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The Availability of Uber on Drunk Driving
By Abigail Russo
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I. Introduction

Drunk driving continues to be a problem throughout the United States. One out of every 121 licensed drivers are arrested in a given year for drunk driving.¹ This poses significant negative externalities to society. There is one death every 50 minutes in the United States due to motor vehicle crashes that involve an alcohol-impaired driver.² The annual cost of alcohol-related crashes totals more than \$44 billion.³ There are also costs associated with DUI enforcement.

The invention of ride-share apps such as Uber or Lyft present an easy alternative to getting behind the wheel. The incentives to call a ride-share app are even greater than other alternative because unlike public transportation, it picks you up right from your current location offering a door-to-door experience. In addition, you don't have to bother a friend or family member with the task of being a designated driver. Furthermore, you don't have to attempt to hail a cab while drunk. I hypothesize that the availability of Uber and other rideshare apps have decreased the number of DUIs in the United States thus saving the US money in alcohol-related crashes. However, I note it could also be the case that ride-share apps create more cars on the road. Heavier congestion could also lead to increased accidents (both alcohol-related and non-alcohol-related).

This is especially relevant to discuss in 2021 since the pandemic has caused Uber prices to increase. The New York Times reported that the cost of a ride was 40% higher in April 2021

¹ *Drunk Driving Arrest Statistics*, DRUNKDRIVINGPREVENTION.COM, <http://www.drunkdrivingprevention.com/drunkdrivingarreststatistics.html>

² *Impaired Driving: Get the Facts*, CDC, https://www.cdc.gov/transportationsafety/impaired_driving/impaired-drv_factsheet.html

³ *Id.*

than it was a year ago.⁴ Higher prices may deter drunk drivers from using ride-share apps and once again drivers will revert to getting behind the wheel. This paper proceeds as follows: first I will discuss the relevant literature, next I will discuss the data used, then I will discuss the results and policy conclusions.

II. Literature Review

Studies are mixed when it comes to the size and significance of the effect of ride-sharing apps on drunk driving rates. Some studies have confirmed a negative relationship. Uber itself, claims the entrance of Uber in Seattle caused the number of DUI arrests to decrease by more than 10%. They claim these results are robust and statistically significant.⁵ A study done by Jessica Lynn Peck (2017) found that the introduction of Uber in New York City in May of 2011 led to a 25-35% decrease in alcohol-related collisions.⁶ This study looked at January 2007 through July 2013.⁷ Anne Burton (2021) looked at the impact of Uber and Lyft on drunk-driving related fatal motor vehicle incidents in the 100 most populated U.S. cities from 2006 to 2016.⁸ Through event study specifications, Burton found statistically significant declines in annual drunk-driver-related crashed and fatalities two to six years after a ride-share app started operating in the city.⁹ Downie and Abaluck (2018) found that Uber market entry in Illinois had a moderately significant impact on reducing drunk driving by preventing about 3 DUIs per 100,000 county residents in per capita terms. This paper used data from 2010-2017 and uses drunk driving arrests as a dependent variable.¹⁰ Greenwood and Wattal (2017) found a

⁴ Kate Conger, *Prepare to Pay More for Uber and Lyft Rides*, THE NEW YORK TIMES (June 15, 2021), <https://www.nytimes.com/article/uber-lyft-surge.html>

⁵ DUI Rates Decline in Uber Cities, UBER (2014) <https://www.uber.com/blog/chicago/dui-rates-decline-in-uber-cities/>

⁶ Jessica Lynn Peck, *New York City Drunk Driving After Uber*, CUNY Academic Works (Jan. 2017).

⁷ Id.

⁸ Anne Burton, *Do Uber and Lyft Reduce Drunk-Driving Fatalities?* (June 3, 2021).

⁹ Id.

¹⁰ Downie and Abaluck, *Ubering Under the Influence*, Yale Department of Economics (2018)

significant drop in the rate of alcohol related motor vehicle fatalities after Uber X was introduced into California Markets. The study used data from 2009 to 2014.¹¹ Greenwood and Wattal also looked at the difference between Uber X (which offers as significant price reduction over traditional taxi cabs) and Uber Black (where users pay a premium to ride in high end vehicles). They found that the introduction of Uber X had a significant dampening effect on the number of alcohol related driving fatalities, but the introduction of Uber Black did not.¹²

Zhou (2020) finds the entrance of Uber had no impact on the number of drunk driving when using data from 2008 to 2016. As a dependent variable, Zhou used drunk driving survey data from the BRFSS SMART survey which asks participants how many times they have driven when drinking too much during the past 30 days.¹³ I will note survey data has its limitations, specifically, when it comes to reporting something that is a crime.

Brazil and Kirk (2020) found that Uber availability is not associated with changes in total, alcohol-involved and weekend and holiday-specific traffic fatalities in the aggregate, but is associated with increased traffic fatalities in urban counties. The study looked at 2009 to 2017. This counters previous studies which have found no association or negative associations between ride-sharing apps and traffic fatalities.¹⁴

Most of the literature uses a time period that ends before the real rise in popularity of Uber. I believe there would be a lagged effect from when Uber entered the market, to when people became aware of its' existence as an option and felt comfortable using and relying on it. Thus, I think the literature would greatly be improved by a study using more recent data.

III. Research design & Discussion of Data

¹¹ Greenwood and Wattal, *Show Me The Way to Go Home*, MIS Quarterly Vol. 41 No. 1 (2017)

¹² Id.

¹³ Zhou, *Ride-sharing, Alcohol Consumption, and Drunk Driving*, Regional Science and Urban Economics (2020)

¹⁴ Brazil and Kirk, *Ridehailing and Alcohol-involved Traffic Fatalities in the United States* (2020)

I decided to focus on Uber because Uber is a dominant player in the market in terms of valuation, number of trips, and number of cities.¹⁵ Uber was founded in 2009 and the first Uber ride was requested in July 2010 in San Francisco. In 2012 Uber started offering Uber X.¹⁶ In August 2014, Uber launched UberPool, offering a cheaper ride-share option. In December 2015, Uber reached 1 billion trips.¹⁷ I use Uber valuation, Uber users, and Uber annual revenue as my independent variables. Each variable had data starting in a different time period.

Ubers has become exponentially popular in recent years. For example its valuation in 2013 was only \$3.7 billion and by 2019 the valuation hit \$82 billion (see table 1). The number of Uber users tracks a similar trend. In 2015 there were 11 million users whereas in 2019 there were 111 million users (see table 2).¹⁸ A Google trends search, revealed that “Uber” as a search term peaked in popularity in May of 2019.¹⁹ My study will end with the year 2019, since the pandemic led to obvious irregularities in the data.

Table 1: Uber Valuation²⁰

Year	Valuation	% Change
2011	\$.03 billion	x
2013	\$3.7 billion	+12,233.3%
2014	\$18 billion	+386.5%
2015	\$51 billion	+183.3%
2016	\$63 billion	+23.5%
2017	\$48 billion	-23.8%
2018	\$72 billion	+50%
2019 (IPO)	\$82 billion	+13.9%

¹⁵ Note: biggest competitor, Lyft, launched in June 2012 so there is also not as much data available

¹⁶ Blystone, The Story of Uber (2021) <https://www.investopedia.com/articles/personal-finance/111015/story-uber.asp>

¹⁷ Uber. “The History of Uber- Uber’s Timeline, <https://www.uber.com/newsroom/history/>. Accessed Nov. 30th, 2021.

¹⁸ <https://www.businessofapps.com/data/uber-statistics/>

¹⁹ <https://trends.google.com/trends/explore?date=all&geo=US&q=uber>

²⁰ <https://www.businessofapps.com/data/uber-statistics/>

Table 2: Uber Users²¹

Year	Users	% Change
2015	11 million	x
2016	37 million	+236.4%
2017	68 million	+83.7%
2018	91 million	+33.8%
2019	111 million	+21.98%

Table 3: Uber Annual Revenue²²

Year	Annual Revenue	% Change
2014	\$0.4 billion	x
2015	\$1.7 billion	+325%
2016	\$5 billion	+194.1%
2017	\$7.9 billion	+58.0%
2018	\$11.3 billion	+43.0%
2019	\$14.1 billion	+24.8%

I decided to use number of DUI arrests and number of alcohol-impaired crash fatalities as my dependent variables. I found number of DUI arrest data from the FBI Uniform Crime Reporting program. It's possible that the previous literature that uses only alcohol-impaired crash fatalities is under inclusive since not everyone who drives drunk will end up crashing. However, not everyone that drives drunk ends up getting caught and arrested. Table 4 lists the number of DUIs arrests reported by year. I should also note that there are some limitations to using UCR Data for the number of DUI arrests. UCR data is voluntarily reported by agencies. Thus some

²¹ Id.

²² Id.

agencies might be missing if they choose not to report. There also may be incentives for agencies to under or over report such as for funding purposes.

Table 4: DUI Arrests²³

Year	# of DUI Arrests	% Change
2019	9,107,942	+1,040.3%
2018	798,701	-4.4%
2017	835,195	-1.5%
2016	847,645	-3.0%
2015	873,892	-3.2%
2014	892,438	-10.9%
2013	1,001,465	-2.4%
2012	1,025,830	+6.5%
2011	963,568	-13.5%
2010	1,113,877	-3.8%
2009	1,158,468	x

I then found data on the total number of alcohol-impaired crash fatalities from the U.S. Department of Transportation, National Highway Traffic Safety Administration (see table 5). Alcohol-impaired driving crashes are defined as crashes that involve at least one driver operating with a BAC of 0.08 or above.

Table 5: Alcohol-impaired Crash Fatalities²⁴

Year	# Alcohol-impaired Crash Fatalities	% Change
2019	10,142	-5.3%
2018	10,710	-1.6%
2017	10,880	-0.8%
2016	10,967	+6.3%

²³ <https://crime-data-explorer.app.cloud.gov/pages/explorer/crime/arrest>

²⁴ <https://www.iii.org/table-archive/20843>

2015	10,320	+3.8%
2014	9,943	-1.6%
2013	10,110	-2.2%
2012	10,336	+4.8%
2011	9,865	-2.7%
2010	10,135	x

IV. Analysis

The number of DUI arrests in 2019 is an extreme outlier, and I had trouble determining why. I thought it was best to exclude this from my data. I first used valuation as a proxy for reliance on Uber. I hypothesize that the valuation of Uber signals public confidence in using the app as a reliable transportation method. Since I have overlapping data from 2011-2018 this is the time period I ended up using. As the valuation of Uber increased by 239,900% from 2011-2018, the number of DUI arrests decreased by 17%. Using data during the years Uber began to peak in popularity (2015-2018) I found as the number of Uber users has increased by 727%, the number of DUI arrests decreases by 8.6%. Finally, when looking at Uber annual revenue from 2014 to 2018 I found as Uber's annual revenues increased by 2,725% the number of DUI arrests decreased by 10.5%.

When using alcohol-impaired crash fatalities as my dependent variable I found that from 2011- 2019 there was a 273,233% increase in the valuation of Uber and a 2.8% increase in alcohol-impaired crash fatalities. This aligns with the results of the Brazil and Kirk study which found a positive relationship. As previously hypothesized, this could be because of increased road congestion. When using the User users data, I found that from 2015-2019 there was a 909% increase in the number of Uber users and a 1.7% decrease in the number of alcohol-impaired crash fatalities. When using Uber annual revenue, I found that from 2014-2019, there was a \$3,425% increase in Uber's revenue and a 2% increase in alcohol-impaired crash fatalities.

My study show that the results differ depending on the time period used, and what you use as your dependent variable. All Uber metrics caused the number of DUI arrests to decrease. There were mixed results when looking at alcohol-impaired crash fatalities and the magnitudes are a lot smaller. I think the mixed results are partially because of the different years used.

V. Limitations & Other Factors at Play

This paper relies on the assumption that drunk drivers would use Uber as an alternative to driving while intoxicated. People might not act rationally when intoxicated and thus may be unable to weigh the cost and benefits of various transportation options. There is some research suggesting that even inebriated decision makers take action only after comparing viable alternatives.²⁵ In terms of societal impact, it could also be the case that reliance on Uber leads to increased alcohol consumption.

It is possible that a decrease in car ownership, would also lead to a decrease in either DUI arrests or alcohol impaired crash fatalities. If less people own cars there would be less opportunities for DUIs. In 2014 there were 260,350,938 total registered vehicles in the U.S. in 2019 this number increased to 276,491,174.²⁶ This could mean more opportunities for DUIs, however, people who own cars still have the opportunity to use Uber as a substitute, thus the connection is too attenuated.

It is also possible that a societal trend of a decrease in alcohol consumption would decrease either DUI arrests or alcohol-impaired crash fatalities. Statista reported that per capita alcohol consumption in the US has increased in the past couple of decades. In 2009 alcohol

²⁵ Greenwood and Wattal at 166

²⁶ Lena Borrelli, *Car Ownership Statistics*, BANKRATE (2021)

consumption per capita in gallons of ethanol was 2.29, by 2019 this number increased to 2.38.²⁷ Thus this doesn't seem to be a limiting factor.

Furthermore, it is possible that an increase in bars & nightclubs or hours of operation would lead to more people drinking outside of their homes and thus increase DUI opportunities. I found data for the number of establishments in the bars, taverns, and nightclubs industry in the United States from 2003 to 2016. The number appears to be steadily diminishing during this time. In 2009, the year Uber was founded, there were 67,900 establishments. By 2017, this number had decreased to 63,305.²⁸ However, just because the number of establishments is decreasing doesn't mean the overall number of people leaving their homes to drink is decreasing.

Public transportation data also needs to be discussed. Jackson and Owens (2008) found that each additional hour of late-night operation reduced the total number of DUIs in Washington by 9%.²⁹ This shows that people do substitute public transportation for operating a vehicle while intoxicated. In January 2009 public transit ridership was at 827,360. In January 2019 it had dropped to 773,669.³⁰ It is possible that people are substituting Uber for public transit and that is contributing to the decrease. The increase in car ownership could also be a contribution. In order to explore this further I decided to compare two California cities: one that has a good public transit system (San Francisco) and one that doesn't (Los Angeles). Table 6 shows the number of DUI arrests per year across these two cities. Note that Uber was introduced in San Francisco in 2011 and in Los Angeles in 2012. I gathered data from 2010 (right before the introduction of Uber) all the way to 2018 (to account for the hypothesized lag I previously discussed).

²⁷ John Elflein, *Per Capita Alcohol Consumption of All Beverages in the U.S. 1850-2019*, STATISTA (2021) <https://www.statista.com/statistics/442818/per-capita-alcohol-consumption-of-all-beverages-in-the-us/>

²⁸ Statista, Number of Establishments in the Bars, Taverns, and Nightclubs Industry in the United States from 2003-2017. <https://www.statista.com/statistics/281713/us-bars-taverns-und-nightclubs-industry-establishments/>

²⁹ Jackson and Owens, *One for the Road: Public Transportation, Alcohol Consumption, and Intoxicated Driving* (2008)

³⁰ FRED, Public Transit Ridership <https://fred.stlouisfed.org/series/TRANSIT>

Table 6: DUI Arrests by City³¹

Year	Los Angeles	% Change	San Francisco	% Change
2010	40872	x	1480	x
2011	40249	-1.5%	1766	+19.3%
2012	39741	-1.3%	1728	-20.3%
2013	37559	-5.5%	1377	-20.3%
2014	36125	-3.82%	1075	-21.9%
2015	30779	-14.8%	1094	+1.8%
2016	26877	-12.7%	1056	-3.5%
2017	25087	-6.7%	841	-20.4%
2018	24642	-1.8%	909	+8.1%

From 2010 to 2018 there was a 40% decrease in the number of DUI arrests in Los Angeles and a 39% decrease in the number of DUI arrests in San Francisco. Thus, the introduction of Uber caused the number of DUI arrests to fall by relatively the same amount in these two cities regardless of their public transit differences. I would have liked to explore this further by using Uber ridership data by the city level, however, that was not publicly available.

It is also possible that changing DUI laws can disincentivize intoxicated drivers from getting behind the wheel. I looked to see if any states had changed DUI laws during the Sample period. I found Utah lowered its BAC limit from .08 to .05% for drivers over the age of 21 as of December 30, 2018.³² In August 2017, Pennsylvania changed their DUI law to offer no second

³¹ Annual Report of the California DUI Management Information System: <http://www.ddot-hso.com/assets/docs/impaired/DUI%20-%20CA.pdf>; <https://www.dmv.ca.gov/portal/uploads/2020/04/S5-259.pdf>; [https://www.dmv.ca.gov/portal/file/2020 annual report of the california dui management information system-pdf](https://www.dmv.ca.gov/portal/file/2020%20annual%20report%20of%20the%20california%20dui%20management%20information%20system%20pdf); <https://www.dmv.ca.gov/portal/file/annual-report-of-the-california-dui-management-information-system/>

³² IHPL, *Utah's new Law Against Drinking and Driving* (2019) <https://ihpl.llu.edu/blog/utah-s-new-law-against-drinking-and-driving>

chances. Now, any first-time DUI offender with a BAC of at least 10% must install an ignition interlock system in their vehicle, whereas previously any first-time offender automatically lost their license for one year.³³ In October 2016, a new DUI law “Noah’s Law” went into effect in Maryland. This also significantly expanded the use of ignition interlock devices.³⁴ In 2016, Connecticut introduced a law creating a mandatory minimum sentencing of 30 day days jail for a conviction of a DUI where underaged children were in the vehicle.³⁵ Other states have recently changed their laws in similar ways.

Next I looked at trends of the number of police officers in the United States. If there are more officers working, there is a greater chance of catching someone driving while intoxicated. The number of full-time law enforcement officers in the United States reached its peak in 2008, right before the introduction of Uber, with 708,569 officers. It then dropped and hit a low in 2013 with 626,942 officers. It has since steadily increased again to reach 697,195 officers in 2019.³⁶ Even with an increase in officers since 2013, there was a decrease in number of DUI arrests, which means that Uber may be a factor contributing to the decline.

Lastly, I thought about how a rise in self-driving cars could play a factor. However, it doesn’t appear that self-driving cars are wide-spread enough to impact the study. As of March 2019, three in four Americans reported to be afraid of fully self-driving vehicles.³⁷

VI. Policy Implications

³³ Dui Charges and The State’s Changing Laws (2017) <https://www.schimizilaw.com/blog/2017/09/dui-charges-and-the-states-changing-laws/>

³⁴ Marland.gov, New Laws Impacting Maryland Drivers to Take Effect October 1 (2016) <https://mva.maryland.gov/Pages/NewsDetails2.aspx?NR=201658>

³⁵ DeMatteo, CONNECTICUT IS NOT KIDDING AROUND WITH ITS NEW DUI PENALTIES (2017) <https://conncriminaldefense.com/blog/connecticut-not-kidding-around-its-new-dui-penalties/>

³⁶ Statista, Number of full-time law enforcement officers in the United States from 2004 to 2020, <https://www.statista.com/statistics/191694/number-of-law-enforcement-officers-in-the-us/>

³⁷ Edmonds, Three in Four Americans Remain Afraid of Fully Self-Driving Vehicles, AAA NEWSRoom (2019) <https://newsroom.aaa.com/2019/03/americans-fear-self-driving-cars-survey/>

If rideshare apps decrease the number of DUIs in the United States, maybe the government should seek to subsidize the cost to further incentivize people to “call an Uber” instead of getting behind the wheel. Uber uses surge pricing thus prices are higher when demand is high. It is the case that demand is high, and thus prices are higher, at popular times when people are leaving bars (for example, 12 am or 2am when the bars close, or the time a concert ends). Uber could change this pricing model to offer cheaper rides late at night, or at these peak times. This would especially be beneficial on holidays such as the 4th of July, NYE, Labor Day, etc. The surge pricing drives up prices on these days which are more likely to have drunk drivers.

Another way to decrease the price, would be to somehow incentivize more people to become Uber drivers thus increasing the supply of labor. This could be achieved through higher pay, better employment benefits, tax reductions, or even cheaper gas/ cars for Uber drivers. This would also decrease wait times. If wait times are high, people might be impatient and opt to get behind the wheel. Lastly, this could highlight the need for greater Uber availability outside of major cities.