



# One for the road: Public transportation, alcohol consumption, and intoxicated driving

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## ABSTRACT

We exploit arguably exogenous train schedule changes in Washington DC to investigate the relationship between public transportation, the risky decision to consume alcohol, and the criminal decision to engage in alcohol-impaired driving. Using variation over time, across days of the week, and over the course of the day, we provide evidence that overall there was little effect of expanded public transit service on DUI arrests, alcohol related fatal traffic and alcohol related arrests. However, we find that these overall effects mask considerable heterogeneity across geographic areas. Specifically, we find that areas where bars are within walking distance to transit stations experience *increases* in alcohol related arrests and *decreases* in DUI arrests. We observe no sign of behavioral changes in neighborhoods without any bars within walking distance of transit stations.

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## 1. Introduction

There are 159 million self-reported episodes of alcohol-impaired driving among U.S. adults each year (Quinlan et al., 2005). During 2005, 17,602 people in the U.S. died in alcohol related motor vehicle crashes, representing 41% of all traffic-related deaths.<sup>1</sup> It is estimated that alcohol related crashes in the U.S. cost about \$51 billion each year (Blincoe et al., 2002).<sup>2</sup> The Center for Disease Control at the Department of Health and Human Services provides a variety of policy recommendations to reduce the incidence of alcohol-impaired driving.<sup>3</sup> Virtually all these policies involve stricter laws, harsher penalties, and more aggressive enforcement intended to either increase the penalties associated with drinking while driving or to decrease general alcohol consumption among youth. These tough-on-crime policies affect a substantial fraction of adults; over 1 million drivers were arrested for driving under the influence of alcohol in 2007.<sup>4</sup> In this paper we evaluate the impact of a different sort of public policy aimed at reducing the probability that a drinker gets behind the wheel of a car.

It is a commonly held belief that the provision of accessible public transportation could reduce the incidence of DUIs. For example, the

popular press regularly prints articles blaming high DUI incidence on the lack of public transportation.<sup>5</sup> Both public and private organizations provide transportation to drinkers in order to reduce DUIs – for example both the MillerCoors and Anheuser-Busch Brewing Companies provide free transportation on popular holidays to and from “member” bars. The slogan of a current Illinois campaign to reduce DUI incidence is “designate a driver – stay overnight – use public transportation.”<sup>6</sup> However, there is virtually no evidence on the relationship between the provision of public transportation and drunk driving, and there is no empirical quantitative evidence that providing public transportation would actually reduce the incidence of drunk driving. This lack of credible evidence is due, in large part, to the fact that alteration of public transportation, particularly fixed rail service, requires a huge investment in infrastructure and thus rarely changes.

Between November 5th 1999 and July 4th 2003, Washington DC’s Metro system gradually extended its weekend operating hours – changing the end of service from midnight to 1 am, then 1 am to 2 am and then from 2 am to 3 am. We exploit the sequential expansion of Washington DC Metro’s late night service to identify how risky behavior changes in response to public transit.<sup>7</sup> Because the changes in schedule allow us to observe the same geographic area on the same day of the week during the same time of day, both with and without

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<sup>1</sup> National Highway Traffic Safety Administration: <http://www.nrd.nhtsa.dot.gov/Pubs/810821.PDF>.

<sup>2</sup> <http://www.cdc.gov/ncipc/factsheets/drving.htm>.

<sup>3</sup> The complete list is available on their website. See Web Appendix for webpage.

<sup>4</sup> Sourcebook of Criminal Justice Statistics Online: <http://www.albany.edu/sourcebook/pdf/t4272007.pdf>.

<sup>5</sup> Marsha Dorgan (Oct 22, 2008) “CHP DUI checkpoint results” Napa Valley Register, Alan K. Category (Oct 2 2008) The Drunk Driving Situation in Los Angeles, Mutineer Magazine.

<sup>6</sup> [http://www.cyberdriveillinois.com/publications/pdf\\_publications/dsd\\_a1495.pdf](http://www.cyberdriveillinois.com/publications/pdf_publications/dsd_a1495.pdf).

<sup>7</sup> In addition to Washington, DC, Boston’s Massachusetts Bay Transportation Authority and Austin’s Capital Metro Authority introduced late night service with the last ten years.

public transportation availability, one can use the changes in hours of operation of fixed rail transportation in DC to conduct a credible investigation into the relationship between public transportation provision and the incidence of alcohol-impaired driving.

We take advantage of four sources of variation created by this policy to estimate the impact of public transportation on drinking behavior. First, we use the change over time in drunk driving, comparing how late night weekend arrests for drunk driving change as Metro extends its hours of operation.

Second, in order to control for evolution in attitudes towards drinking, laws relating to drunk driving, or any general changes in DC nightlife, we take advantage of the fact that Metro only offered late night service on Friday and Saturday. Comparing changes in late night arrests on Friday and Saturday to changes in late night arrests on Thursday will allow us to difference out any impact of other policies that might impact drunk driving during the late evening.

Third, in order to control for general changes that might differentially affect weekend activity, we take advantage of the fact that Metro changes only affected service during the late evening and not the early evening. Comparing changes in late night arrests on Friday and Saturday to changes in evening arrests on Friday and Saturday will allow us to difference out any impact of other policies that might impact drunk driving during the weekend.

Finally, Metro stations are concentrated in certain parts of the city. We therefore expect to see larger temporal effects in neighborhoods with both Metro stations and bars than in neighborhoods with no Metro stops or no bars. Comparing the change in late night arrests in areas close to bars and Metro stations to the change in areas far away from Metro stations or with no bars will allow us to further identify the effect of Metro access on drunk driving.

Exploiting all sources of temporal variation we use a difference-in-difference-in-difference (DIDID) strategy. This strategy compares the changes in arrests occurring between 10 pm and 5 am to arrests occurring between 6 pm and 10 pm during the weekend, to the same changes on Thursdays. When we focus solely on temporal variation in Metro service, we find that the aggregate impact of public transportation on drunk driving is small. This finding is robust to using each of the differences. However, when we look at the DIDID effects across neighborhoods we find substantial spatial heterogeneity. In neighborhoods where bars are located within walking distance of a Metro station there were sizable reductions in drunk driving arrests for each additional hour of Metro availability after midnight. In neighborhoods where bars are not located close to Metro stations, expanding Metro service does not appear to have changed the number of people arrested for intoxicated driving behavior.<sup>8</sup>

By making it easier to get home after a night of drinking, expanded public transportation may have a perverse effect on alcohol consumption outside the home, what we refer to as “risky” alcohol consumption. As such, while the estimated effects on DUI arrests may be the policy relevant estimates, because an increase in drinking will mechanically increase drunk driving, such estimates may not provide evidence on the behavioral effect of public transportation availability on drunk driving (i.e. the effect that public transportation has on the likelihood that a given drinker gets behind the wheel). To speak to the possible moral hazard associated with public transit and its effect on drunk driving conditional on drinking, we estimate not only how intoxicated driving changed, but also how the number of people drinking changed as Metro extended its hours.

Since DC law prohibits the release of site-identified alcohol sales, we draw on a large literature linking alcohol consumption and risky behavior and estimate the size of the drinking population using changes in the number of arrests for minor nuisance crimes, which we

refer to as “alcohol related” arrests. While not a perfect proxy for alcohol consumption, such nuisance crimes have been found to be strongly related to alcohol consumption. Using the same triple differences approach, we find evidence of moral hazard in the form of increased alcohol related arrests in the same neighborhoods where we observed a reduction in arrests for DUIs. When this increase in potential drunk drivers is taken into account, the implied localized reduction in the rate of intoxicated driving becomes quite large.<sup>9</sup>

The fact that alcohol related arrests and DUI arrests move in opposite directions it indicates that our effects are not driven by secular changes in overall crime and we conduct a variety of tests to support the validity of our identification strategy. Indeed, we show that our results are robust to a variety of alternate specifications, including neighborhood-specific time trends, relaxing our definitions of “late night” and “evening,” our definition of “bars” and “alcohol related” arrests, and our use of Thursday as a counterfactual for the weekend. We do find evidence consistent with a spillover effect on Thursday nights in areas where bars are located near Metro stations, implying that our main estimates of outcomes on Friday and Saturday evenings (that use Thursday as a comparison) may be interpreted as lower bounds of the overall effect.

While we are careful to control for numerous sources of confounding variation one shortcoming of all studies that use arrest data as a proxy for crime is that changes in arrests reflect both police behavior as well as criminal activity. Specifically, if police shifted resources towards nuisance crimes and away from DUIs, precisely in those areas with bars located near Metros, only between the hours of 10 pm and 5 am on Friday and Saturday nights, then our estimated effects would be too large. While we cannot empirically rule out this possibility, given that the specific kind of shifting that could generate our results would entail shifting resources away from crimes with a high social costs towards crimes with lower social costs, this scenario is unlikely. In fact, during our sample period the DC police engaged in a campaign to “crack down” on dangerous drivers,<sup>10</sup> meaning that if anything our results may be conservative.

This paper presents the first credible evidence on the relationship between public transportation on intoxicated driving and alcohol consumption (both in areas directly served by public transportation and for the Metropolitan area as a whole). The remainder of the paper is as follows. Section 2 outlines the extant literature on alcohol consumption, crime and public transportation, and provides institutional detail of the Washington DC Metro expansion. Section 3 presents the analytical framework describing how public transportation may affect drunk driving and drinking behaviors, Section 4 presents the empirical strategy, Section 5 presents the results and Section 7 concludes.

## 2. Alcohol consumption, crime, and public transportation

### 2.1. Alcohol consumption and crime

The decision to drive while intoxicated is twofold: the *risky* decision to drink excessively outside of the home and the *criminal* decision to drive home once inebriated. As stated in Becker (1968) “a person commits a crime if the expected utility to him exceeds the utility he could get by using his time and other resources at other activities.”<sup>11</sup> Researchers have primarily focused on one side of this

<sup>8</sup> The localized effects of public transportation on crime are consistent with research documenting that public transportation only affects worker commuting patterns of residents within 2 km of businesses within 6 miles of fixed rail transportation (Baum-Snow and Kahn, 2000; Holzer et al., 2003).

<sup>9</sup> If the average drinker who commits a crime is equally likely to drive drunk as the marginal drinker who commits a crime that is induced to drink more and commit a crime as a result of increased Metro access then scaling the number of DUIs by the number of alcohol related arrests will be appropriate for isolating the behavioral response. However, if the marginal drinker who commits a crime is less/more likely to drive drunk than the average drinker who commits a crime, then the scaling the number of DUIs by the number of alcohol related arrests will lead to an over/under estimate of the behavioral effect.

<sup>10</sup> [http://mpdc.dc.gov/mpdc/cwp/view,a,1240,Q,547928,mpdcNav\\_GID,1552,mpdcNav,%7C,asp](http://mpdc.dc.gov/mpdc/cwp/view,a,1240,Q,547928,mpdcNav_GID,1552,mpdcNav,%7C,asp).

<sup>11</sup> See Doob and Webster (2003) and Levitt (2002a,b) for reviews of the literature on risky behavior and deterrence.

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