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## But do Lower-Wage Jobs Follow? Comparing Wage-Based Outcomes of Light Rail Transit to Control Corridors

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1 **BUT DO LOWER-WAGE JOBS FOLLOW?**  
2 **Comparing Wage-Based Outcomes of Light Rail Transit to Control Corridors**

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42

43 **Abstract**

44 Literature suggests that rail transit improvements should be associated with more jobs and  
45 perhaps increasing share of jobs in a metropolitan area. Literature and some research also  
46 suggest that such improvements should increase the number of lower-wage jobs accessible to  
47 transit. In this paper, we assess both in the context of all 11 light rail transit systems built in  
48 metropolitan areas of fewer than eight million residents in the nation since 1981. Using census  
49 block-level job data over the period 2002 to 2011, we evaluate change in jobs and change in  
50 metropolitan area job share for all jobs, and lower- and upper-wage jobs for selected light rail  
51 transit (LRT) corridors and comparable corridors in each of these 11 metropolitan areas. Overall,  
52 we find little difference between the LRT and control corridors in both attracting new jobs and  
53 new lower-wage jobs, or in changing relative share of jobs compared to their metropolitan areas,  
54 though systems built since 2004 appear to have fared slightly better in both respects. We view  
55 these results as generally supportive of LRT employment-related objectives. Planning and policy  
56 implications are offered.

57

58 **Introduction**

59 Scholars and civil rights organizations assert that America’s transportation policies perpetuate  
60 social and economic inequity. Sanchez and Brenman (1) for instance, show that highway-based  
61 transportation investments limit low income and people-of-color access to education, jobs, and  
62 services. Echoing their concerns is the Leadership Conference Education Fund (2, 3), a civil  
63 rights organization which asserts that low-wage jobs are inaccessible to those who are transit-  
64 dependent. Public transit is seen as one way in which to connect people to low-wage jobs,  
65 reduce poverty, increase employment, and help achieve social equity goals (4, 5).

66

67 In recent decades, such transit has included light rail systems. Unlike bus systems, rail transit is  
68 viewed by the real estate market as a long-term commitment by government to providing a  
69 transit service. A growing number of studies report a relationship between new rail transit  
70 investment and job growth (6). But do rail transit investments attract lower-wage jobs?

71

72 Our paper addresses this question. It begins with a review of literature on the relationship  
73 between light rail transit (LRT) and lower-wage job change. We then evaluate the change in  
74 lower-wage jobs between selected LRT corridors and comparable (“control”) corridors for 11  
75 metropolitan areas with LRT systems in descriptive and economic base terms (using location  
76 quotients) over the 10-year period 2002 through 2011. For this, we use one-half mile buffers  
77 from the centerline of each corridor. We continue with half-mile circle analysis of lower-wage  
78 job change for about half those systems between 2007 – to year before the Great Recession – and  
79 2011 – two years into recovery. We conclude with implications.

80

81

82 **Literature**

83 Fan, Guthrie and Levinson (7) provide an especially pertinent review of literature addressing our  
84 question. Citing Kain's pioneering work (8) they observe that the urban poor are harmed for  
85 want of affordable housing near job opportunities and reliable public transit to connect them to  
86 those jobs (see also 9, 10).

87  
88 One limiting factor in gaining access to lower wage jobs is that the income from such jobs is  
89 often insufficient to buy and operate an automobile to access those jobs in the first place.  
90 Sanchez (11) and Sanchez, Shen, and Peng (12) note that it is difficult for public transit to  
91 reduce the spatial mismatch between lower income jobs and residential options for a  
92 number of reasons. One problem is that bus systems often do not provide sufficient service  
93 for the kinds of working hours that make low-skill/entry-level, temporary, and  
94 evening/weekend shift-work jobs feasible (13). Public transit, especially if it is more rapid and  
95 reliable than conventional buses – a feature of LRT systems – is seen as a way to connect lower  
96 income urban workers from their lower income neighborhoods to lower-wage jobs (7).

97  
98 Unfortunately there are very few empirical studies showing whether and the extent to which LRT  
99 generates these outcomes. It seems that just as many studies show a positive outcome (14, 15,  
100 16) as there which show small or ambiguous associations (17, 18, 19).

101  
102 Two recent studies have further shown different results. In the first, McKenzie (20) studies  
103 neighborhoods in Portland, Oregon to identify differences in transit access for those  
104 neighborhoods. Using 2000 Census and 5-year 2005–2009 American Community Survey  
105 data, McKenzie compares changes in levels of transit access across neighborhoods based  
106 on their concentrations of blacks, Latinos, and poor households. The study found that  
107 neighborhoods with high Latino concentration have the poorest relative access to  
108 transit and that transit access declined for black and Latino-dominated neighborhoods.  
109 McKenzie did not evaluate job growth along transit lines serving or near those  
110 neighborhoods, however.

111  
112 The second is the study by Fan, Guthrie and Levinson (7). They find that residential  
113 proximity to light rail stations and bus stops offering direct connection to rail stations are  
114 associated with statistically significant gains in accessibility to low-wage jobs (Fan, Guthrie and  
115 Levinson: 29). On the other hand, their overall regression equations explained only about 20  
116 percent of the variation in change in low wage jobs between 2004 and 2007. The Center for  
117 Transportation Research at the University of Minnesota (2010) goes further by reporting that  
118 between 2004, when the Hiawatha Line LRT line opened, and 2007 just before the Great  
119 Recession low-wage jobs accessible within 30 minutes of transit within Hennepin County grew  
120 by 14,000 with another 4,000 where the LRT was accessed directly by bus.

121  
122 Nonetheless, the question remains: If light rail transit is provided, will lower-wage jobs  
123 necessarily follow as some may assume?

124  
125 **Research Design, Study Areas and Data**

126 As we are interested in know whether and the extent to which there are more lower-wage jobs  
127 locating along LRT corridors over time, we will use a quasi-experimental, longitudinal study

128 approach. We apply our analysis to 11 all LRT systems operating in metropolitan areas of fewer  
129 than eight million population: Charlotte (opened in 2007), Dallas (1996), Denver (1994),  
130 Houston (2006), Phoenix (2008), Portland (1986), Sacramento (1987), Salt Lake City (1999),  
131 San Diego (1981), Seattle (2009) and Twin Cities (2004).

132  
133 Unlike all other studies, we compare change in lower-wage jobs over time between treatment  
134 (LRT) and control corridors. Just because an LRT corridor experienced a change in jobs does not  
135 mean necessarily that the change would have occurred anyway along that corridor or relative to  
136 other corridors it would have seen more or fewer jobs.

137  
138 For each of the 11 LRT systems we match one LRT corridor with a control. Our criteria are:

- 139  
140       Within the same metropolitan statistical area;  
141       Equal length;  
142       Existing transit route;  
143       Direct with no doubling-back;  
144       Anchored on both ends (unless the original line was not);  
145       Anchors of equal magnitude; downtowns, transit centers, shopping centers, malls, etc.;  
146       Along a major corridor;  
147       Similar land use mix along the corridor where both corridors contain substantial  
148               commercial development;  
149       Conformity with existing rapid transit plans; and  
150       Similar relative nearness to a parallel freeway in both distance and degree.

151  
152 Given these overall criteria, there are operational considerations. Many of the metropolitan areas  
153 analyzed have only as single light rail corridor, dictating the selection. For metropolitan areas  
154 with more corridors, ones that began operation between 2002 and 2011 were preferred. When no  
155 such corridor was available, corridors between regional-scale use such as airports were avoided  
156 as representing major confounders.

157  
158 For comparable corridors, the emphasis was placed on creating control corridors that be viable as  
159 transit corridors. This meant that corridors were contiguous and followed a continuous existing  
160 right-of-way that was viable as a transit corridor. Availability of right-of-way was the primary  
161 concern, and this dictated either existing major roads or existing railway right-of-way. For the  
162 former, highways and major arterials were preferred. For the latter, this meant the majority of  
163 right-of-way needed to follow an existing rail corridor.

164  
165 For the Dallas DART system, the Red line was used as a transit corridor. The 29.3-mile light rail  
166 corridor opened in 1996, and runs from Parker road in Plano to Westmoreland. The comparable  
167 corridor follows an existing railroad corridor (one of the few not used for later DART lines).

168  
169 For the Denver, the RTD light rail's Southwest Corridor was used as the transit corridor. It is an  
170 8.7 mile corridor stretching from downtown Denver to Littleton. For a comparable corridor, the  
171 Northwest corridor, an existing rail corridor stretching from Denver Union station to Broomfield  
172 was used.

173

174 For the Portland MAX system, the yellow line corridor was used, running between Expo center  
175 and Portland State University. It is 5.8 miles long, and began operations in 2005. The  
176 comparable corridor is a parallel path to the yellow line, on the east side of I-5, along Albina  
177 Avenue, and then along Martin Luther King Boulevard for a similar length.

178  
179 For the Sacramento Regional Transit light rail, the Southern extension to the Blue line was used.  
180 The section is about 5.5 miles long, and began operations in 2003. The analysis portion runs  
181 from the southern beltway to Meadowview Road. The comparable corridor was a Southern  
182 Pacific railroad corridor running parallel to the line, characterized by similar types of land uses.

183  
184 For the Salt Lake TRAX system, the 400 South University line was used, running from  
185 downtown to the University of Utah. For a comparable corridor, 2100 South, a comparable  
186 arterial that also links into the rest of the TRAX system was used.

187  
188 For the San Diego Trolley, the Mission Valley East extension to the Green line was used. It  
189 stretches from Mission San Diego to La Mesa, and began operations in 2005. It stretches 19.4  
190 miles. As a comparable corridor, a corridor origination in Mission San Diego northward along I-  
191 5, and then east to Mira Mesa was used. Both corridors run parallel to freeway corridors for  
192 much of their length.

193  
194 For the Charlotte Metro area LYNX light rail, running along the South Boulevard between I-485  
195 and downtown Charlotte. It is a 9.6 mile corridor that began operations in 2007. For a  
196 comparable corridor, the planned blue line extension. This corridor extends along an existing  
197 railroad corridor from downtown Charlotte to UNC Charlotte.

198  
199 For the Houston METRORail light rail line, the Red line, a 6.7 mile corridor stretching from the  
200 University of Houston to the Reliant Park (Astrodome) in the south, along surface streets. For a  
201 comparable corridor, a route running along existing arterial roads was used. It ran from the  
202 Houston CBD to the Galleria, along Gray Street, Westheimer Road, and Post Oak Boulevard.

203  
204 For the Minneapolis-St. Paul metropolitan area, 8.8 miles of the Hiawatha corridor (now part of  
205 the METRO transit Blue line) from downtown Minneapolis to the Minneapolis-St. Paul  
206 International Airport was used. The corridor began operations in 2004. The comparable corridor  
207 follows a portion of the proposed Southwest Corridor light rail, originating in Minneapolis along  
208 the existing railroad corridor toward St. Louis Park, then towards Hopkins, ending at Shady Oak  
209 road.

210  
211 For the Metro Light Rail in Phoenix, Arizona the original 20 mile corridor began operations in  
212 2008. It stretches from the city of Glendale in the north, where it is anchored by a Walmart,  
213 through downtown Phoenix, past Sky Harbor international airport, past Arizona State  
214 University's main campus, and into downtown Mesa. The comparable corridor starts in  
215 downtown Phoenix, then eastward past the Banner Desert Medical Center, to Mesa Community  
216 College, ending at Fiesta Mall.

217  
218 For the Seattle metro area, the 1.6 mile Tacoma LINK light rail was used as the analysis corridor.  
219 It began operations in 2003, and stretches northward from the Tacoma Dome CRT station to the

220 Theatre district. It is branded as light rail, and the guideway is built to light rail standards, but it  
221 uses Inekon trams as rolling stock. The comparable corridor is located in Everett, linking the  
222 Everett Station for the Sounder Commuter Rail to the Everett Naval station, past the Historic  
223 Everett Theatre.

224  
225 Our principal source of job data is the Census Bureau’s Longitudinal Employer and Housing  
226 Dynamics (LEHD). Since 2002 (but only since 2004 in the case of Phoenix), 2-digit NAICS job data  
227 have been reported at the census block level. Among other data reported are wage brackets of workers.  
228 Those brackets are less than \$1,250 per month, between \$1,250 and \$3,333 per month, and more than  
229 \$3,333 per month. Unfortunately, the wage brackets are not adjusted for inflation over time. The  
230 consumer price index changed by 25 percent between 2002 and 2011, the latest year reported. Thus,  
231 over time, some workers earning wages in a lower bracket will have crept into a higher bracket as a  
232 function merely of inflation. Our analysis addresses this as follows.

233  
234 We use two key measures: share of a metropolitan area’s jobs by wage bracket that are along each  
235 corridor between two points in time, and location quotient which is the local share of jobs in a given  
236 bracket relative to the metropolitan area’s share where an  $LQ > 1.0$  means the local area has a greater  
237 concentration than the metropolitan area as a whole. Even with bracket creep, since we use shares and  
238 LQs between points in time we will uncover changes in shares and concentrations over time between  
239 the control and transit corridors.

240  
241 The reason we have used the term “lower-wage” to this point in the paper is that we combine the lower  
242 and middle wage brackets into a single “lower-wage” bracket. This further helps control for bracket  
243 creep from the lower wage into the middle wage bracket during the study period.

244  
245 Procedurally, we assign each census block to a corridor if its centroid falls within 0.50 mile of the  
246 centerline of the corridor.

## 247 248 **Results**

249 Table 1 reports share results for three combinations of corridors: the oldest 6 corridors where LRT  
250 systems were implemented before 2004 (and for which we have no LEHD data for prior years); the  
251 newest 5 corridors where LRT systems were implemented in or after 2004; and all 11 corridors. Table  
252 2 reports LQ results. For the 6 oldest LRT corridors, we use 2004 as our base year of analysis as it  
253 includes all 11 LRT systems, given that LEHD data for Arizona began being reported that year.

254  
255 From Table 1, we see that regardless of the vintage of the LRT groups (the oldest 6 or the newest 5) or  
256 LRT systems as a whole in our study, there is no substantial difference between the control and LRT  
257 corridors. The share and change in share of total jobs in their respective metropolitan areas between the  
258 control and LRT corridors remained about the same over the study periods. While both groups lost  
259 some jobs in the lower-wage group this may be a function of wage bracket creep into the upper wage  
260 bracket, but again there is no substantial difference between the control and LRT corridors.

261  
262 Table 2 shows some different trends, however, in the concentrations of jobs. Although there is  
263 essentially no difference in the concentration or change in concentration of lower- or upper-wage jobs  
264 among the 6 oldest LRT lines used for analysis over the study period, there appear to be substantial  
265 differences among the newest 5 LRT lines. While the LRT corridors lost job concentration in the



266 lower-wage category at faster pace than the control corridor, on the other hand the LRT corridors  
267 gained job concentration in the upper-wage category at a faster pace. This may be a combination of  
268 wage bracket creep and that LRT corridors attracted more jobs on the whole than the control corridors.  
269

### 270 **Implications**

271 Overall, we find that compared to control corridors, light rail transit corridors perform about as well in  
272 attracting jobs overall. Moreover, the distribution and change in distribution of jobs by lower- and  
273 upper-wage categories over time are also similar between the older corridors as well as the weighted  
274 sums for all corridors. On the other hand, newer LRT corridors appear to have concentrated more  
275 upper-wage jobs than control corridors.  
276

277 There are several limitations to our analysis. Perhaps the most important is that Census LEHD wage  
278 data are not adjusted for inflation over time. We recommend that the Census Bureau build in periodic  
279 adjustments to the recorded wage brackets or expand the brackets perhaps in \$100/month increments.  
280

281 A second limitation is timing. None of the LRT lines we studied actually opened in the same year with  
282 a range from 1994 (Denver) to 2009 (Seattle). Job-sorting associated with LRT may occur in the initial  
283 years of operations followed by a lull before large scale redevelopment of depreciated property along  
284 the lines becomes economically feasible – perhaps more feasible than comparably depreciated property  
285 along control corridors. Related to the timing issue is that perhaps many more areas along LRT  
286 corridors are built-out than in the control corridors, which will delay the time in which developed  
287 property is rebuilt.  
288

289 Third, we considered only total jobs and jobs by two wage brackets. We did not consider other forms  
290 of development, such as residential. This is an area of analysis we will be reporting at a later time.  
291

292 Fourth, our terminating year, 2011, is really part of a slow recovery from the Great Recession. Results  
293 reported by Fan, Guthrie and Levinson for the Twin Cities were based on the period 2004 to 2007, a  
294 time of economic robustness. It may not be until LEHD data are reported in the middle 2010s that we  
295 can fairly compare LRT corridor outcomes to control corridors covering the period of economic  
296 expansion from the early 2000s to the Great Recession, through the Great Recession to full recovery,  
297 and then post-recovery.  
298

299 Fifth, in most of metropolitan America and in the case of all the LRT systems included in our study,  
300 highway-based economic activity has had a multi-generational head start over alternative modes. This  
301 did not used to be case; before the Great Depression American metropolitan economies were closely  
302 tied to transit systems, often privately-provided ones. In the half century since the end of World War II,  
303 only five metropolitan areas added heavy rail to their transportation options (Atlanta, Los Angeles,  
304 Miami, San Francisco Bay Area and metropolitan Washington, DC) while only about a dozen added  
305 light rail (those included in our study plus Los Angeles and the San Francisco Bay Area). The 21<sup>st</sup>  
306 century may be seen as a return to fixed-guideway transit options but only by historians comparing the  
307 20<sup>th</sup> to the 21<sup>st</sup> centuries.  
308

309 Sixth, the LRT alignments of many of the earlier LRT lines may not have maximized economic  
310 interactions. Portland's first light rail line was sandwiched between an Interstate freeway and a gulch;  
311 accessing light rail stations meant walking over the freeway or down the gulch to staircases/elevators.

312 Much of the Sacramento light rail system is built in the median of major highways. Modern LRT  
313 systems do better at integrating stations with their service areas often at-grade with easy walking to  
314 mixed-use destinations.

315  
316 Lastly, we cannot know the counter-factual; that is, how would the LRT corridors performed compared  
317 to our control corridors if LRT was not constructed in the first place? We suspect but cannot prove that  
318 the LRT investments sustained economic activity along those corridors, and further that without those  
319 investments economic activity may have declined. Our reasoning is consistent with urban economic  
320 literature showing that as highways become increasingly congested, economic activity disperses to  
321 newly developing locations. Regional economic expansion continues but at marginally declining levels  
322 as the cost of exchange mounts (21, 22). A key role of transit is to mitigate transportation  
323 congestion effects of agglomeration (23). Voith (24) characterizes public transit as essentially  
324 “noncongestible” and is best suited to sustaining agglomeration economies in downtowns and  
325 secondary activity centers, and along the corridors that connect them. LRT may be a key element  
326 of sustained economic improvement over the long term.

327  
328 Although our results are mixed, we view them as a cautious endorsement of light rail and implicitly  
329 other forms of modern fixed-guideway transit options over the long term. Still, investments in these  
330 systems should not be seen as a panacea for advancing local economies in the short term.

331  
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337

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413  
414

415 **Table 1**  
 416 **LRT and Control Corridor Share Results**  
 417

| <b>LRT Groups</b>          | <b>Total<br/>Jobs</b> | <b>Metro<br/>Share</b> | <b>Lower<br/>Wage Jobs</b>     | <b>Upper<br/>Wage Jobs</b> | <b>Total<br/>Jobs</b> | <b>Metro<br/>Share</b> | <b>Lower<br/>Wage Jobs</b> | <b>Upper<br/>Wage Jobs</b> |
|----------------------------|-----------------------|------------------------|--------------------------------|----------------------------|-----------------------|------------------------|----------------------------|----------------------------|
| <b><i>Oldest 6 LRT</i></b> |                       |                        | <b><i>Control Corridor</i></b> |                            |                       |                        | <b><i>LRT Corridor</i></b> |                            |
| Base Year 2004             | 408,165               | 5.7%                   | 249,950                        | 158,215                    | 673,853               | 9.5%                   | 401,618                    | 272,235                    |
| End Year 2011              | 437,494               | 5.5%                   | 219,027                        | 218,467                    | 726,675               | 9.2%                   | 352,544                    | 374,131                    |
| (End Year/Base Year)       | 7.2%                  | -3.8%                  | -12.4%                         | 38.1%                      | 7.8%                  | -3.2%                  | -12.2%                     | 37.4%                      |
| <b><i>Newest 5 LRT</i></b> |                       |                        | <b><i>Control Corridor</i></b> |                            |                       |                        | <b><i>LRT Corridor</i></b> |                            |
| Base Year 2004             | 359,440               | 6.5%                   | 202,287                        | 157,153                    | 695,793               | 12.6%                  | 383,749                    | 312,044                    |
| End Year 2011              | 384,926               | 4.7%                   | 175,627                        | 209,299                    | 738,770               | 9.0%                   | 314,802                    | 423,968                    |
| (End Year/Base Year)       | 7.1%                  | -28.1%                 | -13.2%                         | 33.2%                      | 6.2%                  | -28.7%                 | -18.0%                     | 35.9%                      |
| <b><i>All 11 LRT</i></b>   |                       |                        | <b><i>Control Corridor</i></b> |                            |                       |                        | <b><i>LRT Corridor</i></b> |                            |
| Base Year 2004             | 767,605               | 6.1%                   | 452,237                        | 315,368                    | 1,369,646             | 10.8%                  | 785,367                    | 584,279                    |
| End Year 2011              | 822,420               | 5.1%                   | 394,654                        | 427,766                    | 1,465,445             | 9.1%                   | 667,346                    | 798,099                    |
| (End Year/Base Year)       | 7.1%                  | -15.9%                 | -12.7%                         | 35.6%                      | 7.0%                  | -16.0%                 | -15.0%                     | 36.6%                      |

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424 **Table 2**  
 425 **LRT and Control Corridor Location Quotient Results**  
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| <b>LRT Groups</b>          | <b>Lower Wage LQ</b>           | <b>Upper Wage LQ</b> | <b>Lower Wage LQ</b>       | <b>Upper Wage LQ</b> |
|----------------------------|--------------------------------|----------------------|----------------------------|----------------------|
| <b><i>Oldest 6 LRT</i></b> | <b><i>Control Corridor</i></b> |                      | <b><i>LRT Corridor</i></b> |                      |
| Base Year 2004             | 0.92                           | 1.15                 | 0.90                       | 1.20                 |
| End Year 2011              | 0.88                           | 1.16                 | 0.85                       | 1.20                 |
| (End Year/Base Year)       | -5%                            | 1%                   | -5%                        | -0%                  |
| <b><i>Newest 5 LRT</i></b> | <b><i>Control Corridor</i></b> |                      | <b><i>LRT Corridor</i></b> |                      |
| Base Year 2004             | 0.88                           | 1.22                 | 0.8595                     | 1.2517               |
| End Year 2011              | 0.80                           | 1.27                 | 0.7444                     | 1.3422               |
| (End Year/Base Year)       | -9%                            | 4%                   | -13%                       | 7%                   |
| <b><i>All 11 LRT</i></b>   | <b><i>Control Corridor</i></b> |                      | <b><i>LRT Corridor</i></b> |                      |
| Base Year 2004             | 0.90                           | 1.19                 | 0.8775                     | 1.2311               |
| End Year 2011              | 0.84                           | 1.21                 | 0.7974                     | 1.2697               |
| (End Year/Base Year)       | -7%                            | 2%                   | -9%                        | 3%                   |

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