Transit and Wages
The Association between Wages and Transit Station Proximity over Time and with Respect to the Great Recession

Arthur C. Nelson
Professor of Planning and Real Estate Development
School of Landscape Architecture and Planning
College of Architecture, Planning and Landscape Architecture
University of Arizona
1040 N. Olive Road
Tucson, AZ 85719
V: 520.621.4004
E: acnelson@email.arizona.edu

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Abstract
Literature implies but does not provide much evidence to support or refute the proposition that fixed guideway transit systems will facilitate the location of lower-, middle- and upper-wage jobs near them. We help close this gap in literature. Using shift-share analysis, we first explore shifts in the share of lower, middle and upper wage jobs toward light rail, streetcar, commuter rail, and bus rapid transit stations over time. While many individual systems saw the regional share of jobs in one or more categories shift to areas within 0.5 miles of a transit station, for the most part results do not support the proposition over time. A second analysis entailed dividing time periods into those before the Great Recession and after, leading to very interesting outcomes. It is as though before the recession, areas away from transit stations were hemorrhaging jobs generally and across most wage categories. We surmise the reason is sustained dispersal of new development during that period. However, during the Great Recession and recovery, jobs in most wage categories shifted toward transit stations but in different ways. Upper and middle wage jobs shifted toward light rail and streetcar transit stations perhaps pushing lower wage jobs out. In contrast, lower wage jobs shifted toward bus rapid transit stations. For the most part, commuter rail stations lost regional share of jobs in all wage categories. We offer implications for transit planning and investment.

Introduction

Scholars and civil rights organizations assert that America's transportation policies perpetuate social and economic inequity. Sanchez and Brenman (2008), for instance, show that highway-based transportation investments limit the access of low-income and people-of-color to education, jobs and services. Echoing their concern is the Leadership Conference Education Fund (Leadership Conference Education Fund, 2011a, 2011b), a civil rights organization which asserts that low-wage jobs are inaccessible to those who are transit-dependent. Public transit is seen as one way to connect people to low-wage jobs, reduce poverty, increase employment and help achieve social equity goals (Blumenberg et al. 2002; Blumenberg and Manville, 2004; Sen et al. 1999). But does transit deliver on this promise?

This article begins with a review of literature on the relationship between transit and change in jobs by wage level. Using literature as a guide, we review our study design, subjects, data and methodology. We then evaluate the change in jobs by wage level between light rail transit (LRT), streetcar transit (SCT), commuter rail transit (CRT), and bus rapid transit (BRT) systems. Figures 1 through 4 illustrate each mode visually. In particular, our analysis assesses the change of jobs by broad income category (lower, middle and upper) from a baseline year for each system (see below for details) to 2011, the most recent year for which data were available for our study. This analysis is applied to 10 LRT systems, four SCT systems, five CRT systems, and 10 BRT lines serving eight metropolitan areas. We then apply our analysis to systems operating before the Great Recession and during the recession as well as recovery. It includes seven LRT systems, three SCT systems, four CRT systems, and six BRT lines serving four metropolitan areas. We offer implications for transit planning policy tailored generally to each type of system.

Figure 1
Dallas Area Rapid Transit light rail
Source: https://www.dart.org/images/darttrainatstation.jpg

Figure 2
City of Portland, Oregon, streetcar
Source: http://opb-media.s3.amazonaws.com/news/legacy/uploads/images/articles/011112_streetcar_gallery_full_export.jpg

Figure 3
Utah Transit Authority Frontrunner commuter rail
Source: http://www.rideuta.com/uploads/commuterRailHighRes.jpg

Figure 4
Lane County Transit Emerald Express bus rapid transit serving Eugene-Springfield, Oregon
Source: National Bus Rapid Transit Institute

Literature Review

Fan et al. (2012) provide an especially pertinent review of literature addressing our question. Citing Kain's (1968; 1992) pioneering work, they observe that the urban poor are harmed for want of affordable housing near job opportunities and reliable public transit to connect them to those jobs (see also Blumenberg et al., 2002; Sanchez, 2008).

A limiting factor in gaining access to lower-wage jobs is that the income from such jobs is often insufficient to buy and operate an automobile to access those jobs in the first place. Sanchez (1999) and Sanchez et al. (2004) note that it is difficult for public transit to reduce the spatial mismatch between lower-income jobs and residential options for a number of reasons. One problem is that bus systems often do not provide sufficient service for the kinds of working hours that make low-skill/entry-level, temporary, and evening/weekend shift-work jobs feasible (Giuliano, 2005). Fixed-guideway transit systems—if they are more rapid and reliable than conventional buses—may be one way to connect lower-income workers from their lower-income neighborhoods to lower-wage jobs (Fan et al. 2012).

Unfortunately, there are very few empirical studies showing whether and the extent to which fixed-guideway transit systems produce these outcomes. It seems that just as many studies report positive outcomes (Ong and Houston, 2002; Ong and Miller, 2005; Kawabata, 2002; 2003) as negative ones or those with ambiguous associations (Thakuriah and Metaxatos, 2000; Cervero et al. 2002; Bania et al., 2008).

Two recent studies have further shown different results. In the first, McKenzie (2013) studies neighborhoods in Portland, OR, to identify differences in transit access for those neighborhoods. Using 2000 Census and five-year (2005–2009 American Community Survey) data, McKenzie compares changes in levels of transit access across neighborhoods based on their concentrations of blacks, Latinos and poor households. The study found that neighborhoods with a high Latino concentration have the poorest relative access to transit, and that transit access declined for black and Latino-dominated neighborhoods. McKenzie did not evaluate job growth along transit lines serving or near those neighborhoods, however.

The other is the study by Fan et al. (2012). They find that residential proximity to light rail stations and bus stops offering direct connection to rail stations are associated with statistically significant gains in accessibility to low-wage jobs. On the other hand, their analysis covered only a short period of time before the Great Recession: 2004 to 2007 but not since. The Center for Transportation Research at the University of Minnesota (Fan, et al., 2012) goes further by reporting that between 2004, when the Hiawatha Line LRT line opened, and 2007, just before the Great Recession, low-wage jobs accessible within 30 minutes of transit within Hennepin County grew by 14,000, with another 4,000 where the LRT was accessed directly by bus.

In sum, there are no studies showing the relationship between fixed-guideway transit systems and wages differentiated by lower, middle and upper categories. Our article helps to close this gap in the literature. We also pose implications for transit investment policy and planning.

Research Design, Study Areas and Data

Our principal interest is measuring the change in share of lower-wage jobs before the Great Recession and during the recovery associated with BRT stations. Doing so will also require measuring the change in share of other wage categories such as middle- and upper-wage jobs. The analysis requires wage-related employment data at a reasonably small geographic scale. Both needs are met by the Longitudinal Employment-Household Dynamics (LEHD) database.

We first convert the LEHD data into wage categories. As we wish to compare change of jobs between geographic units, those jobs should be stationary; that is, jobs should be based mostly at a single location in urbanized areas. We therefore exclude agriculture, mining and construction jobs. We also want to create categories of jobs based on wages. We estimate average annual wages per worker from the County Business Patterns (for 2013) and apportion the nation's jobs into roughly equal thirds, defined as lower-wage, middle-wage and upper-wage jobs by North American Industrial Classification System (NAICS) sector, excluding those noted above. Table 1 shows our allocation.

Table 1
Allocation of Jobs by Lower-, Middle- and Upper-Wage Category

NAICS	Description	Mean Annual Wages, 2013	Wage Category	Share of Jobs
44	Retail Trade	$25,779	Lower	
71	Arts, Entertainment and Recreation	$32,188	Lower	
72	Accommodation and Food Services	$17,453	Lower	
81	Other Services (except Public Administration)	$29,021	Lower	
	Weighted Mean Wages and National Share of Jobs		***$23,696***	***31%***
48	Transportation and Warehousing	$45,171	Middle	
53	Real Estate and Rental and Leasing	$46,813	Middle	
56	Administrative, Support, Waste Mgmt., Remediation	$35,931	Middle	
61	Educational Services	$35,427	Middle	
62	Health Care and Social Assistance	$44,751	Middle	
	Weighted Mean Wages and National Share of Jobs		***$41,723***	***35%***
22	Utilities	$94,239	Upper	
31	Manufacturing	$54,258	Upper	
42	Wholesale Trade	$65,385	Upper	
51	Information	$83,677	Upper	
52	Finance and Insurance	$88,677	Upper	
54	Professional, Scientific and Technical Services	$75,890	Upper	
55	Management of Companies and Enterprises	$105,138	Upper	
	Weighted Mean Wages and National Share of Jobs		***$70,490***	***34%***

Source: County Business Patterns, 2013.

We use shift-share analysis as our quasi-experimental method. Shift-share analysis assigns the change or shift in the share or concentration 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 our case, where we want to see whether there are intra-metropolitan shifts in the share of jobs by sector, our region is the central county of the metropolitan area. 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. Our local areas are block groups with centroids within 0.50 mile of the nearest light rail transit (LRT), streetcar transit (SCT), commuter rail transit (CRT) and bus rapid transit (BRT) station; we call these the “Station Areas”. 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. Our “industries” in this context are the sector-based wage categories. Our analytic method is similar to that used by Nelson et al. (2013). The shift-share approach we use is described below, following the notation format used by the Carnegie Mellon Center for Economic Development (undated):

$$\mathbf{SS_i = CC_i + SM_i + Station\ Area}$$

Where,

SS_i = Shift-Share

CC_i = Central County share

SM_i = Sector Mix

Station $Area_i$ = Transit Station Area shift

The CC share measures by how much total employment in a 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 Station Area would have also grown by 10 percent if there is no Station Area effect. The Sector Mix (SM) identifies fast-growing or slow-growing economic sectors in a Station Area based on the CC growth rates for the individual economic sectors. For instance, a BRT station area with an above-average share of the metropolitan area's high-growth sectors would have grown faster than a Station Area with a high share of low-growth sectors. The Station Area shift, also called the "competitive effect," is the most relevant component; it identifies a Station Area's leading and lagging sectors. The competitive effect compares a Station Area's growth rate in a given economic sector with the growth rate for that same sector at the metropolitan area. A leading sector is one where that sector's Station Area growth rate is greater than its metropolitan area growth rate. A lagging sector is one where the sector's Station Area growth rate is less than its CC growth rate.

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

$$\mathbf{CC} = ({}_{i}\text{Station Area}^{t-1} \bullet CC^{t} / CC^{t}\text{-}1)$$

$$\mathbf{SM} = [({}_{i}\text{Station Area}^{t-1} \bullet {}_{i}CC_{t} / {}_{i}CC^{t-1}) - CC]$$

$$\mathbf{Station\ Area} = [{}_{i}\text{Station Area}^{t-1} \bullet ({}_{i}\text{Station Area}^{t} / {}_{i}\text{Station Area}^{t-1} - {}_{i}CC^{t} / {}_{i}CC^{t-1})]$$

Where:

iStation Area^{t-1}	=	number of jobs in the Station Area sector (i) at the beginning of the analysis period (t-1)
iStation Area^{t}	=	number of jobs in the Station Area in sector (i) at the end of the analysis period (t)
CC^{t-1}	=	total number of jobs in the central county at the beginning of the analysis period (t-1)
CC^{t}	=	total number of jobs in the central county at the end of the analysis period (t)
iCC^{t-1}	=	number of jobs in the central county in sector (i) at the beginning of the analysis period (t-1)

iCC^t = number of jobs in the central county in sector (i) at the end of the analysis period (t)

We caution that shift-share analysis by itself does not necessarily ascribe a causal relationship, merely an associative one.

We conduct two sets of analyses. First, we use shift-share analysis to estimate the shift in share of jobs by income level between the year a system opened (or 2002, whichever is earlier) to 2011 for each system by mode. We then use shift-share analysis to compare the shift in share of jobs for systems launched in 2005 or earlier for pre-recession (2002-2007) and recession-recovery (2007-2011) periods.

Results

For brevity, we report only the "industry shift" part of the shift-share analysis for each of the transit systems evaluated overall, and then during the recession and recovery. We call this the *Station Area Share*.

Overall Results

Tables 2 through 5 report overall results for each of the LRT, SCT, CRT and BRT systems evaluated and as groups, respectively. With some exceptions, Station Areas in nearly all LRT and CRT transit systems lost share of jobs relative to their regions (central counties). Half the SCT systems also saw losses, but Seattle and Tampa gained considerable share. For LRT systems as a whole, Station Areas lost the largest share of jobs in the middle-income category, followed by lower-wage jobs. For SCT Station Areas, lower-income jobs increased share substantially, followed by higher-income jobs. Station Areas served by CRT systems lost large shares of lower- and upper-income jobs. BRT Station Areas lost jobs as a whole but gained shares in lower- and upper-wage categories, though losing substantial share in middle-wage jobs. Overall, Station Areas for each type of system lost share of regional jobs though SCT and BRT systems gained share of lower- and upper-wage jobs.

We turn next to exploring changes in the share of jobs before the recession and then during recession and recovery.

Table 2
LRT Station Area Share of Job Shifts by Wage Category

LRT System	Station Area Share of Lower Wage Job Shift	Station Area Share of Middle Wage Job Shift	Station Area Share of Upper Wage Job Shift	Station Area Share of Total Job Shifts
Charlotte	1,519	1,721	244	3,485
Dallas	(4,364)	(9,000)	(5,017)	(18,381)
Denver	(464)	(727)	897	(294)
Houston	(11,076)	(32,419)	(11,074)	(54,569)
Phoenix	(1,361)	(2,418)	(1,239)	(5,018)
Portland	(1,579)	(15,775)	(182)	(17,537)
Sacramento	597	491	879	1,967
Salt Lake City	(1,612)	(670)	(1,351)	(3,632)
San Diego	(5,107)	1,962	(1,053)	(4,197)
Twin Cities	(948)	2,397	3,369	4,819
Composite	(22,612)	(51,679)	(10,367)	(84,658)

Note: Analysis extends from 2002 or when the system was commenced, whichever is the earlier, to 2011. “Composite” is not the sum of the respective columns but rather a shift-share analysis including all station areas for all systems compared to the central counties for all systems.

Table 3
SCT Station Area Share of Job Shifts by Wage Category

Streetcar System	Station Area Share of Lower Wage Job Shift	Station Area Share of Middle Wage Job Shift	Station Area Share of Upper Wage Job Shift	Station Area Share of Total Job Shifts
Portland	(4,092)	(14,963)	(3,057)	(22,111)
Seattle	7,057	3,967	(2,632)	8,392
Tacoma	(8,433)	(6,107)	(7,045)	(21,584)
Tampa	8,922	4,172	12,969	26,063
Composite	6,295	(11,194)	2,853	(2,046)

Note: Analysis extends from 2002 or when the system was commenced, whichever is the earlier, to 2011. "Composite" is not the sum of the respective columns but rather a shift-share analysis including all station areas for all systems compared to the central counties for all systems.

Table 4
CRT Station Area Share of Job Shifts by Wage Category

CRT System	Station Area Share of Lower Wage Job Shift	Station Area Share of Middle Wage Job Shift	Station Area Share of Upper Wage Job Shift	Station Area Share of Total Job Shifts
Albuquerque-Santa Fe	(2,114)	(2,328)	(401)	(4,842)
Miami-South Florida	(3,281)	1,075	(1,118)	(3,324)
Salt Lake City	3,917	2,004	1,407	7,329
San Diego	(2,399)	(1,409)	(3,102)	(6,911)
Seattle	(1,042)	(1,758)	(589)	(3,390)
Composite	(5,413)	(1,684)	(6,240)	(13,337)

Note: Analysis extends from 2002 or when the system was commenced, whichever is the earlier, to 2011. "Composite" is not the sum of the respective columns but rather a shift-share analysis including all station areas for all systems compared to the central counties for all systems.

Table 5
BRT Station Area Share of Job Shifts by Wage Category

BRT Line	Station Area Share of Lower Wage Job Shift	Station Area Share of Middle Wage Job Shift	Station Area Share of Upper Wage Job Shift	Station Area Share of Total Job Shifts
Pittsburgh - South (1977)	117	(230)	(3,870)	(3,993)
Pittsburgh - East (1983)	27	1,928	(473)	1,501
Pittsburgh - West (2000)	1,760	(3,319)	748	(1,013)
Las Vegas - MAX (2004)	4,665	(11,797)	1,782	(1,317)
Kansas City - Main St. (2005)	(271)	945	(792)	(118)
Los Angeles - Orange (2005)	(134)	(7,802)	(901)	(8,618)
Eugene-Springfield - EmX (2007)	289	(214)	1,895	2,537
Cleveland - Health Line (2008)	(296)	(302)	(276)	(748)
New York City - Bronx (2008)	(159)	5,982	1,443	7,387
Salt Lake City - MAX (2008)	282	1,459	1,065	2,827
Composite	9,963	(14,489)	2,581	(546)

Note: Analysis extends from 2002 or when the system was commenced, whichever is the earlier, to 2011. “Composite” is not the sum of the respective columns but rather a shift-share analysis including all station areas for all systems compared to the central counties for all systems.

Pre-Recession Compared to Recession-Recovery Shifts in Shares of Jobs by Wage Category

In this analysis, we compare shifts in the share of jobs by wage category for systems that were operating at least since 2005. This applies to all seven LRT and nearly all SCT and CRT systems (Seattle and Salt Lake City are excluded, respectively), but only six of 10 BRT systems. Shift-share analysis is applied to the period before the recession (from 2002 or when systems opened to 2007) and then during the recession/recovery period (from 2007 to 2011). Tables 6 through 9 report results for LRT, SCT, CRT and BRT systems, respectively. Pre-recession and recession/recovery Station Area shifts of job share by wage categories are illustrated in figures 5 through 8, respectively. Results are intriguing.

For the most part, Station Areas for nearly all systems lost share of jobs before the recession, with the exception of SCT systems which essentially retained their share of regional job change. During the recession and recovery, however, all systems gained share of jobs. CRT systems, which lost share during both time periods, lost a smaller share in the recession/recovery period. We will discuss results for each system.

LRT systems saw the most dramatic turn-around between the pre-recession and recession/recovery periods going from losing regional share of jobs for all wage categories to gaining share (see Table 6). One reason may be that because most systems expanded throughout the 2000s, more territory became accessible to LRT stations. This could be an indirect cause-and-effect relationship because our measurement included all station locations existing in 2011 even if they did not exist as far back as 2002. In effect, jobs would have been added to a station area after the station was built, thereby showing a shift in regional share of jobs from before the station was opened to after. Another explanation is that before the recession, the regional economic structure favored dispersion of development into lower-cost areas—“urban sprawl”—

while the recession and recovery period saw more distant locations lose value as closer-in locations and especially those near transit stations gained value. The market may be hedging its bets against future recessions by choosing more resilient locations. Future research will explore these nuances.

The observation that station areas may command higher values is indirectly borne out in the shift of share of jobs by wage category. While the negative shift of lower-wage jobs before the recession was reversed and the negative shift of middle-wage jobs was lessened during recession/recovery, upper-wage jobs shifted positively and dramatically. This is illustrated in Figure 5. It seems that LRT station areas attract firms able to afford upper-wage jobs, implying that those firms are able to outbid firms employing lower- and middle-wage jobs, and thus real estate values are higher closer to transit stations.

Table 6
LRT Station Area Share of Job Shifts by Wage Category before and after the Great Recession

LRT System	Station Area Share of Lower Wage Job Shift	Station Area Share of Middle Wage Job Shift	Station Area Share of Upper Wage Job Shift	Station Area Share of Total Job Shifts
		Pre-Recession		
Dallas	(2,402)	(4,973)	(7,965)	(15,340)
Denver	(1,245)	(114)	3,192	1,833
Portland	(628)	(169)	(16,821)	(17,618)
Sacramento	(11)	(103)	311	197
Salt Lake City	(562)	84	(2,630)	(3,108)
San Diego	(1,606)	2,882	(3,146)	(1,870)
Twin Cities	(2,760)	(3,698)	(6,255)	(12,714)
Composite	(10,084)	(9,587)	(34,513)	(54,183)
		Recession-Recovery		
Dallas	(923)	637	(2,549)	(2,835)
Denver	(474)	(387)	(1,862)	(2,722)
Portland	1,153	(25)	1,407	2,535
Sacramento	73	358	1,414	1,844
Salt Lake City	(233)	(150)	(352)	(736)
San Diego	(1,547)	(605)	(686)	(2,837)
Twin Cities	315	2,244	5,780	8,338
Composite	2,722	(3,465)	45,643	44,900

Note: Analysis extends from 2002 or when the system was commenced, whichever is the earlier, to 2011. “Composite” is not the sum of the respective columns but rather a shift-share analysis including all station areas for all systems compared to the central counties for all systems.

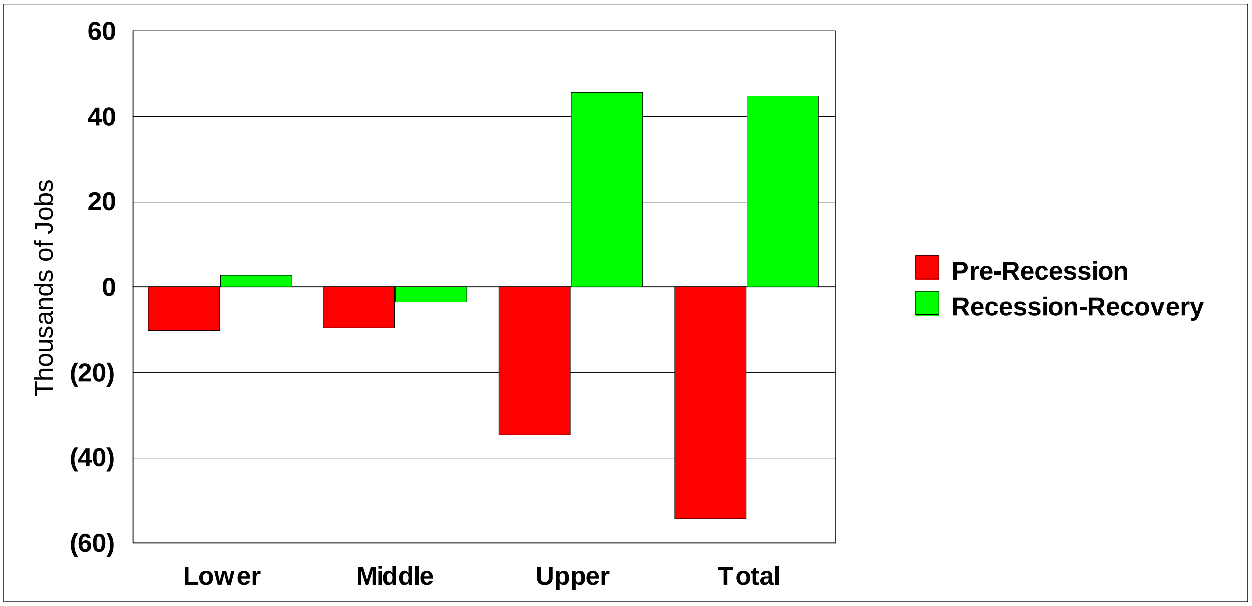

Figure 5
Change in Share of Jobs by Wage Category for LRT Station Areas Compared to their Metropolitan Areas during Pre-Recession and Recession-Recovery Periods

Results for SCT systems are much more uneven (see Table 7 and Figure 6). At first glance, it would appear that Portland's SCT system is not effective in attracting jobs relative to its region. A key reason is that into the 2000s, the Portland streetcar was built in major development areas that displaced thousands of jobs through demolition of warehousing and older, low-rise nonresidential structures, replacing them with thousands of units in high-rise structures housing tens of thousands of new residents. Portland's streetcar success is associated with attracting new residents near SCT stations. Research is underway examining this aspect of the Portland streetcar.

In contrast, the Tacoma streetcar serves a very small area of downtown that is already built-out, and there have been few large-scale redevelopment projects—at least of the scale engaged by Portland. Jobs continue to be added through the Tacoma region, just not in the area served by the streetcar. In many ways, the Portland and Tacoma SCT systems are studies in contrasts: of large versus small scales, and extensive versus isolated redevelopment.

Tampa's streetcar system falls between these two extremes and offers important insights. Its route connects downtown and waterfront tourist areas with a gentrifying mixed-use area. It is lengthy, but was not associated with large-scale, planned redevelopment. It also saw substantial and positive shifts of job shares across all wage groups before the recession and during the recession/recovery period.

Table 7
SCT Station Area Share of Job Shifts by Wage Category before and after the Great Recession

Streetcar System	Station Area Share of Lower Wage Job Shift	Station Area Share of Middle Wage Job Shift	Station Area Share of Upper Wage Job Shift	Station Area Share of Total Job Shifts
		Pre-Recession		
Portland	(1,089)	(1,821)	(12,785)	(15,695)
Tacoma	(223)	(547)	1,053	283
Tampa	4,581	1,130	14,593	20,304
Composite	3,932	(1,862)	(271)	1,799
		Recession-Recovery		
Portland	47	(841)	(4,554)	(5,348)
Tacoma	(3,546)	(503)	(7,488)	(11,537)
Tampa	578	2,759	8,697	12,033
Composite	17,400	882	14,247	32,530

Note: Analysis extends from 2002 or when the system was commenced, whichever is the earlier, to 2011. “Composite” is not the sum of the respective columns but rather a shift-share analysis including all station areas for all systems compared to the central counties for all systems.

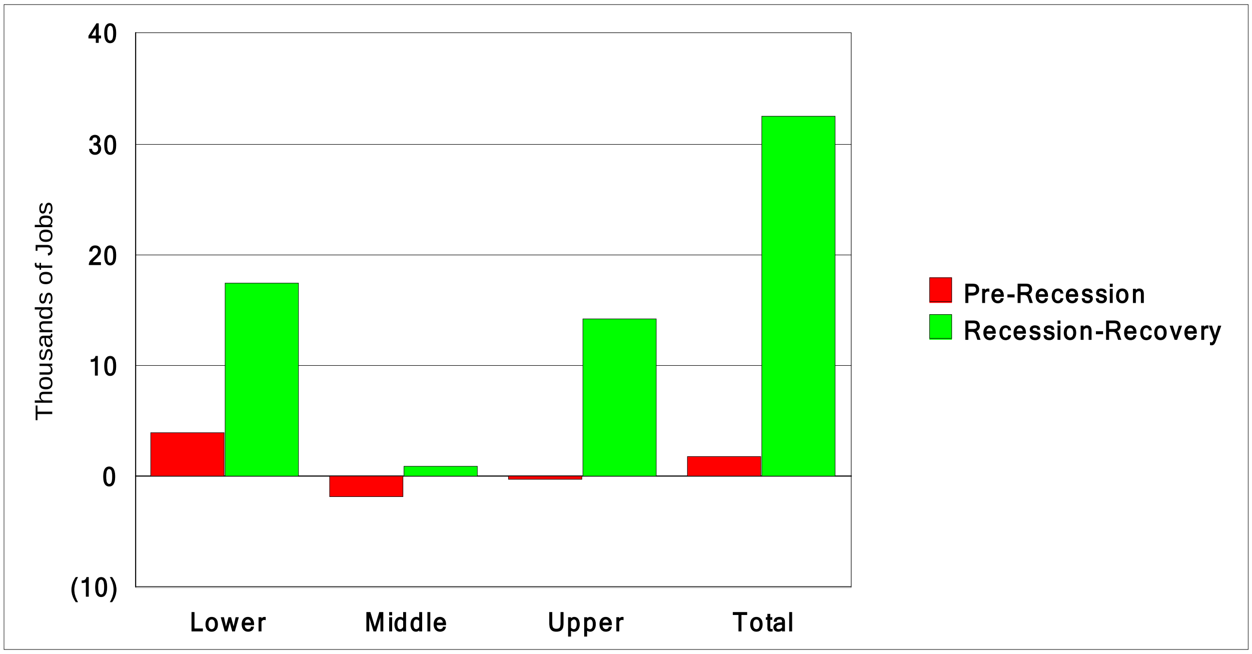

Figure 6
Change in Share of Jobs by Wage Category for SCT Station Areas Compared to their Counties during Pre-Recession and Recession-Recovery Periods

Results for CRT systems show either negative shifts of share or anemically positive ones (see Table 8 and Figure 7). We are not surprised. These four CRT systems use commercial freight lines routed through unattractive industrial areas. Moreover, CRT stations were not substantially designed for mixed use developments. From Table 4, however, we see that only the Salt Lake CRT system showed positive job shifts overall and across all wage categories. It opened in 2008 and since then has been associated with positive job shifts during the recession/recovery period. Although the CRT runs along commercial freight tracks, the Utah Transit Authority master-planned CRT stations to include mixed-use development and easy walking, biking and vehicle connections to nearby development. Future work will compare the role of CRT station-area planning in generating positive development outcomes.

Table 8
CRT Station Area Share of Job Shifts by Wage Category before and after the Great Recession

CRT System	Station Area Share of Lower Wage Job Shift	Station Area Share of Middle Wage Job Shift	Station Area Share of Upper Wage Job Shift	Station Area Share of Total Job Shifts
		Pre-Recession		
Albuquerque-Santa Fe	(2,588)	(2,655)	(411)	(5,654)
Miami-South Florida	(2,922)	1,582	2,083	743
San Diego	(1,572)	(2,017)	21	(3,568)
Seattle	(259)	(1,165)	(1,739)	(3,163)
Composite	(7,130)	(3,673)	(993)	(11,796)
		Recession-Recovery		
Albuquerque-Santa Fe	(5)	416	288	699
Miami-South Florida	(435)	(1,023)	(2,752)	(4,210)
San Diego	(671)	926	(3,596)	(3,341)
Seattle	327	278	(1,022)	(417)
Composite	(1,602)	654	(7,171)	(8,118)

Note: Analysis extends from 2002 or when the system was commenced, whichever is the earlier, to 2011. “Composite” is not the sum of the respective columns but rather a shift-share analysis including all station areas for all systems compared to the central counties for all systems.

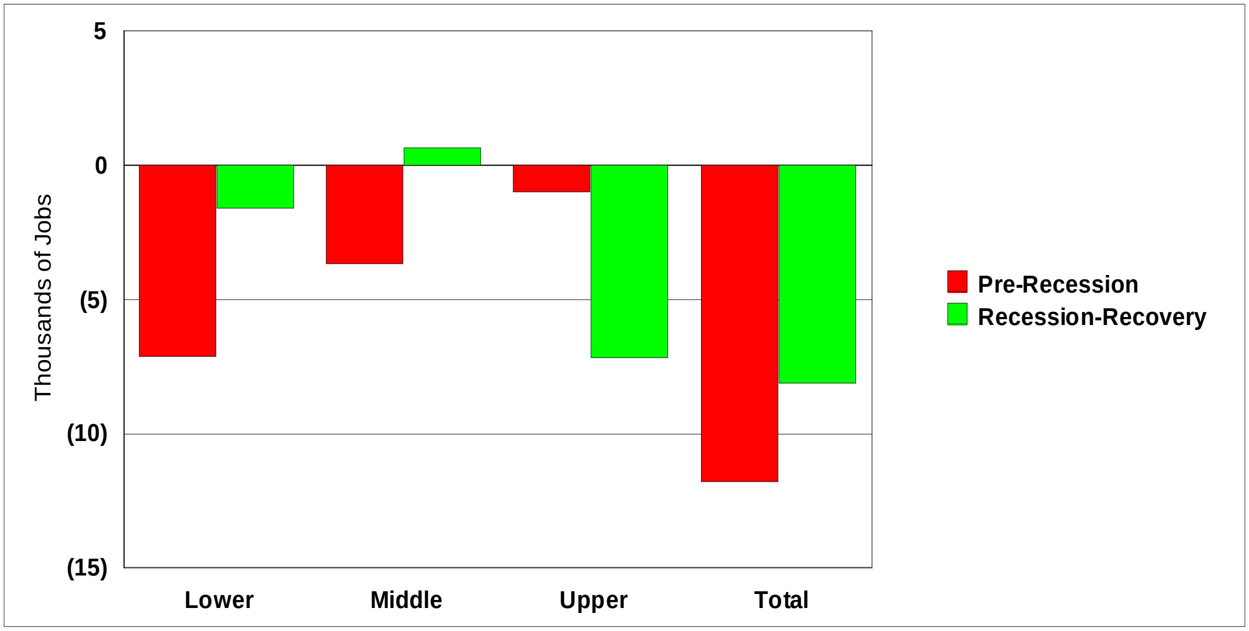

Figure 7
Change in Share of Jobs by Wage Category for CRT Station Areas Compared to their Metropolitan Areas during Pre-Recession and Recession-Recovery Periods

BRT results are reported in Table 8 and illustrated in Figure 8 and show different trends altogether. As with LRT systems, BRT lines lost share of regional jobs overall and among middle- and upper-wage jobs, though they gained share among lower-wage jobs. Also like LRT systems, they gained share overall as well as across most wage categories except the upper-wage. Indeed, LRT systems and BRT lines are almost reverse images, as positive change in share of upper-wage jobs dominated LRT results while positive change in share of lower- and middle-wage jobs dominated BRT lines (as upper-wage jobs lost share). We reason that BRT systems are installed along existing highway corridors dominated by lower- and middle-wage firms. Nonetheless, with few individual exceptions, BRT lines show positive shifts in regional shares of lower- and middle-wage jobs.

Table 9
BRT Station Area Share of Job Shifts by Wage Category before and after the Great Recession

BRT Line	Station Area Share of Lower Wage Job Shift	Station Area Share of Middle Wage Job Shift	Station Area Share of Upper Wage Job Shift	Station Area Share of Total Job Shifts
	Pre-Recession			
Pittsburgh - South	(265)	935	(2,574)	(1,986)
Pittsburgh - East	(195)	1,027	(390)	488
Pittsburgh - West	370	(3,382)	(1,064)	(4,365)
Las Vegas - MAX	(7)	(4,070)	(381)	(4,363)
Kansas City - Main Street	151	62	292	512
Los Angeles - Orange	(207)	1,207	(3,543)	(2,421)
Composite	362	(4,543)	(8,062)	(12,720)
	Recession/Recovery			
Pittsburgh - South	379	(858)	(1,605)	(1,968)
Pittsburgh - East	219	980	(134)	1,004
Pittsburgh - West	1,394	(964)	2,799	3,439
Las Vegas - MAX	4,669	1,723	(11,295)	2,431
Kansas City - Main Street	184	121	236	484
Los Angeles - Orange	(1,563)	(1,009)	(1,390)	(3,747)
Composite	6,436	4,993	(9,739)	2,858

Note: Analysis extends from 2002 or when the system was commenced, whichever is the earlier, to 2011. “Composite” is not the sum of the respective columns but rather a shift-share analysis including all station areas for all systems compared to the central counties for all systems.

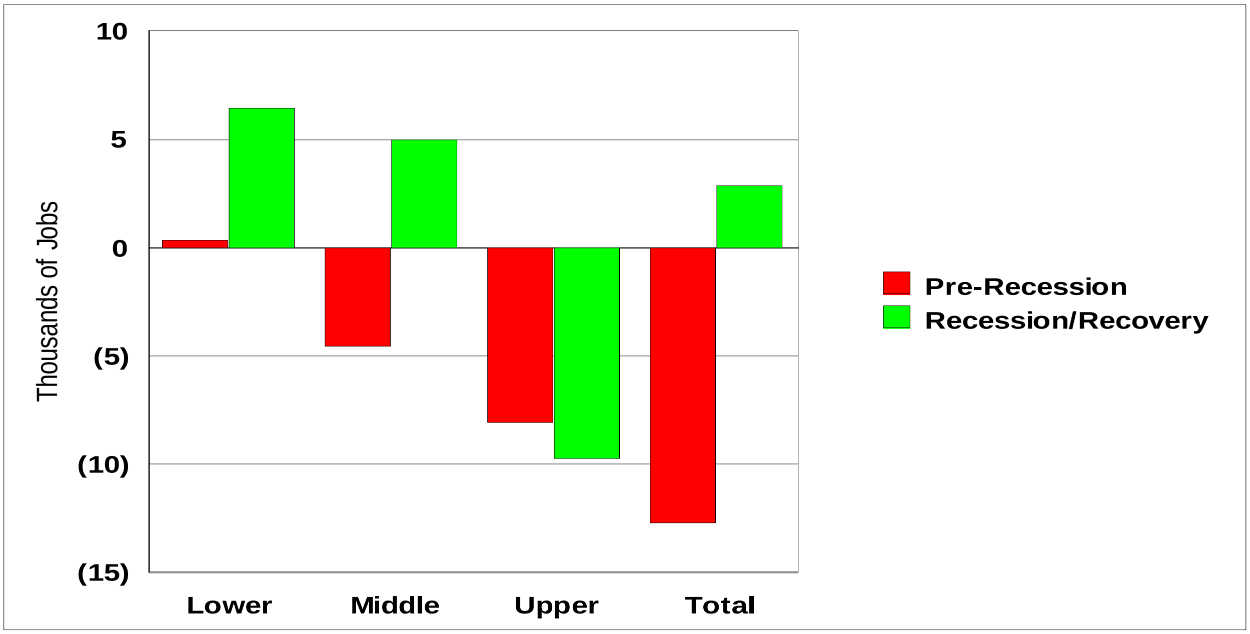

Figure 8
Change in Share of Jobs by Wage Category for BRT Station Areas Compared to their Central Counties during Pre-Recession and Recovery Periods

Summary and Implications

In this article, we used shift-share analysis to assess the association between LRT, SCT, CRT and BRT systems and lines and change in share of jobs over time and with respect to the period before the Great Recession as well as during the recession/recovery period. Results are mixed in interesting but unsurprising ways, especially between pre-recession and recession/recovery periods.

In the period before the Great Recession, America witnessed arguably the most sprawling period of its history. With readily available funds to borrow for development and a vast landscape on which to develop at low land prices (see Nelson 2013), arguably more land was developed during the 2000s than any other decade—even considering the last two years of that decade were frustrated by the Great Recession. But the recession may have reset the investment decision-making temper of real estate developers. Land is cheap at the fringes because it generates smaller rates of return and is also less resilient to economic shocks than closer-in locations, especially those accessible to transit facilities (Nelson 2014).

Before the Great Recession, America's investment in transit systems was not as effective in attracting new jobs as may have been hoped. Indeed, generally and across all wage groups, LRT and CRT systems, as well as BRT lines, lost share of jobs relative to their regions. Only SCT systems saw positive shifts overall though many individual systems also lost share.

The recession/recovery period saw a nearly complete reversal of pre-recession trends, excluding CRT systems. Overall and across all wage groups, and among nearly all individual systems, LRT station areas enjoyed positive shifts in the share of regional jobs—especially upper-wage jobs. Similarly, overall and across all wage groups, and among nearly all individual systems, BRT line areas enjoyed positive shifts in the share of regional jobs—especially lower-and middle wage jobs. SCT systems, which are limited to built-out downtowns and nearby areas, had mixed results which seem nuanced to unique, local circumstances. One reason for their overall success is that LRT, SCT and BRT investments are often made in conjunction with station area planning to encourage private investment. While station area planning may not have been a key part of CRT investments in the past, there is some evidence from the Salt Lake CRT system that such planning may generate positive shift in share of jobs.

We believe this article provides important evidence that fixed-guideway transit investments appear to be associated with overall positive shifts in regional job change as well as change in share of jobs across all wage categories favoring proximity to transit stations, though differentially among LRT, SCT, CRT and BRT systems.

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