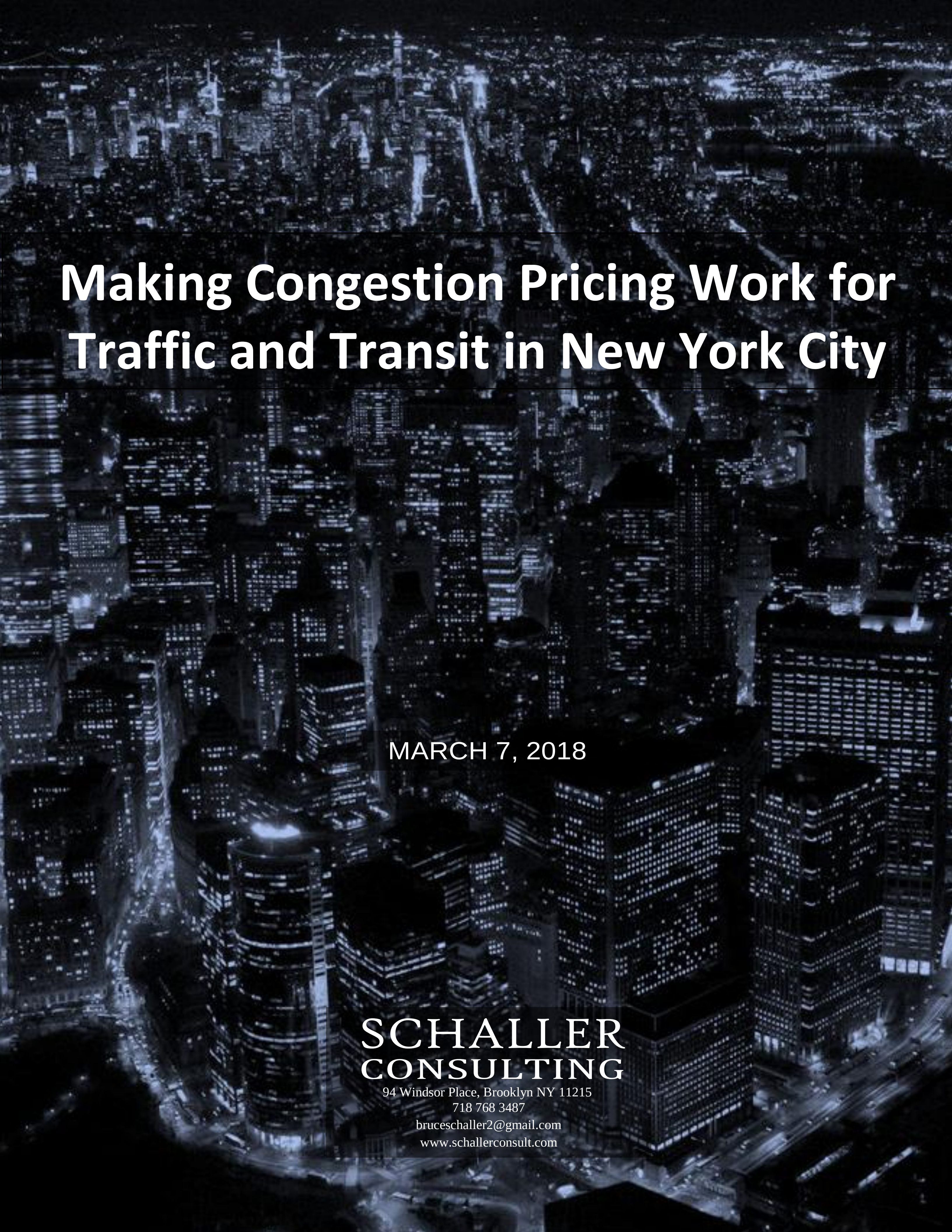

Making Congestion Pricing Work for Traffic and Transit in New York City

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This report was researched and written by Mr. Schaller for the purpose of furthering public discussion of congestion pricing and the role of app-based ride services in New York City. The author would like to thank staff at the Taxi and Limousine Commission and NYC Department of Transportation who provided information and insight for the analysis. The analysis and conclusions are the sole responsibility of the author.

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Summary

In response to deteriorating subway service and increasingly clogged Manhattan traffic, Gov. Andrew Cuomo appointed a task force last fall to make recommendations toward the goals of reducing traffic congestion in central Manhattan and raising funds for transit improvements. In January 2018, the task force, FixNYC, recommended a cordon-based congestion pricing system for the Manhattan Central Business District (CBD -- from 60 Street to the Battery) that would apply to personal autos and trucks, and a surcharge on taxi and other for-hire trips within Manhattan. The panel proposed a cordon charge of $11.52 for passenger cars and $25.34 for trucks and a taxi/for-hire surcharge of up to $5 per trip.

To be successful in relieving CBD traffic congestion, congestion pricing must tackle head-on two powerful trends that are currently producing increased driving in both Manhattan and throughout the city. The first is the well-known proliferation of app-based ride services such as Uber, Lyft and Via, also known as "Transportation Network Companies" (TNCs). The second is increased use of personal vehicles, as evidenced by increases in vehicle registrations in New York City in recent years, and slowing of traffic not only in Manhattan, but on trips in and out of the borough.

These trends have dramatically heightened the challenge of solving Manhattan's traffic problem. This report documents the strong trend toward more driving in the city, through both TNCs and personal autos, and how pricing might be best positioned to surmount the obstacles it throws in the path of traffic relief.

Part of the solution involves congestion fees and surcharges: who gets charged, and how much they pay. Another part of the solution involves technology, looking toward the next generation of tolling technology for New York's system, following the lead of cities with long-established cordon pricing systems, most notably London and Singapore.

To address the impacts of TNC growth, this report recommends that taxi/for-hire fees be levied as an hourly charge rather than a per-trip charge. An hourly charge would provide strong incentives:

- For customers to use shared ride services such as UberPool, Lyft Line and Via, which can reduce traffic impacts with minimal incursion on passenger convenience or reliability;

- For customers to use more efficient and sustainable modes such as the bus, subway, bikes and walking; and

- For TNCs to reduce the amount of time they spend between trips without a passenger, currently 40 percent of their time in the Manhattan CBD, most of which provides no mobility benefit while clogging traffic.

In addition, an hourly charge would automatically vary with congestion levels, with higher charges for a given trip in slower traffic.

To be effective, an hourly charge must mirror the cost of driving a personal vehicle into the most congested parts of Manhattan, including the cost of off-street parking. Parking fees, far more than slow traffic, is what deters people from driving into Manhattan. The high popularity of TNCs is due in large part to their offer of a reliable, comfortable and convenient auto trip, without the cost of off-street parking.

The report recommends that an hourly charge be much higher in Midtown Manhattan, which is significantly more congested than the rest of the CBD, as a way to focus on the most intensively clogged part of the city. A fee of $50/hour in Midtown and $20/hour in the rest of the CBD and the Upper East and West Side would reduce TNC and taxi trips by 8 percent and mileage by as much as 30 percent, depending on how much TNCs and taxis reduce vacant time between trips. This would provide substantial immediate traffic relief to Manhattan streets. It would also provide an immediate infusion of $670 million annually for improved subway and bus service and other transportation needs.

For trips within Midtown, a $50/hour charge would increase the average fare from $10 to $24 with slight differences for yellow cabs and TNCs. An increase of this magnitude is necessary to significantly reduce taxi/TNC mileage in Midtown. It also puts taxi/TNC costs on par with garage parking costs, since the surcharge for two taxi/TNC trips (assuming a round-trip to Midtown) would approximate the cost of parking ($25 to $35 per day or more). The charge would affect only a tiny fraction of trips as trips within Midtown comprise just 0.6 percent of all taxi/TNC trips citywide.

For other trips in Manhattan, the average taxi/TNC fare would increase from $13 to $21. Passengers could offset this surcharge by electing UberPool, Lyft Line or Via instead of

taking a solo TNC trip. These trips comprise 29 percent of all taxi/TNC trips citywide.

Hourly charges should also be applied to trucks operating in the CBD. An hourly charge would replace the proposed $25.34 cordon charge. An hourly fee for trucks would be more directly gauged to their contribution to CBD congestion and would incentivize more efficient operations, such as increasing staff on each truck to make deliveries more quickly. It could also be structured to reduce double-parking and "blocking the box," two common and unnecessary sources of traffic congestion.

To address increasing use of personal autos in the city, the report recommends that all drivers using an East River bridge pay the cordon charge, instead of allowing an exception to "through" drivers on the Brooklyn Bridge, as proposed by the FixNYC panel. The proposed exception is problematic because the high volume of through trips over East River bridges create back-ups on Manhattan streets and would continue. The exception would thus compromise the need to alleviate not only Manhattan traffic but also traffic on Brooklyn and Queens streets and highways leading to the four East River bridges.

Other key findings from the report are:

- TNC growth has added 976 million miles of driving to city streets, citywide, since 2013, including 365 million additional miles from 2016 to 2017.

- Personal auto use is growing as well as TNC ridership, as evidenced by a 9 percent increase in vehicle registrations in New York City since 2012, and zero net growth in all other types of trips (transit, taxi/for-hire, bike and ferry) from 2016 to 2017, despite continued economic growth.

- With a second year of declines in subway and bus ridership in New York City, overall trends toward more driving and less transit use accelerated in 2017. The current trend toward more driving represents a reversal of 25 years of less driving and more transit ridership in the city. The current shift from transit to auto is not a sustainable way for the city to grow, economically, environmentally or for traffic safety or quality of life goals. The shift highlights the risks to the city from current modal growth patterns and the urgent need to improve transit service and manage street use through pricing and other means.

- "Pooled" services such as UberPool and Lyft Line have not so far provided promised efficiencies in the use of TNC services. Only 5 percent of Uber patrons and 15 percent of Lyft customers take the pooled options during the business day in the CBD. (This compares with 74 percent of Via users.)

Introduction

A decade ago, proposals for congestion pricing in New York City built on favorable trends: a transit system revitalized by billions of dollars in capital investment, growing subway and bus ridership, and declines in driving on city streets and auto ownership by city residents.

Today, the situation is reversed. Subway and bus ridership is declining, driven by delays, overcrowding and, for buses, slowing speeds. Auto usage is up, spurred by the rapid growth of popular new app-based ride services like Uber and Lyft, as well as by growing car ownership across the city.

This reversal is in many ways traceable to the State Legislature's failure ten years ago to authorize congestion pricing in New York City. The proposal would have generated badly needed funds for transit and reduced traffic congestion in Manhattan to the benefit of bus riders and motorists alike.

These issues are now being revisited, spurred by recommendations for congestion pricing put forward by the FixNYC task force appointed by Governor Andrew Cuomo. Since the panel's report[1] was released on January 19, 2018, attention has focused in large part on the transit side of the equation -- funding levels, "lock boxes" to assure the money is spend on transit needs, reducing the cost-per-mile of new subway lines, preventing delays in the subway system, and the important needs of bus riders. These are all critical topics that deserve close attention.

Equally important, however, are the traffic and congestion pricing aspects of the panel's recommendations. Increases in auto use, most notably from the arrival and rapid growth of new mobility services, have dramatically heightened the challenge of solving Manhattan's traffic problem through congestion pricing. It is becoming increasingly recognized that the continued rapid growth of Uber and Lyft, as well as Via, which operates mostly as a jitney service in Manhattan, are adding to trips at the same time that congestion pricing would be implemented to reduce traffic. This raises the question of what should be done to reduce congestion and control the future traffic impacts of these new services while at the same time maintaining the mobility benefits they offer.

Part of the answer lies in how congestion charges are structured. While the FixNYC panel's recommendations for a surcharge on taxi and for-hire fares moves in the right direction, an hourly charge would achieve greater congestion reductions than a per-trip surcharge. Another part of the answer lies in technology. At a time that cities with long-established cordon pricing systems, most notably London and Singapore, are looking toward the next generation of tolling technology, New York would benefit by doing likewise, particularly for taxis, for-hire services and trucks, which are the major sources of congestion in the Manhattan business district.

The first section of this report lays out the challenge posed by increases in driving and decreases in transit use in the city. The report updates previous work showing increases in mileage citywide and in the Manhattan Central Business District (CBD, south of 60th Street) from the growth of app-based services. It also shows how the overall modal shift from transit to driving, which began in 2016, continued at a faster pace in 2017.

The second section builds on this problem definition with a discussion of policy options to reverse the trend toward more driving and less transit. Focusing on the Manhattan CBD, the report discusses the benefits of structuring a taxi/for-hire surcharge as an hourly charge that would apply whether vehicles had a passenger or not -- a major consideration given that Uber and Lyft drivers spend 40 percent of their time in the CBD without passengers. The report also addresses how an hourly charge could usefully be applied to trucks as well as taxi/for-hire services, and the technology required to do so. Finally, the report discusses a proposed exemption of vehicles that cross the East River but immediately leave the pricing zone via the FDR Drive.

The intent throughout the report is to strengthen the welcome recommendations of the FixNYC panel as the panel and public continue to debate and refine its recommendations.

1. More Driving, Less Transit

The fastest growing form of transportation in New York City, as across the country, are app-based ride services like Uber and Lyft. From being virtually non-existent just five years ago, these "Transportation Network Companies" (TNCs) surpassed yellow cab ridership in early 2017 and the gap continues to grow. (See Figure 1.) In 2017, TNCs accounted for 48 percent of all trips provided by the taxi/for-hire sector as a whole, which includes yellow cabs, black cars, car services (including green cabs) and TNCs themselves, which are generally classified as black cars.

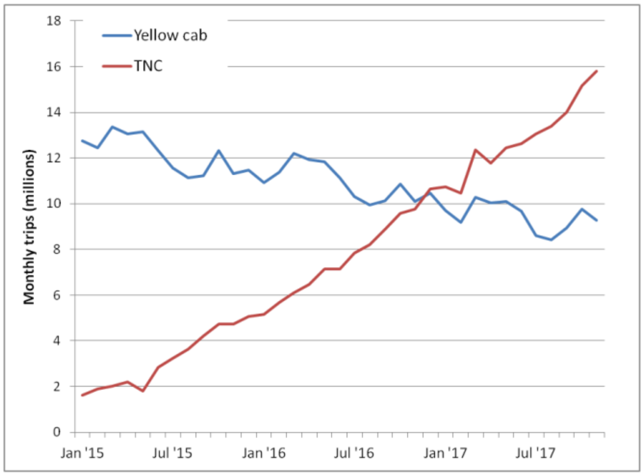
New Yorkers across the city have embraced these new services as a quick, comfortable and reliable way to get around town. They provide for many a welcome alternative to crowded and unreliable subways and buses and to the cost and hassle of owning and parking a personal auto. Their popularity has increased ridership in the taxi/for-hire sector as a whole such that taxi and for-hire drivers transported three-quarters as many people as local buses in New York City in 2017 (543 million taxi/for-hire passengers compared with 712 million local bus passengers). They have thus moved ride services from being a relative sidelight in the city's transportation picture, to a central feature.

TNCs' growing popularity is clear evidence that their services fill long-standing gaps in the city's transportation network. Unlike yellow cabs, Uber and Lyft are available throughout the city. Unlike traditional car services, smartphone apps show clearly how long a customer is likely to wait to be picked up. Payment is simple and easy through the app. Although more expensive than the bus or subway, they provide often more reliable service with the convenience of being picked up at one's doorstep and the comfort of having one's own car and driver.

As they have scaled up, TNCs have become an increasingly large presence on city streets. Figure 2 shows the annual growth in mileage of the taxi/for-hire sector. (Net increases account for shrinking operations of yellow cabs, black cars and car services, which partly offset increases in TNC mileage. See the Appendix for base numbers underlying the annual increases.)

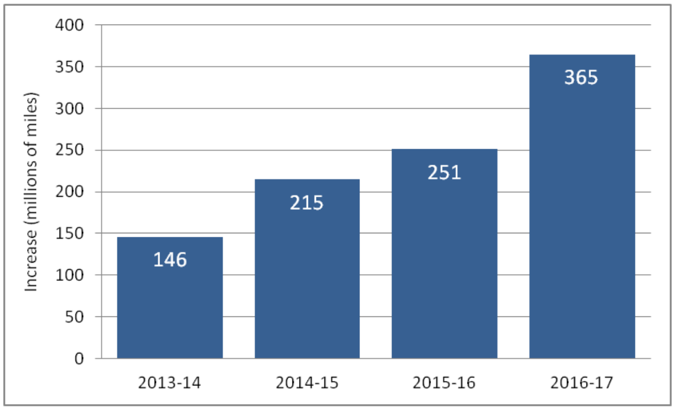
In 2017, the taxi/for-hire sector added 365 million miles of driving to city roads. This additional mileage comes on top of 251 million and 215 million miles in the previous two years. Fueled by rapid TNC growth, the taxi/for-hire sector has added 976 million miles of driving in the five boroughs since 2013.

Figure 1. Yellow Cab and TNC trips by month, January 2015 to November 2017



Source: NYC Taxi and Limousine Commission trip data. Note that data shown are trips, not ridership.

Figure 2. Increase in Taxi/For-Hire Mileage, 2013 to 2017



Net increase in mileage of taxi/for-hire sector, including TNCs, yellow cabs, black cars and car services in New York City. Includes mileage with and without passengers, but does not include personal use of the vehicle. Source: Analysis of TLC trip data. See Appendix for base numbers.

To put that figure in context, total mileage by vehicles of all types was estimated to be about 17 billion miles in 2017.[2] The increase in taxi/for-hire mileage, citywide, is thus 6 percent of all driving in the city.

TNC representatives often point out that TNC growth is predominantly outside of the most congested areas of the city and point particularly to neighborhoods where transit options may be scarce.[3] Trip data for June 2017 show that, in fact, 50 percent of TNC trips originate outside Manhattan. From June 2016 to June 2017 (latest data available), 63 percent of TNC trip growth was in the outerboroughs or upper Manhattan.

Nevertheless, trip growth in the CBD has very substantial impacts on Manhattan congestion. Over the last four years, the number of taxi/TNC vehicles in the Manhattan CBD increased by 59 percent, and doubled in the afternoon rush hour, after accounting for declines in yellow cab trips.[4] These increases are the result of trip growth, a trend toward longer trips, less efficient use of vehicles and the slowdown in traffic speeds over this period. With taxis and TNCs making up 50 percent to 75 percent of all traffic on many Manhattan streets, the FixNYC report concluded that TNCs are "a significant contributor to congestion."[5]

From 2016 to 2017, the number of TNC trips increased by 17,000 trips per day (8 a.m. to 6 p.m., average June weekday). This rate of growth translates to an 8 percent increase in total taxi/TNC mileage in the CBD during business hours in 2018. (Since taxis and TNCs together comprise 50 percent or more of CBD traffic, this increase would generate about a 4 percent increase in overall vehicle miles of travel in the CBD in 2018.)

This growth is likely to quickly cancel out the 3-4 precent reduction in taxi/for-hire trips from a surcharge. Moreover, continued TNC growth would eat into the 9 percent improvement in traffic projected in the FixNYC report from implementing both the surcharge and a congestion pricing fee.

The issue for policy-makers is how to prevent continued TNC growth from compromising the effectiveness of FixNYC recommendations for fixing the CBD traffic problem. Policy alternatives are discussed in section 2 of this report, focused on taxi, TNC and truck traffic, which are the main contributors to daytime congestion in the CBD.

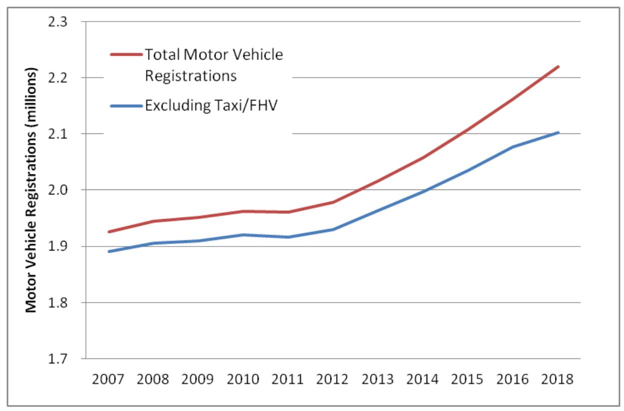
The increase in driving in the city is not limited to TNC growth. While one might expect to see less driving of personal vehicles as TNCs are increasingly used citywide, that does not appear to be the case. Rather, both TNC use and personal auto use appear to be increasing.

One indicator of personal auto use is vehicle registrations, which have grown steadily over the past six years. Since 2012, the total number of vehicles registered in the city increased 12 percent. Setting aside taxis and for-hire vehicles, registrations of all other vehicles are up by 9 percent since 2012. (See Figure 3.) As the number of vehicles increases, trips and mileage driven are likely to increase by a similar amount.

A second indicator involves comparing growth in trips that can be counted precisely with the city's rate of economic growth. From 2012 to 2013, the number of trips by bus, subway, taxi/for-hire, bike and ferry increased faster than the number of jobs (see Figure 4). This is consistent with most of the growth in travel in the city being absorbed by the transit system.

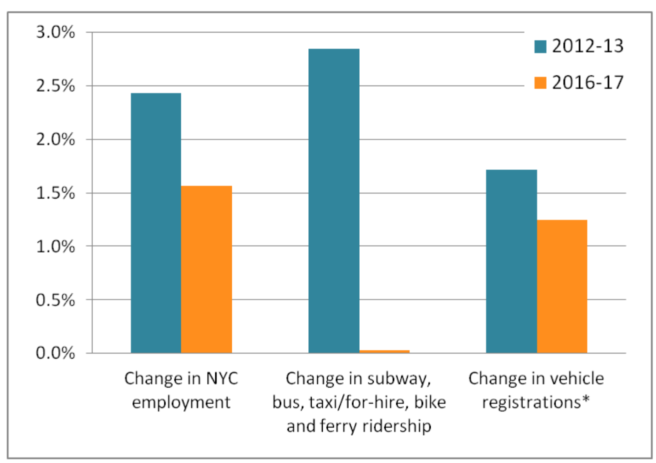
In the last two years, however, the economy expanded more rapidly than the trips counted by transit and other modes.

Figure 3. Motor Vehicle Registrations in New York City, 2007 to 2018



Source: New York State Department of Motor Vehicles

Figure 4. Comparison of Employment and Modal Growth, 2012-13 versus 2016-17



Change in subway, bus, taxi/for-hire, bike and ferry ridership includes modes where annual ridership are available. Most recent change in vehicle registrations is for 2016 to Feb. 2018 (not available for 2017).

From 2016 to 2017, bus, subway, taxi/for-hire, bike and ferry ridership overall was unchanged, while employment grew by 1.6 percent. It is likely that employment growth generated more travel, as an increasing number of people traveled to work, shopping, restaurants and so forth. The growth in travel was thus almost certainly reflected in additional trips and mileage by personal auto. This is also consistent with increases in vehicle registrations.

Even among subway, bus, taxi/for-hire, bike and ferry trips, there has been a very decisive shift toward travel in motor vehicles. Figure 5 shows the change in ridership changes by each mode over the last five years.

From 2012-13 and 2013-14, subway and bike ridership accounted for most of the growth in travel among these modes. Since 2014, however, the picture has reversed. In both of the last two years, taxi/for-hire services accounted for virtually all of the growth in travel among these modes. The picture became more pronounced in 2017, with an increase of 63 million riders for taxi/for-hire services while subway and bus ridership declined by 68 million. (There were smaller increases in bike trips and on ferries.)

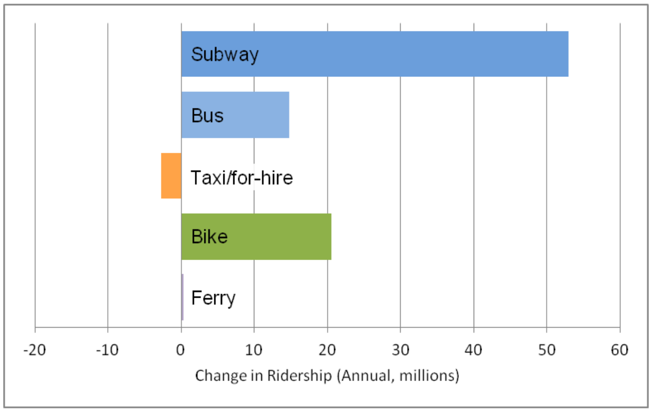
These trends are deeply worrying. The continued success of New York City as a place to live, work and visit depends on the ability of everyone to get around town with reasonable ease, speed, comfort and reliability. This is not possible if the growth in travel from economic and population growth results in more motor vehicles taking to already overcrowded city streets. The resulting congestion is harmful for businesses that depend on trucks and commercial vehicles to carry out essential tasks, and causes ever increasing delays for bus riders, drivers and the passengers of taxis and other for-hire services. The economic cost to the region from congestion is estimated at $20 billion annually.[6] Increased auto use, whether TNC or personal motor vehicle, is not a sustainable way for the city to grow, economically, environmentally or from traffic safety or quality of life perspectives.

An underlying goal of the FixNYC recommendations is to get New York City back on track toward sustainable growth. Increased trip-making from growth in jobs and population needs to be served by a well-funded, well-managed and revitalized public transit system, not by increased personal use of motor vehicles. Equally important is fixing the traffic problem.

The aptly-named FixNYC panel's recommendations are critical steps in this direction. Discussion of these recommendations should focus on how to make them as robust and effective as possible. The next section discusses how best to structure and collect congestion and taxi/for-hire charges to get the city back on the right track.

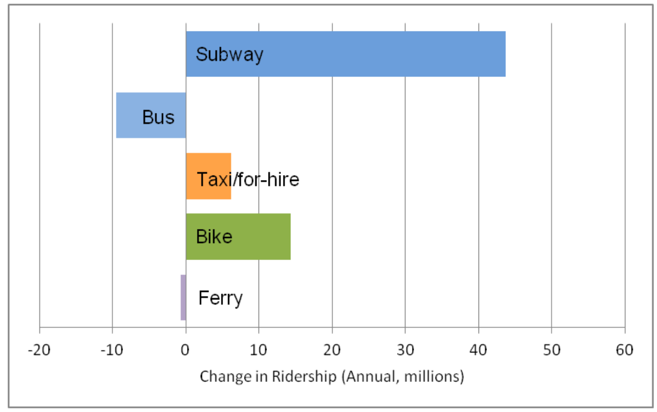
Figure 5. Changes in Ridership by Mode

2012 to 2013

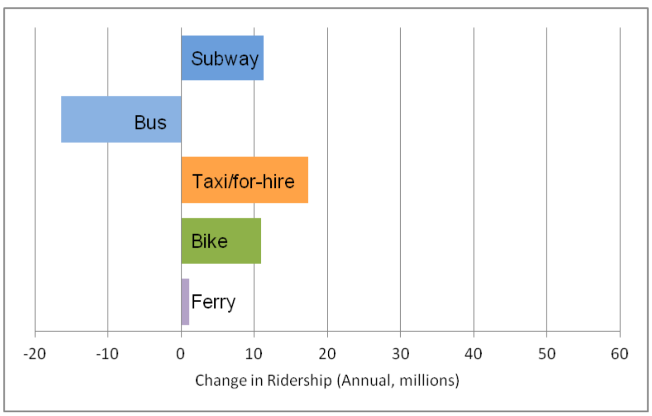


Changes in Ridership by Mode (continued)

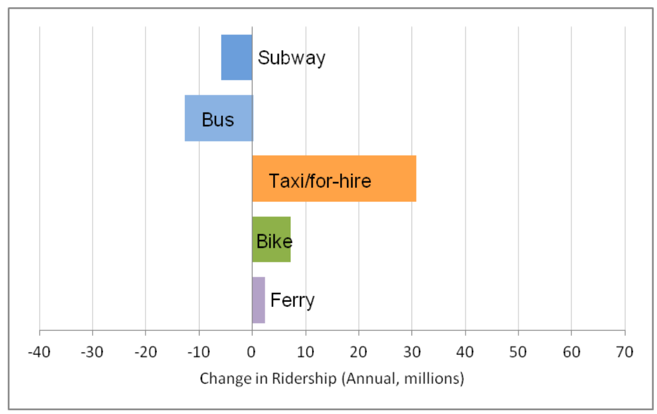
2013 to 2014



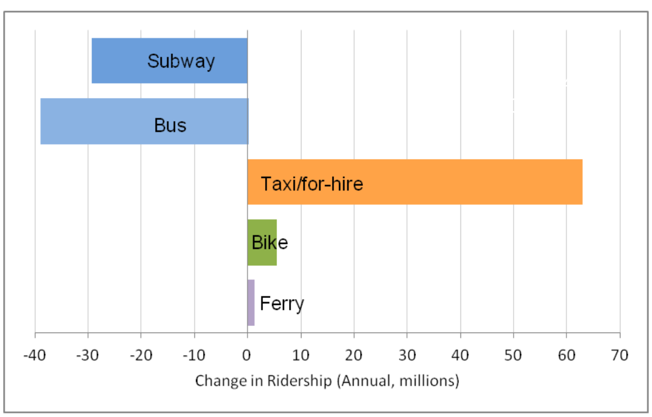
2014 to 2015



2015 to 2016



2016 to 2017



Sources: Subway and bus ridership from MTA New York City Transit.

Taxi/for-hire include TNCs, yellow cabs, black cars and car services (including green cabs). Data from TLC trip files. Data for 2017 are actual counts through November and projected for December.

Bike ridership based on NYCDOT, "Cycling in the City," January 2017, updated using American Commuting Survey commuter cycling and bike share data.

Ferry ridership is from City of New York, "Mayor's Management Report," Sept. 2017. Ferry ridership is for fiscal years ; others are for calendar years.

See Appendix for base numbers

2. Congestion Pricing and Congestion Reduction

1) Surcharge on taxi/for-hire trips in the pricing zone

The FixNYC panel recommended that all yellow cab and for-hire trips in the congestion zone be subject to a surcharge of between $2 and $5 (paid instead of the congestion fee). The surcharge would apply to all trips starting and possibly ending (or going through) the CBD, and possibly extend north to 96 Street. The fee might be the same throughout the business day, or variable depending on typical traffic conditions. The panel estimated that the surcharge could raise between $155 million and $605 million annually.

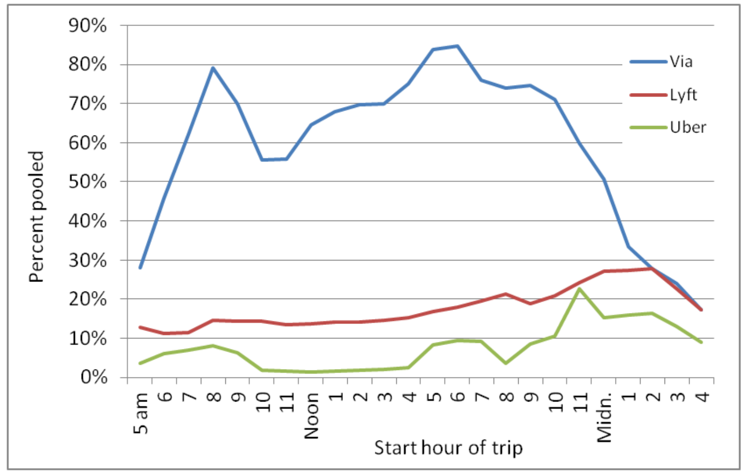
The main purpose of the surcharge is to raise revenue for the MTA. Given that it could raise several hundred million dollars annually, the surcharge is a highly attractive way to quickly turn on a new revenue stream for the MTA. The panel proposed to implement the fee in 2019 and use the proceeds to upgrade transit services in anticipation of implementing a congestion charge in 2020.

While an excellent source of revenue, the FixNYC panel recognized that a surcharge would only modestly reduce traffic congestion since taxi and for-hire passengers are relatively insensitive to price. It has long been documented that yellow cab ridership declines only modestly in response to higher fares; a study in the late 1990s found that a 10 percent increase in taxi fares led to only a 2 percent reduction in ridership.[7]

Manhattan TNC riders are also relatively insensitive to price, as evidenced in the low uptake of "pooled" services in which customers share their ride with one or more strangers. During the daytime in Manhattan, when pooling is most urgently needed to reduce congestion, only 5 percent of Uber users and 15 percent of Lyft users take UberPool or Lyft Line, respectively, despite the opportunity to save as much as 40 percent on the fare.[8] Pooled usage is particularly low during midday hours, with only 1.8 percent of Uber and 14 percent of Lyft riders using UberPool or Lyft Line. (See Figure 6.)

Given Manhattan TNC users' the low sensitivity to fares, a surcharge of a few dollars, proposed by the FixNYC panel, would only modestly reduce TNC trips or mileage in the CBD. A $3 surcharge would reduce TNC trip volumes (and thus mileage) by 3-4 percent. Since these vehicles comprise

Figure 6. Pooling of CBD trips, weekdays, June 2017



Data are for trips beginning in the Manhattan CBD, weekdays, June 2017. Source: Analysis of TLC trip data obtained through Freedom of Information request. "Pooling" refers to strangers sharing a ride after independently requesting service. Includes only where customers requesting pooled services are matched.

more than one-half of vehicles in the CBD during the day, the surcharge would result in a reduction of perhaps 2 percent in overall vehicle mileage in the CBD.

This reduction, however, would be offset by ongoing growth in TNC trip volumes. Projecting the straight-line growth for TNCs (and partially offsetting declines in taxi ridership) from the last three years into 2018, it is likely that taxi/TNC mileage will grow by 8 percent in 2018. Continued growth of taxi/TNC trips would thus quickly offset the 3-4 percent reduction in trips from a surcharge. Moreover, assuming that TNCs continue to expand past 2018, their growth would erode the benefits of a congestion charge implemented in 2020, as proposed by the FixNYC panel.

There seems to be increasing recognition of the need to grapple with the long-term traffic impacts of the rising tide of TNC vehicles in Manhattan's most congested precincts. The option that is discussed most frequently is capping the number of TNC vehicles. A moratorium on vehicle growth was proposed by Mayor Bill de Blasio in 2015 but set aside after an intensive lobbying campaign by Uber and Lyft, and a city study that concluded that TNCs were not primarily responsible for worsening Manhattan congestion.[9] (At that time, there were 15,000 TNCs licensed citywide, compared with 72,000 today.)

There is a long history of controls on the number of taxicabs, including New York City's famous long-standing cap of 11,787 yellow cabs in effect from the 1950s to 1990s. New York and other major North American cities imposed caps in the 1930s as unemployed workers flooded the taxi industry with drivers and auto manufacturers unloaded new cars on the industry. The results were disastrous:

> The expansion of the supply of taxi service at a time of economic depression meant that more taxis competed for fewer passengers. Rate wars flared in cities throughout the country. ... Taxi drivers were forced to rely on cheating, counterfeiting, and demanding trips in order to make any money.[10]

Today, the issue is addressing the traffic impacts of rapid growth in both vehicles and passengers, rather than the problem vehicle caps sought to solve in the 1930s of too many drivers chasing a shrinking number of passengers. While TNCs and taxis could be used more efficiently (with less vacant time between trips), the core issue is rapid growth in passenger demand for service.

In this context, a cap would be counterproductive, just as caps imposed nearly a century ago proved counterproductive in the taxi industry. In New York as in other big cities, medallion caps led drivers to increasingly concentrate on serving the dense trip demand in downtown areas, e.g., the Manhattan CBD. The result was scarcity of yellow cab service in the boroughs outside of Manhattan (giving rise to "gypsy cabs" and what is now the neighborhood car service industry). A cap on TNCs would create the same results -- long waits for TNCs in the outerboroughs while doing little if anything to relieve Manhattan congestion.

Given that the benefit of a surcharge will be quickly offset by continued TNC growth and a vehicle cap would be counterproductive, it is critical to consider other methods for controlling the traffic impacts of TNCs in heavily congested areas of Manhattan.

A good place to start is by focusing on the basic problem: too many vehicles trying to use a fixed amount of street space. Pricing should aim to maximize the productive use of scarce street space. The way to do this is with an hourly charge, just as Manhattan garages charge for parking spaces by the hour and Manhattan landlords charge for office, retail and residential space by the month.

The taxi/for-hire surcharge should thus be based on each hour that TNC and taxi drivers are in the CBD during congested times. The charge should apply regardless of whether drivers are transporting passengers or waiting for their next fare.

Like the per trip surcharge, an hourly charge would lead to higher fares as TNCs pass along the cost to passengers. (For yellow cabs, the hourly charge should be added to the meter fare.) The charge would thus discourage use of TNCs and taxis and provide an incentive for passengers to elect more efficient and sustainable modes -- transit, walking and biking.

Unlike a per-trip surcharge, an hourly charge would automatically vary with congestion levels. Someone traveling 1 mile in Midtown at 5 mph would pay more than someone making the same 1 mile trip at 8 mph on the Lower East Side, for example.

One big advantage to an hourly charge is that it would create a strong incentive for TNC companies to reduce the amount of time their drivers spend empty between trips, which accounts for 40 percent of their time in the CBD.[11] Most of this is wasted time with no mobility benefit but significant traffic impacts.

An hourly charge would also provide strong incentives for shared rides. Currently, very few Uber and Lyft trips in Manhattan during the day involve their pooled services. It appears that factors like convenience, simplicity, comfort and predictability lead to the paltry pooling rates. Speed of travel seems to be a surprisingly small factor, given that pooling involves little additional travel time compared with an exclusive-ride trip. In Manhattan, Uber and Lyft pooled rides during the business day take only, on average, 3 minutes longer than an exclusive ride trip (e.g., 20 minutes versus 17 minutes from pickup to drop-off).

Given the insensitivity of Uber and Lyft riders to price, it is clear that a high hourly charge would be necessary to incentivize Uber and Lyft customers to switch to pooled services. The objective would be to move Uber and Lyft customers to shared services during the daytime in the CBD. Via provides the example: 74 percent of Via trips in the Manhattan CBD during the day are pooled versus 5 percent for Uber and 15 percent for Lyft, as of June 2017.[12]

To be effective in incentivizing the use of pooled services or switching to transit, biking or walking, a time-based charge needs to provide a very strong disincentive for auto use in the most congested parts of the CBD. The city's experience with off-street parking rates is a useful point of reference. The main reason that people do not drive into Manhattan during the business day is the high cost of parking -- $25 to $35 and up for early-bird all-day specials that might be used for someone coming to work in Midtown, for example. An hourly charge should provide a comparable disincentive to using taxis and TNCs for similar types of trips.

Another point of reference is the value of ground-level retail space in the CBD. Retail asking rents in Manhattan range from $325 to $3,900 per square foot (annually) in Manhattan.[13] If this pricing were applied to street space, the rental charge to vehicles would be in a range of $24 to $46 per hour, taking the low end of the range in retail rents.[14]

TNC and taxi surcharges of this magnitude would make a significant dent in traffic. An hourly charge of $20 to $50 per hour as described below would reduce trip demand by 8 percent.[15] There would likely be additional mileage reductions from the incentive to spend less time vacant between trips, for a potential 20-30 percent overall reduction in taxi/TNC mileage in the CBD.[16]

Furthermore, an hourly charge could be finely targeted to the most congested conditions. It should be higher in Midtown Manhattan, which chronically has the most severe congestion in the CBD and also has a wealth of transit, walking and biking options. For example, the rate could be $50 per hour for mileage in Midtown Manhattan during the business day and $20 per hour in the rest of the charging zone during the business day. (As in the FixNYC report, the charging area for taxi/for-hire trips would include the Upper East Side and Upper West Side.)

A $50/hour charge in Midtown and $20/hour charge in the rest of the charging zone would result in:

- **Trips entirely within Midtown:** the average fare would increase from $10.20 to $24.44, including taxi surcharges and tips on cab rides. (Tipping is a relatively new option on TNC apps and are not included in these figures). Also included is vacant time between trips using an average per trip and assuming that vacant time is somewhat reduced from current levels.

  The hourly charge would thus amount to about $15 per trip for an average 11 minute Midtown trip of 0.85 miles at 4.6 mph. It would serve to equalize the financial disincentive to use taxis and TNCs in Midtown with that created by the cost of garage parking in Midtown, comparing two taxi/TNC trips to one day of parking. The reduction in taxi/TNC trips would be about 12 percent. Additional mileage reduction would be likely assuming reduction in vacant time between trips.

- **Trips in the charging zone outside Midtown:** the average fare would increase from $13.25 to $20.77, or about $7.50 for a 17 minute trip covering 2.0 miles at 7.4 mph. The increase is about one-half that for Midtown trips, reflecting the lower hourly rate and modestly faster speeds.

Table 1. Revenue from Daytime, Evening and Weekend Hourly Fees on Taxi/For-Hire Trips

Hourly charge in effect:	Revenue (millions)
8 am - 7 pm weekdays ($20-50/hour)	$ 670
Weekday evening/overnight ($5/hour)	$ 97
Weekends ($5/hour)	$ 98
Total	**$ 865**

Hourly charge would apply to all taxi/for-hire trips that begin and/or end in the surcharge zone, East 96 Street and West 110 Street to the Battery.

Table 2. Proportion of Trips Charged $20 or $50/Hour on Weekdays, 8 a.m. to 7 p.m. or $5/Hour Other Times

	Taxi	TNC	Total
Intra-Midtown: $50/hour	1.1%	0.2%	0.6%
Mix $50/hour & $20/hour	10.0%	4.3%	6.9%
Rest of zone: $20/hour	28.6%	16.1%	21.8%
M-F evening: $5/hour	29.9%	17.6%	23.2%
Sat.-Sun. all day: $5/hour	25.0%	15.7%	20.0%
Out of zone	5.5%	46.1%	27.5%
Total	**100.0%**	**100.0%**	**100.0%**

For purposes of this analysis, Midtown is defined as Third to Eighth Avenue, 42 St. to 60 St.
*Trips within Midtown would be charged $50/hour. Partial Midtown trips are trips partially in Midtown (charged $50/hour) and partially outside Midtown (charged $50/hour or $20/hour depending on location). Other trips in zone would be charged $20/hour.
Hourly charge would apply to all taxi/for-hire trips that begin and/or end in the surcharge zone, East 96 Street and West 110 Street to the Battery.
Based on taxi and TNC trips in June 2017

- **Revenues:** These hourly rates would generate $670 million annually in revenues, after accounting for an estimated 8 percent decline in trips and reduction in vacant time between trips. (See Table 1.)

It is worth noting that the daytime charges of $20 to $50 per hour would apply to a relatively small number of trips: 40 percent of all yellow cab trips citywide, and 21 percent of all TNC trips citywide. The $50 rate would apply in full only to trips entirely within Midtown, which are a very small fraction (0.6 percent) of all taxi and TNC trips citywide. (See Table 2.)

In addition to these charges that would apply Monday through Friday during the business day, there could be an hourly charge for evening, overnight and weekend trips in the charging zone. These might be charged at a lower rate with the goal primarily of raising money for transit. A $5/hour rate would generate $195 million annually. It would increase average fares by about $2 per trip (similar to the FixNYC proposal for $2-$5 per trip surcharge).

For TNC trips, an hourly surcharge would most likely be passed on to riders as discussed above, just as TNCs currently include sales taxes in their calculation of fares. TNCs would also likely pass along the cost of remaining vacant time between trips, although they would have a strong incentive to reduce the amount of vacant time.

For yellow cabs, the hourly charge would need to be included as a surcharge on the fare, which is set by the Taxi and Limousine Commission. A portion of the charge for vacant time might also be included in the surcharge, reflecting that some vacant time is necessary in any street hail system. There might also be incentives for yellow cab drivers to use apps (see below) or other incentives to reduce vacant time.

An hourly charge would be collected using the same technology that would be necessary for the proposed per-trip surcharge. It could likely piggyback off systems already in TNC, taxi and other for-hire vehicles. Detailed trip information is already collected for most of these vehicles. The wireless and GPS-enabled technology in yellow cabs is currently used to calculate the 50 cent MTA surcharge. TNCs currently utilize trip records to calculate and submit sales taxes, which are based on a percentage of fares. Based on existing systems and the current state of technology, wireless, GPS-enabled equipment is clearly technically feasible (see box on page 14.)

Gov. Cuomo recently submitted 30-day budget amendments to fund the FixNYC panel to develop a plan for collection of the panel's proposed surcharge. The panel could include development of an hourly surcharge as part of this work.

One potential complication to an hourly charge is that Uber and Lyft drivers typically use both apps. This is not an issue in charging for time with passengers but the vacant time between trips would need to be assigned to one app or the other. One approach is to attribute the time between trips to the next trip served. Thus, if a driver dropped off a Lyft passenger at 1:00 p.m. and his next trip was through Uber starting at 1:09 p.m., the 9 minutes between trips would be the responsibility of Uber. It might also be possible to split the responsibility between whatever apps the driver has open at the time, depending on the complexity of programming this into each company's back-end system.

However the vacant time is assigned, it is essential that the data stream from TNC vehicles indicate when drivers are logged onto each app and available for dispatch, thus enabling the charge to be applied to the search for the next passenger and not downtime for meal breaks, refueling and the like. Likewise, the data stream from yellow cabs needs to indicate when the cab is available for street hail.

It is also essential that any type of charge, whether per-trip or time-based, be paid equitably by TNC, yellow cab and all other for-hire vehicles operating in the CBD. Not doing so would incentivize passengers to use the service where there is no charge (or a lesser charge) and would compromise the purposes of the charge.

A surcharge on taxi passengers raises a larger set of issues about the future of the yellow cab industry. Any form of surcharge would accelerate the ongoing decline in taxi ridership. While a full discussion of how to address these issues is beyond the scope of this report, it is worth pointing out that there may well be ways to expand the number of people using yellow cabs, for example, by allowing yellow cabs to use Uber and Lyft apps. Combining street hails and smartphone-based trips has the potential to make for very efficient use of the vehicles and help the yellows recover some of the trips lost to the new services. Issues such as the different fare systems of yellow cabs and TNCs and drivers bypassing street hails to pick up an app-based dispatch would need to be resolved. However, the eventual convergence of all the different for-hire services operating in Manhattan should be part of any longer-term policy for regulation of this industry.

2) Trucks

The FixNYC report notes that "trucks are a significant contributor to congestion in the CBD." They are also vital to the economic functioning of CBD businesses, and deserve very careful treatment to maintain their economic benefit while minimizing traffic impacts.

The panel recommended that the truck fee be 2.2 times the automobile rate, consistent with the existing range of rates for tolled tunnels into the CBD. This comes out to a $25.34 one-way charge, capped at one charge per day. The truck fee would apply to all vehicles with a maximum gross weight over 7,000 pounds, which includes many cargo trucks used for deliveries.

As with taxi and for-hire services, truck fees should be structured to produce the most congestion reduction possible. An all-day fee is only inexactly related to the vehicle's congestion impacts, however. A truck that comes in and out of the CBD several times during the day, for example, likely contributes less to congestion than a truck that stays in the CBD all day. The structure of the charge should take account of these differences.

The charge should also take account of the fact that the contribution of trucks to traffic congestion stems from how they drive and not just how much time they are in the CBD. Trucks frequently impede traffic by double-parking while the driver makes deliveries, even when there an available parking spot nearby. They are also often seen "blocking the box," preventing traffic on a cross-street from proceeding after the traffic signal turns red. It would be desirable for a congestion fee to discourage these driving behaviors.

Another important factor in structuring a truck fee is the opportunity for operational efficiencies. It takes longer to make deliveries if one person rather than several people are assigned the task. A fee should provide incentive to speed deliveries with multiple staff in the truck.

These incentives can be achieved better through a time-based charge. As with taxi/for-hire vehicles as discussed above, variable rates would serve to most strongly encourage efficient operations when traffic is most severe, as well as providing an incentive for companies to shift deliveries to less-congested times.

To address how vehicles are driven, the hourly charge could be much higher for time that trucks are double-parked, which is a violation of traffic rules in much of the CBD. It might also be possible to levy a higher charge for blocking intersections after the traffic signal turns red ("blocking the box"). This would provide a strong incentive for minimizing two of the most common and unnecessary sources of traffic congestion.

As with the taxi/for-hire industry, the technology to base an hourly truck fee is widely available and deployed in many trucks that frequent CBD streets. Fleet management systems widely used by trucking and delivery companies include GPS and wireless capabilities. Fee collection could likely piggyback off these existing systems.

Truck operators who do not currently have this technology can readily acquire it, both for the purpose of paying an hourly congestion charge and for their own use in managing their fleets.

Charging additional for double-parking and blocking the box would need to utilize highly accurate GPS technology that is now becoming commercially available. GPS has traditionally been error-prone in the high-rise canyons of Midtown and Downtown Manhattan. GPS signals bounce off tall buildings and throw off the calculation of location. New GPS technology uses a shorter wavelength, with accuracy to 30 centimeters instead of today's 5 meters.[17] It should be possible therefore to determine whether a truck is parked at the curb or double-parked, or stopped in the middle of an intersection versus behind the stop bar.

Because a time-based charge for trucks is more complex than simply charging at each entry point to the CBD, it could be phased in over time. All trucks might initially pay a cordon fee as proposed by the FixNYC panel. Delivery firms whose vehicles frequently go in and out of the charging zone would be likely early adopters of an optional time-based fee. As the technology is proven, it could be required for all trucks that spend substantial time in the CBD. For simplicity, trucks that only occasionally come into the CBD could continue to use E-ZPass and pay the cordon charge.

3) Expanding time-based charges to other vehicles

Congestion pricing proposals for New York City envision that the congestion fee would be collected using a combination of E-ZPass readers and license plate readers mounted over the roadway on light pole arms, gantries and bridge structures. The fee collection system would be integrated with current toll systems operated by regional toll agencies that include the MTA and Port Authority of New York and New Jersey. Most drivers would use their current E-ZPass tag to pay the fee in the same way they pay at tolled tunnels and bridges. The system would use "open road tolling" technology so there would be no toll booths or toll arms and no slowing of traffic to pay the fee. Motorists without an E-ZPass would pay through the mail, as they now do at MTA and some Port Authority crossings.

With a target of 2020 implementation for congestion pricing, it clearly makes sense to use E-ZPass and license plate cameras for fee collection and enforcement for all personal motor vehicles. The technology is proven, fee collection and enforcement can be integrated with the existing regional toll collection system operated jointly for New York-area transportation agencies, and most motorists already have E-ZPass tags in their cars.

Even with a wireless and GPS-enabled system for taxis, for-hire vehicles and trucks, it will necessary to continue with E-ZPass and license plate readers for years to come. E-ZPass will be needed for drivers that only occasionally go in or through the CBD. Likewise, license plate readers will be needed to identify vehicles that do not pay the required congestion fee (just as they are used at every toll facility today for vehicles going through without paying).

However, with these caveats, it is worth considering the benefits of converting as many vehicles as possible to a time-based fee beyond taxi/for-hire vehicles and trucks. A time-based option might be offered to motorists driving their personal vehicles in addition to continuing with E-ZPass as an option. The pricing system could provide increasing incentives to convert, such as with offpeak discounts, just as toll agencies offer a lower toll for E-ZPass users than for cash payers. Variable rates would create an incentive to enter and leave the CBD when traffic is less congested. The flat E-ZPass fee might assume that motorists spend a certain amount of time driving within the CBD, and offer discounts to drivers who head directly to a nearby garage. There could also be additional charges to discourage double-parking and blocking the box.

4) Brooklyn Bridge Exemption

The FixNYC panel recommended exempting from a congestion fee trips that use the FDR Drive from the Brooklyn Bridge to 60 Street. In addition, motorists who use the Ed Koch Queensboro Bridge upper roadway and exit above 60 Street would presumably not be charged.

The rationale for the Brooklyn Bridge exemption appears to be that trips which simply cross the bridge do not contribute to congestion in the CBD itself. The exemption may also help gain acceptance of congestion pricing among outerborough residents who want to use the bridges but are not coming into the CBD.

The exemption should be considered carefully because exempted trips comprise a surprising number of trips across the East River bridges. A regional travel survey conducted in 2010-2011 shows that 46 percent of auto trips over the East River bridges are bound for Manhattan above 60th Street, the Bronx or upstate New York. Although the data do not show which bridge drivers used, it is highly likely that the Brooklyn and Queensboro bridges account for most of their trips since the other two East River bridges (Manhattan and Williamsburg) do not have convenient connections to the FDR Drive.

Exempting nearly one-half of all East River bridge auto entries from the cordon fee has significant implications for the CBD given the impact of bridge traffic on CBD traffic. Back-ups approaching the Queensboro Bridge radiate back onto 57th Street, Second and Third Avenue and other local streets every afternoon. Extensive back-ups are also seen on Canal Street, Delancey Street and the southbound FDR Drive on the approaches to the other three East River bridges. A congestion fee with the exemption would thus be significantly less effective in reducing traffic delays approaching these bridges than if all vehicles were charged.

Moreover, the exemption might induce drivers not currently using the bridges at peak times to do so. Improved speeds on these bridges would likely induce drivers to shift from other crossings, or to shift when they drive into Manhattan to peak times. These shifts would further offset the benefits of the congestion fee, both in the CBD and on the Brooklyn and Queens roads leading to the East River bridges.

Given these considerations, the proposed exemption for the Brooklyn Bridge should be considered further, as should appropriate treatment of the Queensboro Bridge northbound upper roadway exit.

Using New Technology In the Congestion Pricing System

The potential benefits of using wireless and GPS-enabled devices installed in vehicles for collection of tolls or congestion fees have been recognized for many years. But until recently, a combination of cost, privacy and data security issues prevented its use. Toll collection agencies in the New York region and nationally have instead continued to rely on traditional tag readers (e.g., E-ZPass) and license plate cameras for collecting tolls and enforcement.

In recent years, however, the situation has begun to change. Wireless communication costs have dropped dramatically as has the cost of GPS chips and related technology. This is most obvious in the cellphone industry with widespread consumer adoption of GPS-enabled smartphones.

In addition to the use in smartphones, wireless and GPS technology is now widely integrated with vehicle operations. It is standard practice for freight, delivery, taxi and service businesses to track and communicate with their drivers through fleet management systems that include GPS and wireless communications. The systems are used to manage day-to-day operations and monitor safe driving practices, vehicle condition and reduce fuel consumption. Taxi and other for-hire fleets across the country have used wireless and GPS technology for dispatching trips and managing drivers and vehicles for many years.

At the consumer level, auto insurance companies such as Allstate, Progressive, State Farm, Travelers collect mileage and in some cases data on driving behavior for usage-based insurance. Companies collect data for a few months to determine mileage driven and, in some cases, the time of day of driving and driving behavior (such as how often drivers slam on the brakes) and use these data to offer insurance discounts of 5 percent to 30 percent. Insurers mail a small wireless device that plugs into the data port (this "OBD-II" data port is used by auto mechanics to read vehicle diagnostic codes) to motorists who can readily install them under the dashboard. In 2015, adoption of usage-based insurance reached 20 percent of U.S. households.

These technologies are also now moving to the realm of congestion fees and tolls. Singapore, which was the first city to implement a cordon-based congestion pricing system, is developing a system that will track vehicles and charge tolls based on distance traveled and congestion levels. The new system will replace gantries currently used for open-road tolling, which are almost two decades old and are becoming increasingly expensive and difficult to maintain. The new system is scheduled to be implemented progressively starting in 2020.

London implemented a cordon-based congestion pricing system in 2003 that identifies vehicles entering the zone, or driving within the zone, using license plate cameras. London is now looking to replace license plate cameras with a more sophisticated system. Transport for London, which operates the London congestion pricing system, has noted that "more advanced technology would be used if the scheme were being introduced today," according to a January 2017 report by the London Assembly. The report recommended replacement of the congestion charge, which it called "successful but is far too blunt an instrument and too narrow in scope," with a charge "based on charging vehicles according to when, where and how much they are driven." In June 2017, London Mayor Sadiq Khan said he will give consideration to a road user charging system that “reflects distance, time, emissions, road danger and other factors in an integrated way”.

In addition to these international developments, several states in the U.S. have undertaken field tests of road user charges that would replace the gas tax with a tax based on mileage driven. Tests that utilize a variety of technologies for measuring mileage, funded by the federal government, were recently completed in California, Oregon and Nevada among other states. California's test program was the largest, with 5,000 volunteer participants and over 37 million miles driven in the pilot. Participants were offered several options for recording mileage. Notably, 60 percent of the participants chose to install a small wireless device that plugs into the vehicle's OBD-II data port. Another 12 percent used a smartphone app that also records location information. Only 14 percent used the less-intrusive option of recording odometer readings. Results showed that 87 percent said participating in the pilot was easy and 85 percent were satisfied with the overall pilot program.

California concluded that the technology worked well. However, for a statewide replacement of the gas tax, California is pursuing a pay-at-the-pump model to try to replicate the simplicity, cost effectiveness and public acceptance of the gas tax.

In addition to these tests in the western United States, the I-95 Corridor Coalition is beginning a 3-month pilot of a mileage-charging system this year. The pilot will involve 50 vehicles in Delaware and Pennsylvania and will also use a device that plugs into the OBD-II port.

These pilots show that wireless, GPS-enabled technology can be successfully used by fleets and individual motorists to collect mileage and other data. They also show that a key to public acceptance is the voluntary nature of the program. In the context of a congestion pricing system in New York City, this means that the use of devices that plug into the vehicle systems should be offered as an option to paying the congestion fee in the traditional way, using E-ZPass. Fleets in commercial operation are different; experience with collecting taxi and for-hire trip data demonstrate that mileage and location-related data can successfully be integrated with fleet data and management systems.

Given the success of in-vehicle devices in government pilots and commercial applications, it is timely for New York to start planning the use of this type of technology as part of a congestion pricing system. The system would include both in-vehicle devices and the traditional E-ZPass systems, as discussed further in this report.

It should be noted that to protect user privacy, the location aspects of a system can report very limited information needed to calculate a charge. For example, rather than report precise locations, systems can be programmed to report whether the vehicle was inside or outside of a geographic cordon, or operated within a time window.

Sources:

Expert Market, "GPS trackers for fleet management" at https://www.expertmarket.com/fleet-management/gps-tracking

Nielson Insights, "Usage-Based Insurance is Gaining Traction, Especially Among Millennials," March 4, 2016, available at: http://www.nielsen.com/us/en/insights/news/2016/usage-based-insurance-is-gaining-traction-particularly-among-millennials.html

Land Transport Authority, "Electronic Road Pricing," at https://www.lta.gov.sg/content/ltaweb/en/roads-and-motoring/managing-traffic-and-congestion/electronic-road-pricing-erp.html

The Straits Times, "LTA to roll out next-generation ERP from 2020," February 25, 2016.

Caltrans, "California Road Charge Pilot Program," at https://www.californiaroadchargepilot.com/about/project-resources

Delaware Department of Transportation, "Mileage-Based User Fees in a Multi-State Region," grant application on behalf of I-95 Corridor Coalition, available at http://php.delawareonline.com/news/assets/2016/07/grant.pdf

4. Conclusion

New York City is at a critical decision point. In some ways today's situation is similar to that of 2008, when congestion pricing was proposed, widely and intensively debated, and ultimately fell short of approval. But in other ways today's situation is quite different. No longer are the underlying trends supportive of the goals of congestion pricing. Rather, today's proposal faces a stiff headwind from trends toward more driving and less transit use in New York City. This makes it essential that the congestion pricing plan ultimately adopted be as carefully designed and effective as possible. The city's ability to grow and thrive economically, environmentally and as a safe and attractive place to live, work and visit depends on it.

The purpose of this report is to highlight the transportation challenges facing the city, with a focus on Manhattan traffic congestion. While there are many important issues to be discussed about how to improve the subway and bus system, ranging from management to funding issues, it is important to give equal attention to the complexities of traffic issues. Although most people traveling into and within Manhattan use public transit, essential for the city's functioning, New Yorkers also depend heavily on how the streets work. Everyone crosses the street, everyone shops and takes deliveries, many people take the bus, taxis and for-hire vehicles. Not being able to get around on the streets thus affects everyone, one way or the other.

One of the most beneficial but also perplexing issues facing traffic management in New York as in other major U.S. cities is the rise and rapid growth of app-based ride services such as Uber, Lyft and Via. These services have clearly brought a welcome new transportation option to New Yorkers, who have embraced them in Manhattan and throughout the city. At the same time, their rapid growth has profound implications for how the city can absorb increased travel from economic and population growth.

This report shows that TNC growth has added nearly 1 billion miles of driving to city streets over the last four years, and added significantly to Manhattan traffic congestion. It has also been part of a broader trend toward more auto use across the five boroughs. Substantial effort and strong policy initiatives will be required to adequately address these impacts.

This report recommends enhancement of the FixNYC panel's recommendations to provide the strongest possible policy prescription. It includes hourly surcharges on taxi and for-hire trips, extended to trucks as well and possibly over time to personal motor vehicles as well. The report also recommends reconsidering a recommended exemption for drivers using the Brooklyn Bridge and FDR Drive and exiting at 60 Street.

Recommendations in this report for an hourly charge for taxis, for-hire vehicles and trucks, combined with a cordon pricing fee for all other vehicles, are designed to bring substantial reductions in mileage of these vehicles, provide real relief to clogged Manhattan streets, and advance the health and vitality of New York City.

Appendix. Mileage and Ridership Data

Table A-1. Annual Mileage by Industry Segment, 2013 to 2017

	2013	2014	2015	2016	2017
Yellow cabs	956	924	822	770	686
TNCs	51	268	645	1,189	1,954
Other for-hire vehicles	1,264	1,324	1,362	1,212	1,032
Total	**4,284**	**4,531**	**4,844**	**5,188**	**5,689**
Increase from prior year*		146	215	251	365

*Increase from prior year is net of declines in personal use of motor vehicles by passengers (switching from personal auto to taxi/for-hire) and drivers' use of taxi/TNC vehicles that replace prior driving in a personal auto.

For methodology, see Schaller Consulting, "Unsustainable? The Growth of App-Based Ride Services and Traffic, Travel and the Future of New York City," February 2017.

Table A-2. Ridership by Mode, New York City, 2012 to 2017

	2012	2013	2014	2015	2016	2017
Subway	1,655	1,708	1,751	1,763	1,757	1,727
Bus	788	803	793	777	764	725
Taxi/for-hire	429	426	432	450	480	543
Bike	107	127	141	152	159	164
Ferry	31	31	31	32	34	35
Total	**3,009**	**3,095**	**3,149**	**3,173**	**3,194**	**3,195**
Increase from prior year		2.8%	1.7%	0.8%	0.7%	0.0%

Sources: Subway and bus ridership from MTA New York City Transit.

Taxi/for-hire include TNCs, yellow cabs, black cars and car services (including green cabs). Data from TLC trip files. Data for 2017 are actual counts through November and projected for December.

Bike ridership based on NYCDOT, "Cycling in the City," January 2017, updated using American Commuting Survey commuter cycling and bike share data.

Ferry ridership is from City of New York, "Mayor's Management Report," Sept. 2017. Ferry ridership is for fiscal years ; others are for calendar years.

Endnotes

[1] "FixNYC Advisory Panel Report," January 2018.

[2] New York Metropolitan Planning Council, Best Practice [Travel Demand] Model forecast.

[3] Winnie Hu, "Uber, Surging Outside Manhattan, Tops Taxis in New York City," *New York Times*, October 12, 2017.

[4] Schaller Consulting, "Empty Seats, Full Streets: Fixing Manhattan's Traffic Problem," December 2017. TNC trips are longer in distance than taxi trips, so that as TNCs have grown and cabs declined, the average trip overall has become longer. Efficiency here refers to the percentage of time that a vehicle is carrying a passenger, which declined for taxis/TNCs over the last four years.

[5] FixNYC report, page 19.

[6] Partnership for New York City, "Cost of Traffic Congestion in Metro New York," January 2018. Available: http://pfnyc.org/wp-content/uploads/2018/01/2018-01-Congestion-Pricing.pdf

[7] Bruce Schaller, "Elasticities for Taxicab Fares and Service Availability," *Transportation*, Vol. 26, August 1999.

[8] These figures are for the number of passengers who request a pooled service and are matched with other patrons. Some users request UberPool or Lyft Line and pay the discounted rate but travel solo when the company cannot match them with other passengers. Although this could be considered an indicator of customer demand for pooled services, many of those making the request are hoping not to be matched while paying the pooled rate. They might be less inclined to request pooled service if matches were the norm.

[9] City of New York, "For-Hire Vehicle Transportation Study," Office of the Mayor, January 2016.

[10] Gorman Gilbert and R.E. Samuels, *The Taxicab: An Urban Transportation Survivor*, University of North Carolina Press, Chapel Hill, NC., 1980. It is interesting to note that a few cities, including Los Angeles and Chicago, had at least for a time limited the number of cabs in the mid to late-1920s. For the most part, however, caps on the number of taxicabs came in response to Depression-era economic conditions that led to a proliferating number of drivers chasing shrinking customer demand. The mid to late-1920s are more analogous to today's situation in which both the number of drivers and passengers are expanding. In these pre-Depression years, both cab fleets and passenger volumes increased rapidly as the taxi industry shed high-priced custom-built vehicles for everyday sedans. The industry then applied the savings from lower vehicle costs to reduce fares and attract growing legions of customers. See Gilbert and Samuels; Mark W. Frankena and Paul A. Pautler, *An Economic Analysis of Taxicab Regulation*, Federal Trade Commission, Washington, D.C., 1984, and Donald F. Davis, "The Canadian Taxi Wars, 1925-1950", *Urban History Review*, Vol. 27, No. 1, October 1998, pp. 7-22, which details the 1920s and 1930s dynamics in major Canadian cities.

[11] "Empty Seats, Full Streets: Fixing Manhattan's Traffic Problem."

[12] These are actual matches, meaning that multiple passengers share a trip, as opposed to the number of customers who request a pooled trip. The difference is important as only about one-half of requested pooled trips result in a match, according to news reports.

[13] Real Estate Board of New York, "Manhattan Retail Rents, Fall 2017. Asking rents for ground floor retail, as of last fall, ranged from $323 per square foot on 14 Street between Ninth and Tenth Avenues and $351 per square foot on Bleecker Street to $2,100 per square foot on Broadway and Seventh Avenue in the 40s to a high of $3,900 per square foot on Fifth Avenue in the 50s.

[14] Vehicles typically take up 300-400 square feet of space in a 10 foot lane in moderately moving traffic. A rent of $350-400 per square foot, divided over the year and assuming a store is open 12 hours a day, 365 days a year, translates to 8-11 cents per hour, or $24-46 per hour for the space a vehicle takes up in moderately moving traffic.

[15] This assumes an elasticity of -0.2, consistent with the rate found for taxis in the late 1990s and the market share of exclusive ride and pooled TNC services in Manhattan today. An elasticity of -0.2 means that every 1 percent increase in fares produces a 0.2 percent decrease in ridership.

[16] See "Empty Seats, Full Streets" report for discussion of how TNCs can reduce vacant time between trips.

[17] Samuel K. Moore, "Superaccurate GPS Chips Coming to Smartphones in 2018," IEEE Spectrum, Sept. 21, 2017.