

UBER'S POTENTIAL IMPACT ON DRUNK-DRIVING RELATED ACCIDENTS

By

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Abstract:

Contrary to popular belief, cars are one of the most dangerous modes of transportation. Every day, 3,700 people die from car crashes, making crash injuries the 8th leading cause of human death. As a result, car crashes kill more individuals than HIV. These crashes are not only devastating, but also have a serious impact on the world's economy. In fact, fatal and nonfatal crash injuries cost the world \$1.8 trillion a year.¹ Governments around the world have tried to implement solutions to help reduce crashes, including increasing driving age limits and more stringent drunk-driving laws. However, as urbanization and car ownership increase, these policies cannot keep up.

In 2009, Uber Technologies Inc was founded. Since then, society has optimistically looked towards ride-sharing services like Uber as a potential silver bullet to decreasing car crashes and fatalities. Over the past decade, multiple studies have tried to identify the impact Uber has on reducing drunk-driving related accidents and fatalities. Most of these studies showed that Uber has a positive impact on society and helps reduce accidents and deaths on the road. However, most of these studies were conducted in rural areas where the majority of people rely on personal vehicles instead of public transportation. As a result, Uber's impact in those areas is magnified. However, this study aims to identify Uber's impact in New York City, a city where the majority of residents rely on public transportation instead of personal vehicles.

If a relationship is found between Uber and drunk-driving related accidents in a city like New York, where Uber's impact should not be apparent, a strong argument could be

¹ <https://www.cdc.gov/injury/features/global-road-safety/index.html#:~:text=Each%20year%2C%201.35%20million%20people,on%20roadways%20around%20the%20world.&text=Every%20day%2C%20almost%203%2C700%20people,pedestrians%2C%20motorcyclists%2C%20or%20cyclists.>

made in favor of Uber's impact on society. This could overall improve Uber's position amongst policymakers and anti-Uber governments.

Background:

Accidents on the road are one of the leading causes of human death in the United States. Each year, more than 38,000 individuals die from road crashes. Most of these deaths are caused by impaired driving. In fact, every 52 minutes a person dies because of a drunk driver. In New York City alone between 2003 and 2012, 3,752 people were killed because of a car accident involving at least one drunk-driver. In 2018, 32.8% of road fatalities were caused by a drunk driver. These alarming statistics show the dire need for a solution to reduce drunk-driving related accidents.²

To tackle this issue, the US government has imposed drinking-age limits,³ reduced the tolerable amount of blood alcohol concentration,⁴ and imposed taxes on alcohol. These measures have undoubtedly been impactful. For example, the Insurance Institute for Highway Safety conducted a study showing that the percentage of fatally injured drivers between the ages of 16 and 20 with a positive Blood Alcohol Content (BAC) declined from 61% in 1982 to 31% in 1995.⁵

While these measures have had a positive effect, many drunk drivers are not arrested or fined in the first place. For example, in 2014, although there were 121 million drunk-driving related accidents in the US, only 1.1 million arrests were made for driving under the influence. What is concerning is that the United States population is expected to increase by

² Impaired driving is defined as driving under the of alcohol. In the United States, it is defined as a blood alcohol content (BAC) greater than or equal to 0.08%.

³ In 1988, the US government imposed a MLDA of 21 in all 50 states.

⁴ Blood alcohol concentration is defined as the percent of alcohol in a person's blood stream.

⁵ <https://pubmed.ncbi.nlm.nih.gov/20497803/>

about 1% each year, and alcohol consumption is expected to grow 3.8% each year.⁶ As a result, accidents on the road and DUIs are expected to rise along with those numbers.

Therefore, what are other measures that could help reduce drunk-driving related accidents? One potential solution could be the increased use of ride-sharing services like Uber.

Uber Technologies Inc:

Uber is a San Francisco based company which, amongst other services, provides ride-hailing to individuals in 72 countries. Uber is a marketplace where customers are able to reserve a chauffeured car for a specific ride, similar to a taxi. The individual inputs their pickup point and destination into the Uber app. The application then matches the rider with the closest driver and calculates the ride's cost.

While there are other ride hailing services in the US such as Via and Lyft, Uber dominates the US market. Specifically, Uber's market share in the US as of July 2021 was 68%, compared to Lyft's 31% (Uber's biggest American competitor). A part of Uber's success can be attributed to the first mover advantage. Uber was founded three years before Lyft, and by the time Lyft entered the US market in 2012, Uber had already started to expand outside the US and added new features to its platform such as UberX - allowing different users to share the same car.⁷

Uber's biggest market is New York City. The service entered the Big Apple in 2011 and since then it has been used by millions of customers. Within a few years, Uber's

⁶ <https://www.forbes.com/sites/hudsonlindenberger/2021/06/16/alcohol-consumption-in-the-united-states-saw-its-most-significant-volume-gain-in-almost-two-decades-in-2020/?sh=4d88200d724d>

⁷ https://en.wikipedia.org/wiki/Timeline_of_Uber

popularity within the city grew exponentially, and in 2015 its New York City bookings exceeded \$1 billion.

Part of Uber's popularity can also be attributed to its convenience. Unlike taxis, Uber is able to calculate the cost of the trip in advance, giving riders a higher degree of transparency and certainty on the ride's cost. Uber also tracks the ride for safety purposes, provides 24/7 customer service, and supplies the rider with information on the driver, who is verified before being onboarded onto the app. These factors have made transportation more convenient, and to some degree, safer for riders. For example, according to a recent study conducted by Alarms, women find Uber to be the mode of transportation they feel most safe taking.⁸

Therefore, when Uber entered the US market, the supply of ride hailing services drastically increased and more individuals, especially of the younger demographic, had convenient access to for-hire cars.

Why New York City:

There have been multiple studies that have identified the impact ridesharing businesses like Uber have had on traffic fatalities and impaired driving which will be analyzed in detail further on. Most studies have analyzed Uber's impact at the national level. For example, the National Bureau of Economic Research states that "ride-sharing has decreased alcohol-related US traffic fatalities by 6.1% and reduced overall US traffic deaths by 4%".⁹

⁸ <https://www.alarms.org/uber-lyft-womens-safety-report/#:~:text=Our%20data%20shows%20they%20still,Nearly%2067%20percent%20for%20Lyft.>

⁹ <https://www.thezebra.com/resources/research/drunk-driving-statistics/>

However, Uber's impact on drunk-driving related accidents should not be evaluated at the national level, but more so on a state-by-state or city-by-city level. This is because Uber's usage and presence are extremely unequal in different geographies. In 2021, 23% of Uber's mobility gross bookings were derived from New York City, Chicago, Miami, Sao Paulo, and London.¹⁰ This is because Uber is extremely focused on expanding its business in metropolitan areas. In more rural areas, Uber, and ridesharing services in general, are less common.

For example, one study identifies Uber's impact in Houston, TX, a city that relies heavily on personal vehicles. As a result, only 8.3% of people who live in Houston do not own a car.¹¹ However, in New York City, 54.4% of households do not own a vehicle. Because the number of people who take personal vehicles is much higher in Houston compared to New York City, Uber's impact on a personal vehicle-reliant city is more apparent. New York City is also heavily reliant on public transportation – New York City has 472 subway stations, while Houston only has 39. For comparison, New York City's land area is about half that of Houston.

Therefore, this thesis aims to demonstrate the impact Uber might have on drunk-driving related accidents and impaired driving in a city that is already heavily reliant on public transportation.

Literature Review:

Uber's Impact on Drunk-Driving Arrests and Drunk-Driving Related Accidents in Houston:

According to a study conducted by the Journal of American Medical Association, companies like Uber might be the key to the dramatic problem of drunk-driving accidents.

¹⁰ Uber 10K

¹¹ <https://www.governing.com/archive/car-ownership-numbers-of-vehicles-by-city-map.html>

A 2021-study conducted by researchers from The University of Texas Health Science Center at Houston, showed that between 2007 and 2019 in Houston, DUI arrests and serious motor vehicle traumas (MVTs) decreased significantly after Uber entered that market in 2014. Specifically, MVTs decreased by 23.8% across all ages and 38.9% specifically for those under the age of 30. The study included three major data sets. The first, included hospital data from the Red Duke Trauma Institute within the Memorial Hermann Hospital–Texas Medical Center and Ben Taub General Hospital. The second, tracked the number of Uber hourly rides taken on the weekend. This data was collected directly from Uber. The third dataset included impaired driving statistics from the Harris County, Texas, District Attorney’s office.

This study has been used by many to prove Uber’s positive impact in Houston and many have extended that perception of the company’s impact to society to the rest of the United States.

Uber’s Impact on Traffic Fatalities in the 100 Most Populated Metropolitan Areas Across the United States:

This study analyzes the association between the presence of Uber and drunk-driving traffic fatalities in the 100 most populated metropolitan areas in the United States. The study used an observational panel to determine monthly changes within counties with motor vehicle fatalities between 2005 and 2014, before and after Uber’s market entrance. Traffic fatality data was gathered from the Fatality Analysis Reporting System, produced by the National Highway Traffic Safety Administration. To determine the impact of Uber, the study then identified when Uber’s ride-hailing service entered in each of the 100 most metropolitan cities. This information was sourced in part from Uber’s website, which publishes data on the

launch of its service in each new market. To determine the deployment of Uber in cities not published on the website, the study used local media outlet information.

The study used a difference-in-difference strategy to analyze the data as well as negative binomial and Poisson regression models. The study found that there is no association between the availability of Uber and traffic fatalities in the top 100 most populated cities in the United States.

Uber's Impact on Drunk-Driving Related Accidents and Fatalities Across the United States:

This study aims to identify the impact of Uber in drunk-driving related accidents and fatalities across the United States.

The study used data from the National Highway Traffic Safety Administration Fatality Analysis Reporting System to gather information on fatal crashes in the United States between 2001 and 2016. The study also used Uber's proprietary data to gather information on the number of Uber rides.

The study showed that ridesharing activity has a positive impact on alcohol-related traffic fatalities. More specifically, Uber reduced alcohol-related traffic fatalities by 6.1% and total traffic fatalities by 4%. To prove Uber's positive impact, the study also estimated that the ridesharing company saved 219 lives in 2019 across the United States.

To quantify Uber's impact even further, the study concluded that the company saved between to \$2.3 to \$5.4 billion in annual life-saving benefits.

Uber's Impact on Drunk-Driving Related Accidents Based on Difference-in-Difference Analysis

This study aims to identify Uber's impact in New York City on drunk-driving related accidents by comparing different New York City boroughs.

The study gathered alcohol-related crash data from the New York State Department of Motor Vehicles and the Department of Transportation. The researcher used data from 2007 to 2013. The study chose to omit data beyond 2013 to avoid certain confounders including the introduction of “boro” or green taxis into the city. These taxis are not allowed to pick up passengers in lower Manhattan. Another confounder the study avoids is the introduction of Uber’s Hamptons service. In 2013, Uber launched its service in the Hamptons for summer weekends only.

To determine when Uber launched in each borough and how often Ubers were being used, the study gathered data from articles, blog posts, and press-releases.

The study then ran a difference-in-difference analysis to determine the overall impact of Uber in New York City. The researcher designated certain New York State counties as treatment variables and others as control variables. Specifically, New York City, Bronx, Queens, Manhattan, and Brooklyn were assigned as treated, while Staten Island was determined as the control variable.

The study concluded that since entering New York City, Uber decreased alcohol-related collisions by 25-35%. Specifically, Uber’s impact was more significant in Manhattan, and the least significant in Queens. Based on these results, the study also suggests that utilizing Uber reduces accidents while helping individuals gain easier access to urban centers like Manhattan. However, it does not help make transportation easier and more accessible in areas with weaker public transportation systems like in Queens.

The Study:

i. Data

This study contains four data sets from two different sources. The first data source is from the New York Police Department and shows the number of intoxicated and impaired driving arrests by year in New York City across all five boroughs. The data ranges from the year 2000, the earliest available data, to 2021,¹² the most recent available data. The data set also includes the number of yearly traffic fatalities caused by drunk driving in New York City from 2000 to 2021. This data is publicly available under Article 6 of the New York State Public Officers Law which states that under the Freedom of Information Law, members of the public are allowed to request records from New York State and/or local government agencies.

The second data set is from the Taxi and Limousine Commission database, which tracks daily average Uber rides taken in New York City from January 2015 to December 2021. The daily average is then multiplied by the number of days in each month to find the average monthly rides in New York City. The monthly averages were then aggregated to find total yearly Uber rides in New York City.

For comparison purposes, Lyft data was also tracked from 2015 to 2019 and the same methodology used for the Uber data was applied to the Lyft data.

ii. Hypothesis

Based on the previous studies, there is reason to believe that there is a connection between the number of Ubers taken and the number of drunk-driving related accidents. The

¹² For all data sets, 2020 was omitted given that due to COVID, Ubers were not allowed to operate, showing a drastic decrease in Uber rides. Therefore, 2020 data is considered as an outlier in most Uber financial analysis reports.

study assumes that an increase in the use of Ubers in New York City decreases the number of drunk-driving related accidents. As such my null hypothesis is the following:

- There is no statistically significant relationship between the number of Ubers and drunk-driving related accidents.

As a result, my alternative hypothesis is:

- There is a statistically significant relationship between the number of Ubers and drunk-driving related accidents.

The potential outcomes of the study are as follows:

As the number of Ubers increase, drunk-driving related accidents decrease.

Or

As the number of Ubers decrease, drunk-driving related accidents increase.

Or

As the number of Ubers increase, drunk-driving related accidents do not change.

Or

As the number of Ubers decrease, drunk-driving related accidents do not change.

Based on previous studies, there is also reason to believe that there is a connection between the number of Ubers and the number of traffic fatalities caused by drunk driving. The study assumes that the use of Ubers in New York City decreases the number of traffic fatalities caused by drunk driving. As such my null hypothesis is the following:

- There is no statistically significant relationship between the number of Ubers and traffic fatalities caused by drunk driving.

As a result, my alternative hypothesis is:

- There is a statistically significant relationship between the number of Ubers and traffic fatalities caused by drunk driving.

The potential outcomes of the study are as follows:

As Ubers increase, traffic fatalities caused by drunk driving decrease.

Or

As Ubers decrease, traffic fatalities caused by drunk driving increase.

Or

As Ubers increase, traffic fatalities caused by drunk driving do not change.

Or

As Ubers decrease, traffic fatalities caused by drunk driving do not change.

iii. Methodology

To analyze the data, the study uses an OLS regression model using R to identify the relationship between Uber and traffic fatalities caused by drunk driving and Uber and drunk-driving accidents. The same analysis was performed for Lyft. The same methodology described below was applied to the Lyft data. The purpose of this parallel analysis is to have an additional data point on ridesharing services in New York City, but is not the scope of the study – only the conclusion of the results is shared.

The study runs a regression with Uber rides as a regressor and drunk-driving related accidents as a dependent variable. A secondary regression was run with traffic fatalities caused by driving as a dependent variable, keeping Uber rides as a regressor. Given the equation $Y = mx + b$, the equation for this study is the following:

- Drunk-driving related accidents = m_1 *number of Ubers + b_1
- Traffic fatalities caused by drunk driving = m_2 *number of Ubers + b_2

The parallel analysis for Lyft follows the same equation:

- Drunk-driving related accidents = m_3 *number of Lyfts + b_3
- Traffic fatalities caused by drunk driving = m_4 *number of Lyfts + b_4

The study's regression for Uber showed the following results:

Drunk-driving related accidents

Coefficients:	Estimate	Std. Error	T value	P value
Intercept	6.364e+03	1.246e+03	5.107	0.00695
Number of Ubers	-1.275e-05	1.003e-05	-1.271	0.27254

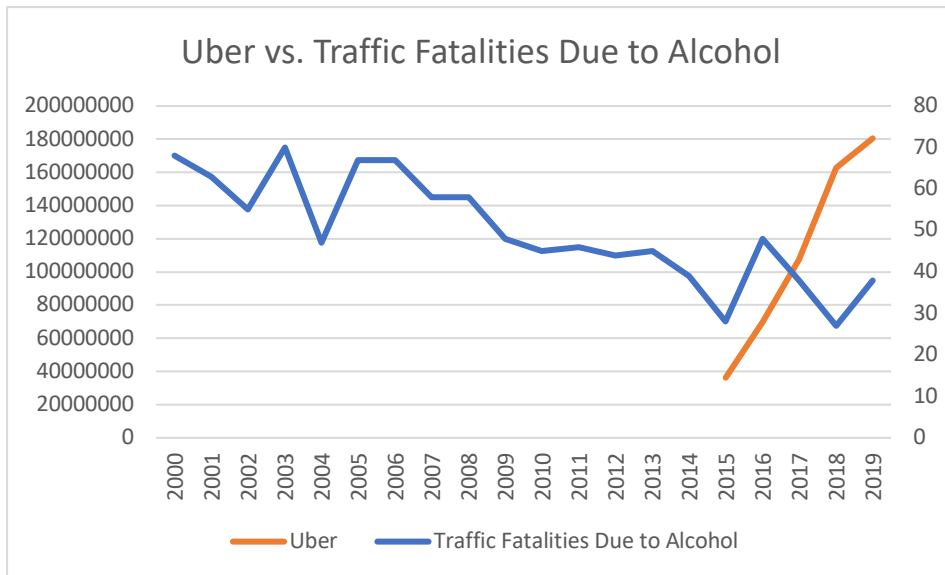
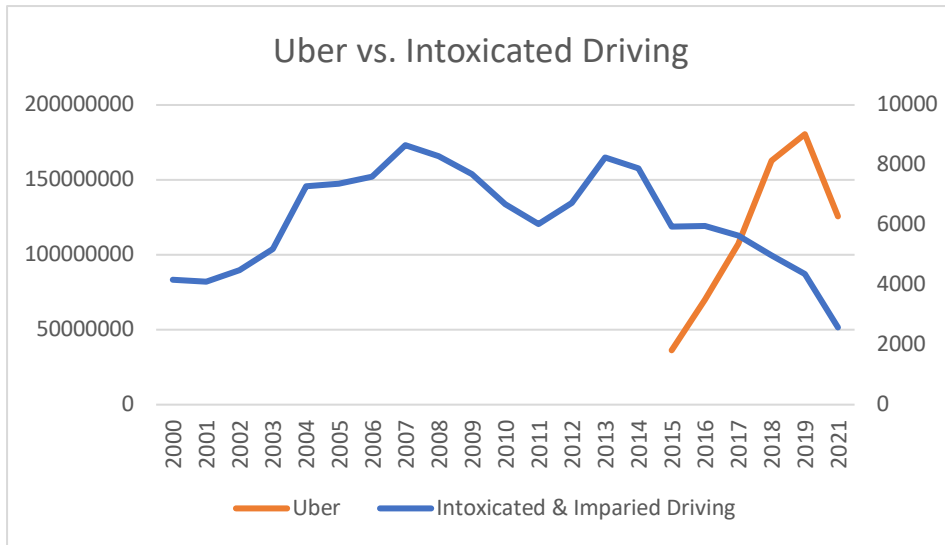
Traffic fatalities caused by drunk driving

Coefficients:	Estimate	Std. Error	T value	P value
Intercept	3.752e+01	1.008e+01	3.723	0.0337
Number of Ubers	-1.542e-08	8.132e-08	-0.190	0.8617

iv. Results

After running the OLS regression, the results show that there appears to be no statistically significant relationship between Uber and drunk-driving related accidents. Hence, the null hypothesis is accepted. There also appears to be no statistically significant relationship between Uber and traffic fatalities caused by drunk drivers. The same is true for Lyft's regression results. This means that Ubers do not seem to be a good indicator of traffic fatalities caused by drunk drivers nor drunk-driving related accidents.

This could imply that other measures might be more impactful in decreasing drunk-driving related accidents and fatalities in highly urbanized areas. These might include increasing police controls, increasing taxes on alcohol, and implementing stricter drinking limits. These results might contradict those from previous studies given the nature of New York City. As mentioned, New York City is extremely urban and most people, especially younger individuals, rely on public transportation to move around rather than personal vehicles. This is even more true in the Manhattan borough.



v. *Potential Confounders*

One potential confounder is the impact COVID has had on the ridesharing business. Even though 2020 data has been eliminated from the datasets and analysis, COVID’s impact on the ridesharing business is still present. For the majority of 2020, Uber was not allowed to operate and during that time, 320,000 people moved out of New York City.¹³ While many have returned to the city since then, with the Omicron variant wave and the continuation of work-from-home policies, New York City trip volume has not fully recovered. Because trips

¹³ <https://abc7ny.com/nyc-exodus-census-fleeing-leaving/10949972/>

have not fully recovered, and individuals have not fully returned to New York City, both the number of drunk-driving and Uber rides have not yet normalized.

Another potential confounder might be the maximum number of riders allowed in an Uber. Before the pandemic, up to four people were allowed to be in a UberX, or six in an UberXL.¹⁴ However, to increase safety for both riders and drivers, riders are not allowed to sit in the front seat of the car. This reduced the number of allowed riders from 4 to 3 for UberXs and from 6 to 5 for UberXLs. As a result, individuals are forced to call more Ubers which could artificially increase the company's ride figures.

Another potential confounder is that with an OLS regression, correlation does not equal causation. However, analyzing Uber's impact on a city like New York through another model like difference-in-difference model, like in the New York City study, is challenging. Specifically, a difference-in-difference model requires the use of a control variable and a treated variable, which in this case is New York City. The control variable should be a city as similar to New York City as possible and should not have Uber as an active ridesharing player. However, there are few cities in the world that are comparable to New York City. No city in the US is as urban as New York, and every city in the US has a live ridesharing Uber service. The same is true for Asian cities, which all have Didi, Uber's equivalent. Some European cities do not have Uber; however, the nature of European cities is very different to New York and the comparison would not hold. As explained by Dr. Conner, the author of the Texas study, the best test to run is an OLS regression which implicitly does not imply causation. As such, this study relies on an OLS regression model to infer Uber's impact in New York City.

¹⁴ UberX is the standard Uber service car, UberXL matches riders with larger cars that can seat more people.

vi. Conclusion

Not assuming causation, the results of the study could imply that Uber's impact on New York City's drunk driving related accidents and traffic fatalities caused by drunk driving is nonexistent. The same thing can be said for Lyft.

Implications:

This study found no statistically significant relationship between Uber and drunk-driving related accidents and found no statistically significant relationship between Uber and traffic fatalities caused by drunk driving in New York City. However, given that previous studies have proven that Uber does have a positive impact on society, and given that this study can be improved, there is still room to show Uber's benefits to the world. As such these include:

i. Allowing Uber to Have Contractor-only Drivers

In recent years, Uber has been at the center of backlash due to its business model. According to the company, Uber drivers are considered contractors. This means that drivers, regardless of how many hours they work, are not entitled to benefits like healthcare and paid time off. Many drivers and regulators have protested Uber's decision to keep its employees as contractors.

Uber, alongside many other companies in the gig-economy space, claim that it should not hire drivers given that ride-sharing business serves simply as an "algorithmic matchmaker" (Financial Times)¹⁵ between drivers and riders. Uber also claims that 91% of its

¹⁵ <https://www.ft.com/content/8adf4de7-90e9-4304-aa6e-71d652946e80>

drivers work less than 40 hours a week,¹⁶ and because the company simply serves as a connecting platform, Uber drivers are their own bosses and can manage their own schedule. Uber claims that considering drivers as contractors allows for increased flexibility, which most drivers seem to want.

Critics, however, argue that Uber's reasoning is simply a façade to save money. According to certain policymakers, Uber should be considered like a minicab booking service, like taxis, and therefore should consider its employees full-time workers. This is because, even though the drivers are able to set their own schedule, they have no say over who they can pick-up and where they can drop-off the riders.

Certain states in the US have already taken action against Uber. For example, in 2019, California's Assembly Bill 5 stated that in order for workers to be considered contractors, they must have freedom from direction and control. Increasingly more governments and policymakers around the world, such as in the United Kingdom, are trying to push for companies like Uber to change their employment business models.

However, Uber claims that this could have devastating impacts for the company. According to Uber, hiring full-time drivers cannot be supported by the company's finances and that the company was not built with the intention to hire full-time drivers. In fact, according to Wedbush Securities, full-time drivers could cost Uber an additional \$500 million each year.¹⁷ The company has not reached profitability yet and compensating drivers as full-time employees would ultimately have two impacts: 1) force Uber to decrease the number of drivers due to the cost of labor and benefits and 2) increase Uber prices for consumers.

¹⁶ The US Department of Labor guidelines indicate that standard full-time jobs consist of working 40 hours per week, and hours after that should be considered as over-time.

¹⁷ <https://www.businessinsider.com/uber-lyft-ab5-fight-reveals-dependence-full-time-drivers-2020-8>

If this were the case, Uber's utilization rate would decrease, and potentially even increase the number of drunk-drivers and drunk-related accidents.

The other studies mentioned show the potential positive impact of Uber on society. This could help Uber's case and push for the company to maintain its contractor employment business model in order to benefit society as a whole.

ii. *Allowing Uber to Enter Other Markets (ex. Italy)*

Uber currently operates in 72 countries. However, it does not operate in certain major markets like France, Italy, and the Netherlands, amongst other countries. This is because these countries have deemed Uber to create unfair competition within the ridesharing space. For example, in Italy, in 2017 the government ruled that Uber cannot operate in the country because it poses a threat to the taxi business. The Italian government also banned Uber from operating in Italy given that Uber drivers are not required to acquire taxi medallions, which can cost up to \$1 million.

While the arguments these countries make could be valid, these countries could be missing out on the broader benefits to their society. Uber could help reduce drunk-driving accidents especially in a country like Italy, which has an underdeveloped public transportation system and relies on personal vehicles for travel. This could additionally result in a positive financial impact to society. For example, in Italy, between the years 2011 and 2020, the government implemented effective regulations to decrease drunk-driving related accidents (ex. TV campaigns and increased police controls). Alongside the decrease in accidents and mortality rates, the country saved \$43 billion in national spending. The money saved could not only increase with Uber active in the market, as shown in the Texas study,

but could most importantly be directed towards other high-priority programs within the country.¹⁸

iii. Improved Government-Uber Partnerships

Previous studies might also help improve the relationship between the US government and Uber. The government could increase partnerships with Uber to help improve population safety and transportation. Some initiatives that have already started include the partnership with the Governors Highway Safety Association and State Highway Safety Offices in Colorado, Connecticut, Maryland, New Mexico, and Texas. This partnership awarded \$95,000 to these states in Uber credits during the holiday season to avoid people from driving, especially while under the influence. Proving Uber's positive impact could push the US government to provide further grants like these in other cities around the US and help reduce the rising number of drunk-driving related accidents.

Study Improvements:

There are a few improvements that could be made to this study. The first relates to the underlying data. The amount of Uber data readily available is limited. Daily and monthly data is available only through the Taxi and Limousine Commission database. However, after speaking with Dr. Conner, he mentioned that having the number of Uber trips by the hour provides a clearer picture of Uber's impact. This data is not publicly available and is confidential to Uber. An attempt to gather this data was made by contacting an Uber employee, however there was no response.

¹⁸ https://www.istat.it/it/files/2021/07/Incidenti-stradali_2020.pdf

Moreover, because Uber only entered the United States in 2011, the data available in relation to time is limited - not enough years have passed for the data set to be extensive. Additionally, given COVID's impact, Uber rides have not fully recovered. Re-running this study later in time will give Uber time to fully recover its ride volume as well as recover additional data points.

Closing Remarks:

While this study found no statistically significant relationship between Uber and drunk-driving accidents and Uber and traffic fatalities caused by drunk-driving in New York City, Uber's positive impact across other cities is apparent. As such, policymakers and governments around the world should consider Uber as an ally in increasing overall societal well-being and road safety.

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