Commuter Rail Transit and Economic Development

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Abstract

Commuter rail transit (CRT) is a form of rail passenger service connecting suburbs and more distant areas to downtowns and other major activity centers. Between 1834 and 1973, only three public CRT systems were built in the U.S., serving New York, Chicago, and later Boston. But 2016, there were 29 public CRT systems. Modern CRT systems aim to expand economic development in metropolitan areas. But do they? This article evaluates the economic development performance of five modern CRT systems built in the South and West: “Tri Rail” connecting the metropolitan areas of Miami and West Palm Beach, Florida; “Rail Runner “connecting the metropolitan areas of Albuquerque and Santa Fe, New Mexico; “FrontRunner” connecting the metropolitan areas of Ogden and Salt Lake City, Utah; “Coaster” serving metropolitan San Diego; and “Sounder” connecting the metropolitan areas of Tacoma and Seattle. For all metropolitan areas combined, areas within 0.50 miles of CRT stations lost share in the change of jobs. All CRT station areas gained share of jobs in the office and health care economic groups, and most gained share in the knowledge economic group. All CRT station areas lost share of jobs in manufacturing, and nearly all lost share in the retail-lodging-food service economic group. Yet, station areas served by the FrontRunner CRT system gained share of jobs overall as well for nearly all economic groups while those for Tri Rail performed nearly as well. Planning and policy implications are offered.

Introduction

Commuter rail transit (CRT) is a form of rail passenger service connecting downtowns and other major activity centers with suburban and exurban places. Historically, CRT systems connected distant suburbs with downtowns in the northeast and Great Lakes regions, serving mostly affluent business people working there. In recent years, commuter rail service has been introduced to metropolitan areas in the South and West. One implicit purpose of these systems is to create new jobs, especially around commuter rail stations. But there is scant empirical analysis of whether and the extent to which commuter rail stations are associated with economic development. Based on analysis of five commuter rail systems, this article explores the connection between CRT systems and economic development around CRT stations. It begins with an overview of commuter rail transit including its role in facilitating economic development; presents the research design, analytic approach, data and study areas; reports results with interpretations; and offers overall implications for CRT planning and economic development.

Overview of Commuter Rail Transit and its Relation to Economic Development

The nation's first public commuter rail service was launched in 1834 connecting Long Island with Manhattan Island, New York.[1] Nearly 70 years later in 1903, the nation's second public commuter rail service started connecting South Bend, Indiana with Chicago.[2] It took nearly another 70 years (1973) before the nation's third public commuter rail service was launched, connecting Boston with its suburbs.[3] Since then, another 26 public CRT systems have been

[1] See https://en.wikipedia.org/wiki/Long_Island_Rail_Road.
[2] See https://en.wikipedia.org/wiki/South_Shore_Line.
[3] See https://en.wikipedia.org/wiki/MBTA_Commuter_Rail.

initiated.[4] Table 1[5] shows key features of all public systems in place as of 2016[6]. But there were also situations where suburban commuters boarded longer distance intercity trains in the era before there were formal commuter rail systems.[7]

CRT service areas extend 10 to 100 miles from downtowns, traveling at speeds from about 30 to that approaching freeway speeds. According to the American Public Transit Association (APTA 2015), the average trip was nearly 25 miles in 2013, or about five times the distance traveled by light rail passengers. Because of longer travel distances and travel times, CRT cars offer more seating options than light rail, and often have Wi-Fi, food and beverage services. Most CRT lines run along commercial rails, by agreement with commercial carriers. They are also driven by diesel engines, though occasionally with electrical drivetrains.

While the chief function of CRTs is to connect workers living in suburban and more distant areas to mostly their downtown workplaces, literature suggests that a collateral purpose can be to advance economic development at CRT stations (APTA, 1997; Ayvalik and Khisty, 2002; Deka and Marchwinski, 2014; Kennedy, 2002; Seskin, Cervero and Zupan, 1996). CRT systems tend to run along major transportation corridors. An important function of CTRT systems and the stations serving them is to create more jobs near CRT stations, especially in downtowns, other employment centers and perhaps in some suburban and more distant locations (see generally Boarnet and Haughwout, 2000; Ciccone and Hall, 1996; Glaeser, 2011; Voith, 1998). But there is scant research into the connection between CRT systems and economic development among the most recent CRT systems. An earlier study by the American Public

[4] To be sure, many cities had privately operated commuter rail services that were abandoned after World War II as the private railroads shed passenger operations. See, for example, service in the Philadelphia area began in 1832 (https://philadelphiaencyclopedia.org/archive/commuter-trains/). We are indebted to an anonymous reviewer for this clarification.
[5] We note that the dates shown in table 1 relate to the year in which the current agency began operating the line. We acknowledge an anonymous reviewer for this clarification.
[6] See https://en.wikipedia.org/wiki/List_of_United_States_commuter_rail_systems_by_ridership
[7] We are indebted to an anonymous reviewer for this insight.

Transit Association (APTA 1997) found generally positive relationships between CRT systems and economic growth but that study focused on mostly very large systems serving the Great Lakes and the Northeast, and did not provided disaggregated outcomes to individual systems, meaning results from larger and more established systems could overcome negative outcomes from smaller and perhaps newer ones. A more recent study by Chi and Kasu (2015) also reported aggregate outcomes and focused mostly on demographic changes. In short, we find no recent literature on the disaggregated effects of newer, and smaller, CRT systems in the South and West on economic outcomes. .

Table 1. Summary of U.S. Commuter Rail Systems

Rank	System	Major cities served	Annual Ridership (2016)	Average Weekday Ridership (Q4 2016)	Route Miles	Ridership per mile (Q4 2016)	Lines	Stations	Year Opened
1	MTA Long Island Rail Road	New York	103,196,800	354,800	321	1,105	11	124	1834
2	NJ Transit Rail	New York / Newark / Trenton / Philadelphia	88,050,000	241,233	530	455	11	164	1983
3	MTA Metro-North Railroad	New York / Yonkers / Bridgeport	86,302,500	305,700	385	794	6	122	1983
4	Metra	Chicago	80,402,000	294,600	488	582	11	241	1984
5	SEPTA Regional Rail	Philadelphia	35,453,700	125,400	280	448	13	153	1983
6	MBTA Commuter Rail	Boston / Worcester / Providence	33,749,600	127,500	368	346	13	127	1973
7	Caltrain	San Francisco / San Jose	19,038,300	56,100	77	729	1	32	1987
8	Metrolink	Los Angeles / San Bernardino	10,903,000	39,500	388	102	7	55	1992
9	MARC Train	Baltimore / Washington, D.C.	8,980,600	33,300	187	178	3	43	1984
10	UTA FrontRunner [14]	Salt Lake City / Provo	4,545,800	17,200	88	195	1	16	2008

11	Virginia Railway Express	Washington, D.C.	4,496,000	17,900	90	199	2	18	1992
12	Denver RTD : A and B Lines	Denver	4,317,400	19,400	29	669	2	9	2016
13	Tri-Rail	Miami / Fort Lauderdale / West Palm Beach	4,175,000	14,200	71	200	1	18	1987
14	Sounder Commuter Rail	Seattle / Tacoma	4,163,400	15,800	83	190	2	9	2000
15	NICTD South Shore Line	Chicago / South Bend	3,503,700	11,700	90	130	1	20	1903
16	Trinity Railway Express	Dallas / Fort Worth	2,032,800	7,700	34	226	1	10	1996
17	Capitol Corridor	San Jose / Oakland / Sacramento	1,573,200	5,100	168	30	1	15	1991
18	NCTD Coaster	San Diego / Oceanside	1,503,700	4,600	41	112	1	8	1995
19	Keystone Service	Philadelphia	1,492,000	4,900	104.6	47	1	12	1976
20	Altamont Corridor Express (ACE)	San Jose / Stockton	1,295,500	5,200	86	60	1	10	1998
21	SunRail	Orlando	877,600	2,404	32	75	1	12	2014
22	New Mexico Rail Runner Express	Albuquerque / Santa Fe	858,700	2,700	97	28	1	13	2006

23	Capital MetroRail	Austin	810,100	2,700	32	84	1	9	2010
24	Northstar Line	Minneapolis	711,300	2,400	40	60	1	6	2009
25	Shore Line East	New Haven	606,300	1,900	59	32	1	13	1990
26	A-Train	Denton	530,400	2,000	21	95	1	6	2011
27	Downeaster	Boston / Brunswick, Maine	493,500	1,300	148	9	1	12	2001
28	Westside Express Service	Beaverton	455,000	1,700	15	113	1	5	2010
29	Music City Star	Nashville	280,900	1,200	32	38	1	6	2006

Source: Adapted from http://en.wikipedia.org/wiki/List_of_United_States_commuter_rail_systems_by_ridership

Our interest is in assessing economic development outcomes to newer and smaller CRT systems in the South and West. We operationalize economic development as the change in jobs with respect to distance from CRT stations over time. Details of our research design, analytic approach, data, and study areas are discussed next.

Research Design, Analytic Approach, Data and Study Areas

The research question is:

> *Do areas within 0.50 miles of CRT stations ("station areas") gain share of regional change in jobs over time overall and with respect to economic sectors combined into economic groups?*

We choose the one-half mile radius because literature suggests it is the most appropriate for assessing development outcomes associated for fixed-guide transit systems such as light rail transit, heavy rail transit, streetcars, bus rapid transit and CRT (see Belzer et al. 2008).

As the research question addresses change over time, a longitudinal quasi-experimental study design is appropriate. Further, as the research question addresses change in jobs within CRT station areas compared the region, shift-share analysis is a reasonable analytic approach the details of which will be described below.

Because the research question requires small-area data on jobs disaggregated to economic sectors, the appropriate source of data is the Longitudinal Employee-Household Dynamics (LEHD) database, which is available annually for most metropolitan areas at the census block level since 2002. LEHD data are collected in 20 economic sectors defined by the North American Industrial Classification System (NAICS). Only those sectors that involve occupying physical spaces are considered, meaning that the two natural resources sectors and the

construction sector are removed from analysis. The remaining 17 sectors are combined into eight economic groups in the manner shown in Table 2. Jobs are those based on the location of work place and not headquarters.

Table 2
Combinations of NAICS Sectors into Economic Groups for Analysis

NAICS Code	NAICS Sector Title and Economic Group Name
	Manufacturing
31-33	Manufacturing
	Light Industrial
22	Utilities
42	Wholesale Trade
48-49	Transportation and Warehousing
	Retail-Lodging-Food (also "Ret-Lodg-Food")
44-45	Retail Trade
72	Accommodation and Food Services
	Knowledge
51	Information
54	Professional, Scientific, and Technical Services
	Office
52	Finance and Insurance
53	Real Estate and Rental and Leasing
55	Management of Companies and Enterprises
56	Administrative and Support and Waste Management and Remediation Services
81	Other Services (except Public Administration)
92	Public Administration
	Education
61	Educational Services
	Health
62	Health Care and Social Assistance
	Arts-Entertainment-Recreation (also "Arts-Ent-Rec")
71	Arts, Entertainment, and Recreation

Source: Adapted from the North American Industrial Classification System.

The study areas were selected as follows. They should be in growing areas so that the attractiveness of CRT station areas can be reasonably detected. Metropolitan areas in the South and West census regions lend themselves to this first filter. CRT systems should also be sufficiently large, measured in ridership, to also generate reasonably detectible results; more than one million riders in 2013 are selected as the second filter (see Table 1). Finally, CRT systems selected for analysis should not be within very large metropolitan areas that have multiple transit systems, as size and variety of transit options can complicate analysis. The final filter thus rules out the top 10 largest combined statistical areas. The study areas selected for this analysis include the following, arrayed clockwise from southeast to northwest:

- Tri Rail serving the metropolitan areas of Miami, Ft. Lauderdale and Palm Beach, Florida;
- Rail Runner serving the metropolitan areas of Albuquerque and Santa Fe, New Mexico, and the counties between them;
- FrontRunner serving the Salt Lake City combined statistical area and the Ogden metropolitan area, Utah;
- Coaster serving metropolitan San Diego; and
- Sounder serving the Seattle combined statistical area

Images 1 through 5 illustrate the routes of these CRT systems. Key features of each study area will be described in the results and interpretations section.

Shift-share analysis, the method used to guide the overall analytic approach, assigns the change or shift in the number of jobs with respect to the region, other economic sectors, and the local area. The “region” can be any level of geography and is often the nation or the state. In this case, the regions are the study areas described above. The ‘local” area is often a city or county or

even state, but it can be any geographic unit that is smaller than the region. In this study, it is the areas within 0.50 miles of the nearest CRT station. This is called the "CRT station area." As shifts in the share of jobs may vary by sector over time because of changes in economic sector mixes, there is also an "industry mix" adjustment that is called "sector mix." Adapting notations by the Carnegie Mellon Center for Economic Development (no date), the shift-share formula is used in this analysis is as follows:

$SS_i = RA_i + SM_i + CRT_i$

Where

SS_i = Shift-Share

RA_i = Regional Area share

SM_i = Sector Mix

CRT_i = CRT station area shift

The Regional Area (MA) share measures by how much total employment in a CRT station area changed because of change in the metropolitan area economy during the period of analysis. If metropolitan area employment grew by 10 percent during the analysis period, then employment in the CRT station area would have also grown by 10 percent. The Sector Mix (SM) identifies fast growing or slow growing economic sectors in a CRT station area based on the metropolitan area growth rates for the individual economic sectors. For instance, a CRT station area with an above-average share of the metropolitan area's high-growth sectors would have grown faster than a CRT station area with a high share of low-growth sectors. The CRT station area shift, also called the "competitive effect," identifies the portion of the change in jobs attributable to characteristics of the local area (station area). A leading sector is one where that sector's CRT station area growth rate is greater than its metropolitan area growth rate. A lagging

sector is one where the sector's CRT station area growth rate is less than its metropolitan area growth rate.

The equations for each component of the shift-share analysis are:

$RA = ({}_{i}\text{CRT station area}_{t-1} \bullet RA_t / RA_{t-1})$;

$SM = [({}_{i}\text{CRT station area}_{t-1} \bullet {}_{i}RA_t / {}_{i}RA_{t-1}) - RA]$; and

$CRT = [{}_{i}\text{CRT station area}_{t-1} \bullet ({}_{i}\text{CRT station area}_t / {}_{i}\text{CRT station area}_{t-1} - {}_{i}RA_t / {}_{i}RA_{t-1})]$.

Where:

${}_{i}\text{CRT station area}_{t-1}$ = number of jobs in the CRT station area sector (i) at the beginning of the analysis period (t-1);

${}_{i}\text{CRT station area}_t$ = number of jobs in the CRT station area in sector (i) at the end of the analysis period (t);

RA_{t-1} = total number of jobs in the regional area at the beginning of the analysis period (t-1);

RA_t = total number of jobs in the regional area at the end of the analysis period (t);

${}_{i}RA_{t-1}$ = number of jobs in the regional area in sector (i) at the beginning of the analysis period (t-1); and

${}_{i}RA_t$ = number of jobs in the regional area in sector (i) at the end of the analysis period (t).

For instance, jumping ahead to Table 3, consider change of jobs in the manufacturing group. The Regional Area share of 7,527 is the change in jobs that occur in the region because of the region's growth. Absent any industry-specific effects, manufacturing jobs would have increased by 7,527 just because of the region's job growth. The Industry Mix share however reflects the expected change associated with the sector's change in job share. The CRT share is

the share of the shift in industry jobs in the region that are attributable to the 0.50 mile station area.

The study period extends from 2002 through 2011, the latest year for which data were available for the analysis. Future research may update the study period. The study period extends from just after the recession of the early 2000s through the Great Recession and into recovery.

Results and interpretations are presented next.

Results and Interpretations

Results and interpretations are presented for each CRT system and for all CRT systems as a whole. Descriptions of each CRT system are also included for context.

Tri Rail

The Tri Rail CRT system that opened in 1984. It is the oldest system included in our analysis. At the time of analysis, it had 70 miles of track along a freight rail corridor with 19 park and ride stations. It has gradually added several additional stations over the past few years. As a commuter rail system, its length is extensive as it connects multiple metropolitan areas running along the narrow strip of land between the Atlantic Ocean and Lake Okeechobee, traversing the three metropolitan areas of Miami, Ft. Lauderdale, and Palm Beach. Table 3 reports descriptive changes over the period from 2002 through 2011 as well as shift-share results for each economic group and all jobs. Figure 1 illustrates the CRT station area share of shift in jobs by economic group.

Overall, CRT station areas lost share of the change of jobs in the region. Losses in share of jobs were especially large among the light industrial and retail-lodging-food economic groups, though less so in the manufacturing group. One reason may be that low-value and land-extensive manufacturing and light industrial activities are outbid for locations near CRT stations. Notably, several nonindustrial groups gained share such as Knowledge, Office, Education and Health. It would seem that as a whole Tri Rail station areas are attracting certain economic groups that then displace others in the competition for space and location in those areas. Why the retail-lodging-food economic group would lose share is not entirely clear.

On the other hand, the CRT station areas gained important regional shares of jobs in the knowledge, office, education, and health economic groups. It is important to note that the Tri-Rail system has stops at or near major government and education centers; indeed, the system was designed to access these kinds of centers.

Rail Runner

The Rail Runner runs along a 97 mile corridor from south of Albuquerque to Santa Fe. It began with 3 stations in 2006 and was expanded to 13 stations by 2013 (see Figure 2). Only the stations operating during the entire study period are used. It makes use of existing freight rail right of way, and consists largely of single track with passing sidings. Descriptive changes and shift-share results are reported in Table 4 while Figure 2 illustrates results for shift-share analysis.

Compared to the study area region, CRT stations along Rail Runner lost share of jobs overall and in nearly all the economic groups during the study period. For the most part, it appears that not only do the rails run mostly through industrial or otherwise undevelopable areas, but stations were not located to maximize access to existing employment areas or perhaps even to stimulate new development.

Table 3
Descriptive Change and Shift-Share Analysis for Tri Rail CRT, 2002-2011

Economic Group	2002 CRT	2011 CRT	2002 Region	2011 Region	Regional Area Share	Sector Mix Share	CRT Station Share
Manufacturing	7,948	4,617	116,900	77,390	7,527	(2,265)	(645)
Light Industrial	14,496	11,932	333,526	299,815	13,728	(697)	(1,099)
Retail-Lodging-Food	9,973	8,234	448,922	538,136	9,444	2,511	(3,721)
Knowledge	22,452	25,384	536,089	567,244	21,262	2,495	1,627
Office	7,855	8,497	205,680	203,725	7,439	342	717
Education	236	651	181,973	188,476	223	21	407
Health	4,596	6,723	253,427	317,431	4,352	1,404	966
Arts-Ent-Rec	932	1,067	40,789	43,596	883	114	71
Total	68,488	67,105	2,117,306	2,235,813	64,858	3,924	(1,677)

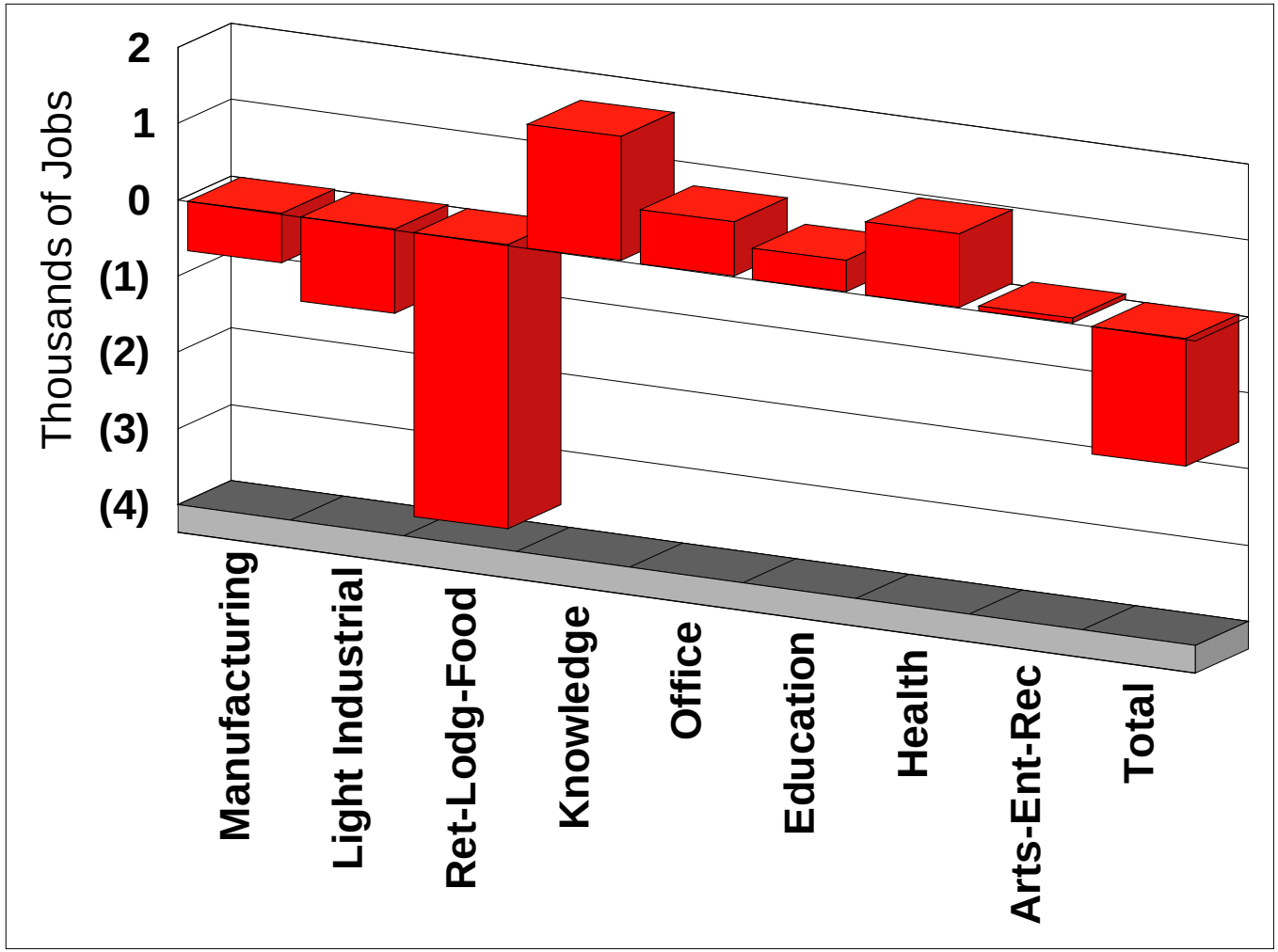

Figure 1
Shift-Share Analysis for Tri Rail CRT, 2002-2011

Table 4
Descriptive Change and Shift-Share Analysis for Rail Runner CRT, 2002-2011

Economic Group	2002 CRT	2011 CRT	2002 Region	2011 Region	Regional Area Share	Sector Mix Share	CRT Station Share
Manufacturing	576	407	26,189	20,189	532	(88)	(37)
Light Industrial	2,854	2,477	54,296	49,580	2,636	(30)	(129)
Retail-Lodging-Food	7,070	6,234	89,852	98,901	6,529	1,253	(1,548)
Knowledge	6,018	3,867	45,701	37,417	5,558	(631)	(1,060)
Office	15,171	17,726	87,854	97,211	14,011	2,776	939
Education	3,024	1,131	35,895	42,897	2,793	821	(2,483)
Health	2,144	4,012	45,017	71,501	1,980	1,425	607
Arts-Ent-Rec	2,066	1,084	9,910	9,700	1,908	114	(938)
Total	38,923	36,938	394,714	427,396	35,947	5,641	(4,650)

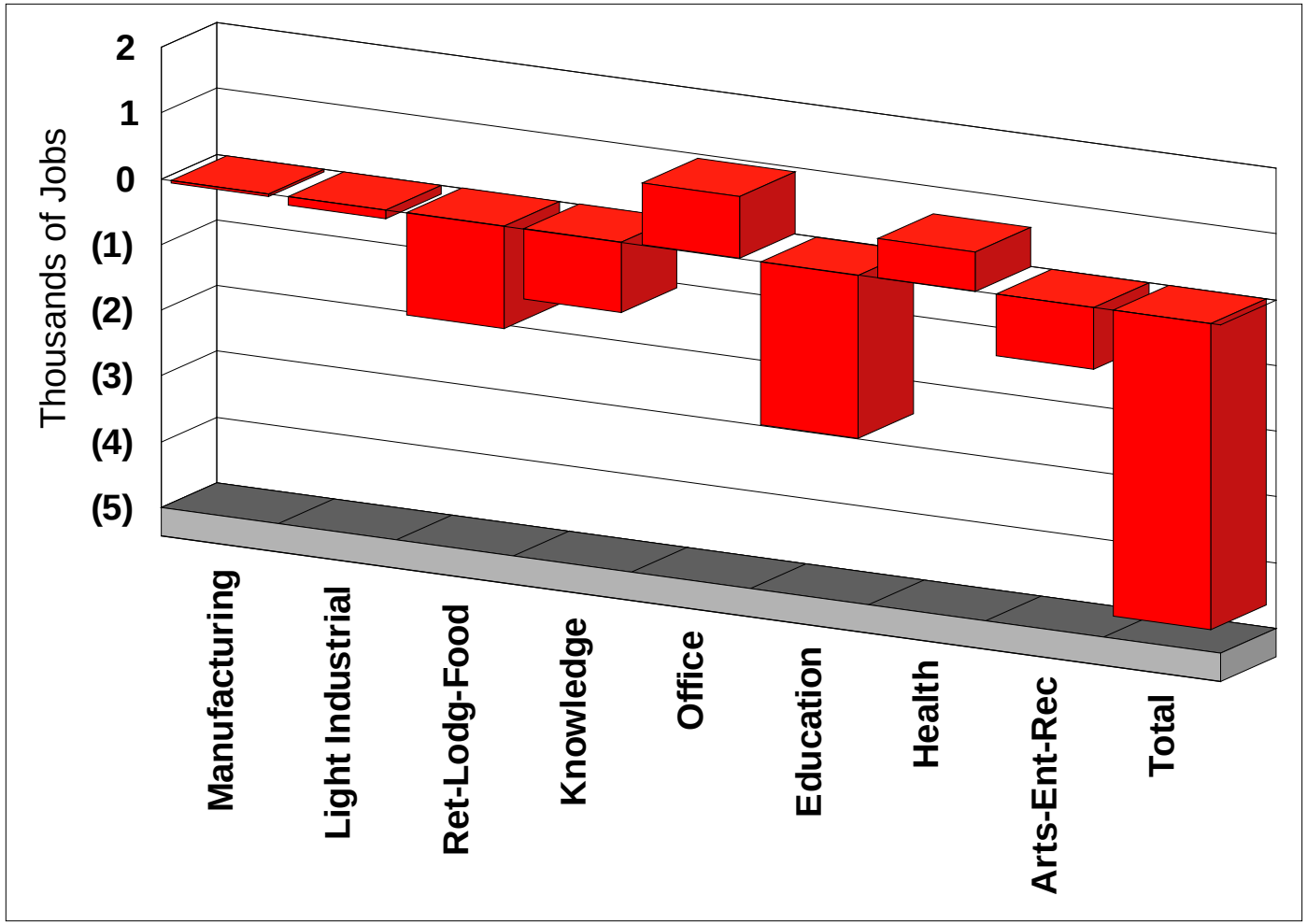

Figure 2
Shift-Share Analysis for Rail Runner CRT, 2002-2011

FrontRunner

The Utah Transit Authority's Front Runner commuter rail system started operations in 2005. It has since been extended to almost double its initial length. Only the initial segment between downtown Ogden and downtown Salt Lake City is used in the analysis, as only it was operating through the study period. The study corridor thus has 8 stations along 42 miles of track. Though it is the newest system studied, the local market was fully knowledgeable of the planning and investment since at least 2002.

As revealed throughout this analysis, the FrontRunner CRT system is the only one which realized positive net increase in share of jobs relative to its region (see Table 5 and Figure 3). It also enjoyed positive share in the shift of regional jobs in all economic groups except manufacturing and retail-lodging-food. Manufacturing operations tend to require substantial areas of land, and they will often be outbid for locations near transit stations.

The largest gain in the share of regional jobs is with respect to the office economic group. As part of its station area planning, the Utah Transit Authority (UTA), operator of the CRT system, worked with local governments to assure that station areas had land use designations that allowed a mix of land uses, notably offices. Station area plans also included residential development, analysis of which is the subject of future work.

A key element of economic development success near FrontRunner CRT stations is public-private partnerships between the UTA and developers/investors. To build CRT stations, the UTA acquired large tracts of land. Surplus land is sold at market rates to facilitate economic development around CRT stations. Market rates as opposed to discounted prices are an incentive because the land assembly and infrastructure improvements have already been completed.

Table 5
Descriptive Change and Shift-Share Analysis for FrontRunner CRT, 2002-2011

Economic Group	2002 CRT	2011 CRT	2002 Region	2011 Region	Regional Area Share	Sector Mix Share	CRT Station Share
Manufacturing	2,295	1,088	93,384	92,489	2,009	264	(1,185)
Light Industrial	1,882	2,223	122,196	131,150	1,647	372	203
Retail-Lodging-Food	2,742	2,856	173,091	186,468	2,400	554	(98)
Knowledge	2,552	3,283	71,951	91,363	2,234	1,007	42
Office	2,684	10,687	190,164	220,660	2,349	765	7,573
Education	146	404	81,094	93,544	128	41	236
Health	618	1,095	77,414	110,036	541	337	217
Arts-Ent-Rec	641	938	18,018	19,390	561	129	248
Total	13,560	22,574	827,312	945,100	11,870	3,468	7,236

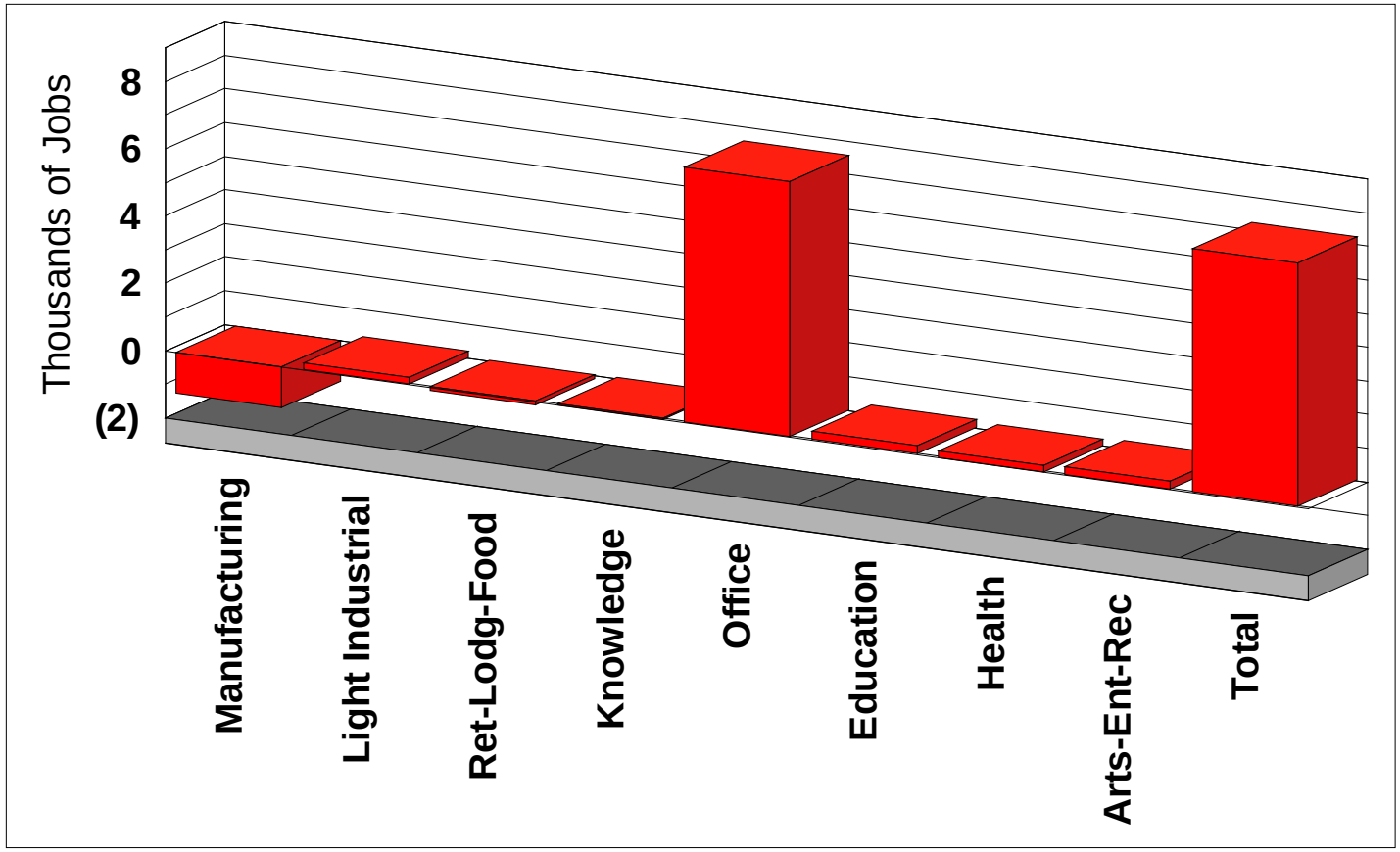

Figure 3
Shift-Share Analysis for FrontRunner CRT, 2002-2011

Coaster

The Coaster is a commuter rail service that operates in the central and northern coastal regions of San Diego County, California. The service is operated by TransitAmerica Services through a contract with North County Transit District (NCTD). The Coaster has 8 stations along 41 miles of track. It serves commuters connecting suburban areas to downtown San Diego. It runs parallel to major north-south highways along commercial freight tracks. It tends to operate mostly during peak commuting times during workdays.

In many ways, the Coaster CRT systems performed the worst from an economic development perspective among all the CRT systems studied. Not only did it lose the largest share of jobs relative to its region but it lost share of jobs in nearly all economic groups, the principal exception being light manufacturing.

One reason may be that stations tend to be more distant from each other, and Coaster operations are shared with freight rail traffic. While this is also the case in many other CRT systems, it seems especially to be the case in San Diego. Notably, the Coaster's limited economic development outcomes could be associated with Camp Pendleton to the north, which creates a large buffer separating north San Diego County and the Los Angeles basin that may suppress employment growth. Closer-in stations in north San Diego along the I-85 freeway and light rail transit corridors may have absorbed economic growth north of downtown San Diego.[8] Moreover, it is not apparent that CRT station area planning encourages other than freight-rail related development in them. Our assessment is consistent with that of an earlier study by Cervero and Duncan (2002).

[8] We are indebted to an anonymous reviewer for this insight.

Table 6
Descriptive Change and Shift-Share Analysis for Coaster CRT, 2002-2011

Economic Group	2002 CRT	2011 CRT	2002 MSA	2011 MSA	Metropolitan Area Share	Sector Mix Share	CRT Station Share
Manufacturing	1,860	766	115,957	96,145	1,739	(197)	(776)
Light Industrial	5,183	5,447	142,502	122,668	4,846	(384)	985
Retail-Lodging-Food	13,078	12,422	240,954	260,760	12,228	1,925	(1,731)
Knowledge	13,657	9,704	143,849	158,426	12,769	2,272	(5,337)
Office	32,640	36,029	251,614	281,802	30,518	6,038	(527)
Education	1,793	795	119,433	131,856	1,676	303	(1,185)
Health	1,582	2,128	108,745	142,958	1,479	601	48
Arts-Ent-Rec	1,353	1,294	28,525	37,053	1,265	492	(464)
Total	71,146	68,585	1,151,579	1,231,668	66,520	11,051	(8,986)

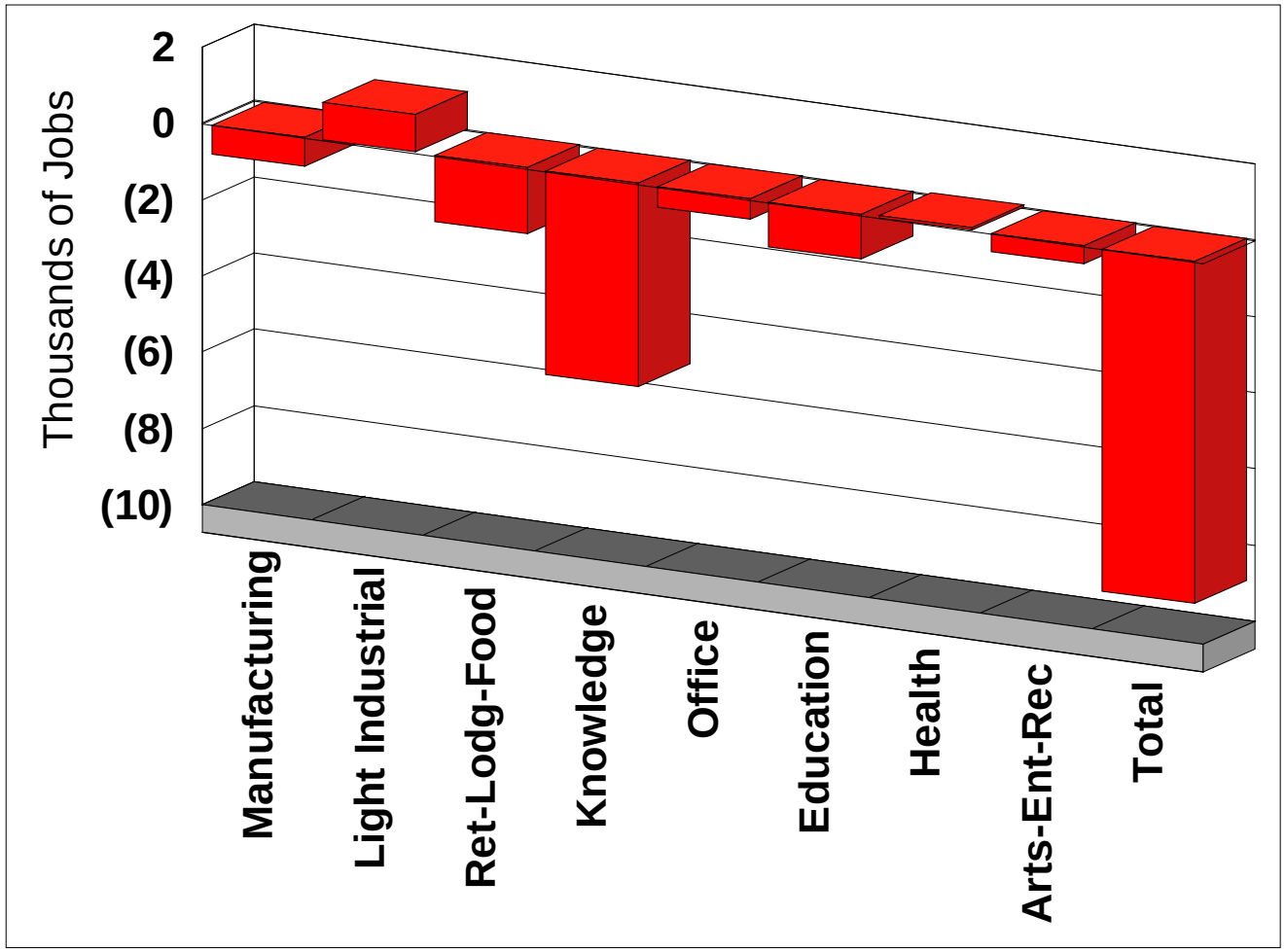

Figure 4
Shift-Share Analysis for Coaster CRT, 2002-2011

Sounder

Sounder commuter rail is a regional rail service operated by the Burlington Northern-Santa Fe Railroad on behalf of Sound Transit serving the greater Seattle metropolitan area. Service began in 2000 and by 2013 it had 9 stations along 80 miles of track.

As with nearly all the other CRT systems, Sounder CRT station areas lost share of regional job growth overall in nearly all economic groups (see Table 7 and Figure 5). The principal exceptions are the manufacturing and light industrial economic groups. Among the CRT systems, however, it may have the most challenging physical constraints. From Seattle northward, the tracks run parallel to Puget Sound often below steep banks upland from the water. Where the system runs inland, it passes through substantially built-out areas and often protected landscapes such as wetlands and agricultural preserves. Like the Coaster CRT, station area planning does not appear to anticipate economic development opportunities.

Overall implications for CRT planning and economic development are addressed in the last section of this article.

Table 7
Descriptive Change and Shift-Share Analysis for Sounder CRT, 2002-2011

Economic Group	2002 CRT	2011 CRT	2002 MSA	2011 MSA	Metropolitan Area Share	Sector Mix Share	CRT Station Share
Manufacturing	2,149	2,166	167,680	167,626	1,919	229	18
Light Industrial	5,796	6,404	226,220	228,556	5,176	679	548
Retail-Lodging-Food	6,568	7,390	289,050	308,906	5,866	1,153	371
Knowledge	8,103	9,103	177,427	222,907	7,237	2,943	(1,077)
Office	23,545	23,798	354,774	401,918	21,028	5,646	(2,876)
Education	4,350	4,679	132,488	143,112	3,885	814	(20)
Health	4,379	4,616	166,546	218,300	3,911	1,829	(1,124)
Arts-Ent-Rec	1,671	1,742	31,887	39,805	1,492	594	(344)
Total	56,561	59,898	1,546,072	1,731,130	50,515	13,887	(4,504)

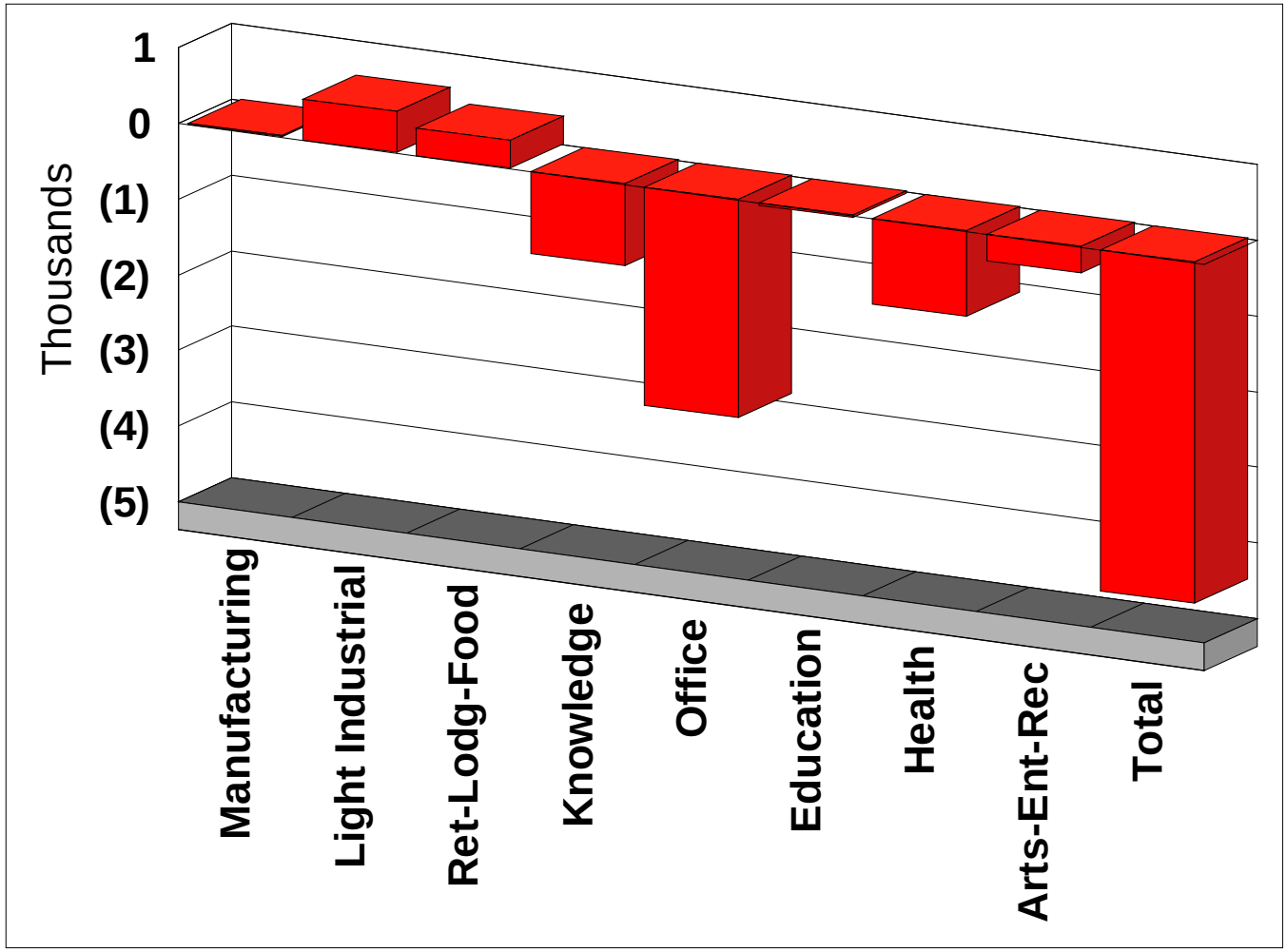

Figure 5
Shift-Share Analysis for <u>Sounder</u> CRT, 2002-2011

Implications for CRT Planning and Economic Development

Until now there has been very little analysis of the association between commuter rail transit stations and economic development. Although there are important differences between the five CRT systems studied there are also some important similarities. These similarities will be reviewed first. This will be followed by an overall comparison of the systems and then implications for converting what may be considered under-performing economic development opportunities into performing ones.

Table 8 combines the data for all systems into an overall analysis, which is illustrated in Figure 6. Bear in mind that figures in Table 8 include employment data for all systems and are not averages. Taken as a whole, these five CRT systems lost share of regional change in jobs over the study period, 2002 through 2011. Indeed, only the office economic group gained substantial share. This is similar to findings for three of the five individual CRT systems presented earlier. At first blush, CRT systems do not result in much economic development at least within CRT station areas.

Table 9 suggests (illustrated in Figure 7) that CRT station area outcomes are varied for reasons that will be explored here. Three systems stand out for their lack of performance: Coaster, Rail Runner and Sounder. Google Earth inspections of CRT station areas suggests what the data confirm: most are surrounded by asphalted park-and-ride lots, older and even derelict manufacturing, light industrial, warehousing and related structures, natural development constraints such as water, wetlands, open space preserves, and other land uses or constraints that seem to inhibit economic development. It as is though CRT rail stations built by these systems were not intended to advance economic development; at least that is what the outcomes suggest. Indeed, it seems reasonable to assert based on the data and analysis that as a whole, CRT station

areas serving these three systems do not generate substantial economic development and in fact discourage it.

In contrast, two systems stand out for their positive economic development outcomes: Tri Rail and FrontRunner. Station areas for both CRT systems either lost share of regional growth or performed minimally among the manufacturing, light industrial and retail-lodging-food economic groups. They also gained share of regional job growth in all other economic groups. Overall, FrontRunner CRT station areas gained job share relative to their regions while Tri Rail CRT stations lost a small share—otherwise performance of these two systems is remarkably similar. Future research is needed to understand why.

Unlike the other three systems analyzed, the Tri Rail and FrontRunner CRT systems included station area plans geared to attracting mostly nonmanufacturing and related development. For instance, Tri Rail stations are often located at or near employment centers as well as public institutions such as government centers and higher education facilities. In the case of the FrontRunner, the Utah Transit Authority, which operates the CRT system, engaged in station area planning before the system was operated, and implements the plan through public-private partnerships with developers (noted earlier). For their part, FrontRunner stations are closely proximate to commercial centers and have station area plans calling explicitly for office, institutional, and residential development. The vision for one of the FrontRunner's CRT rail station area plans, Clearfield, is illustrative:

Table 8
Descriptive Change and Shift-Share Analysis for <u>All Five</u> CRT Systems, 2002-2011

Economic Group	2002 CRT	2011 CRT	2002 MSA	2011 MSA	Metropolitan Area Share	Sector Mix Share	CRT Station Share
Manufacturing	14,828	9,044	520,110	509,765	13,623	(684)	(3,895)
Light Industrial	30,211	28,483	878,740	1,030,889	27,755	841	(113)
Retail-Lodging-Food	39,431	37,136	1,241,869	1,347,782	36,226	8,009	(7,099)
Knowledge	38,185	34,454	644,608	670,094	35,081	7,205	(7,832)
Office	96,492	113,624	1,420,495	1,541,730	88,649	17,920	7,055
Education	9,549	7,660	550,883	580,962	8,773	1,626	(2,738)
Health	13,319	18,574	651,149	735,160	12,236	5,359	978
Arts-Ent-Rec	6,663	6,125	129,129	148,685	6,121	1,595	(1,591)
Total	248,678	255,100	6,036,983	6,565,067	228,465	41,870	(15,235)

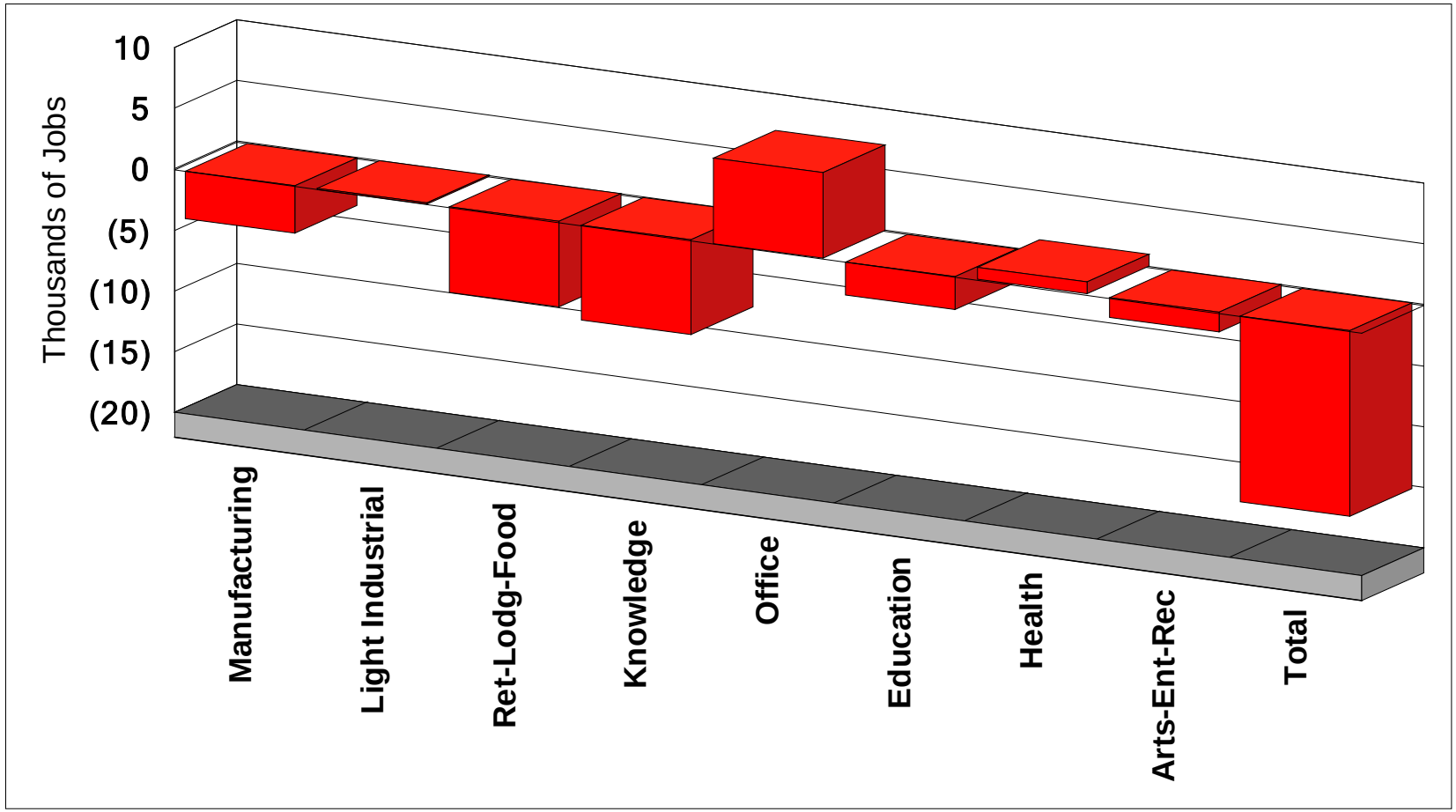

Figure 6
Shift-Share Analysis for <u>All Five</u> CRT Systems, 2002-2011

Table 9
CRT Station Area Shares for Each of Five CRT Systems, 2002-2011

Economic Group	Miami	Albuquerque	Salt Lake	San Diego	Seattle
Manufacturing	(645)	(37)	(1,185)	(776)	18
Light Industrial	(1,099)	(129)	203	985	548
Retail-Lodging-Food	(3,721)	(1,548)	(98)	(1,731)	371
Knowledge	1,627	(1,060)	42	(5,337)	(1,077)
Office	717	939	7,573	(527)	(2,876)
Education	407	(2,483)	236	(1,185)	(20)
Health	966	607	217	48	(1,124)
Arts-Ent-Rec	71	(938)	248	(464)	(344)
Total	(1,677)	(4,650)	7,236	(8,986)	(4,504)

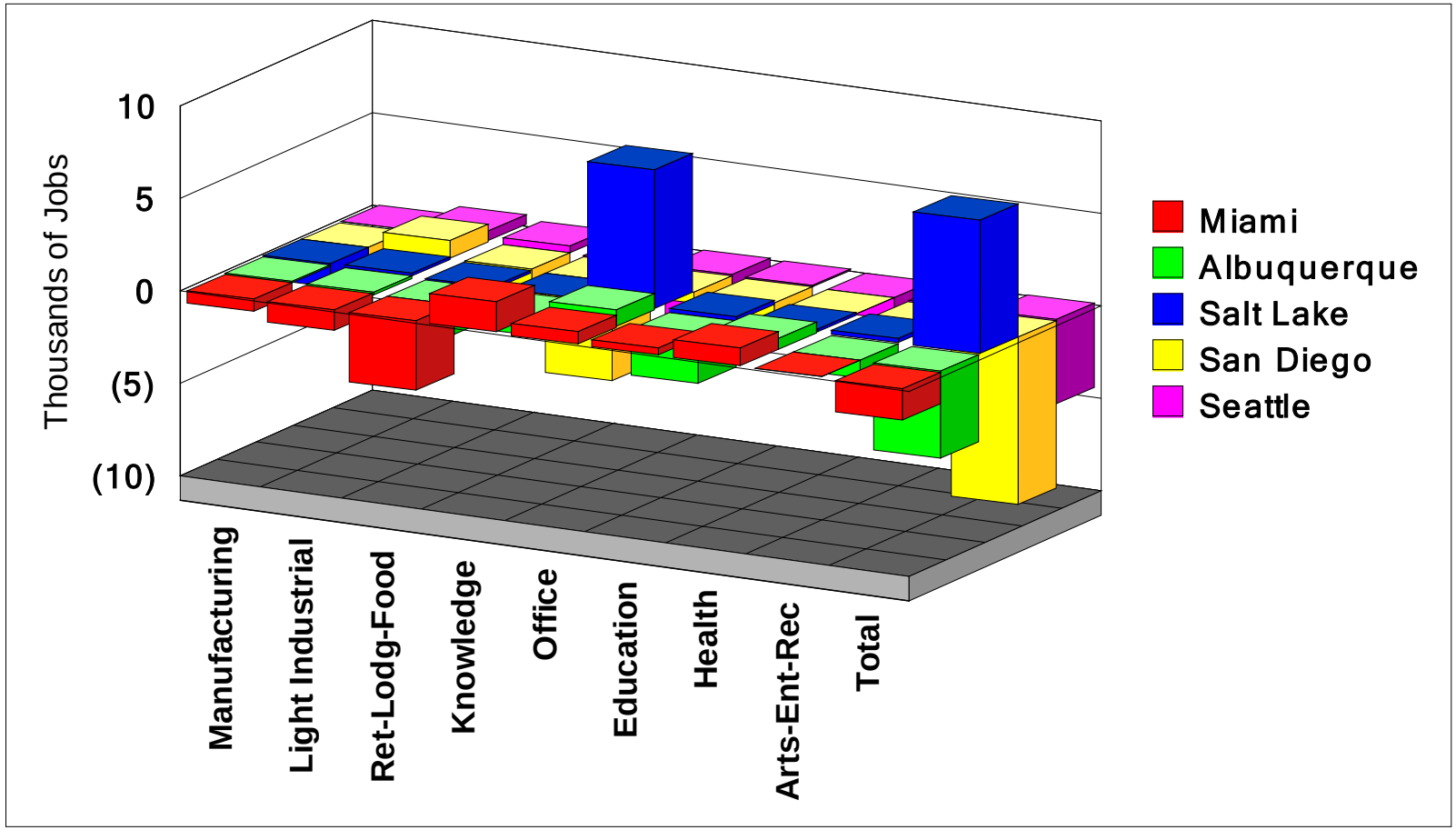

Figure 7
Shift-Share Analysis for Each of Five CRT Systems, 2002-2011

> *Clearfield Station is envisioned to be a unique mixed-use community with a variety of land uses that take advantage of the adjacent commuter rail line and major employment centers within the area. The plan is oriented around a commuter rail transit station, creating an intermodal hub for the community. Clearfield Station provides users a walkable, pedestrian friendly community in addition to flexible business space for incubator and small businesses.* (Utah Transit Authority 2014: 10.)

Nonetheless, we acknowledge that our research does not establish a causal relationship between economic development outcomes and CRT station area planning; this will be the subject of future research. In contrast, inspection of Google Earth images reveals that many CRT stations along the Coaster, Rail Runner and Sounder CRT systems have location constraints and appear unattractiveness to economic development.

How can CRT system officials and planners unlock their economic development potential?

First of all, it may only be a matter of time before the market recognizes the strategic investment opportunities these systems present. Derelict buildings and park-and-ride lots may become opportunities for redevelopment especially through public-private partnerships (Nelson 2014). But long range planning may help facilitate this. Such planning can include market studies revealing long-term opportunities, infrastructure upgrades, and the occasional acquisition of land by public development agencies.

Second, it seems many of these CRT stations are positioned behind buildings and across unattractive landscapes, the stations themselves nothing more than drab platforms. It is as though these are unwanted places. Certainly constraints exist but planners, urban designers and

architects can convert many into desired places especially as buildings themselves are replaced through the course of aging. While train activities can seem noxious they can also seem quaint and even attractive, at least to certain market segments and land uses.

Third, the forgotten element in CRT station areas seems to be people. It is as though there is an assumption that people do not want to live near trains, especially in derelict industrial areas. Perhaps most people do not want to but there is growing evidence from surveys that millions of American households would live near transit options, including CRT, if they had the opportunity and presumably if land use planning, urban design, and urban amenities addressed their preferences (see Nelson 2013).

We note that our analysis is aggregated to systems as a whole, and for all operating nuances. Future research should include operating patterns, such as peak vs off- peak, directional services, weekday vs weekend services, and presence or absence of park and ride facilities the refined analysis of subareas such as downtowns, key suburban centers, and more dispersed suburban areas. Moreover, future research should consider multiple one-half mile distance bands perhaps to two miles to determine the extent to which economic development around CRT stations behaves differently than for other fixed guideway transit systems such as light rail, streetcar and bus rapid transit.

Nonetheless, unlocking the economic development potential of commuter rail station areas ought to be the next priority of many of America's rail transit systems.

References

American Public Transportation Association (2015). *Ridership Report Archives.* http://www.apta.com/resources/statistics/Pages/RidershipArchives.aspx. Retrieved December 27, 2016.

American Public Transportation Association (1997). *Commuter Rail: Serving America's Emerging Suburban/Urban Economy.*" http://www.apta.com/resources/reportsandpublications/Documents/Commuter_Rail_Suburban_Urban_Economy_1997.pdf. Retrieved December 27, 2016.

Ayvalik, Cemal and C. Jotin Khisty (2002). Heuristic analysis of impacts of commuter rail station consolidation on pedestrian access. *Transportation Research Record: Journal of the Transportation Research Board* 1793: 47-54.

Belzer, Dena, Sujata Srivastava, and Mason Austin. 2011. *Transit and regional economic development*. No. FTA CA-26-1007-03. 2011.

Boarnet, Marlon G. and Andrew F. Haughwout. 2000. *Do Highways Matter? Evidence and Policy Implications of Highways Influence on Metropolitan Development*. Washington, DC: The Brookings Institution, Center on Urban and Metropolitan Policy.

Carnegie Mellon Center for Economic Development. Undated. *Methods of regional analysis: Shift-share*. Pittsburgh, PA: H. John Heinz School of Public Policy and Management, Carnegie Mellon University. http://www.andrew.cmu.edu/user/jp87/URED/readings/Shift_Share.pdf retrieved December 27, 2016.

Cervero, Rovert and Michael Duncan. (2002a). *Land Value Impacts of Rail Transit Services in San Diego County.* Washington, DC: Urban Land Institute.

Ciccone, Antonio and Robert E. Hall. (1996) “Productivity and the Density of Economic Activity.” *American Economic Review*. 86(1): 54-70.Chi, Guangqing and Bishal Kasu (2015). *Economic and Demographic Impacts of Passenger Rail Systems: The Impact of Intercity Passenger Rails on Population and Employment Change in the United States, 2000–2010*. University Park PA: Population Research Institute, and Social Science Research Institute, Pennsylvania State University

Deka, Devajyoti, Michael Lahr, and Thomas Marchwinski, and Maia de la Calle (2015). Economic Impacts of Rail Transit on Recreational Shore Communities–The Case of the North Jersey Coast Line. *Transportation Research Board 94th Annual Meeting*, no. 15-1546.

Glaeser, Edward. (2011). *The Triumph of the City: How Our Greatest Invention Makes Us Richer, Smarter, Greener, Healthier and Happier*. New York: NY: Penguin Press.

Kennedy, Christopher A. (2002). A comparison of the sustainability of public and private transportation systems: Study of the Greater Toronto Area." *Transportation* 29(4): 459-493.

Nelson, Arthur C. (2013). *Reshaping Metropolitan America: Development Trends and Opportunities to 2030*. Washington, DC: Island Press, 2013.

Nelson, Arthur C. (2014). *Foundations of Real Estate Development Finance: A Guide for Public-Private Partnerships*. Washington, DC: Island Press.

Seskin, Sam, Robert Cervero, Jeffrey Zupan, and Jane Howard (1996). *Transit and urban form*. Washington, DC: Federal Transit Administration.

Utah Transit Authority (2014). Clearfield Station: Urban Design Plan, Standards and Guidelines. Salt Lake City UT: Utah Transit Authority retrieved October 30, 2017 from

http://www.clearfieldcity.org/UserFiles/Servers/Server_58896/File/Departments/Planning%20&%20Zoning/Current%20Projects/Clearfield%20Station%20MDP%20-%20FINAL%20adopted%203.11.14.pdf

Voith, Richard. (1998). Parking, Transit, and Employment in a Central Business District, *Journal of Urban Economics* 44(1): 43-48.

CRT Route Map Images

To the editor:

The following images may be included but are not strictly necessary.

Image 1
Tri Rail route map
Source: www.tri-rail.com/train-schedules/System_Map_MIC_Construction_2012_Edited.pdf

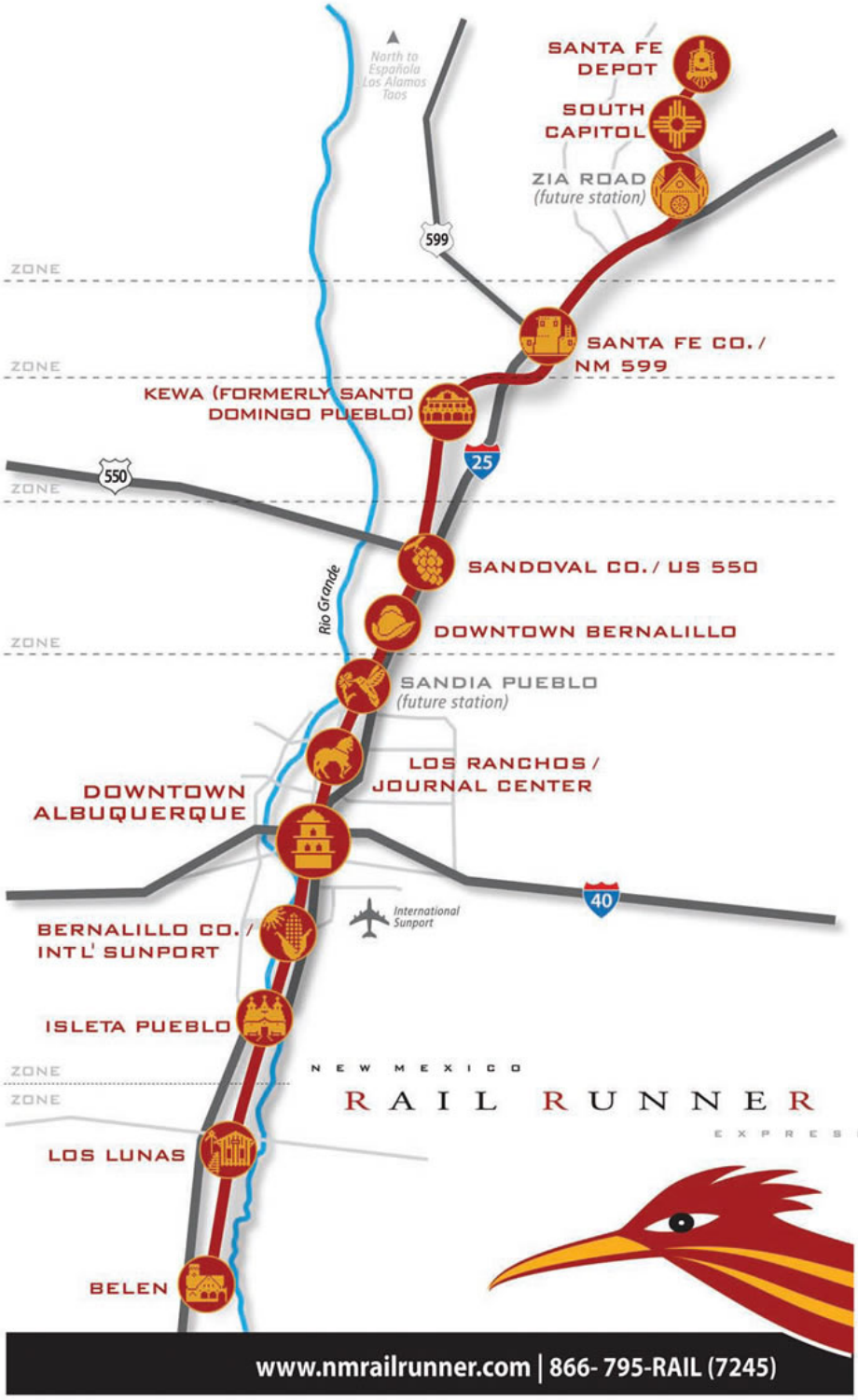

Image 2
Rail Runner route map
Source: http://riometro.org/images/general/system-map-rr.jpg

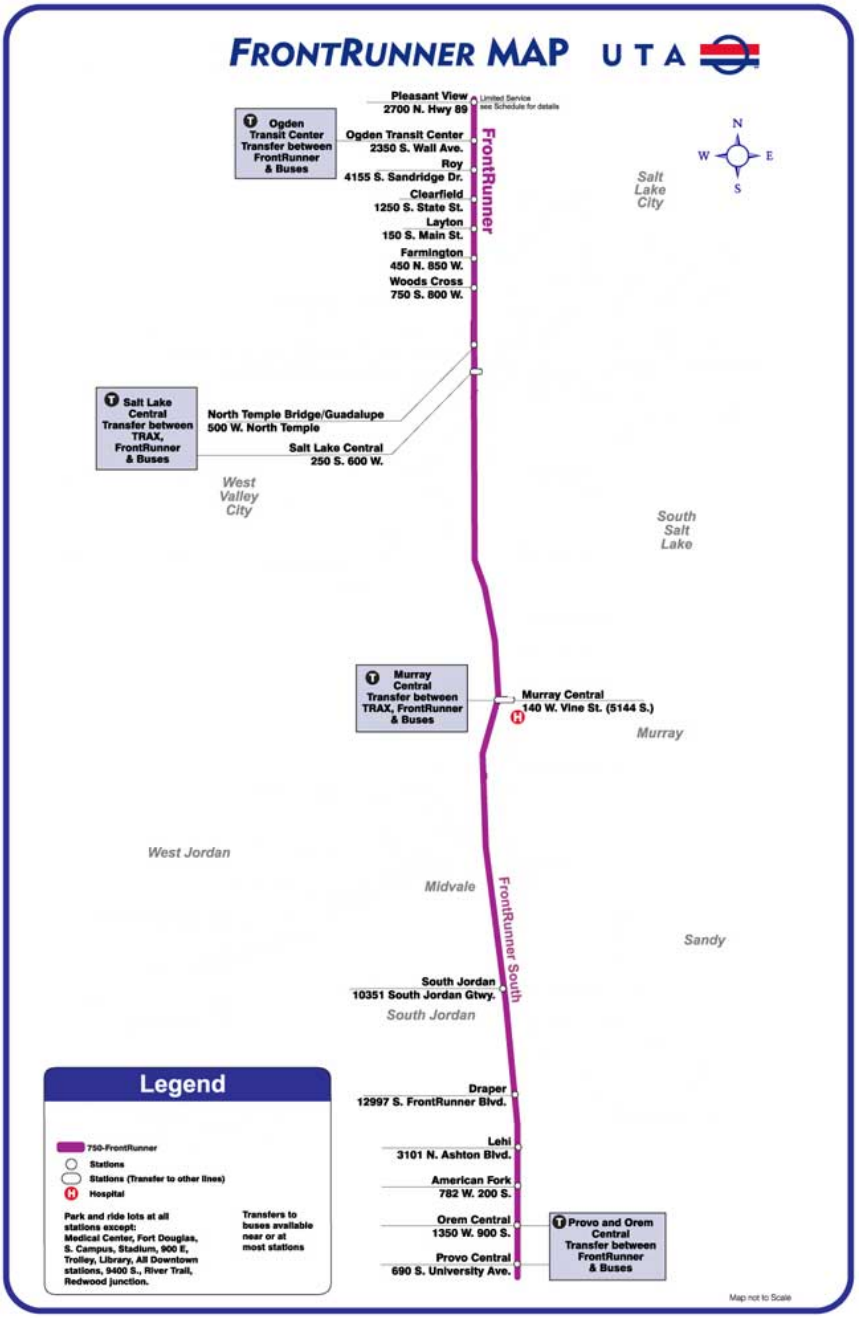

Image 3

FrontRunner route map

Note: The study area extends from Ogden to Salt Lake City.

Source:

http://68.media.tumblr.com/7cc4cd6d5b4b3eddb8537361e056deed/tumblr_mlczfqedvs1r54c4oo2_1280.jpg

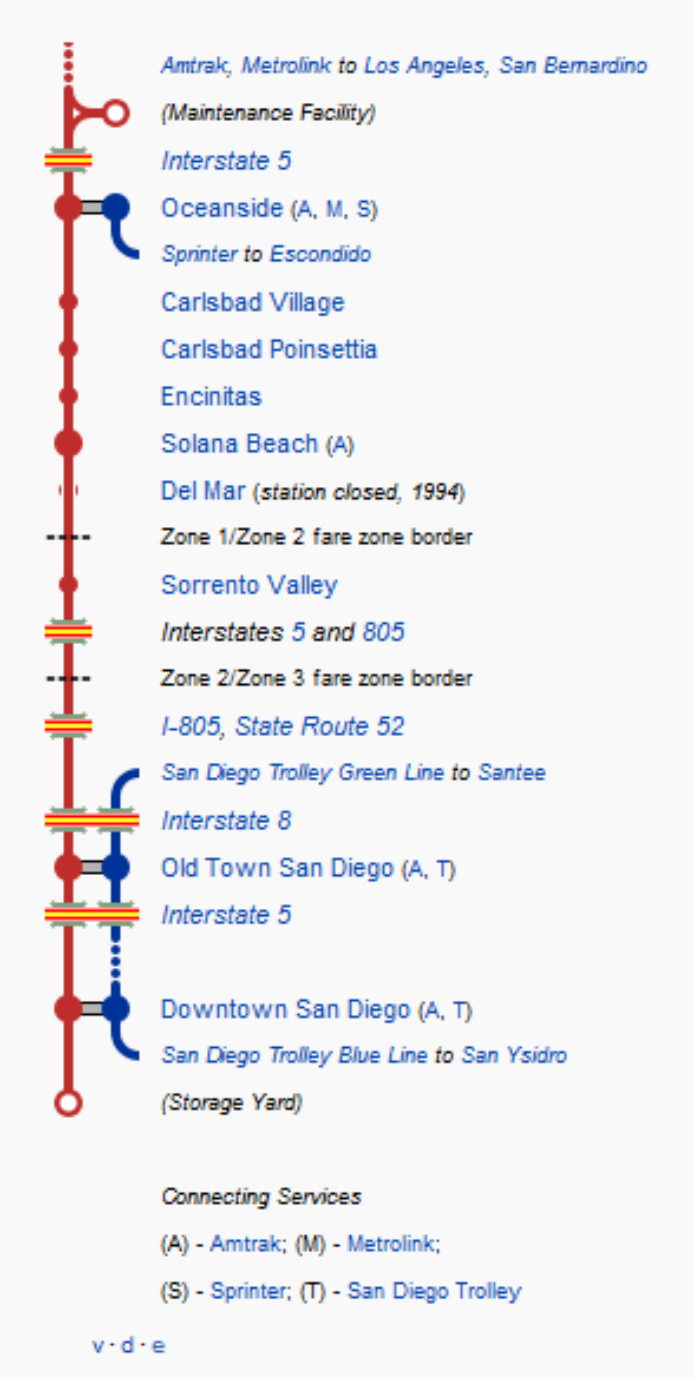

Image 4
Coaster route map
Source: http://www.sandiegoasap.com/gfx/coastal-station-stop-points.png

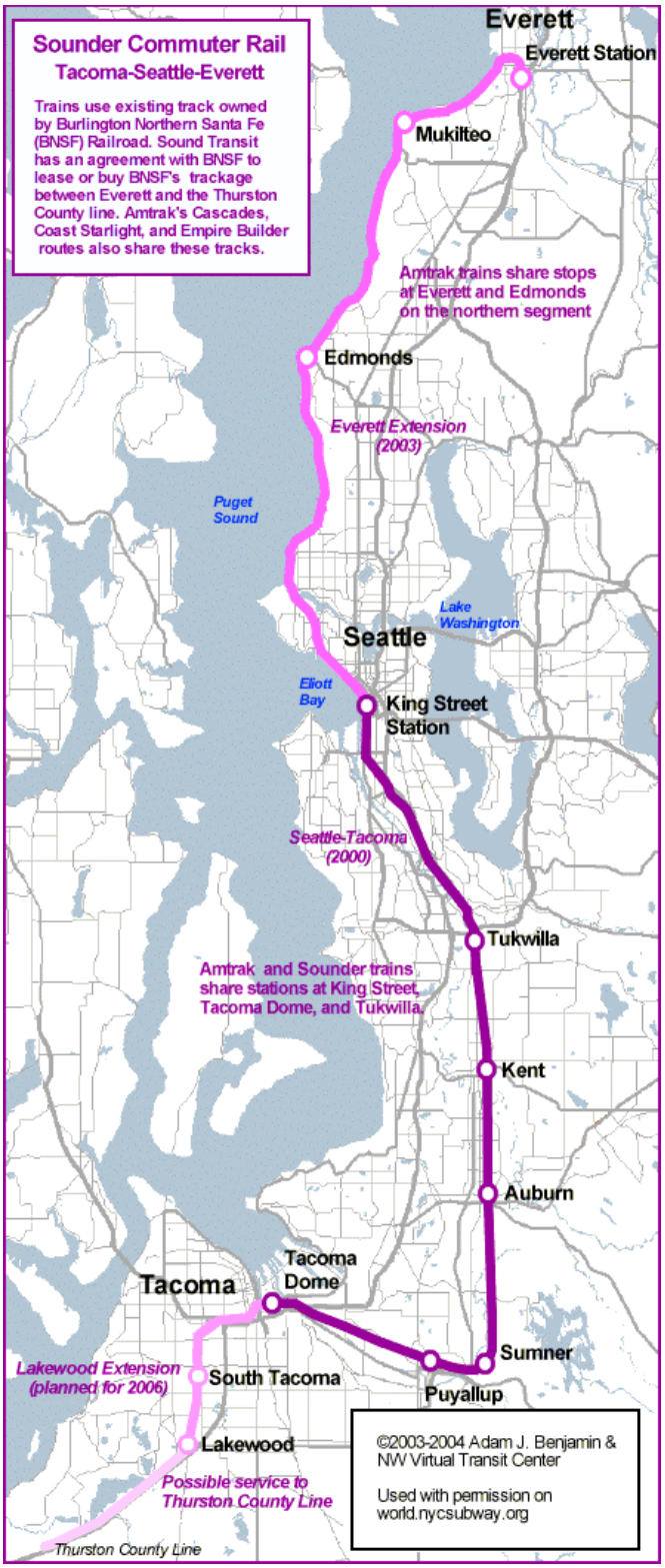

Image 5
Sounder route map
Source: http://nycsubway.org.s3.amazonaws.com/images/maps/soundermap.gif