it to the state of North Dakota. This tool shows the impacts of spending in terms of output (total gross sales), value added (gross domestic product at the local level), earnings,

and jobs by tracing the path of spending throughout the local economy.

Results

A summary of the results are shown in Table 1, taking into consideration the transportation cost savings and low-cost mobility benefits but excluding the other economic impacts. Benefit-cost ratios were estimated to be 2.16 in small urban areas and 1.12 in rural areas. A large share of the benefits was from providing medical trips and work trips to those who would otherwise not be able to make the trips.

Table 1. Estimates of Transit Benefits and Costs

	Small Urban	Rural
Benefits per Trip		
Vehicle ownership and operation cost savings	$0.32	$0.38
Chauffeuring Cost Savings	$0.56	$1.21
Taxi cost savings	$1.04	$1.34
Travel time cost savings	-$0.47	-$0.58
Accident cost savings	$0.07	$0.15
Emission cost savings	-$0.01	-$0.49
Cost of foregone medical trips	$4.16	$6.65
Cost of foregone work trips	$4.24	$5.00
Cost of other foregone trips	$0.52	$0.83
Total Transit Benefits	$10.43	$14.49
Total Transit Cost per Trip	$4.83	$13.01
Benefit/Cost Ratio	**2.16**	**1.12**

Sensitivity analysis was conducted to illustrate how sensitive the results are to different variables. Increasing the percentage of foregone trips in the absence of transit to 50% increased total transit benefits by 88% (the original analysis assumed 22% of fixed-route and 31% of demand-response trips would be foregone). Further, increasing the cost of foregone medical and work trips by 25% resulted in a 20% increase in total transit benefits. Results were also found to be sensitive to trip purpose. Increasing the percentage of medical trips from 5-7% to 30% increased total benefits by 158%. Figure 3 shows how sensitive results are to trip purpose and the percentage of trips that would be foregone. Results were also found to vary between regions and states.

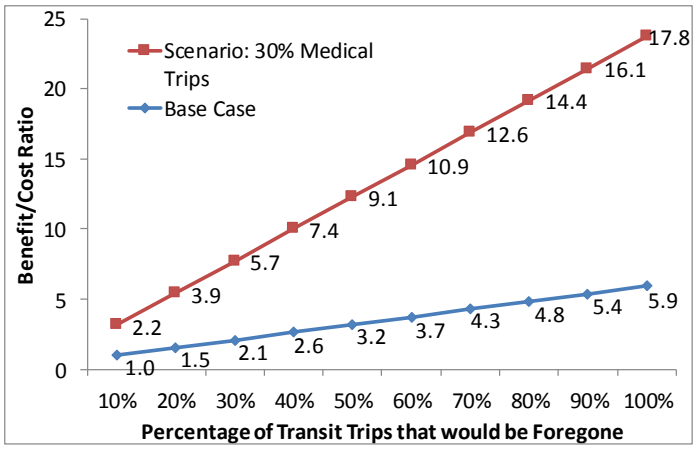

Figure 3. Changes in Benefit/Cost Ratios under Different Scenarios

These benefit-cost ratios are likely conservative estimates that do not include all potential benefits. The economic impacts of transit operations within a community or region were not included within the benefit-cost ratio estimation. To illustrate the magnitude of these potential benefits within a region, the economic impacts of transit operations were estimated for the state of North Dakota. The results of this analysis show that every $1 invested in public transportation results in $1.35 in output, $0.57 in value added, and $0.37 in earnings, and 10.3 jobs are supported for every $1 million invested. If we assumed that 50% of operating expenses and 20% of capital expenses were from local sources and accounted for the opportunity costs associated with those funds, then every $1 invested in public transportation results in $0.69 in output, $0.29 in value added, and $0.19 in earnings. These benefits can be added to the transportation cost savings and low-cost mobility benefits previously discussed to fully assess the impacts of transit services. The estimated results for North Dakota are based on expenditure and multiplier data specific to the state, but similar results may be found for rural and small urban transit systems in other parts of the country. Results vary based on the sources of funding, the destinations of spending, and the multipliers, as well as the size of the area being studied.

Implications

With benefit-cost ratios greater than 1, the results show that the benefits provided by transit services in rural and small urban areas are greater than the costs of providing those services. Results show that benefit-cost ratios are higher in small urban areas than in rural areas, but benefits were found to exceed costs for both small urban and rural

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The funds for this study were provided by the U.S. Department of Transportation through the National Center for Transportation Research at the University of South Florida. The Small Urban and Rural Transit Center within the Upper Great Plains Transportation Institute at North Dakota State University conducted the research.

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transit. Results also showed that fixed-route service has higher benefit-cost ratios than demand-response service. Demand-response service provides significant benefits per trip, but the cost of providing this service is also significantly higher.

While there are a number of different types of benefits from transit service, the study shows that most of the benefits generated by small urban and rural transit services are a result of creating trips for individuals who would not be able to make the trip if the service was not available. In particular, the creation of medical and work trips accounted for the largest share of transit benefits.

The study also showed that the results are highly sensitive to the percentage of trips that would be foregone in the absence of transit, the cost values that you assign to foregone trips, and the percentage of trips that are for medical purposes. Benefit-cost ratios increase to more than 3 to 1 if it is assumed that half of trips would not be made in the absence of transit and to more than 4 to 1 if 30% of trips are for medical purposes.

The implication from these results is that transit services that serve a higher percentage of transit-dependent riders and those that provide a greater percentage of medical or work trips will provide more benefits per trip. The benefit of providing a medical trip to someone who otherwise would not be able to travel is especially high.

This study attempts to estimate overall benefits and benefit-cost ratios at the national, regional, and statewide levels, but it is recognized that these values can vary significantly between individual transit systems based on the types of services they provide and the individuals they serve.

The results can also be considered to be conservative, as some benefits are difficult to quantify. While the study showed significant value for providing medical and work trips, the value of providing other types of trips may have been underestimated due to the difficulty in quantifying the benefits of such trips. In many cases, the benefits of providing these trips are more qualitative in nature. Social trips, for example, can have significant quality-of-life benefits that are difficult to quantify. Further, there are other potential benefits not included in this study because they are generally less relevant to rural and small urban areas or because of difficulties in quantifying them. For example, parking cost savings, congestion mitigation, and land use impacts are significant impacts of transit in urban areas but were not included in this research because they are less relevant for the areas being studied. However, in some small urban areas, these may be significant benefits that need to be considered.

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