Observed and simulated traffic impacts from the 2013 Bay Area Rapid Transit strike

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ABSTRACT
Despite high costs, many cities build public transit to address regional equity, environmental and economic goals. Although public transit accounts for a minority of trips (~5%), the impact is widely felt when service is suspended during a strike through excess road demand and slower journeys. In 2013, Bay Area Rapid Transit (BART) workers participated in two brief strikes, and the resulting traffic conditions illustrate the value of transit to drivers in the San Francisco Bay Area region. This paper tests the impact of rail transit service interruption on freeway traffic conditions using volumes and travel times. During the strike, regional freeway conditions showed negligible change. However, on facilities that parallel BART service, the impacts are as bad as the worst day of a typical week. Conditions on the San Francisco–Oakland Bay Bridge showed significant impacts with travel times and volumes nearly doubling the baseline median values on the worst day.

1. Introduction
The debate surrounding investment in urban public transit touches on diverse and sensitive arguments ranging from accessibility to social equity to environmentalism. Transit users pay fares and experience increased travel times, while taxpayers usually support the capital infrastructure and about two-thirds of the operating costs (FTA 2012). In many contexts (Giuliano 2005; Lachapelle and Frank 2009), the benefits of transit are discussed in relationship to riders in terms of increased mobility, affordability, exercise or activity, etc. and to society in terms of externalities such as safety, congestion costs, social equity and environmental quality (Frankena 1973; Pack 1992). In all American cities except New York City, transit commuters represent a minority of the population (American Community Survey, US Census Bureau, 2010), and societal benefits can sometimes seem nebulous compared to the hard reality of paying for a transit system.

This paper looks at the benefits of transit experienced by drivers. Drivers are more likely to be wealthy and live disproportionately in suburban areas that cannot be well served by transit. These characteristics make it less likely that drivers will relate to either the direct...
benefits of transit (i.e., riding it) or the positive externalities. Instead of considering either the direct or society-level effects, we explore the impact that transit has on demand for roadway facilities and the implications for driver travel times. Through this indirect impact, it is possible to illustrate the importance of transit to people who do not use it.

1.1. The 2013 BART strike

Opened in 1972, Bay Area Rapid Transit (BART) serves San Francisco, Alameda, Contra Costa and San Mateo Counties as shown in Figure 1. Cervero and Landis (1997) provide a retrospective on the land-use impacts of the BART system over the first 20 years of service. Today, the system comprises 104 miles of track with 44 stations. The system is designed to offer frequent service at underground stations in downtown Oakland and San Francisco and commuter-rail like service in the outer parts. With 111 million annual unlinked passenger trips, BART is the fifth busiest heavy rail system in the USA (Neff and Dickens 2013). BART carries 31.3% of all transit trips in the Bay Area (Metropolitan Transportation Commission 2000) and is especially important for transbay trips.

In 2013, BART workers went on strike twice. The first strike occurred between 1 July and 5 July (Monday–Friday), including the public holiday on 4 July. After a one-month contract extension and a Governor-ordered cooling off period, the second strike occurred from 18 October to 21 October (Friday–Monday) with limited service in the morning of 22 October. During this time, BART service stopped completely, but transit riders still had access to other networks including bus, ferry, light rail and Caltrain. Notably, the East Bay bus agency, AC Transit, increased frequencies on some transbay bus service routes during the strike.

When attempting to isolate the impact of transit, researchers are challenged to control for economic and cultural time-sensitive trends that might influence a before-and-after study of new transit investments. It is also necessary to consider location-specific effects such as geography, climate, urban form and historical experience that may impact a cross-sectional study of places with and without transit. Some of the challenges of isolating the impact of transit investment are discussed by Cervero and Landis (1997). Strikes offer an unusual opportunity to study a fixed location over a relatively brief interval with and without transit service.

Previously, Crain and Flynn (1975), Wegmann et al. (1979), Blumstein and Miller (1983), Lo and Hall (2006), Sermpis, Babis, and Theoﬁlis (2009) and Tsapakis et al. (2012) used case studies from Los Angeles, Knoxville, Pittsburgh, Athens and London to study a range of transit strike impacts including economic losses, ridership attrition, congestion, vehicle occupancy levels, excess parking demand and journey times. van Exel and Rietveld (2001) reviewed a series of strike studies to better understand traveler behavior regarding mode choice during and after transit strikes.

Notably, Lo and Hall (2006) used buried-loop-detector data (Section 2.1) from freeways during a Los Angeles transit strike to illustrate the impact of transit on traffic. They found slower travel speeds, especially during the morning peak hour, and longer peak periods. Additionally, Lo and Hall found that speeds decreased most in locations upstream of where queues normally clear, so the spatial extent of the congestion increased as well as the duration and the magnitude.
Using similar data for the same transit strike, Anderson (2013) underscored that transit is preferentially built on busy corridors, so it provides congestion relief where it is most needed. When transit does not operate, the busy corridors are vulnerable to increases in traffic.
in demand and, more importantly, the effect of congestion is felt by more people than if a traffic jam occurred on a lightly used corridor.

Transit strike data provide an excellent illustration of the impact of transit by holding many variables constant that would affect transportation demand such as urban form, geography and climate. However, there are some biasing effects related to the strike being short-term while the prevailing behaviors and infrastructure are due to long-term investment in transit. One manifestation of this bias is that some transit riders might make alternative transportation plans during the strike such as working from home, taking the day off or getting a ride with a coworker that would not be possible if the strike were ongoing. This bias undervalues transit because some people find non-transit travel solutions that only work on a temporary basis.

A more complex component of the bias in strike data is the impact of long-term investments in transit. Cessation of service is not the same thing as never having built BART. In a world where BART was never built, some of the current Bay Area transit riders might have chosen to live in different locations, might have taken different jobs or might drive on freeways that do not exist today. This aspect of the strike data bias tends to overvalue transit’s impact on congestion because the analysis assumes that the presence of BART did not influence location-choice or infrastructure-investment decisions.

In the analysis below, freeway traffic conditions during the BART strike are interpreted as the lower bound of the effect. An upper bound of the effect is estimated from simulated data. The range between the upper and lower bounds illustrates the value to local drivers of one component of the Bay Area’s regional transit network.

2. Data and methods

2.1. Freeway traffic data

Traffic data from Bay Area freeways are taken from Caltrans’ Performance Management System (PeMS). As illustrated in Figure 1, a system of approximately 2000 buried-loop-detector stations on freeways across the nine-county Bay Area collect information about vehicle counts and speeds. The values used in this analysis have been aggregated to hourly averages for each station over a one-year period. To ensure high-quality data, observations with imputed values are removed from the data set.

Each station-hour observation is associated with an average flow which represents the total number of vehicles per hour divided by the number of lanes. In order to normalize across the data set, the speeds provided by PeMS are converted to travel rate, which is the time it takes to travel one mile at that speed.

The observations associated with this analysis have some peculiar properties that are evident in the results. First, the first strike occurred over the Independence Day holiday on Thursday 4 July. Since many people disrupt their usual travel schedules for vacation and celebrations during this week, the traffic conditions are expected to be somewhat unusual regardless of the strike. Comparing the strike conditions to the same week one year earlier also presents some challenges because the holiday falls on a different day of the week. In this analysis, the results are presented graphically by time-of-week and day-by-day in the tables. This allows the user to distinguish between traffic impacts that are likely related to the holiday versus the strike.
A separate problem with similar impacts on the analysis is missing data. The data for this period are missing some values due to detector failure, transmission failure or errors in the PeMS aggregation software. Notably, all of the District 4 detectors went offline for 24 hours on Sunday 20 October 2013. Additionally, imputed values were used in place of observed values for approximately eight hours on Saturday 19 October 2013, so those data are also unavailable. At smaller geographies (e.g. when considering facilities such as the Bay Bridge using observations from a small number (<5) of detectors), failures from individual stations are sometimes evident in the results.

To address these gaps, observations without data were removed from the analysis and, assuming that the strike impacts from the missing times and locations are consistent with the observed times and locations, the results are unaffected. The time-of-week plots illustrate the gaps, especially with respect to the missing data from the Saturday and Sunday of the October strike (19–20 October 2013).

2.2. Isolating the impact of the strike

2.2.1. The lower bound of the impact: observed conditions
Freeway traffic generally shows strong patterns by time-of-day and day-of-week. To account for these patterns, travel rates and volumes during the strike are compared to observations from the same time and day of week throughout the year. In addition to highlighting the impact of the strike, this approach retains heterogeneity from seasonal and weather differences, demand variation, incidents, holidays and special events.

In the lower-bound method, traffic data from the strike periods are compared to typical conditions for the year (calendar year 2013) focusing on differences in travel rate, volume and their product (volume-weighted travel rates). Spatial scale is extremely important for this approach, and the comparison is made at network (across the Bay Area), county, route and facility levels. Traffic impacts of the strike should be more visible on key routes and facilities where BART service accounts for a significant fraction of the trips. Volume-weighted travel rates illustrate the disproportionate impact that transit service disruption can have because transit is usually located in corridors with high demand.

Time-of-week comparisons are a lower bound on the impact of the strike. Because travelers had access to news of the strike beforehand and the disruption was expected to be short-term, many transit riders would have adopted short-term strategies such as a longer commute on another transit mode, working from home, taking the day off or carpooling. Naturally, there is also some overestimation of the impact since the absence of BART might result in increased service for other transit modes and new location choices for residents and businesses. However, we consider these effects to be smaller than the short-term compensation of BART riders during the strike, and the observations mark the assumed lower bound. Longer service disruptions, as observed in the 2003 LA transit strike (Anderson 2013), would likely result in larger increases in vehicle volumes.

2.2.2. The upper bound on the impact: a thought experiment
Because of the undervaluing bias of a short-term strike, the impact of transit on drivers is expected to be deceptively low in the observed traffic conditions. To complement the lower bound provided by the time-of-week comparison, the PeMS data can also suggest an
upper bound for the impact of the transit strike. The upper bound of the value of BART is illustrated using the following thought experiment.

Each weekday, BART has over 315,000 boardings and slightly more than half of these are transbay trips (BART 2013). Furthermore, 68% of riders (77% on transbay trips) report having access to a car (BART 2008). An upper bound on the strike impact would be to assume that all riders with a car made the same trip but shifted to driving alone. Following the principle of triple convergence (Downs 1992), some of these travelers would choose a different route, time of travel, destination or mode, so the drive-alone assumption represents the maximum possible effect.

Understanding this impact at the system level is challenging because the network has built-in redundancy (i.e. there are usually alternative routes to accommodate increased demand), but the geography of the Bay Area allows us to test the impact of the transit strike where the bridges act as route constraints. BART’s transbay tube parallels the San Francisco–Oakland Bay Bridge. It is a key bottleneck in the transportation network and an important case study in road pricing, demand management and transit benefits.

In this approach, we estimate upper-bound volumes eastbound and westbound over the Bay Bridge by assuming that all transbay BART riders who have access to a car will drive over the Bay Bridge following the same time-of-day patterns as the existing drivers. BART reports transbay ridership in terms of exits, and we assume that each exit is part of a roundtrip and there are half as many riders as exits. The expected increases in traffic volume are calculated separately for weekdays, Saturdays and Sundays (Table 1).

To estimate travel-time impacts, we use a non-parametric modeling technique to compare the travel-time distributions associated with the current median traffic volume and under increased demand. A hypothetical increased demand is calculated and observations associated with this level of demand are drawn from the data. The matching approach allows us to retain variation within a simulated distribution drawing on the natural variation in the data.

3. Results

3.1. Bay area

Overall, only 1.9% of trips in the Bay Area take place on BART (Metropolitan Transportation Commission 2000). Many trips occur in areas outside BART’s service area, and the travel-time impact of a strike on these trips is minimal. Since transit is preferentially built in busy corridors, volume-weighted travel time gives a better estimate for how the metropolitan population experiences a transit strike. A comparison between the travel times and the volume-weighted travel times for the nine-county Bay Area is shown in Figure 2(a) and 2(b).

<table>
<thead>
<tr>
<th>Table 1. Transbay riders with car access (i.e. potential drivers) from the BART Ridership Report (2008) and current traffic volumes on the Bay Bridge by day-of-week from PeMS.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transbay riders with car access</td>
</tr>
<tr>
<td>Weekdays</td>
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<tr>
<td>Saturday</td>
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<tr>
<td>Sunday</td>
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In general, strike travel times are very similar to median travel times. Some of the differences can be attributed to the Independence Day holiday occurring on the Thursday with carryover effects on the Friday. The volume-weighted travel times indicate that high-volume routes did experience an increase in travel times, which is expected because BART follows some of the busiest corridors. However, the impact is well within the 80th percentile volume-weighted travel times for the year. In the following sections, time-of-week plots of the volume-weighted travel times are used to illustrate properties of the transit strike’s impact on drivers at the county, route and facility levels. At the

Figure 2. (Colour online) Traffic conditions across the nine-county Bay Area for typical conditions (purple) and during the strike (magenta and fuchsia). Note: The impact of the strike is clearer in the volume-weighted travel times because transit tends to serve busy corridors. (a) Travel times. (b) Volume-weighted travel times.
end, the results are also presented as tables of the travel time and traffic volume effects across spatial scale during the strike (Tables 2 and 3).

3.2. Focusing on transit-served locations

The impact of the strike increases in places that are usually well served by transit. Due to geographic and planning constraints, the East Bay is highly dependent on BART and proportionally impacted by the strike. The PeMS data include information about the county and route identification for each detector station. In comparison to the overall Bay Area impacts shown in Figure 2, BART-served counties such as Alameda (Figure 3(a)) and routes that parallel the BART lines, such as California Highway 24 (Figure 3(b)), show a bigger impact. Disregarding the observations from the Independence Day holiday, travel times are at or above median travel times. These observations indicate that, without BART, the lower bound of the typical conditions on popular corridors could be as high as the current 80th percentile conditions.

3.3. The Bay Bridge

The Bay Bridge represents a key facility in the Bay Area transportation network. Using a set of three eastbound stations and three westbound stations, the traffic conditions with and without the strike can be localized to this bottleneck. For this analysis, we begin with the observed vehicle volumes shown in Figure 4(a) and 4(b).

Compared to the larger scale facilities considered above, the Bay Bridge has a relatively small difference between the median and 80th percentile volumes. This is especially true for the westbound stations because there is traffic metering coming out of the toll plaza on

<table>
<thead>
<tr>
<th>Facility</th>
<th>1-Jul %</th>
<th>2-Jul %</th>
<th>3-Jul %</th>
<th>4-Jul %</th>
<th>5-Jul %</th>
<th>18-Oct %</th>
<th>19-Oct %</th>
<th>21-Oct %</th>
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<td></td>
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<td></td>
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<td></td>
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<tr>
<td>All</td>
<td>10.60</td>
<td>−0.36</td>
<td>19.10</td>
<td>−12.37</td>
<td>−12.43</td>
<td>−15.36</td>
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<td>19.01</td>
<td>−9.02</td>
<td>−12.18</td>
<td>−11.44</td>
<td>−47.76</td>
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</tr>
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<td>23.30</td>
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<td>−4.86</td>
<td>−8.36</td>
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<td>−0.69</td>
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<td>2.95</td>
<td>−12.64</td>
<td>−35.42</td>
<td>51.35</td>
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<td>−13.58</td>
<td>−28.19</td>
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<tr>
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<td>−10.09</td>
<td>−8.43</td>
<td>−3.36</td>
</tr>
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<td>Sonoma</td>
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<td>4.55</td>
<td>18.32</td>
<td>4.42</td>
<td>−1.49</td>
<td>8.03</td>
<td>12.49</td>
<td>2.76</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td></td>
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<td>I-80</td>
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<td>5.52</td>
<td>24.47</td>
<td>3.83</td>
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<td>−4.22</td>
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<td>−10.64</td>
<td>7.99</td>
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<td>−24.80</td>
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<td></td>
<td></td>
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<tr>
<td>Eastbound</td>
<td>25.21</td>
<td>23.45</td>
<td>18.21</td>
<td>−5.10</td>
<td>0.32</td>
<td>7.99</td>
<td>13.47</td>
<td>7.79</td>
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<td>Westbound</td>
<td>29.51</td>
<td>17.60</td>
<td>22.07</td>
<td>−0.49</td>
<td>6.50</td>
<td>−6.34</td>
<td>No data</td>
<td>13.85</td>
</tr>
<tr>
<td>Base (WB)</td>
<td>94.00</td>
<td>38.74</td>
<td>28.07</td>
<td>11.20</td>
<td>29.92</td>
<td>23.89</td>
<td>60.21</td>
<td>4.61</td>
</tr>
</tbody>
</table>
the Oakland side of the bridge. This ensures that, even in periods of demand well in excess of capacity (the dashed horizontal line), the flow over the bridge stays high. In contrast, the eastbound lanes on the bridge are not metered and they show lower typical volumes and greater variation.

Because of the one-way metering, the eastbound bridge illustrates unmanaged volumes during the strike, while the westbound bridge shows conditions where flow is managed and congestion is shifted upstream from the bottleneck. During the strike, over 100,000 drivers who travel each way over the bridge each weekday experienced high volumes, approximately equal to the 80th percentile volumes in the unmanaged eastbound lanes as shown in Figure 4(a). Although these delays are sizable, this represents the lower bound of the impact of transit on drivers.

The upper bound on the traffic impact of BART is shown by assuming that all BART riders who have access to a car switch to single-occupancy automobiles and drive to the same destinations. At the network level, estimating this impact is beyond the data’s capabilities, but it is possible to isolate the effect across the Bay Bridge. The yellow lines in Figure 4(a) and 4(b) show the per-lane vehicle volumes on the Bay Bridge under the hypothetical condition that all transbay BART riders with access to a car would drive across the Bay Bridge alone following the same time-of-day demand pattern as the existing drivers. The horizontal dashed line in these figures indicates the capacity – the highest observed volume per lane in the data. The upper-bound volumes that exceed the capacity would not be observed and some assumptions are necessary to estimate the observed travel times during these congested periods.

### 3.3.1. Managed lanes

One simplifying assumption is that volumes in both directions would be managed with meters to ensure that flow across the bridge is always at capacity when demand is
greater than capacity. This approach is a sort of best-worst case scenario because all of the BART riders have switched to driving over the same bridge, but the bridge throughput is maximized through an intelligent transportation system infrastructure investment. The impacts of the meters on traffic on either side of the bridge are disregarded.

To simulate this effect, volumes in excess of capacity during each hour roll over into the next hour causing a right-handed cascade which results in peak spreading. The effect is illustrated in Figure 5. Under these conditions, the westbound lanes lose the distinction between the morning and evening peaks – the bridge would be operating at capacity
from morning until evening. The peak-period queue durations for the eastbound and westbound lanes are summarized in Table 4.

The validity of the peak-spreading model is supported by observations of the westbound bridge traffic during the strike. The flow over the bridge itself is managed through metering in this direction, but congestion spills upstream. Relying on four nearby stations associated with the ramp and base of the bridge, we can compare observed traffic flows on the bridge and bridge base during the strike. Time-of-week plots are shown

Figure 4. (Colour online) Per-lane traffic volumes on the Bay Bridge. Notes: The current typical conditions (purple) and strike conditions (pink and fuchsia) are compared to volume assuming that all riders with access to a car will drive (yellow). Any volumes above the horizontal capacity line would not be observed and would result in congested conditions. (a) Eastbound volumes. (b) Westbound volumes.
Figure 5. (Colour online) Current conditions (purple) compared to hypothetical volumes if all transbay BART riders switch to driving on the Bay Bridge (yellow). Notes: The green line shows conditions if the lanes are managed to operate at capacity when demand is higher than capacity. The morning and evening peaks blur together and congestion does not clear until late into the evening. (a) Eastbound. (b) Westbound.

Table 4. Hours when a queue would in effect be under the managed lane scenario.

<table>
<thead>
<tr>
<th>Day of the week</th>
<th>Westbound</th>
<th>Eastbound</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Start</td>
<td>End</td>
</tr>
<tr>
<td>Monday</td>
<td>6 am</td>
<td>9 pm</td>
</tr>
<tr>
<td>Tuesday</td>
<td>4 am</td>
<td>10 pm</td>
</tr>
<tr>
<td>Wednesday</td>
<td>6 am</td>
<td>10 pm</td>
</tr>
<tr>
<td>Thursday</td>
<td>6 am</td>
<td>11 pm</td>
</tr>
<tr>
<td>Friday</td>
<td>6 am</td>
<td>12 am</td>
</tr>
</tbody>
</table>
in Figure 6. Notice how the flows on the bridge are consistent with typical conditions but the congestion has been pushed upstream resulting in extremely high volumes at the base of the bridge and peak periods that stretch later into the evening.

Using the volumes predicted under the managed-lanes scenario, upper-bound travel times can be estimated by drawing similar observations from the data. To capture the effect of stochastic capacity and related effects, travel times for each volume are found through a non-parametric modeling approach. Each time of the week is associated with a range of observations that have similar volumes to the hypothetical managed volume.

Figure 6. (Colour online) Comparison of traffic flows on the Bay Bridge and the base (westbound in both cases). Note: Metering in the toll plaza means that the strike conditions are fairly typical on the bridge, but the upstream congestion results in extreme volumes on the base that last later into the evening. (a) Westbound on the Bay Bridge. (b) Four stations leading up to the Westbound Bay Bridge before the toll plaza.
The matching algorithm increases the volume-matching tolerance from 2.5% to 5% to 10% to create a large enough sample of matching observations. From this sample of observations, 100 travel times are randomly drawn and assigned to the managed volume. This matching produces a simulated distribution of travel times by time of week, and the median and 80th percentiles are compared to the current median travel times in Figure 7.

The simulated time-of-week travel times associated with the managed volumes show the impact of increased volumes even under management. Unlike the current conditions, evidence of morning and evening peaks is not obvious in the simulated travel times because the Bay Bridge is at capacity most of the day. The noise in the median and 80th percentile travel-time lines is influenced by the non-parametric method, which

![Figure 7](image-url)

**Figure 7.** (Colour online) Current median travel times (purple) compared to hypothetical travel times if all transbay BART riders switch to driving on the Bay Bridge (green). (a) Eastbound. (b) Westbound.
introduces variation, and by the current traffic conditions on the bridge, which show some natural variation.

Combining the observations across an entire week, a comparison of median travel times under current and managed conditions is shown in Figure 8. The simulated travel times are strongly bimodal – the left peak is for travel times when the bridge is not at capacity (in the middle of the night) and the right peak is for travel times that occur while the bridge is at capacity during the day. The median simulated travel time (TT50 simulated) is 20%

![Figure 8](image-url)
slower than the current median eastbound and 14% slower than the current median westbound, and those conditions would be experienced by approximately 175,000 drivers each weekday. On the other hand, operating consistently at capacity does make the Bay Bridge significantly more reliable as indicated by the smaller 80th percentile travel-time indexes – in the managed scenario, the bridge would be slow, but it would be reliably slow.

4. Conclusions

This paper has examined the benefits of public transit experienced by drivers. Since drivers are more likely to be wealthy and live disproportionately in suburban areas that cannot be well served by transit, it is less likely that they will relate to either the direct benefits of transit (i.e. riding it) or the positive externalities. Instead of considering either the direct or society-level effects, we have explored the impact that transit has on demand for roadway facilities and the implications for driver travel times when service is suspended during a strike, leading to excess road demand and slower journey times. Through this indirect impact, in our case of the 2013 BART strike, it has been possible to illustrate the importance of transit to people who do not use it.

At the network level, impacts from the BART strike were not insignificant. Only the core of the nine-county Bay Area is served by BART, so most links did not see change in demand during a strike. Using volume-weighted travel time as a performance metric gives a better picture of the strike’s impact since BART preferentially serves busy corridors. Even at the network level, the strike conditions were slightly above median for volume-weighted travel time. This underscores that, on average, drivers will experience slower journey times across the network in the absence of BART.

Narrowing down on areas that depend on BART (such as Alameda County) and routes that parallel the BART lines (such as CA Highway 24), it becomes clear that there were significant delays, especially in the peak periods. On the Monday of the October strike, morning peak conditions on Highway 24 were nearly at the 80th percentile of annual volume-weighted travel times. Without BART service, the normal travel time on this route would be as bad as the worst day of every week.

Most specifically, BART’s transbay service, which connects San Francisco with the East Bay via the Transbay Tube, interacts strongly with the freeway traffic across the Oakland–San Francisco Bay Bridge. This facility usually operates near capacity, and strike conditions, particularly eastbound during the July Strike, were nearly as slow as the 80th percentile. In the westbound direction, congestion was pushed upstream with volumes and travel rates on the bridge base twice as high as usual on the first day of the July strike. The transbay connection is essential to the movement of workers and goods in the regional economy, so the delays were a serious consideration.

The observed conditions represent a lower bound on the impact of transit. Focusing on the Oakland–San Francisco Bay Bridge, an upper bound was based on the assumption that all transbay BART riders with access to a car would switch to transit. In this scenario, volumes exceeded capacity on every weekday, and travel times were negatively affected even with metering to manage demand. When the lanes were managed in order to keep flow at capacity, queues could operate continuously from 4 am until midnight westbound and 11 am to 2 am eastbound.
During the strike, excess volumes and travel delay were concentrated on some of the Bay Area's busiest freeway facilities. While the regional impact was within the range of normal variation, localized conditions in the BART service area indicated a causal relationship. The results presented for key routes and facilities indicate that some places would experience conditions roughly equivalent to 80th percentile travel times and volumes as the typical status on weekdays. Experiencing these conditions every day is very different from tolerating a slow journey once per week. Since the busiest freeways tend to be preferentially impacted, the transit strike had strong implications for regional productivity, automobile use and accessibility.

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