THE ECONOMIC DISTORTION IN NYC TAXI INDUSTRY CAUSED BY THE ARRIVAL OF UBER

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Introduction

Since Uber was founded in 2009, with Lyft, Via and other competitors following shortly after in 2012, consumers have opted to use the ridesharing giant rather than drive themselves or rely on a traditional taxi or car service. Uber, an app for smartphones, revolutionized the way people travel by connecting riders with a personal driver and facilitating the payment through the app so that no money need be exchanged at the end of the trip. Following the success of Uber, other ridesharing firms entered the market, congesting the roads, competing with local taxis, and altering the economies of large cities. Though the traditional medallion taxicab industry has faced competition over the years from public transportation and car services, Uber has been the most detrimental to the industry with its convenient, on-demand business strategy and the overall consumer trend to partake in a "sharing economy"—in a 2015 survey, "PricewaterhouseCoopers found that 19 percent of US adults had 'engaged in a sharing economy transaction.'"[1] This trend has caused economic distortion in the New York City taxicab economy.

This paper intends to analyze the economic distortion caused in the traditional New York City medallion taxicab industry by Uber and will then propose a tax on Uber to match the current trip tax on local taxicabs. The optimal tax on Uber will be calculated using the Ramsey Rule, using the current Hail Vehicles Trip Tax and Sales Tax on traditional medallion taxicabs, to maximize the social welfare of New York City consumers. The Uber tax is designed to have a higher consumer tax burden so that traditional medallion taxicabs can better compete with

[1] Scott Wallsten, "The Competitive Effects of the Sharing Economy: How is Uber Changing Taxis?" *Technology Policy Institute*, 2015, 3.

pricing. I find that this tax, coupled with the recent bill to limit the number of ridesharing vehicles in New York City, should decrease congestion in New York City streets and encourage city residents to opt for public transportation instead of a private driver.

Background

As of 2015, The New York City Taxi and Limousine Commission oversaw over 13,000 medallion taxis and 38,000 individuals licensed to drive medallion cars.[2] The medallion system, created in 1937, is a transferrable permit system intended to limit the number of taxicabs on the road. A medallion must be purchased in order to drive a yellow taxicab. In 1996, New York City auctioned 2,000 medallions and the shortage in permits drove the price up to as high as $1 million per medallion by 2014, with 14,000 medallions operating in the city.[3] Since the arrival of ridesharing services, the medallion taxicab industry, which is traditionally heavily regulated, has been facing unprecedented competition from Uber and other ridesharing services. In 2015, the price of a medallion had fallen by about 25 percent as a result of decreased demand and competition from ride-sharing services.[4] Consumers are repeatedly choosing ridesharing services over local medallion taxicabs. Since New York City regulates the number of taxis allowed to operate, either traditional medallion taxicab prices are too high, there are not enough taxis to meet consumer demand, or ridesharing is simply more convenient. This is creating a shift in consumer demand away from traditional medallion taxicabs and leading to a reduction in the efficiency of the economy and a misallocation of resources.[5]

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[2] "2016 TLC Factbook," New York City Taxi & Limousine Commission, https://www.tax.ny.gov/bus/mctmt/taxi.htm.
[3] Ibid.
[4] Wallsten, "The Competitive Effects", 4.
[5] Judd Cramer and Alan B. Krueger, "Disruptive Change in the Taxi Business: The Case of Uber" *National Bureau of Economic Research*, 2016, 177.

The NYC Taxi and Limousine Commission, which collects detailed information on all city taxi rides from the cab meters, has analyzed the impact on medallion taxicabs since the growing popularity of Uber and other ridesharing services in New York City. From 2009 to 2015, the data collected shows a decline in the demand for traditional taxis since the entrance of Uber in the New York City market in May 2011.[6]

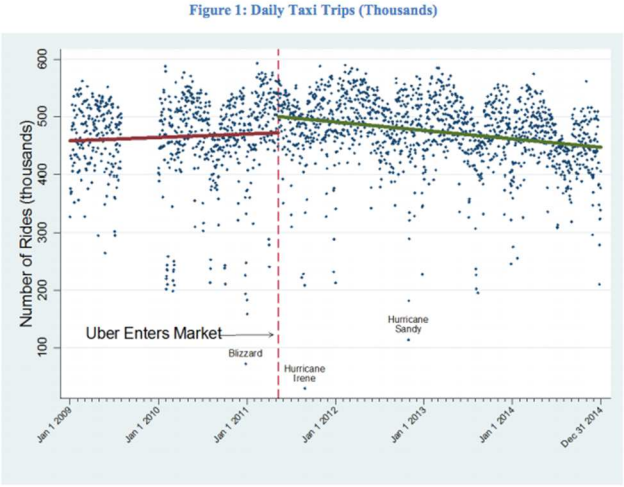

Figure 1. is copied the Technology Policy Institute's "The Competitive Effects of the Sharing Economy: How is Uber Changing Taxis" and shows the decline in daily medallion taxicab trips in New York City since the introduction of Uber and other ridesharing services to the market.

Though there has been a decrease in demand for traditional medallion taxicabs and an increase in demand for ridesharing services, there are still the same number of medallion taxicabs on the streets and an influx of ridesharing drivers and their personal cars. It is estimated that on any given day and at any given time, 30 percent of New York City taxis are vacant and up to 40 percent of ridesharing vehicles are vacant.[7] This leads to more congested streets and more competition among drivers.

Response

[6] Wallsten, "The Competitive Effects", 8.
[7] Jonathan Wolfe and Alexandra S. Levine, "New York Today: Capping Uber" *The New York Times*, August 15, 2018.

In order to combat street congestion and the number of vehicles on the road, in August 2018 New York City became the first major city to cap Uber and other ridesharing services. Mayor Bill de Blasio signed a bill that limits the number of Ubers and other ridesharing services in New York City. The bill is intended to improve congestion, increase driver wages and strengthen the taxi industry.[8] The bill limits Ubers and ridesharing services to 100,000 registered cars in the city, sets minimum wage rules for ridesharing drivers and established standards for how often a vehicle must be occupied by a passenger. The minimum wage regulation will bump app drivers' wages by 23 percent on average, ultimately requiring the consumer to pay more for a ride to cover the wage increase. In addition, the vehicle occupation standard will reduce the time a driver can spend driving an empty vehicle around the city and should improve the flow of traffic. The bill follows appeals from medallion holding traditional taxicab companies to regulators and politicians, hoping to block ridesharing services from their cities. The most popular claims were unfair and deceptive practices, unfair competition, false representation/deception, violation of regulatory framework and unlawful diversion of sales reserved for those with medallions/city contracts with drivers.[9]

Since the entrance of Uber into New York City in May 2011, there has been an intensification of traffic congestion in the city and a strain on traditional medallion taxicabs in their ability to compete with Uber. While New York City has responded by capping the number of ridesharing vehicles allowed in the city, there is still not enough being done to allow traditional medallion taxicabs, a heavily regulated industry, to better compete with their more modern and technologically advanced competitor.

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[8] Ibid.
[9] Carlos Sun and Praveen Edara, "Is Getting an Uber-Lyft from a Sidecar Different from Hailing a Taxi?" 60.

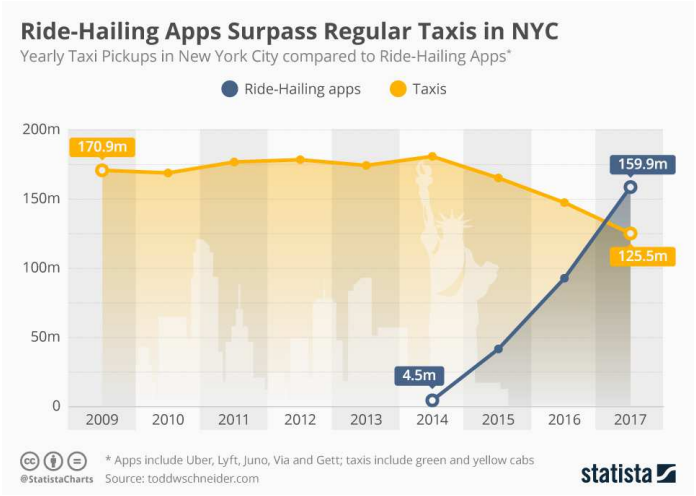

Figure 2. is copied from Statista's "Ride-Hailing Apps Surpass Regular Taxis in NYC" and shows the total number of yearly pickups in New York City from traditional taxis versus ridesharing services like Uber.

Economic Analysis

It is necessary to find the optimal tax on Uber and other ridesharing services because while there are caps and restrictions on the number of taxis and Ubers in New York City, Uber's competitive prices and convenient model are pushing people away from using both traditional medallion taxicabs regulated by the city and the public transportation services offered by the city. A tax on private goods like Uber and medallion taxicabs might encourage people to use the New York City public transport system and further reduce the congestion of city streets.

Presently, New York City taxi drivers face a tax on their product, "The *taxicab and hail vehicle trip tax in the Metropolitan Commuter Transportation District* is a tax of $0.50 per taxicab and hail vehicle trip that starts and ends in New York City."[10] In addition, New York City charges a total sales tax of 8.875% on services and goods, including medallion taxicabs.[11] The policy problem in Appendix A and Appendix B calculates the optimal Hail Vehicle Trip Tax

[10] "Information on the taxicab and hail vehicle trip tax," New York State Department of Taxation and Finance, https://www.tax.ny.gov/bus/mctmt/taxi.htm.
[11] "Sales Tax," The Official Website of the City of New York, https://www1.nyc.gov/nyc-resources/service/2389/sales-tax.

and Sales Tax on Uber and other ridesharing services to minimize deadweight loss and distortion caused in the market by the tax on traditional medallion taxicabs. Below is collated data from the New York State Department of Taxation and Finance, the New York City Taxi and Limousine Commission, and a compilation of credible research papers and studies from which the optimal tax is calculated:

	Traditional Medallion Taxicab	Uber
Elasticity of demand	-0.22[12]	-0.6[13]
Elasticity of supply	+1.0[14]	+1.3[15]
Average pre-tax price	$18.30[16]	$16.80[17]
Pre-tax quantity	125.5 million rides/year[18]	159.9 million rides/year[19]
Hail Vehicle Trip Tax	$0.50/ride[20]	$0.20/ride*
Sales Tax	8.875%	3.9%*

The Ramsey Rule for Hail Vehicle Trip Tax in Appendix A and the Ramsey Rule for Sales Tax in Appendix B calculate that the optimal Hail Vehicle Trip Tax on Uber and other ridesharing services is $0.20/ride and the optimal Sales Tax is 3.9%. The revenue generated from the proposed Hail Vehicle Trip Tax and Sales Tax on Uber is $31,856,283 and $103,851,604 respectively.

Other Impacts

[12] Bruce Schaller, "Elasticities for Taxicab Fares and Service Availability," *Transportation* (August 1999): 283.
[13] Peter Cohen, "Using Big Data to Estimate Consumer Surplus: The Case of Uber," *National Bureau of Economic Research* (2016): 4.
[14] Bruce Schaller, "Elasticities for Taxicab Fares and Service Availability," 283.
[15] Peter Cohen, "Using Big Data to Estimate Consumer Surplus: The Case of Uber," 4.
[16] "2016 TLC Factbook," New York City Taxi & Limousine Commission, https://www.tax.ny.gov/bus/mctmt/taxi.htm.
[17] Peter Cohen, "Using Big Data to Estimate Consumer Surplus: The Case of Uber," 4.
[18] Patrick Wagner, "Ride-Hailing Apps Surpass Regular Taxis in NYC."
[19] Ibid.
[20] "Information on the taxicab and hail vehicle trip tax," New York State Department of Taxation and Finance, https://www.tax.ny.gov/bus/mctmt/taxi.htm.
* Represents proposed taxes calculated using the Ramsey Rule in Appendix A and Appendix B

While the introduction of Uber and other ridesharing services to New York City has a quantitative impact on the traditional medallion taxicab, its effect on the public transport system is not as easily measured. Ridesharing services argue that their drivers complement public transportation by connecting consumers to transit hubs and also assists "last mile" transport—the distance from the station to the final destination. But in reality, only 7 percent of consumers combine ridesharing with public transit on a weekly basis.[21] More widely acknowledged is the substitution effect that Uber has with public transport, most notably buses. It is estimated that the entrance of Uber is associated with a 10.5 percent drop in the amount of passenger trips on the bus.[22] More, instead of complementing public transportation, Uber and other ridesharing services are adding more vehicles to the already congested streets. Researchers at U.C. Davis Institute of Transportation Studies "estimate that 49 percent to 61 percent of ride-hailing trips either wouldn't have been made at all if these apps didn't exist, or would have been made by foot, biking or transit."[23] All of those trips added cars to the streets that without Uber or other ridesharing services would not have been there. Specifically, in New York City, a report by the Economic Development Corporation (NYCEDC) "showed that bus and subway ridership declined 5.6 percent in March 2018, from the same time one year ago—that was the largest year-over-year percentage drop following the decline from December 2016 to 2017."[24] Though there may be many reasons for the decline, MTA and New York City transit blame the declining ridership figures on a growth in taxi and ridesharing services, not on their own service outages like delays and repair work.

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[21] Yang Pan and LiangFei Qiu, "Is Uber Helping or Hurting Mass Transit? An Empirical Investigation (July 13, 2018): 2.
[22] Ibid, 3.
[23] Emily Badger, "Is Uber Helping or Hurting Mass Transit?" *The New York Times*, October 16, 2016.
[24] Dave Colon, "Who's to blame for MTA's declining ridership?" *Curbed New York*, July 25, 218.

Conclusion

The introduction of Uber and other ridesharing services to New York City has altered the economy of the city by and caused distortion in the traditional medallion taxicab industry. The industry, which is traditionally heavily regulated by the city, is facing unprecedented competition. To reduce this distortion, I used the Ramsey Rule to calculate the optimal taxes on Uber using the existing Hail Vehicle Trip Tax and Sales Tax on traditional medallion taxicabs. Combined, the $0.20 Hail Vehicles Trip Tax and the 3.9% Sales Tax on Uber I proposed will generate an estimated $135,707,887 of tax revenue annually in New York City. The revenue from the proposed tax should go to the improvement of New York City infrastructure, specifically streets, which are strained from the current congestion, and to enhancement of the public transportation system. Though it is expected that an improvement in the public transportation system would encourage consumers to use it more, in reality this may not be the case. A Study from Pew Research center concluded that "US adults who earn at least $75,000 a year are twice as likely to have booked trips on ride-hailing services (such as Uber) …as lower-income Americans."[25] It is possible that millions of dollars of ridesharing tax revenue pumped into the New York City transit may still not be enough to encourage high-income consumers to switch from ride-hailing services to public transportation. Nevertheless, the $0.20 Hail Vehicles Trip Tax and the 3.9% Sales Tax on Uber combined will take an estimated 3,335,108 Ubers off the road and greatly reduce the congestion of city streets, which is the original intent of my proposed taxes.

[25] Alison Griswold, "Uber and Airbnb really are for the wealthy and well-educated," *Quartz*, May 19, 2016.

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Appendix A

Economic Analysis: Ramsey Rule for Hail Vehicle Trip Tax

The $0.50 tax on traditional medallion taxicabs has increased the price of an average ride $0.41:

$$\Delta P = \frac{n_s}{n_s - n_d} \times T = \frac{1}{1 - (-0.22)} \times 0.5 = \$0.41$$

While the tax is levied on producers, consumers bear 82 percent of the $0.50 tax:

Consumer tax burden: $\Delta P + T(c) = \$0.41$
Producer tax burden: $-\Delta P + T(p) = \$0.09$

As a result of the increased price, traditional medallion taxicabs have seen a decrease in quantity of 618,584 rides resulting in a market deadweight loss of $154,646:

$$\frac{\Delta Q}{Q} = n_d \times \frac{\Delta P}{P}$$

$$\frac{\Delta Q}{125{,}500{,}000} = -0.22 \times \frac{0.41}{18.3}$$

$$\Delta Q = -618{,}584.7$$

$$DWL = \$154{,}646.17$$

In order to find the optimal tax on Uber, the ratios of marginal deadweight loss and marginal revenue needs to be equal across all commodities:

$$\frac{MDWL_T}{MR_T} = \frac{309{,}292.35}{124{,}881{,}415.3} = 0.00247$$

$$\frac{MDWL_T}{MR_T} = \frac{MDWL_U}{MR_U} = 0.00247$$

$$MDWL_U = \frac{1}{2}(-\Delta Q_U) = 0.00247(Q_{1,U} + \Delta Q_U)$$

$$\frac{1}{2}(-\Delta Q_U) = 0.00247(259{,}900{,}000) + 0.00247(\Delta Q_U)$$

$$\Delta Q_U = -786{,}023$$

An estimated decrease of 786,023 Ubers from New York City streets will decrease supply and increase the price of an Uber $0.14:

$$\frac{\Delta Q_U}{Q_U} = n_d \times \frac{\Delta P_U}{P_U}$$

$$\frac{-786{,}023}{159{,}900{,}000} = -0.6 \times \frac{\Delta P_U}{16.8}$$

$$\Delta P_U = \$0.14$$

As a result, the optimal tax rate on Uber in relation to the current tax rate on traditional medallion taxicabs is $0.20:

$$\Delta P_U = \frac{n_s}{n_s - n_d} \times T$$
$$0.14 = \frac{1.3}{1.3 - (-0.6)} \times T$$
$$T = \$0.20$$

Identical to the current tax on traditional medallion taxicabs, though the proposed tax on Uber is levied on producers, consumers will bear a higher burden of the tax:
Consumer tax burden: $\Delta P + T(c) = \$0.14$
Producer tax burden: $-\Delta P + T(p) = \$0.06$

Appendix B

Economic Analysis: Ramsey Rule for Sales Tax

The 8.875% sales tax on traditional medallion taxicabs has increased the price of an average ride $1.33:

$$\Delta P = \frac{n_s}{n_s - n_d} \times T = \frac{1}{1 - (-0.22)} \times 1.62 = \$1.33$$

While the tax is levied on producers, consumers bear 82 percent of the $1.62 tax:

Consumer tax burden: $\Delta P + T(c) = \$1.33$
Producer tax burden: $-\Delta P + T(p) = \$0.29$

As a result of the increased price, traditional medallion taxicabs have seen a decrease in quantity of 2,006,628.4 rides resulting in a market deadweight loss of $1,625,369:

$$\frac{\Delta Q}{Q} = n_d \times \frac{\Delta P}{P}$$
$$\frac{\Delta Q}{125{,}500{,}000} = -0.22 \times \frac{1.33}{18.3}$$
$$\Delta Q = -2{,}006{,}628.4$$
$$DWL = \$1{,}625{,}369$$

In order to find the optimal tax on Uber, the ratios of marginal deadweight loss and marginal revenue needs to be equal across all commodities:

$$\frac{MDWL_T}{MR_T} = \frac{1{,}003{,}314.2}{123{,}439{,}371.6} = 0.0081$$

$$\frac{MDWL_T}{MR_T} = \frac{MDWL_U}{MR_U} = 0.0081$$
$$MDWL_U = \frac{1}{2}(-\Delta Q_U) = 0.0081(Q_{1,U} + \Delta Q_U)$$
$$\frac{1}{2}(-\Delta Q_U) = 0.0081(259{,}900{,}000) + 0.0081(\Delta Q_U)$$
$$\Delta Q_U = -2{,}549{,}084.826$$

An estimated decrease of 2,549,084.826 Ubers from New York City streets will decrease supply and increase the price of an Uber $0.45:

$$\frac{\Delta Q_U}{Q_U} = n_d \times \frac{\Delta P_U}{P_U}$$
$$\frac{-2{,}549{,}084.826}{159{,}900{,}000} = -0.6 \times \frac{\Delta P_U}{16.8}$$
$$\Delta P_U = \$0.45$$

As a result, the optimal sales tax rate on Uber in relation to the current sales tax rate on traditional medallion taxicabs is 3.9%:

$$\Delta P_U = \frac{n_s}{n_s - n_d} \times T$$
$$0.45 = \frac{1.3}{1.3 - (-0.6)} \times T$$
$$T = \$0.66$$
$$\frac{\$0.66}{\$16.80} = 3.9\%$$

Identical to the current sales tax on traditional medallion taxicabs, though the proposed sales tax on Uber is levied on producers, consumers will bear a higher burden of the tax:
Consumer tax burden: $\Delta P + T(c) = \$0.45$
Producer tax burden: $-\Delta P + T(p) = \$0.21$