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The impact of light rail on congestion in Denver: A reappraisal

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ABSTRACT

In a recent analysis, Bhattacharjee and Goetz (2012) assert that the development of a light rail system in the Denver, Colorado metro area resulted in short-term reductions in traffic on some highway routes in Denver, and that it reduced the growth of highway traffic on major highways near the light rail network by 10% age points between 1992 and 2008. We point out several flaws in their analyses and reanalyze their data. We find no credible evidence that development of light rail reduced highway traffic, nor that it reduced the growth of highway traffic. We also show that light rail, by a large margin, carries too few passengers to have the effect that they assert.

1. Introduction

Proponents of rail mass transit often put forward light rail as a solution to highway congestion. For example, an editorial in the *Denver Post* encouraged citizens to vote in favor of the legislation that would authorize expansion of the Denver's light rail system, stating that "the voters… will have a chance to do something about the mess on I-25…" (Tonsing, 1999). Other Denver rail advocates produced a study that claimed that the planned light rail could carry as many as 14,400 riders per hour, or roughly the capacity of five freeway lanes operating at maximum capacity (Young, 1999). On the other hand, critics of recent rail transit projects in the United States argue that light rail systems have little impact on highway traffic. Richmond's (2001, p. 173) survey of light rail systems states that "in no case…has new rail service been shown to have a noticeable impact upon highway congestion…".

In a recent paper, Bhattacharjee and Goetz (2012) claim that the light rail system in Denver has had a substantial beneficial effect on highway traffic. They analyze traffic flows on major highways in the Denver metro area, comparing the vehicle miles travelled (VMT) for two sets of highways—highway sections near light rail lines, which they deem to be "within the influence of light rail," and all other highways in their study area. They make two claims: First, that "light rail has reduced traffic along some of the adjacent highways for a short period of time," and second, that the light rail system has "succeeded in lowering the rate of increase in the level of traffic on highways within the rail transit influence zone as compared to highways outside the influence zone." We reexamine the data and reinterpret their analysis. We find no clear evidence to support either of these assertions. We demonstrate that the comparisons on which their analysis is based are logically flawed. Furthermore, we show that their estimate of the effect light rail on traffic growth is impossibly large compared to the actual number of passengers carried by light rail. We conclude that there is no evidence that light rail in Denver has reduced highway traffic relative to what it would have been without light rail.

It is worth mentioning that in spite of the title of their paper, "Impact of Light Rail on Traffic Congestion in Denver," none of the analyses that they undertake address directly the question of congestion. Their study is based solely on traffic counts, not the speed of travel. Furthermore, since the data they use do not distinguish the time of day that travel takes place, they ignore the essential nature of congestion, which is excess demand for highways at peak times. Traffic counts are at best indirect indicators of congestion.

2. Study area

On October 7, 1994, Denver initiated service on its first new light rail line. Over the following 12 years, the system was expanded to about 35 miles. Table 1 describes the development of the light rail network over the period of time that we study, summarizing the schedule of the development of the system and describing its component rail lines.[1] Bhattacharjee and Goetz designated sections of several major highways in the southern part of Denver County and parts of Arapahoe County as being "under the influence of light rail." The designation is based on their "knowledge of…the study area and their experience

[1] In 2013, RTD initiated revenue service on the new West Corridor, connecting Denver to Jefferson County through Lakewood and Golden. Other new rail lines are scheduled to open in 2016. However, these expansions took place after the time period that we analyze here.

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Table 1
Chronology of light rail system development in Denver Metro Area.
Source: Regional Transportation District, Facts & Figures webpage; http://www.rtd-denver.com/factsAndFigures.shtml

Line	Description	Length	Start date of revenue service
Central Corridor	Runs from 30th Avenue & Downing to I-25 & Broadway. Serves the central business district of Denver.	5.2 miles	October 7, 1994
Southwest Corridor	Runs parallel to South Santa Fe Drive from Mineral Avenue in Littleton to I-25 & Broadway, where it connects to Central, Central Platte Valley & Southeast Corridors	8.7 miles	July 17, 2000
Central Platte Valley Line	Connects to Central Corridor near Colfax Avenue and runs to Union Station. Provides service to Union Station, also to Sports Authority Field and Pepsi Center, venues for professional sports.	1.8 miles	April 7, 2002
Southeast Corridor	Runs along I-25 for 15 miles from Lincoln Avenue in Douglas County to I-25 & Broadway where it connects to Central & Southeast Corridors. A spur runs parallel to I-225 for about 4 miles, connecting to Parker Road in Aurora.	19 mi	November 17, 2006

with riding the light rail system." (Bhattacharjee and Goetz, 2012, p. 264) We adopt their designation in our analysis for purposes of this study.

3. Short run impacts of light rail on highway traffic

In this section we examine the pattern of traffic on highways near light rail lines. First, we analyze traffic on the highways directly adjacent to the light rail lines. Fig. 1 shows VMT on I-25 (between Lincoln Avenue in Lone Tree and 20th Street in Denver) and I-225 (between Parker Road and I-25). In 2006, the Southeast Corridor light rail line began operation adjacent to these highway segments. If light rail service had an impact on highway traffic, it should have been here, because the Southwest corridor is directly adjacent to this highway, and because its construction more than doubled the capacity of the light rail system. As the figure shows, VMT on this segment of the highway continued to increase even after light rail service began. (The figure also illustrates the significant increase in VMT when new highway lanes were opened in 2005.)

Table 2 analyzes each of the highways that are directly adjacent to Denver's light rail lines, comparing VMT in the full year before the line began operation with the full year after the line began operation. In all of these cases, VMT shows substantial growth when comparing traffic in the year before light rail service began and the year following the initiation of service. (In the case of Santa Fe Drive, the dramatic increase in VMT is attributable to the construction of new highway lanes that also opened in 2000.) Thus, contrary to the assertion of Bhattacharjee and Goetz, traffic on highways *adjacent* to light rail lines did *not* decrease, even for short periods of time.

Perhaps by "adjacent" the authors meant "nearby." However, the authors' own analysis (in their Table 5) shows VMT on all of the highways within the influence of the Southwest rail line increased between 1999 and 2000, when that line opened. But in their Table 4, Bhattacharjee and Goetz report decreases in VMT for several highway segments near the Central corridor between 1995 and 1996. Comparing these 2 years is an odd choice, since the light rail began operation in 1994. If we compare VMT on these same highways in 1993 (the year before light rail began operation) and 1995 (the year after it began), the results are dramatically different. For example, on Federal Boulevard, VMT increased by about 9% from 1993 to 1995 (versus decrease of 16% for 1995–1996). On Colorado Boulevard, traffic increased by about 15% (versus decrease of 8% for 1995–1996). VMT on Colfax Avenue also increased. Thus, in our analysis of rail system expansions in 1994 and 2000, we find that VMT on all highways within the influence zone increased in the year after the commencement of light rail service compared to the same highways before the commencement of service.

When we examine changes that might have been associated with the Southeast expansion in 2006, we do see VMT fall on some of the highways within the influence zone between 2005 and 2007. We estimate that traffic fell by about 3% on highways within the zone if I-25 and I-225 are excluded from the analysis. However, VMT increased by more than 2% on the relevant portions of I-25 and I-225. Because these two highways carry such a large fraction of highway capacity

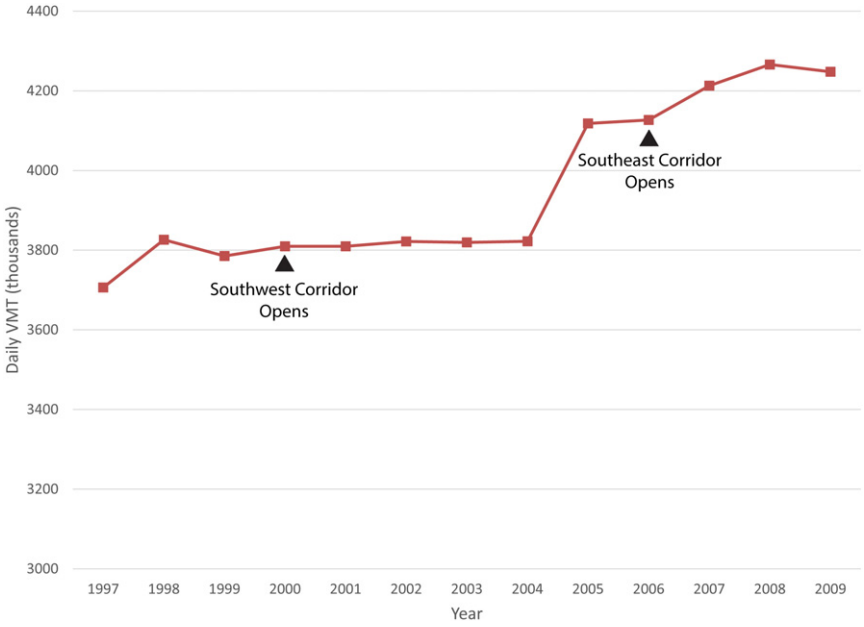

Fig. 1. Daily VMT on segments of I-25 and I-225 adjacent to light rail.