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Evaluating New Start Transit Program Performance

Comparing Rail and Bus

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Photos courtesy of David Dobbs

Abstract

There is ongoing debate over the relative advantages of rail and bus transit investments. Rail critics assert that cities which expand their bus transit systems exhibit better performance than those that expand rail systems. This study examines those claims. It compares public transport performance in U.S. urban areas that expanded rail transit with urban areas that expanded bus transit from the mid-1990s through 2003, using Federal Transit Administration data. This analysis indicates that cities that expanded their rail systems significantly outperformed cities that only expanded bus systems in terms of transit ridership, passenger-mileage, and operating cost efficiency. This indicates that rail transit investments are often economically justified due to benefits from improved transit performance and increased transit ridership.

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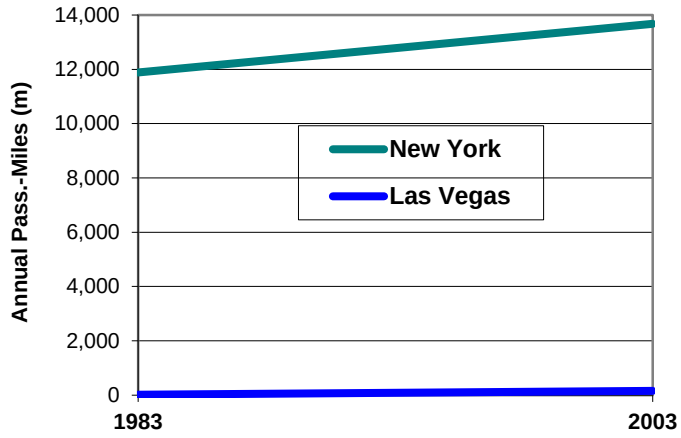
Introduction

During recent decades several American cities developed new rail transit systems, hoping to achieve various benefits including increased transit ridership, enhanced transit system attractiveness, and improved cost efficiency. Have these objectives been achieved? How do these projects compare with alternative transit investments?

Some critics assert that rail investments are wasteful and even a "disaster," and cities can achieve greater ridership gains and cost efficiency with bus transit improvements. For example, one publication contrasts ridership trends from 1983 to 2003 in 23 urban areas operating both rail and bus services with eight urban areas that only operate bus transit (O'Toole 2005). The bus-only areas selected (Austin, Charlotte, Eugene, Houston, Las Vegas, Louisville, Phoenix, and Raleigh-Durham) experienced large growth in rider-trips (boardings) and passenger-miles (p-m), which the author claims demonstrates that bus service performs better than rail. In the case of Austin, for example, transit trips increased by over 522% and passenger-miles by nearly 640% during the two-decade period. In Las Vegas, the area with the greatest growth, trips increased 1,239% and passenger-miles increased 1,161%.

However, some of these results reflect incomplete analysis (LRN 2005; Litman 2006). The cities selected to represent bus transit were growing rapidly, with transit systems that expanded from small to medium size, and so experienced high ridership growth rates during the analysis period, while most rail cities were large and mature and experienced slow or negative population growth (although many have since gained population). The study highlighted the bus cities' proportionately large ridership growth, although rail city ridership actually increased much more in absolute terms, as illustrated in Figure 1. In addition, several of the newer rail systems in the study did not exist during much of the analysis period. Recent rail transit expansions have met or exceeded their ridership targets (Henry and Dobbs 2013).

Figure 1 **Total Transit Ridership Growth** (Litman, 2006)



Transit ridership growth in Las Vegas (the fastest growing of the selected "bus only" cities, which O'Toole rated A) is proportionally large, but small in absolute terms compared with New York (which he rated F).

This study investigates these issues. It examines various differences between rail and bus transit performance and uses what we believe is a more appropriate and accurate approach to compare transit performance in U.S. cities that expanded their rail and bus systems.

Comparing Rail And Bus Transit Performance

There is considerable debate over the relative merits of rail and bus transit (Abt Associates 2010; Cain, Flynn, and McCourt 2009; Currie and Delbosc 2013; Hass-Klau, et al. 2003; Litman 2004; Litman 2005; Pascall 2001; Steer Davies Gleave 2005; Zhang 2009). Key issues are summarized below.

Advantages of Rail

Compared to conventional bus transit, rail tends to provide a superior service quality (speed, comfort and convenience) and social status and so tends to attract more riders, particularly *discretionary riders* (travelers who would otherwise drive, also called *choice riders*) and so is particularly effective at reducing traffic and parking congestion, energy consumption and pollution emissions. Because it has more prestige, rail transit tends to receive more public support and voters appear more willing to fund rail than bus improvements. Rail stations often stimulate transit-oriented development, where residents own fewer cars, drive less and rely more on alternative modes, which leverages additional vehicle travel reductions, besides those shifted from automobile to transit.

Several studies indicate that per capita transit ridership tends to increase with rail transit supply. Bento, et al (2003) found that "rail supply has the largest effect on driving of all our sprawl and transit variables." The study concluded that a 10% increase in rail supply reduces the probability of driving by 4.2%, and that a 10% increase in a city's rail transit service reduces 40 annual vehicle miles of travel per capita (70 VMT if New York City is included in the analysis), compared with just a one mile reduction from a 10% increase in bus service. That study found a 3.0 elasticity of rail transit ridership with regard to transit service supply (7.0 including New York), indicating significant network effects, that is, the more complete the transit network, the more ridership it receives. Transit ridership increased significantly (from 95% up to 350%) after rail replaced bus service on major travel corridors in Los Angeles (Berg 2012).

Schumann (2005) compared transit performance in Sacramento, California, which built a rail system in the 1980s, with Columbus, Ohio, which only had bus transit. During the subsequent 17 years transit ridership and service increased significantly in Sacramento, but declined in Columbus, while operating costs increased more in Columbus than Sacramento (Table 1).

Table 1 **Transit Performance Change 1985-2002** (Schumann 2005)

Indicator	Sacramento (rail transit)	Columbus (bus transit)
Transit trips per capita	15%	-47%
Transit passenger-miles per capita	-12%	-54%
Revenue vehicle miles	15%	-1%
Transit operating costs per passenger-mile	151%	205%

Sacramento experienced far better transit performance after establishing a rail transit system than Columbus, a similar size city that only operated bus transit.

Baum-Snow and Kahn (2005) found that, although transit mode share declined in most US cities from 1970 to 1990, declines were much smaller in cities with rail transit systems. Transit mode share declined 23% (from 30% to 23%) in *old rail* cities (cities with well-established rail transit systems in 1970), 20% (from 8% to 6%) in *new rail* cities (cities that built rail transit lines between 1970 and 1990), and 60% (5% to 2%) in cities without rail. Transit ridership was much higher in residential areas near rail transit lines than in similar areas not served by rail. Similarly, Renne (2005) found that neighborhoods with rail transit stations maintained stable and sometime increasing transit commute mode shares while overall metropolitan average transit mode shares declined from 1970 to 2000. Litman (2005) found that cities with large rail transit systems had 400% higher per capita transit ridership (589 versus 118 annual passenger-miles) and 887% higher transit commute mode split (13.4% versus 2.7%) than cities with only

bus transit service. Analyzing 2009 *American Community Survey* travel data Freemark (2010) concluded that cities with rail lines experienced larger declines in automobile mode share between 2000 and 2009 than cities that lack rail. Freemark (2014) found that, of five cities that established rail transit systems during the 1980s, only one (San Jose) experienced transit mode share growth between 1980 and 2012, but their transit mode shares declined far less than 61 otherwise similar metro areas, whose median transit mode share declined from 3.6% to just 1.7%. He also found that the rail transit investments encouraged central city development: the median 1980s light rail metro saw its center city's share of regional population decline by just 6% by 2012, compared to more than 10% for the 45 otherwise comparable regions.

Demery and Setty (2005) compare transit ridership and financial performance between Portland (which has a rail transit system) and Seattle (which has bus transit). They found that although per capita transit ridership was roughly equivalent in the two cities, Seattle spent 13% more ($23 annually per capita) than Portland to achieve the same result. Seattle area taxpayers spent approximately 25% more in subsidy per linked transit trip than Portland area taxpayers. Part of this reflects Seattle's longer travel distances, but the average linked transit trip in Seattle was not 25% longer than in Portland, suggesting that rail transit provides operating cost efficiency gains.

Similar efficiencies were found when comparing Portland's rail and bus transit services (Demery 2005). Between 1997 and 2001 Portland light rail service intensity (annual vehicle-miles per directional route-mile) increased 50%, while vehicle utilization (annual revenue vehicle-miles per annual peak vehicle) increased 38%. Inflation-adjusted unit operating costs fell per vehicle revenue-hour by 32%, per vehicle revenue-mile by 43%, and per directional route mile by 15%. These savings reflect the spreading of fixed costs over a larger number of revenue service hours. This analysis indicates scale economies in rail transit operation. No such economy of scale has been found for Portland's bus operations. During the four-year interval between FY 1997 and FY 2001, Portland bus fleet utilization (annual revenue vehicle-miles per annual peak vehicle) decreased slightly (by 2%), while inflation-adjusted unit operating cost increased by 7-10%.

Severen (2020 and 2022) found that Los Angeles rail services increases mobility and reduces congestion, but these benefits are insufficient to repay total costs due to high construction costs and unresponsive land use policies which prevent adequate development around stations. Chatman (2013), found substantially lower vehicle ownership, and lower auto commute and shopping trip mode shares for households located in transit-oriented development, but that residential density, housing type, local bus service and limited parking supply had more impact than rail accessibility. He concludes that smart growth development policies, which help create more accessible, compact and multi-modal neighborhoods, can help increase transport system efficiency with or without rail transit development.

In a detailed analysis Bruun (2005) found that both *Light Rail Transit* (LRT) and *Bus Rapid Transit* (BRT) typically have lower operating costs per passenger-space-kilometer than regular buses. For trunk line capacities below about 1,600 spaces-per-hour, BRT tends to be cheapest, while above 2,000 spaces-per-hour BRT headways become so short that traffic signal priority becomes ineffective, reducing efficiency and increasing unit costs. The marginal cost of adding off-peak service is lowest for LRT, higher for BRT, and highest for regular buses.

Advantages of Bus

Bus advocates argue that bus service is cheaper and more flexible, and that much of the preference for rail reflects prejudices rather than real advantages (Hensher 2007; Cain, Flynn, and McCourt 2009). Bus transit can serve a greater area, and so potentially can attract greater total ridership than rail, particularly in areas with dispersed destinations.

Some critics argue that rail investments are inequitable on the grounds that they primarily benefit higher-income people and drain funding from basic bus service used by lower-income, transit-dependent people. However, since rail funding often substitutes for highway project funding and voters appear more willing to support new funding for rail than for bus improvements, rail funding often represents an overall increase in transit funding rather than a substitute for bus funding, and some rail lines carry large numbers of lower-income riders. In addition, over the long run, by attracting more discretionary transit riders (people who would otherwise drive), increasing total transit demand, and justifying more transit support programs, rail transit improvements often lead to increased bus service, improved walking and cycling conditions, more accessible land use, more commuter financial incentives for transit riders (such as parking cash out and employer provided transit passes), and overall increases in transportation system diversity, which benefits physically, economically and socially disadvantaged people.

Summary

Rail transit can only serve a limited number of stations, but those stations can stimulate intense development, with increased density (residents, employees and business activity per acre), higher per capita transit ridership and walking trips, and lower per capita vehicle ownership and trips. Bus transit can serve more destinations, including dispersed, suburban activity centers, but attracts fewer riders per capita, and by itself has little or no effect on land use patterns. Buses tend to have lower costs per vehicle-mile, but rail often has lower costs per passenger-mile due to higher load factors. Key differences between bus and rail transit are summarized below.

Bus	Rail
Flexibility. Bus routes can change and expand when needed, for example, if a roadway is closed, or if destinations or demand changes.	Greater demand. Rail tends to attract more discretionary riders than buses.
Requires no special facilities. Buses can use existing roadways, and general traffic lanes can be converted into a busway.	Greater comfort, due to larger seats with more legroom, more space per passenger, and smother and quieter ride.
Several routes can converge onto one busway, reducing the need for transfers. It is therefore more suitable for dispersed land use, such as suburban locations.	More voter support for rail than for bus improvements.
Lower capital costs.	Greater maximum capacity. Rail requires less space and is more cost effective on high volume routes.
Lower operating costs per passenger-mile where transit demand is low.	Greater travel speed and reliability, where rail transit is grade separated.
Is used more by people who are transit dependent, so bus service improvements provide greater equity benefits.	More positive land use impacts. Rail tends to be a catalyst for more accessible development patterns.
	Increased property values near transit stations.
	Less air and noise pollution, particularly when electric powered.
	Lower operating costs per passenger-mile where transit demand is high.
	Rail stations tend to be more pleasant than bus stations, so rail is preferred where many transit vehicles congregate.

Comparing New Start Cities

The present study seeks to assess overall transit system performance in urban areas with major new (since the 1970s) capital-intensive rail transit investments. Excluded were urban areas with older "legacy" rail systems (including New York City, Chicago, Philadelphia, Boston, San Francisco); unfortunately, this required the exclusion also of the relatively new PATCO Highspeed Line, serving Philadelphia and its New Jersey suburbs, and San Francisco's BART system. Restricting the data population for rail-and-bus cities only to cities with new rail service has enabled this study to focus on responding to rail opponents' criticism of new rail projects.

For this analysis we focus on cities that have participated in the Federal Transit Administration's New Start program. This is a Federal government program that finances new "guideway" capital investments, which includes both rail and bus rapid transit systems (FTA 2005). Most major new rail and busway projects participate in this program. The following types of transit service were included in this study:

- *Light Rail Transit* (LRT) which generally consists of medium-size vehicles offering local service using a combination of grade-separated and mixed traffic rail lines.
- *Rail Rapid Transit* (RRT) which generally consists of larger vehicles offering inter-neighborhood service operating on grade-separated rail lines (often underground or elevated)
- *Regional Passenger Rail* (RPR, commonly called "commuter rail"), which generally consists of larger vehicles offering intercommunity service operating on grade-separated lines.
- *Bus Rapid Transit* (BRT), which consists of high-quality bus services, often on grade-separated busways, and which generally offer intercommunity express services, usually complemented by improved local services and other amenities.

Only systems that functioned as line-haul commutation-type lines at least five miles in length in these urban areas were included. Small circulator or shuttle services, special-purpose systems (such as airport peoplemovers), and recreational operations, were excluded.

Performance is evaluated based on changes in total and per capita transit system ridership, and financial performance. To avoid problems such as those exhibited in O'Toole's studies, the study focuses on the period 1996-2003, an extended period during which the majority of new rail systems have operated.

Data is from the National Transit Database (NTD), available on the U.S. Federal Transit Administration website (FTA, 2003). The NTD Annual Reports are based on mandatory information provided by all transit agencies in a standardized format, and includes profiles for each transit agency filing an NTD annual report for the 2003 report year. A profile consists of general, financial, and modal data, as well as performance and trend indicators. For the 2003 report year 622 transit agencies submitted reports to the NTD. The NTD also provides population data for UZA (urbanized area) population. The raw data was adjusted to avoid double-counting population in metropolitan areas with more than one transit system.

Urban area size is an important consideration since, all else being equal, transit performance and ridership tends to increase with city size. The cities operating both rail and bus examined in this study are generally over one million in population, whereas the group of bus-only cities includes some that are below a million. However, since most of the U.S.A.'s largest cities now have some form of rail transit, limiting the study only to cities with rough population parity would reduce the bus-only group to a number so small that comparative results would be questionable on that basis. This is offset by the fact that many of the bus-only cities are growing rapidly and so their transit ridership would probably have grown significantly regardless of what type of transit service were offered.

In addition, while there are minor performance differences on the basis of size, these seem generally marginal. For example, Montgomery, the smallest of the bus-only areas in the analysis with a 2003 UZA population of 196,892, exhibited an average operating expense in that year of $4.71/trip and $1.14/passenger-mile; in comparison, Columbus, a much larger bus-only city with a UZA population of 1,133,193, exhibited average expenses of $4.20/trip and $1.11/passenger-mile. While some weaknesses in any comparison can be expected, these differentials do not seem sufficient to disqualify the comprehensive analysis of a wide variety of urban areas performed in the course of this study.

Almost all the new rail systems were in operation over the entire period examined (1996-2003). Exceptions are Salt Lake City's TRAX LRT system and Seattle-Tacoma's Sounder regional passenger ("commuter") rail system, both launched in 2000; accordingly, both those urban areas have been excluded. In some cases, urban areas jointly served by new rail starts (e.g., Los Angeles-San Bernardino-Riverside and Miami-Ft. Lauderdale) have been combined in this analysis. The "rail & bus" urban areas, with years of first rail operation, and rail modes in service, are listed in Table 2.

Table 2 **New-Start Rail Cities Studied**

Urbanized Area	1996 Population	First Rail Opened	Rail Modes
Atlanta	2,157,806	1979	RRT
Baltimore	1,889,873	1983	RRT, LRT, RPR
Buffalo	954,332	1985	LRT
Dallas	3,198,259	1996	LRT, RPR
Denver	1,517,977	1994	LRT
Los Angeles	12,573,142	1990	LRT, RRT, RPR
Miami-Ft. Lauderdale	3,152,794	1984	RRT, RPR
Portland	1,172,158	1986	LRT
Sacramento	1,097,005	1987	LRT
St. Louis	1,946,526	1993	LRT
San Diego	2,348,417	1981	LRT, RPR
San Jose	1,435,019	1987	LRT, RPR
Washington	3,363,031	1976	RRT, RPR
Total	*36,806,339*		

LRT = Light rail transit; RRT = Rail rapid transit; RPR = Regional passenger rail

Transit data and trends in these urban areas that have had New Start rail projects were contrasted with those in 48 urban areas that had New Start bus projects, listed in Table 3 (some of which, like Houston and Minneapolis, have subsequently installed their own new rail starts, or begun projects to do so). It should be noted that a number of urban areas were omitted for various reasons. In some cases, NTD agency profile data for the systems in question were not available or inconsistent (e.g., Las Vegas, Eugene, Charleston). In some cases, core cities were already served by "legacy" rail transit (RPR), thus making their "bus-only" status dubious (e.g., Hartford, New Haven, Providence, Wilmington, Trenton, etc.). Similarly, Ft. Worth has been excluded, since the Trinity Railway Express service was extended to it in 2001.

Table 3 **Bus-Only Cities**

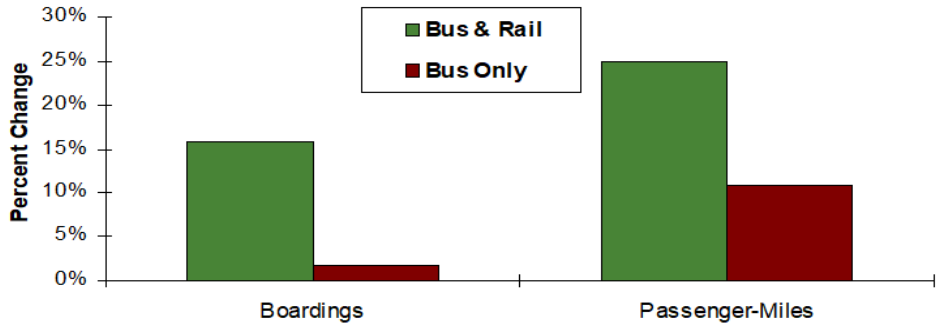
City	1996 Population
Akron	527,863
Albuquerque	497,120
Ann Arbor	222,061
Augusta GA	118,829
Baton Rouge	365,943
Birmingham	622,074
Charlotte	455,597
Chattanooga	296,955
Cincinnati	1,212,675
Colorado Springs	352,989
Columbus	945,237
Dayton	613,467
Des Moines	293,666
Detroit	3,697,529
El Paso	571,017
Harrisburg	292,904
Honolulu	632,603
Houston	2,901,851
Indianapolis	914,761
Jacksonville	738,413
Kansas City	1,275,315
Knoxville	304,466
Lansing	265,095
Little Rock	305,353
Louisville	754,956
Madison	244,336
Memphis	825,193
Milwaukee	1,226,293
Minneapolis	2,079,676
Montgomery	210,007
Nashville	573,294
Oklahoma City	784,425
Omaha	544,292
Orlando	887,126
Peoria	242,353
Phoenix	2,006,239
Raleigh-Durham	511,280
Reno	213,747
Richmond	589,980
Rochester	619,653
St. Petersburg	820,180
San Antonio	1,129,154
Shreveport	256,489
Spokane	279,038
Tampa	888,530
Toledo	489,155
Tucson	579,235
Totals	*35,178,414*

Study Results: Urban Area Groups

The two groups show striking differences in performance, as summarized below. See the report appendix for more detailed information on the data used.

Ridership Performance (boardings and passenger-miles): Unlinked trips increased an average of nearly 16% in Rail & Bus cities but only 1.7% in Bus-Only cities; in other words, the Rail & Bus cities saw ridership (boardings) grow at over *nine times* the rate in the Bus-Only cities. Similarly, the Rail & Bus group experienced passenger-mile increases averaging over 25%, while the Bus-Only group averaged only 10.8% – less then half the rate of increase in this metric. These comparisons are shown in Figure 2.

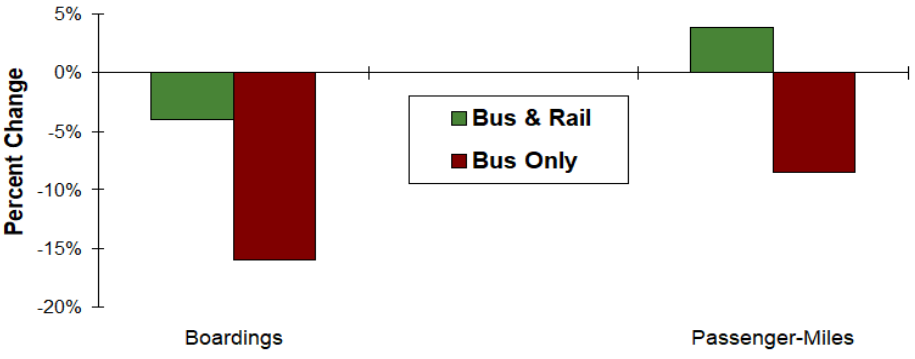
Figure 2 **Changes in Transit Ridership – 1996 to 2003**



Between 1996 and 2003 total transit use increased much faster in cities that have new or expanded rail service than in cities that only expanded bus service.

Public Attractiveness (per capita ridership): In terms of per-capita performance as a measure of general attraction to and use of public transport by the urban area public, both groups experienced a decrease. However, the loss by the Rail & Bus group (-4.0%) was only one-fourth that of the Bus-Only group (-16.0%). On the other hand, in terms of passenger-miles per capita, the Rail & Bus group experienced a modest gain of nearly 4%, while the Bus-Only group lost more than 8%. These comparisons are summarized graphically in Figure 3.

Figure 3 **Changes in Per Capita Transit Ridership – 1996 to 2003**

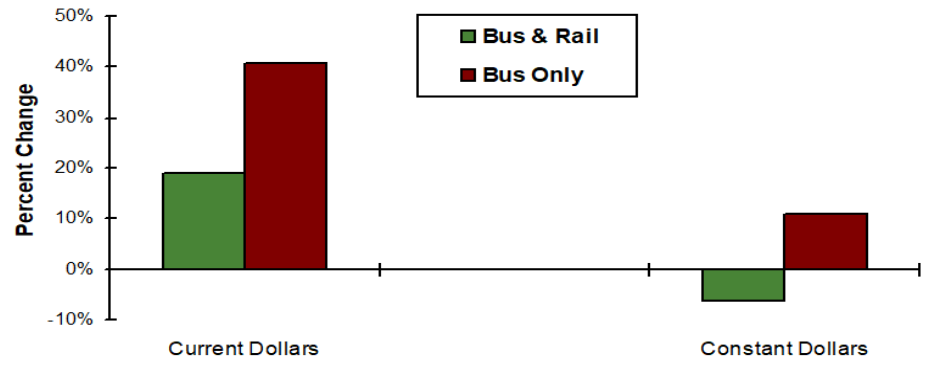


Between 1996 and 2003 per capita transit use declined less or increased in cities that expanded rail service compared with cities that only expanded bus service.

Financial Performance (operating costs per passenger-mile): In this metric, the Rail & Bus group of urban areas exhibited a substantial advantage over the Bus-Only group. For both groups, operating and maintenance (O&M) costs, in both "raw" and "constant" dollar terms, increased substantially, as might be expected with the expansion of transit services to respond to population growth and other dynamics (although the rate of O&M expenses growth for the Bus-Only group was nearly 38% higher than that of the Rail & Bus group). However, in terms of O&M per passenger-mile, the Rail & Bus group showed a distinct advantage – a significant *decline* of over 6% in "constant" (1996) dollar terms, compared with a

substantial increase of over 11% for the Bus-Only group. It is also worth noting that, measured in "constant" dollars, the average cost per passenger-mile in the Rail & Bus cities was nearly 27% below that of the Bus-Only cities. These comparisons are summarized graphically in Figure 4.

Figure 4 **Change in Operating Costs Per Passenger-Mile**



Between 1996 and 2003 real operating costs per passenger-mile declined in cities that have new or expanded rail service, but increased in cities that only expanded bus service.

Austin Texas - Example

While it was not possible to include Austin in the full Bus-Only group analysis, it was of interest to study the performance of this all-bus system (Capital Metro) at least for the period 1997-2003, especially in view of O'Toole's (2005) emphasis on this city's substantial transit ridership growth. (Unfortunately, data for two other important urban areas in O'Toole's study – Las Vegas and Eugene – were not available for this period.) The Austin urbanized area grew in population from 562,008 to 901,920 in this period, but a comparative per-capita analysis is not appropriate because 1997 population data remain the same as 1996 in the NTD data.

Table 4 **Austin – Key Performance Data**

	1997	2003	Change	Annual Change
Trips (millions)	32.5	37.2	14.5%	2.6%
P-M (millions)	107.7	124.5	15.6%	2.6%
O&M ($millions)	$69.3	$107.6	55.3%	9.2%
O&M (1997$, millions)	$69.3	$87.6	26.4%	4.4%
O&M/p-m $	$0.64	$0.86	34.4%	5.7%
O&M/p-m (1997$)	$0.64	$0.70	9.4%	1.6%

Table 4 presents data for selected items for the Austin urbanized area. To compare with the Rail & Bus cities, the percentage change for the six-year period was converted to annual percentage change. The results can be summarized as follows:

Ridership Performance: The Bus & Rail group experienced a ridership increase in unlinked trips averaging 2.3% annually; in contrast, Austin's all-bus average was slightly greater at 2.6%. The Rail & Bus group's passenger-miles increased an average of 3.6% annually compared with Austin's annual average of 2.6%. By these metrics, Austin's all-bus transit systems seems to have performed reasonably well, compared both to national all-bus systems and to rail and bus systems.

Financial Performance: In this measure, the Rail & Bus group of urban areas again exhibited a substantial advantage in comparison with Austin. In terms of O&M per passenger-mile, the Rail & Bus group showed a significant *decline* of over 0.9% annually. In comparison, Austin exhibited an increase averaging about 1.6% per year.

Additional Analysis

A recent study by Lewyn (2017), compared “bus only cities” (cities with over 7 million bus boardings for the first half of 2017 and no significant municipal rail service) with the newest light rail cities (those with light rail built after 1996). The results were mixed. Ridership was stable in Albany, Columbus and Detroit, but in the other cities, ridership declined quite a bit. In Cincinnati, San Antonio, Tuscon, and Rochester, ridership decreased by between 10% to 20% between 2014 and 2017. In Milwaukee, ridership decreased from 20.2 billion to 15.9 billion trips, a decline of over 20%.

There were only half a dozen light rail built since 1996: Salt Lake City, Charlotte, Phoenix, Minneapolis, Houston and Norfolk. The results for bus ridership, standing alone, were comparable to those in the major "bus only" regions. In two (Salt Lake City and Houston), bus ridership was stable or went up slightly between 2014 and 2017. In the rest, ridership decreased by about 10-20%. What about overall transit ridership—that is, bus and rail combined? By this measure, 2014-17 ridership increased modestly (by under 10%) in Minneapolis as well as Salt Lake City and Houston. In Phoenix and Charlotte, ridership decreased by about 5-10% (from 26.7 million to 25.3 million in Phoenix, 12 million to 11 million in Charlotte) and decreased by over 10% only in Norfolk(from 7.9 million to 6.6 million).

On balance, it seems that the "best" bus-only cities did almost as well as the "best" new rail cities—ridership in the "best" bus only city increased by about 1%, while total transit ridership in the "best" bus/rail city, Houston, increased by about 7% (from 40 million to 43 million trips). However, transit ridership decreased by over 10% in only one rail city, Norfolk, while decreasing by over 10% in five out of eight bus-only cities.

Comparing 2017 results to those for the first half of 2007, among the bus-only regions, ridership actually rose significantly in Columbus (from 7.3 million to 9.0) and Albany (from 6.3 million to 8.1). Ridership was fairly stable in Las Vegas, and Rochester, declined by about 10% in San Antonio (from 19.9 billion to 18.1 million) and Tuscon (from 8.7 million to 7.8 million) and declined by over 30% in Milwaukee (from 25.3 million to 15.9 million) and Detroit (from 19.5 million to 11.4 million). In sum, a few bus-only transit systems did very well, but the majority were either stable or lost riders.

What about transit systems with newly adopted light rail service? Similarly, total 2007-17 transit ridership rose in some and declined in others. In Charlotte, overall transit ridership (bus and light rail combined) rose from 8.8 million in the first half of 2007 to 10.8 million a decade later, an increase of slightly over 20 percent. In Phoenix, ridership rose from 21.9 million to 25.3 million. In Minneapolis, ridership rose from 36.6 million to 40.4 million. But ridership declined in Houston and Norfolk, in both cases by about 10% (7.5 million to 6.6 million in Norfolk and 48.4 to 43 million in Houston). So the best bus-only systems did very well over the long run, but it seems that the average bus-plus-rail transit system did a little better than the average bus-only system, and that some bus-only systems suffered horrendous ridership losses. What can we get from this?

First, it doesn't seem that adding light rail harmed overall transit ridership; transit ridership seems to have increased more frequently in regions with new, small light rail systems than in regions that rely solely on buses. But the small size of many new light rail systems, combined with the small number of cities involved, makes it difficult to make precise conclusions. Second, it seems that bus-only transit systems are more volatile; they seem to have greater ridership increases and greater ridership losses than "bus plus rail" transit systems. If the political climate is hostile to transit, a bus-only system can deteriorate far more rapidly than a rail system, perhaps because cutting back bus routes is technically and politically easier than destroying a train system.

Conclusions

This analysis indicates that U.S. urban areas that expanded rail service on average significantly outperformed urban areas that only expanded bus service in terms of transit ridership and financial performance. Cities that expanded their rail transit systems gained far more total transit riders than cities that expanded bus transit systems. Measured in constant dollars, operating and maintenance expenses per passenger-mile declined for rail cities but rose in bus cities. In 2003, overall operating cost per passenger-mile in the cities with New-Start rail transit systems was only about 74% of that in cities with New-Start bus services.

Rather than a debate about which is overall superior, it is generally better to consider which is most appropriate *in a particular situation*. Bus is best serving areas with more dispersed destinations and lower transit demand. Rail is best serving corridors where destinations are concentrated (Kuby, Barranda and Upchurch 2004). Rail and bus transit systems are generally integrated, with buses providing local service and servicing more dispersed destinations, and rail providing service along the highest density corridors. Both can become more efficient and effective at achieving planning objectives if implemented with supportive policies that improve service quality, create more supportive land use patterns and encourage ridership.

Rather than being competitors, bus and rail are complements: as rail transit funding, service and ridership increase so do bus since they both experience scale economies (transit service tends to become more efficient as total transit ridership increases). As a result, cities with successful rail transit systems also tend to have more bus ridership than automobile-oriented cities (Levine 2013).

While there may be other factors involved, this analysis refutes criticism that developing new rail transit systems reduces overall transit ridership and cost efficiency. This study is consistent with other research indicating that rail service is effective at attracting riders and increasing transit system efficiency. It indicates that rail transit investments are often economically justified due to benefits from improved transit performance and increased transit ridership.

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Appendix – Data Tables

Data are from the U.S. Federal Transit Administration's National Transit Database Transit Agency Profiles. Tables 5 through 10 provide data on cities that expanded their rail systems (called *Rail & Bus Cities*). Tables 11 through 16 provide data on cities that expanded their bus systems (called *Bus-Only Cities*). Included are raw data on urbanized area (UZA) population, unlinked transit trips (boardings), passenger-miles (p-m), and operations and maintenance (O&M) expenses (in millions of dollars). Tables for 2003 (Tables 10 and 14) also present O&M expenses in constant 1996 dollars. Tables 7 and 13 calculate per capita trips (boardings) and passenger-miles (p-m). This per-capita index can be considered a measure of the "attractiveness" of the system to the public.

Tables 8 and 14 calculate financial performance in terms of O&M per passenger-mile (p-m) – a widely accepted measure of costs with respect to actual transportation service delivery, also expressed in constant 1996 dollars. Tables 9 and 15 present percentage changes over the seven-year study period, including changes in unlinked trips, passenger-miles (p-m), trips per capita, and p-m per capita. Tables 10 and 16 present percentage changes in financial performance over this period, including changes in O&M expenses, both "raw" and in constant (1996) dollars; and the same in terms of O&M per passenger-mile (p-m).

Table 5 Rail & Bus Cities – 1996 Size and Performance Data

		Millions of 1996…		
Urbanized Area	**UZA 1996**	**Trips**	**P-M**	**O&M $**
Atlanta	2,157,806	144.8	659.9	$222.5
Baltimore	1,889,873	101.2	502.1	$253.0
Buffalo	954,332	27.6	82.0	$66.0
Dallas	3,198,259	48.5	186.5	$145.8
Denver	1,517,977	69.9	298.2	$158.7
Los Angeles	12,573,142	483.6	2,112.6	$991.8
Miami-Ft. Lauderdale	3,152,794	106.3	545.9	$250.3
Portland	1,172,158	71.4	273.2	$144.8
Sacramento	1,097,005	25.2	110.1	$61.6
St. Louis	1,946,526	52.2	233.6	$118.7
San Diego	2,348,417	66.7	358.1	$119.2
San Jose	1,435,019	49.0	194.8	$156.5
Washington	3,363,031	319.5	1,505.2	$661.5
Totals	*36,806,339*	*1,565.9*	*7,062.2*	*$3,350.4*

Table 6 Rail & Bus Cities – 2003 Size and Performance Data

		Millions of 2003…			
Urbanized Area	**UZA 2003**	**Trips**	**P-M**	**O&M $**	**O&M 2003 (1996$)**
Atlanta	3,499,840	142.8	724.6	$312.5	$245.7
Baltimore	2,076,354	111.7	637.0	$360.2	$283.2
Buffalo	976,703	24.1	73.4	$78.8	$61.9
Dallas	4,145,659	76.5	403.4	$303.7	$238.8
Denver	1,984,889	78.6	383.2	$260.1	$204.5
Los Angeles	13,296,303	600.0	2,709.6	$1,389.2	$1,092.1
Miami-Ft. Lauderdale	4,919,036	87.8	476.9	$353.9	$278.2
Portland	1,583,138	98.5	414.9	$245.1	$192.7
Sacramento	1,393,498	28.9	124.7	$109.5	$86.1
St. Louis	2,077,662	48.1	272.1	$174.8	$137.4
San Diego	2,674,436	74.5	405.0	$178.8	$140.6
San Jose	1,851,704	47.5	220.1	$310.2	$243.9
Washington	3,933,920	395.2	2,004.9	$904.1	$710.8
Totals	*44,413,142*	*1,814.2*	*8,849.8*	*$4,980.9*	*$3,915.8*

Table 7 Rail & Bus Cities – Ridership Performance

Urbanized Area	Trips/cap. 1996	Trips/cap. 2003	P-M/cap. 1996	P-M/cap. 2003
Atlanta	67.1	40.8	305.8	207.0
Baltimore	53.5	53.8	265.7	306.8
Buffalo	28.9	24.7	85.9	75.2
Dallas	15.2	18.5	58.3	97.3
Denver	46.0	39.6	196.4	193.1
Los Angeles	38.5	45.1	168.0	203.8
Miami-Ft. Lauderdale	33.7	17.8	173.1	96.9
Portland	60.9	62.2	233.1	262.1
Sacramento	23.0	20.7	100.4	89.5
St. Louis	26.8	23.2	120.0	131.0
San Diego	28.4	27.9	152.5	151.4
San Jose	34.1	25.7	135.7	118.9
Washington	95.0	100.5	447.6	509.6
Totals	*42.5*	*40.8*	*191.9*	*199.3*

Table 8 Rail & Bus Cities – Financial Performance

Urbanized Area	O&M/p-m 1996	O&M/p-m 2003	O&M/p-m 2003 (1996$)
Atlanta	$0.34	$0.43	$0.34
Baltimore	$0.50	$0.57	$0.44
Buffalo	$0.80	$1.07	$0.84
Dallas	$0.78	$0.75	$0.59
Denver	$0.53	$0.68	$0.53
Los Angeles	$0.47	$0.51	$0.40
Miami-Ft. Lauderdale	$0.46	$0.74	$0.58
Portland	$0.53	$0.59	$0.46
Sacramento	$0.56	$0.88	$0.69
St. Louis	$0.51	$0.64	$0.50
San Diego	$0.33	$0.44	$0.35
San Jose	$0.80	$1.41	$1.11
Washington	$0.44	$0.45	$0.35
Totals	*$0.47*	*$0.56*	*$0.44*

Table 9 Rail & Bus Cities – Change in Ridership Performance, 1996-2003

Urbanized Area	Trips	P-M	Trips/cap	P-M/cap
Atlanta	-1.4%	9.8%	-39.2%	-32.3%
Baltimore	10.4%	26.9%	0.6%	15.5%
Buffalo	-12.7%	-10.5%	-14.5%	-12.5%
Dallas	57.7%	116.3%	21.7%	66.9%
Denver	12.4%	28.5%	-13.9%	-1.7%
Los Angeles	24.1%	28.3%	17.1%	21.3%
Miami-Ft. Lauderdale	-17.4%	-12.6%	-47.2%	-44.0%
Portland	38.0%	51.9%	2.1%	12.4%
Sacramento	14.7%	13.3%	-10.0%	-10.9%
St. Louis	-7.9%	16.5%	-13.4%	9.2%
San Diego	11.7%	13.1%	-1.8%	-0.7%
San Jose	-3.1%	13.0%	-24.6%	-12.4%
Washington	23.7%	33.2%	5.8%	13.9%
Totals	*15.9%*	*25.3%*	*-4.0%*	*3.9%*

Table 10 **Rail & Bus Cities – Change in Financial Performance, 1996-2003**

Urbanized Area	O&M $	O&M 1996$	O&M/p-m	O&M/p-m 1996$
Atlanta	40.4%	10.4%	26.5%	0.0%
Baltimore	42.4%	11.9%	14.0%	-12.0%
Buffalo	19.4%	-6.2%	33.8%	5.0%
Dallas	108.3%	63.8%	-3.8%	-24.4%
Denver	63.9%	28.9%	28.3%	0.0%
Los Angeles	40.1%	10.1%	8.5%	-14.9%
Miami-Ft. Lauderdale	41.4%	11.1%	60.9%	26.1%
Portland	69.3%	33.1%	11.3%	-13.2%
Sacramento	77.8%	39.8%	57.1%	23.2%
St. Louis	47.3%	15.8%	25.5%	-2.0%
San Diego	50.0%	18.0%	33.3%	6.1%
San Jose	98.2%	55.8%	76.3%	38.8%
Washington	36.7%	7.5%	2.3%	-20.5%
Totals	*48.7%*	*16.9%*	*19.1%*	*-6.4%*

Table 11 Bus-Only Cities – 1996 Size and Performance Data

		Millions of 1996…		
City	**UZA 1996**	**Trips**	**P-M**	**O&M $**
Akron	527,863	5.4	18.2	$20.5
Albuquerque	497,120	6.8	22.9	$17.4
Ann Arbor	222,061	4.2	13.3	$14.5
Augusta Ga	118,829	1.3	4.4	$2.6
Baton Rouge	365,943	4.2	11.5	$4.8
Birmingham	622,074	3.0	13.7	$8.8
Charlotte	455,597	11.8	44.9	$22.0
Chattanooga	296,955	2.5	12.4	$8.0
Cincinnati	1,212,675	30.2	138.7	$64.0
Colorado Springs	352,989	3.6	18.2	$7.3
Columbus	945,237	17.7	72.7	$46.9
Dayton	613,467	15.4	34.9	$42.2
Des Moines	293,666	3.8	3.7	$8.9
Detroit	3,697,529	58.2	241.1	$178.9
El Paso	571,017	15.8	78.8	$25.6
Harrisburg	292,904	3.1	8.9	$6.1
Honolulu	632,603	69.1	313.0	$97.7
Houston	2,901,851	80.8	401.4	$191.3
Indianapolis	914,761	12.1	53.2	$25.6
Jacksonville	738,413	8.8	46.2	$25.1
Kansas City	1,275,315	14.4	47.9	$38.2
Knoxville	304,466	1.7	4.9	$6.8
Lansing	265,095	4.0	15.2	$13.8
Little Rock	305,353	3.8	13.0	$6.6
Louisville	754,956	17.9	58.3	$34.8
Madison	244,336	10.0	36.7	$24.4
Memphis	825,193	12.0	64.7	$24.2
Milwaukee	1,226,293	60.0	169.6	$89.5
Minneapolis	2,079,676	61.9	250.4	$130.6
Montgomery	210,007	0.7	2.2	$2.6
Nashville	573,294	8.0	37.1	$15.7
Oklahoma City	784,425	3.5	13.7	$10.3
Omaha	544,292	5.2	20.0	$13.9
Orlando	887,126	15.7	103.2	$42.5
Peoria	242,353	1.9	9.8	$5.1
Phoenix	2,006,239	32.9	126.9	$60.1
Raleigh-Durham	511,280	9.8	39.2	$20.5
Reno	213,747	8.4	27.8	$14.8
Richmond	589,980	15.7	35.1	$20.0
Rochester	619,653	12.9	40.6	$30.1
St. Petersburg	820,180	8.1	37.8	$26.0
San Antonio	1,129,154	38.7	156.7	$75.6
Shreveport	256,489	4.3	17.9	$6.0
Spokane	279,038	8.4	39.0	$30.7
Tampa	888,530	9.0	43.6	$31.4
Toledo	489,155	4.5	20.5	$16.8
Tucson	579,235	17.9	64.0	$26.9
Totals	*35,178,414*	*749.1*	*3,047.9*	*$1,636.1*

Table 12 Bus-Only Cities – 2003 Size and Performance Data

		Millions of 2003…			
City	UZA 2003	Trips	P-M	O&M $	O&M 2003 (1996$)
Akron	570,215	6.3	23.3	$27.9	$21.9
Albuquerque	598,191	7.8	21.4	$24.3	$19.1
Ann Arbor	283,904	4.3	13.9	$21.0	$16.5
Augusta GA	335,630	1.0	5.5	$3.3	$2.6
Baton Rouge	479,019	4.7	14.8	$11.2	$8.8
Birmingham	663,615	3.8	18.3	$15.2	$11.9
Charlotte	758,927	18.9	100.0	$57.4	$45.1
Chattanooga	343,509	2.4	11.3	$11.0	$8.6
Cincinnati	1,503,262	24.1	132.2	$73.3	$57.6
Colorado Springs	466,122	3.4	12.3	$9.3	$7.3
Columbus	1,133,193	15.8	60.4	$70.6	$55.5
Dayton	703,444	13.7	46.0	$52.7	$41.4
Des Moines	370,505	4.2	24.0	$12.9	$10.1
Detroit	3,903,377	48.5	259.3	$278.2	$218.7
El Paso	674,801	11.1	61.8	$37.3	$29.3
Harrisburg	362,782	2.6	10.4	$12.4	$9.7
Honolulu	718,182	69.8	311.7	$135.9	$106.8
Houston	3,822,509	77.4	425.1	$280.2	$220.3
Indianapolis	1,218,919	11.3	57.5	$38.9	$30.6
Jacksonville	882,295	9.7	68.2	$61.6	$48.4
Kansas City	1,361,744	13.6	53.7	$53.4	$42.0
Knoxville	419,830	2.6	7.2	$10.6	$8.3
Lansing	300,032	8.7	27.2	$26.8	$21.1
Little Rock	360,331	3.2	12.0	$9.1	$7.2
Louisville	863,582	13.3	49.0	$50.2	$39.5
Madison	329,533	11.2	35.2	$36.3	$28.5
Memphis	972,091	13.0	65.9	$46.9	$36.9
Milwaukee	1,308,913	58.2	162.2	$134.5	$105.7
Minneapolis	2,388,593	72.2	319.7	$237.8	$186.9
Montgomery	196,892	0.4	2.1	$3.9	$3.1
Nashville	749,935	6.8	33.8	$27.1	$21.3
Oklahoma City	747,003	4.1	21.4	$15.9	$12.5
Omaha	626,623	4.7	16.5	$18.0	$14.2
Orlando	1,157,431	22.7	147.1	$81.7	$64.2
Peoria	247,172	1.8	11.3	$10.5	$8.3
Phoenix	2,907,049	45.2	171.7	$152.3	$119.7
Raleigh-Durham	829,323	13.2	52.0	$36.8	$28.9
Reno	303,689	8.0	26.2	$24.2	$19.0
Richmond	818,836	12.2	42.0	$30.5	$24.0
Rochester	694,396	13.6	50.9	$46.4	$36.5
St. Petersburg	1,237,403	9.7	49.6	$37.4	$29.4
San Antonio	1,327,554	40.3	161.9	$97.7	$76.8
Shreveport	275,213	2.9	13.5	$8.0	$6.3
Spokane	334,858	8.1	37.2	$35.3	$27.8
Tampa	824,936	9.8	46.1	$33.5	$26.3
Toledo	503,008	4.4	20.6	$25.0	$19.7
Tucson	720,425	16.9	62.4	$41.2	$32.4
Totals	*42,598,796*	*761.6*	*3,375.8*	*$2,565.6*	*$2,017.0*

Table 13 **Bus-Only Cities – Ridership Performance**

City	Trips/cap. 1996	Trips/cap. 2003	P-M/cap. 1996	P-M/cap. 2003
Akron	10.2	11.0	34.5	40.9
Albuquerque	13.7	13.0	46.1	35.8
Ann Arbor	18.9	15.1	59.9	49.0
Augusta Ga	10.9	3.0	37.0	16.4
Baton Rouge	11.5	9.8	31.4	30.9
Birmingham	4.8	5.7	22.0	27.6
Charlotte	25.9	24.9	98.6	131.8
Chattanooga	8.4	7.0	41.8	32.9
Cincinnati	24.9	16.0	114.4	87.9
Colorado Springs	10.2	7.3	51.6	26.4
Columbus	18.7	13.9	76.9	53.3
Dayton	25.1	19.5	56.9	65.4
Des Moines	12.9	11.3	12.6	64.8
Detroit	15.7	12.4	65.2	66.4
El Paso	27.7	16.4	138.0	91.6
Harrisburg	10.6	7.2	30.4	28.7
Honolulu	109.2	97.2	494.8	434.0
Houston	27.8	20.2	138.3	111.2
Indianapolis	13.2	9.3	58.2	47.2
Jacksonville	11.9	11.0	62.6	77.3
Kansas City	11.3	10.0	37.6	39.4
Knoxville	5.6	6.2	16.1	17.1
Lansing	15.1	29.0	57.3	90.7
Little Rock	12.4	8.9	42.6	33.3
Louisville	23.7	15.4	77.2	56.7
Madison	40.9	34.0	150.2	106.8
Memphis	14.5	13.4	78.4	67.8
Milwaukee	48.9	44.5	138.3	123.9
Minneapolis	29.8	30.2	120.4	133.8
Montgomery	3.3	2.0	10.5	10.7
Nashville	14.0	9.1	64.7	45.1
Oklahoma City	4.5	5.5	17.5	28.6
Omaha	9.6	7.5	36.7	26.3
Orlando	17.7	19.6	116.3	127.1
Peoria	7.8	7.3	40.4	45.7
Phoenix	16.4	15.5	63.3	59.1
Raleigh-Durham	19.2	15.9	76.7	62.7
Reno	39.3	26.3	130.1	86.3
Richmond	26.6	14.9	59.5	51.3
Rochester	20.8	19.6	65.5	73.3
St. Petersburg	9.9	7.8	46.1	40.1
San Antonio	34.3	30.4	138.8	122.0
Shreveport	16.8	10.5	69.8	49.1
Spokane	30.1	24.2	139.8	111.1
Tampa	10.1	11.9	49.1	55.9
Toledo	9.2	8.7	41.9	41.0
Tucson	30.9	23.5	110.5	86.6
Totals	*21.3*	*17.9*	*86.6*	*79.2*

Table 14 **Bus-Only Cities – Financial Performance**

City	O&M/p-m 1996	O&M/p-m 2003	O&M/p-m 2003 (1996$)
Akron	$1.13	$1.20	$0.94
Albuquerque	$0.76	$1.14	$0.89
Ann Arbor	$1.09	$1.51	$1.19
Augusta Ga	$0.59	$0.60	$0.47
Baton Rouge	$0.42	$0.76	$0.59
Birmingham	$0.64	$0.83	$0.65
Charlotte	$0.49	$0.57	$0.45
Chattanooga	$0.65	$0.97	$0.76
Cincinnati	$0.46	$0.55	$0.44
Colorado Springs	$0.40	$0.76	$0.59
Columbus	$0.65	$1.17	$0.92
Dayton	$1.21	$1.15	$0.90
Des Moines	$2.41	$0.54	$0.42
Detroit	$0.74	$1.07	$0.84
El Paso	$0.32	$0.60	$0.47
Harrisburg	$0.69	$1.19	$0.93
Honolulu	$0.31	$0.44	$0.34
Houston	$0.48	$0.66	$0.52
Indianapolis	$0.48	$0.68	$0.53
Jacksonville	$0.54	$0.90	$0.71
Kansas City	$0.80	$0.99	$0.78
Knoxville	$1.39	$1.47	$1.15
Lansing	$0.91	$0.99	$0.78
Little Rock	$0.51	$0.76	$0.60
Louisville	$0.60	$1.02	$0.81
Madison	$0.66	$1.03	$0.81
Memphis	$0.37	$0.71	$0.56
Milwaukee	$0.53	$0.83	$0.65
Minneapolis	$0.52	$0.74	$0.58
Montgomery	$1.18	$1.86	$1.48
Nashville	$0.42	$0.80	$0.63
Oklahoma City	$0.75	$0.74	$0.58
Omaha	$0.70	$1.09	$0.86
Orlando	$0.41	$0.56	$0.44
Peoria	$0.52	$0.93	$0.73
Phoenix	$0.47	$0.89	$0.70
Raleigh-Durham	$0.52	$0.71	$0.56
Reno	$0.53	$0.92	$0.73
Richmond	$0.57	$0.73	$0.57
Rochester	$0.74	$0.91	$0.72
St. Petersburg	$0.69	$0.75	$0.59
San Antonio	$0.48	$0.60	$0.47
Shreveport	$0.34	$0.59	$0.47
Spokane	$0.79	$0.95	$0.75
Tampa	$0.72	$0.73	$0.57
Toledo	$0.82	$1.21	$0.96
Tucson	$0.42	$0.66	$0.52
Totals	*$0.54*	*$0.76*	*$0.60*

Table 15 **Bus-Only Cities – Change in Ridership Performance, 1996-2003**

City	Trips	P-M	Trips/cap	P-M/cap
Akron	16.7%	28.0%	7.8%	18.6%
Albuquerque	14.7%	-6.6%	-5.1%	-22.3%
Ann Arbor	2.4%	4.5%	-20.1%	-18.2%
Augusta Ga	-23.1%	25.0%	-72.5%	-55.7%
Baton Rouge	11.9%	28.7%	-14.8%	-1.6%
Birmingham	26.7%	33.6%	18.8%	25.5%
Charlotte	60.2%	122.7%	-3.9%	33.7%
Chattanooga	-4.0%	-8.9%	-16.7%	-21.3%
Cincinnati	-20.2%	-4.7%	-35.7%	-23.2%
Colorado Springs	-5.6%	-32.4%	-28.4%	-48.8%
Columbus	-10.7%	-16.9%	-25.7%	-30.7%
Dayton	-11.0%	31.8%	-22.3%	14.9%
Des Moines	10.5%	548.6%	-12.4%	414.3%
Detroit	-16.7%	7.5%	-21.0%	1.8%
El Paso	-29.7%	-21.6%	-40.8%	-33.6%
Harrisburg	-16.1%	16.9%	-32.1%	-5.6%
Honolulu	1.0%	-0.4%	-11.0%	-12.3%
Houston	-4.2%	5.9%	-27.3%	-19.6%
Indianapolis	-6.6%	8.1%	-29.5%	-18.9%
Jacksonville	10.2%	47.6%	-7.6%	23.5%
Kansas City	-5.6%	12.1%	-11.5%	4.8%
Knoxville	52.9%	46.9%	10.7%	6.2%
Lansing	117.5%	78.9%	92.1%	58.3%
Little Rock	-15.8%	-7.7%	-28.2%	-21.8%
Louisville	-25.7%	-16.0%	-35.0%	-26.6%
Madison	12.0%	-4.1%	-16.9%	-28.9%
Memphis	8.3%	1.9%	-7.6%	-13.5%
Milwaukee	-3.0%	-4.4%	-9.0%	-10.4%
Minneapolis	16.6%	27.7%	1.3%	11.1%
Montgomery	-42.9%	-4.5%	-39.4%	1.9%
Nashville	-15.0%	-8.9%	-35.0%	-30.3%
Oklahoma City	17.1%	56.2%	22.2%	63.4%
Omaha	-9.6%	-17.5%	-21.9%	-28.3%
Orlando	44.6%	42.5%	10.7%	9.3%
Peoria	-5.3%	15.3%	-6.4%	13.1%
Phoenix	37.4%	35.3%	-5.5%	-6.6%
Raleigh-Durham	34.7%	32.7%	-17.2%	-18.3%
Reno	-4.8%	-5.8%	-33.1%	-33.7%
Richmond	-22.3%	19.7%	-44.0%	-13.8%
Rochester	5.4%	25.4%	-5.8%	11.9%
St. Petersburg	19.8%	31.2%	-21.2%	-13.0%
San Antonio	4.1%	3.3%	-11.4%	-12.1%
Shreveport	-32.6%	-24.6%	-37.5%	-29.7%
Spokane	-3.6%	-4.6%	-19.6%	-20.5%
Tampa	8.9%	5.7%	17.8%	13.8%
Toledo	-2.2%	0.5%	-5.4%	-2.1%
Tucson	-5.6%	-2.5%	-23.9%	-21.6%
Totals	*1.7%*	*10.8%*	*-16.0%*	*-8.5%*

Table 16 **Bus-Only Cities – Change in Financial Performance, 1996-2003**

City	O&M $	O&M 1996$	O&M/p-m	O&M/p-m 1996$
Akron	36.1%	6.8%	6.2%	-16.8%
Albuquerque	39.7%	9.8%	50.0%	17.1%
Ann Arbor	44.8%	13.8%	38.5%	9.2%
Augusta Ga	26.9%	0.0%	1.7%	-20.3%
Baton Rouge	133.3%	83.3%	81.0%	40.5%
Birmingham	72.7%	35.2%	29.7%	1.6%
Charlotte	160.9%	105.0%	16.3%	-8.2%
Chattanooga	37.5%	7.5%	49.2%	16.9%
Cincinnati	14.5%	-10.0%	19.6%	-4.3%
Colorado Springs	27.4%	0.0%	90.0%	47.5%
Columbus	50.5%	18.3%	80.0%	41.5%
Dayton	24.9%	-1.9%	-5.0%	-25.6%
Des Moines	44.9%	13.5%	-77.6%	-82.6%
Detroit	55.5%	22.2%	44.6%	13.5%
El Paso	45.7%	14.5%	87.5%	46.9%
Harrisburg	103.3%	59.0%	72.5%	34.8%
Honolulu	39.1%	9.3%	41.9%	9.7%
Houston	46.5%	15.2%	37.5%	8.3%
Indianapolis	52.0%	19.5%	41.7%	10.4%
Jacksonville	145.4%	92.8%	66.7%	31.5%
Kansas City	39.8%	9.9%	23.8%	-2.5%
Knoxville	55.9%	22.1%	5.8%	-17.3%
Lansing	94.2%	52.9%	8.8%	-14.3%
Little Rock	37.9%	9.1%	49.0%	17.6%
Louisville	44.3%	13.5%	70.0%	35.0%
Madison	48.8%	16.8%	56.1%	22.7%
Memphis	93.8%	52.5%	91.9%	51.4%
Milwaukee	50.3%	18.1%	56.6%	22.6%
Minneapolis	82.1%	43.1%	42.3%	11.5%
Montgomery	50.0%	19.2%	57.6%	25.4%
Nashville	72.6%	35.7%	90.5%	50.0%
Oklahoma City	54.4%	21.4%	-1.3%	-22.7%
Omaha	29.5%	2.2%	55.7%	22.9%
Orlando	92.2%	51.1%	36.6%	7.3%
Peoria	105.9%	62.7%	78.8%	40.4%
Phoenix	153.4%	99.2%	89.4%	48.9%
Raleigh-Durham	79.5%	41.0%	36.5%	7.7%
Reno	63.5%	28.4%	73.6%	37.7%
Richmond	52.5%	20.0%	28.1%	0.0%
Rochester	54.2%	21.3%	23.0%	-2.7%
St. Petersburg	43.8%	13.1%	8.7%	-14.5%
San Antonio	29.2%	1.6%	25.0%	-2.1%
Shreveport	33.3%	5.0%	73.5%	38.2%
Spokane	15.0%	-9.4%	20.3%	-5.1%
Tampa	6.7%	-16.2%	1.4%	-20.8%
Toledo	48.8%	17.3%	47.6%	17.1%
Tucson	53.2%	20.4%	57.1%	23.8%
Totals	*56.8%*	*23.3%*	*40.7%*	*11.1%*

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