



## Curbing For-Hire Vehicle Stockpiling in the Manhattan Core

Empty-Vehicle Charges for Ride-Hail Companies



A report to the New York City Council

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# **CURBING FOR-HIRE VEHICLE STOCKPILING IN THE MANHATTAN CORE**

## **Empty-Vehicle Charges for Ride-Hail Companies**

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## EXECUTIVE SUMMARY

### INTRODUCTION

This report proposes charging ride-hail companies (Lyft, Uber and Via) for the time their vehicles spend without a fare-paying passenger within the FHV Congestion Surcharge Zone — the area of Manhattan south of 96th Street. This charge on empty-vehicle time would incentivize the companies to reduce their stockpiling of vehicles in gridlocked Manhattan and nudge ride-hail customers toward less-congesting modes of travel. These outcomes would amplify the street-unclogging benefits of congestion pricing, improving travel efficiency and reliability in and around the Manhattan Central Business District (CBD).

This report was commissioned by the New York City Council and researched and written by transportation and traffic analyst Charles Komanoff (see Appendix for credentials). It was completed in March, 2020 but withheld from publication on account of the Covid-19 pandemic and ensuing lockdown. Release of the report was also impeded by the Trump administration's prolonged holdup of the environmental review required to launch the congestion pricing program. (The report's recommendations were premised upon congestion tolling of car and truck traffic into the CBD.)

Today, we publish the report essentially as written last March. The ascension of Joe Biden to the presidency is very likely to end the federal hold on congestion pricing. While it is true that the traffic patterns and transit usage assumed in the report have changed, the underlying facts and principles remain: equitably reducing the underpricing of motor vehicle traffic in and near the Manhattan core will measurably improve New York City's economy, ecology and quality of life.

### PROBLEM STATEMENT

The Taxi and Limousine Commission (TLC) estimated in 2019 that to complete a typical 20-minute fare trip in the Manhattan core, a ride-hail vehicle spends 8.3 minutes waiting for the pickup notification and 5.6 minutes traveling to the pickup. Because of the combined 13.9 minutes of unoccupied time, only about 60 percent of ride-hail vehicle time in the Manhattan core is spent conveying passengers; the other 40 percent is spent empty.

This is partly by design, as the ride-hail companies' business model relies on rapid and reliable arrival at customers' requested locations, which the companies facilitate by keeping a supply of empty vehicles at the ready. This stockpiling of vehicles enables customers to quickly secure a ride, but at a high cost: both the empty vehicle waiting for the next pick-up notification and the driver traveling to the passenger worsen congestion in Manhattan, slowing down everyone — from ride-hail customers themselves to taxicab users, motorists, truckers, service workers, bus riders, pedestrians and cyclists.

While it's not possible to entirely eliminate ride-hail empty time, public policy can make a considerable dent in it. City government has the authority to incentivize the ride-hail companies to reduce both the number of vehicles they field in the Manhattan core and each vehicle's average empty-time percentage. This report explores the rationale, outlines policy and engineering tools, and estimates the benefits of doing so.

## METHODOLOGY

This report employs publicly available data and the author's open-source New York City traffic model known as the Balanced Transportation Analyzer (BTA). Although the BTA was developed and has been most intensively used to model congestion pricing, it is also suited for analyzing congestion impacts and solutions concerning ride-hail vehicles.

Two features of the BTA model figure heavily in this report. One is its ability to estimate the average congestion causation — literally the time everyone loses because traffic is incrementally heavier — associated with one vehicle (or fleet of vehicles) taking up space in Manhattan's Central Business District (CBD) as it travels to or waits for passengers. The other is the model's capacity to calculate how ride-hail fares and thus usage are likely to change in response to both congestion pricing and potential charges on ride-hail vehicles' empty time in the FHV Congestion Surcharge Zone; and, in turn, how these changes will affect congestion levels and travel speeds. (See "Manhattan Zones" box on p.15 for various pricing geographies.)

The first feature is valuable because it enables city policy makers to calibrate empty-time charges for ride-hail vehicles to the level of the congestion tolls recommended by experts which have been authorized by statute to go into effect in the near future. The second feature lets us predict with confidence the magnitude of the travel-speed benefits from implementing the empty-vehicle charge.

## THE FIVE CATEGORIES OF TAXIS AND FOR-HIRE VEHICLES

- 1 **Yellow (medallion) taxicabs.** Capped by statute at 13,587. The only type of vehicle legally permitted to pick up "street hails" below 110th Street on Manhattan's West side or 96th Street on the East side and at the airports. Regulated fares are set by TLC.
- 2 **Ride-hail vehicles.** This report uses the term ride-hail vehicle to refer to app-based services — Lyft, Uber and Via — that employ online-enabled platforms to connect passengers with drivers using their personal vehicles, and which are capped at approximately 80,000. (Juno shut down in November, 2019.) Fares are set by the companies (which are sometimes referred to as transportation network companies, or TNCs).
- 3 **Green "street hail liveries."** Sometimes referred to as boro taxis. Permitted to pick up street hails anywhere outside of the yellow Taxi Exclusion Zone noted above. Fares are same as for yellow cabs. Poor economics due to competition from ride-hail services and prohibition against picking up fares in the Taxi Exclusion Zone are limiting number in service to around 3,500.
- 4 **Traditional livery cars.** Operate from "bases," typically in working-class and predominantly Latino neighborhoods. Fares are negotiated. Number has dwindled to less than 10,000.
- 5 **Traditional black cars.** Premium service typically serving businesses or other high-end clientele. Fares are negotiated.

## KEY FINDINGS

In 2019, the TLC adopted rules setting a cap on the percent of time that ride-hail vehicles may spend without a passenger within congested areas of Manhattan (“Cruising Cap”). These rules were set to take effect early last year but are tied up in litigation.

The TLC cruising cap does not apply to owners or operators of medallion taxicabs, whose numbers have been capped for years at 13,587 vehicles — effectively limiting the impact of taxi cruising on Manhattan traffic congestion. Similarly, this report’s recommendations to charge for empty ride-hail vehicle time would not apply to medallion taxis.

This report concludes that a policy charging the ride-hail companies 11 cents for each minute their vehicles are in the FHV Congestion Surcharge Zone (Manhattan south of 96th Street) without a passenger during peak hours (half that rate at other times) would be in sync with the pending congestion tolls on cars and trucks. Such a policy would lift CBD travel speeds during those hours by 2.5 to 3 percent, in part by reducing the presence there of empty ride-hail vehicles by nearly 10 percent.

The empty-vehicle charge proposed in this report would replace, not supplement, the TLC’s proposed cap on the ride-hail vehicles’ cruising time. Charging the ride-hail companies for each minute of their affiliated vehicles’ empty time in the FHV Congestion Surcharge Zone (“Surcharge Zone”) would outperform the Cruising Cap in the following ways:

- 1 The projected boost in Manhattan travel speeds from the empty-vehicle charge, estimated to be 2.7 percent, would be nearly four times as great as the boost in speeds from the Cruising Cap (0.7 percent).
- 2 The societal net benefits from reducing traffic gridlock and other congestion costs with the empty-time charge are estimated to be \$160 million per year, far exceeding the estimated \$40 million annual net benefit from the Cruising Cap.
- 3 The empty-vehicle charge would provide the city with \$80 million a year to improve travel times and ameliorate street conditions worsened by ride-hail vehicle stockpiling.
- 4 The empty-vehicle charge on ride-hail vehicles can be digitally monitored and collected directly by the TLC.
- 5 Time-based empty-vehicle charges for ride-hail vehicles could create a pathway to graduating New York State’s “one size fits all” lump-sum taxi and ride-hail vehicle congestion surcharges to a more efficient and equitable surcharge system based on each fare-trip’s time within the Surcharge Zone.
- 6 Empty-vehicle charges for ride-hail vehicles in Manhattan could also serve as a template for regulating the proliferating delivery services that are overwhelming many New York neighborhoods.

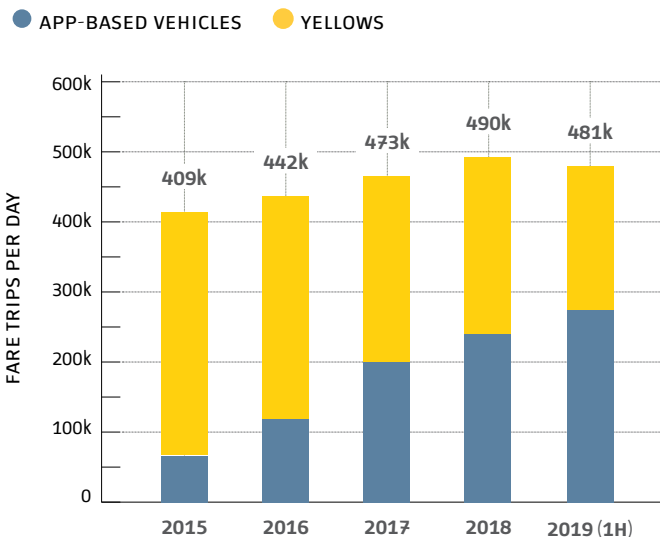


## EMPTY-TIME CHARGES FOR RIDE-HAIL COMPANIES

### MANHATTAN TRAFFIC CONGESTION: CONTEXT AND BACKGROUND

Prior to the pandemic, the three major ride-hail companies — Lyft, Uber, and Via — accounted for nearly a third of all vehicle-miles traveled in the Manhattan CBD. Their combined share was second only to private autos.

FIGURE 1  
FHV Trip Volumes, Manhattan Taxi Zone



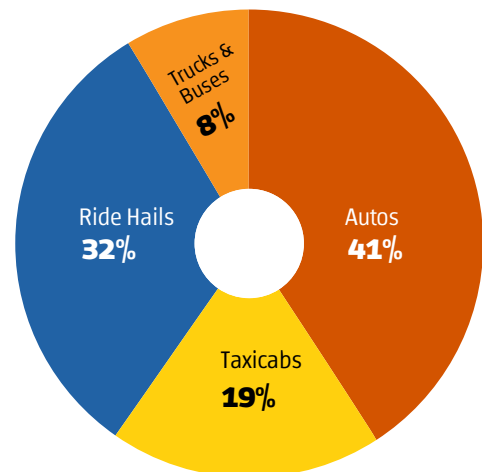
The ascendancy of ride-hail services has led some to blame them for Manhattan traffic. The truth is more nuanced. By virtue of their meteoric rise in recent years, ride-hail vehicles bear considerable responsibility for the increase in Manhattan traffic in this period. But it is also true that any vehicle occupying Manhattan streets contributes to worsening congestion there.

Estimates abound for costs of traffic congestion in and around Manhattan. The iconic estimate, attributed to the [Partnership for New York City](#), is that traffic congestion costs New Yorkers \$20 billion a year in lost time, decreased productivity, and increased exposure to pollution and vehicular danger.

### DERIVATIONS AND SOURCES

See Appendix immediately following the main body of this report for all sources, derivations and links supporting our facts, figures and findings.

FIGURE 2  
Shares of Vehicle-Miles Traveled in Manhattan CBD



Aggregate figures such as the Partnership's are important guideposts for public concern. Yet in designing public policy we need to drill more deeply, to assess *the congestion costs attributable to individual trips or vehicles*. This quantification is available in my BTA Excel spreadsheet model referred to earlier.

As noted, the BTA model can translate any hypothesized change in traffic volumes in the Manhattan Central Business District into estimated changes in average vehicle travel speeds. Comparing the drop in speeds from the higher volumes to the baseline speeds produces an estimate of the aggregate time that vehicles in the CBD lose due to one vehicle's being driven an additional mile or minute.

Those estimates are distilled in Fig. 3, below. They show that within the CBD, the introduction of just one vehicle driven for a single minute imposes two and a half minutes of total cumulative travel delays on all other vehicles within the zone — slightly less during midday (10 am-2 pm) and somewhat more during the long 2-8 pm afternoon-evening peak. The only exceptions are overnight and early morning, at which times the incremental delay is slight.

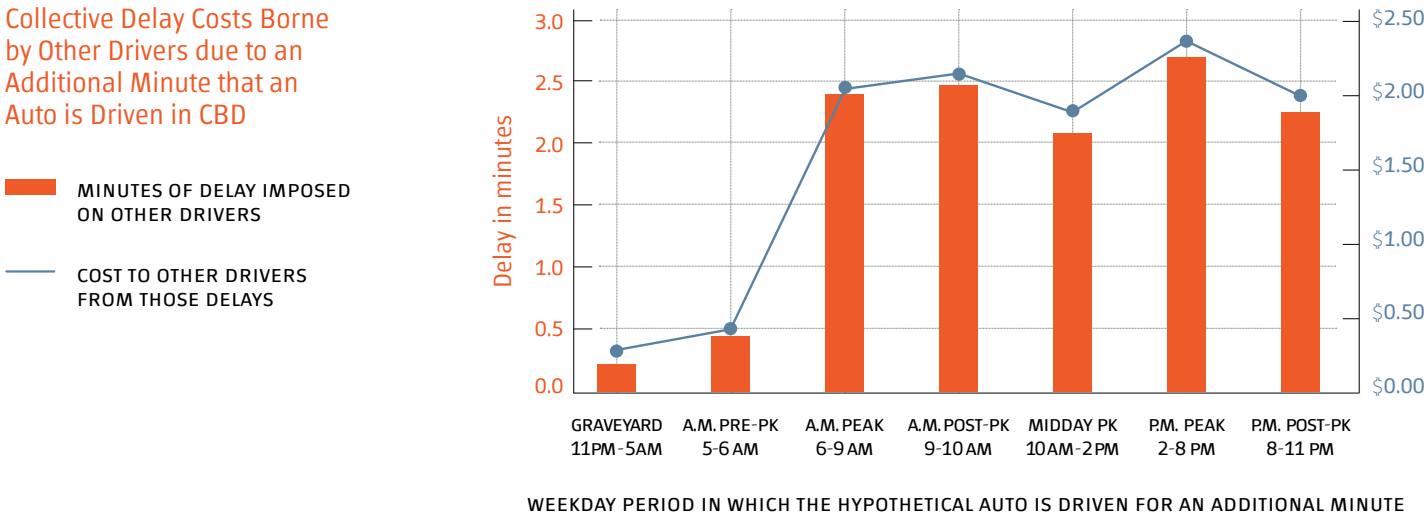
Fig. 3 also presents those delays in dollar terms. This is done in the BTA by estimating the composition of vehicles circulating in the CBD and attributing to each vehicle type a “value of time” — literally, the estimated value of an hour or minute of drivers’ and passengers’ time, and its flip side: the cost of enduring an additional minute stuck in traffic. Fig. 3 indicates that except overnight or in the early morning, the collective slowdown of Manhattan traffic caused by adding one more automobile to the mix for one minute costs vehicle users, in the aggregate, between \$1.80 and \$2.30 worth of lost time — to say

nothing of further costs to the public from traffic’s other externalities: increased pollution, noise, and endangerment.

This calculation suggests that it would be justified on efficiency grounds to require users of private autos or for-hire vehicles to pay a dollar or two for each minute they are traveling in the FHV Congestion Surcharge Zone. While this result is somewhat theoretical, it offers striking evidence of the need for congestion charging in the heart of the city: vehicle users are quite cognizant that prevailing congestion makes their trip take longer, but they’ve not had reason to be mindful of the impact of *their* driving on *others’* time.

Congestion pricing will change that mindset by making drivers pay for some of the congestion they impose on others. Laudably, it appears that the State-imposed lump-sum congestion surcharges on trips in the FHV Congestion Surcharge Zone by taxicabs and ride-hail vehicles that went into effect in 2019 began to instill a similar feedback loop among users of for-hire vehicles, as Fig. 1 suggests.

FIGURE 3  
Collective Delay Costs Borne by Other Drivers due to an Additional Minute that an Auto is Driven in CBD



## CONGESTION SURCHARGES AND TOLLS

### FHV SURCHARGES

Since February 2, 2019, FHV trips by yellow cabs and ride-hail vehicles that touch the Manhattan Surcharge Zone have been assessed a For-Hire Vehicle (FHV) Transportation Surcharge of \$2.50 for trips in yellow cabs, \$0.75 per passenger for trips in “shared” or “pooled” ride-hail vehicles, and \$2.75 for ordinary trips in ride-hail vehicles. The assessments, commonly known as “congestion surcharges,” were mandated by state legislation adopted in March 2018. The amounts are added automatically to the trip fare and the collected revenues are transferred to the MTA, contributing an estimated \$35 million a month to support mass transit.

### CONGESTION PRICING

State legislation enacted in March 2019 directed the MTA’s Bridges and Tunnels Division to develop a Central Business District Tolling Program to charge cars and trucks entering Manhattan south of 61st Street tolls sufficient to generate a minimum of \$1 billion annually, net of toll-administration costs. Toll collection was authorized to begin as early as 2021, with the toll levels and other program details to be set pursuant to recommendations from a state-controlled Traffic Mobility Review Board in late 2020, although these target dates will not be met. Taxis and for-hire vehicles are likely to be exempted from these pending congestion pricing cordon tolls, since they are already subject to the congestion surcharges described above.

## CONNECTIVITY FOR RIDE-HAIL VEHICLES

Ride-hail vehicles’ empty time can be monitored seamlessly and definitively by requiring every for-hire vehicle that is affiliated with Lyft, Uber and Via in the five boroughs to maintain continuous, real-time wireless connectivity to the TLC computer servers while it is operating in the CBD. This would be similar to what is already required of the medallion cabs.

Implementing this “vehicle connectivity” entails equipping each vehicle with a “smart tracking device” — a digital apparatus with Global Positioning System (GPS) capability that uploads the vehicle’s location and its passenger status in timed intervals to a digital platform. The platform would be powered by configurable software programmed to extract and report the number of minutes the vehicle spends between fare trips.

The device can be mounted under the car dashboard or under the hood, from which it is connected to the vehicle’s power supply. If the car is turned off, the vehicle’s battery maintains the device’s GPS reporting capabilities. Should the device be disconnected from the vehicle’s power supply for any reason or the battery removed from the vehicle, an internal battery allows it to continue reporting data for up to 30 minutes.

GPS and telematics technology make it possible to precisely record the movement of tracker-equipped vehicles throughout New York City, even amidst the “canyons” created by tall buildings in the FHV Congestion Surcharge Zone. The mandated connectivity would ensure that during every minute a TLC-licensed ride-hail vehicle is inside the Surcharge Zone, its location data is continuously logged and uploaded in real time to the TLC servers. Time between fares would be recorded and reported as well.



In the case of vehicles affiliated with more than one company, the empty time would be charged to the platform that registered the vehicle's previous fare.

New York City yellow cabs have been connectivity-enabled since 2008, when the TLC implemented rules that were dubbed T-PEP (Taxicab Passenger Enhancement Program). The T-PEP program was motivated by a desire to bring credit card payment systems to taxicabs and to promote passenger safety, and it appears to have

fulfilled both mandates. A side benefit of this connectivity has been public access to pickup and drop-off records for all taxi trips, which the TLC has enabled by posting the data online. The City Council later required ride-hail vehicles to report pickup and drop-off data as well — creating a trove of data that we have used in this report. However, it has not required the type of connectivity currently mandated for yellow cabs.

#### ENSURING DATA INTEGRITY IN MANHATTAN'S "CANYONS"

Because location data for ride-hail trips would be recorded with GPS (Global Positioning System), it's natural to ask whether the prevalence of "street canyons" walled in by skyscrapers in the FHV Congestion Surcharge Zone might prevent the system from achieving the necessary high levels of data resolution. After all, GPS is a satellite-based technology, one that requires simultaneous access to a minimum of three satellites in order to precisely triangulate vehicle location.

The answer is no, primarily for two reasons. First, motor vehicles travel in defined paths (think streets, roads, and highways), allowing any interruption in location-reporting to be filled in via interpolation (also known as map-matching). In the same way that dots on a graph can be connected by lines even if one or two data points are missing, software will be able to draw the path taken by the vehicle and render the missing map points as part of trip records transmitted to the TLC.

Additionally, since the urban canyon model is constrained as pieces of lines, the minimum number of available

satellites reduces to two, which satisfies many urban canyon environments. Coupled with techniques such as Kalman filtering and A-GPS (Assisted or Augmented GPS), mapping algorithms can provide sufficient information for the reporting process even in the face of occasional interruption by a canyon effect. And keep in mind that in a city environment canyon effects are mostly limited to the span of a city block. For the purposes of tracking vehicles inside a zone, this should not pose any unresolvable issues.

The second reason is data-processing advances enabled by ever-cheaper computing. Because of the extremely low (and still-falling) cost to record and transmit each data point, transmission frequency can be set at a high rate, say every five seconds. This will make data interruptions extremely rare and their complement, data continuity, high enough to distinguish any minutes or seconds in which the vehicle is moved off-street (to a garage or parking lot) to keep it from being subject to the empty-time charge.

The type of system that met TLC’s specifications for connecting taxicabs to its servers consisted of bulky devices connected through wires running throughout the vehicle. These systems cost approximately \$1,000 per installation. In contrast, the capability envisioned here for connecting and tracking ride-hail vehicles’ empty time is readily provided by miniature digital devices that are smaller than a deck of cards and retail for \$50. With installation, which would be performed at certified stations and can be done in a matter of minutes, the cost per vehicle should be under \$100.

As the first step toward creating the system to digitally record and report ride-hail vehicle empty time, the TLC would develop and publish the technical specifications for the GPS-capable devices. The TLC would also: instruct the ride-hail vehicle owners in installing the devices, certify shops to perform the installations, and manage the task of writing and launching the software through which each vehicle’s GPS-certified device will communicate with the company platform’s pickup and drop-off records to calculate each vehicle’s empty time. This data would then be conveyed to the TLC servers. I have had conversations with several individuals who are knowledgeable about and versed in taxi technology and regulation in New York City. It is their opinion that the above tasks can be accomplished within 6-9 months of the enactment of the enabling legislation.

Developing the necessary communications protocols between each in-vehicle GPS and the company platforms with which it is affiliated is primarily a compliance matter rather than a technical issue. Accordingly, the legislation mandating connectivity for the ride-hail vehicles would need to specify the data communication required of the companies and would likely need to include stringent penalties to ensure compliance and cooperation.

FIGURE 4: ILLUSTRATION OF CONNECTIVITY-CAPABLE IN-VEHICLE DEVICE TO TRACK RIDE-HAIL VEHICLES’ EMPTY TIME.  
DIMENSIONS: IN MILLIMETERS, 79 X 43 X 12; IN INCHES, 3.1 X 1.7 X 0.5.



#### HOW RIDE-HAIL EMPTY-TIME CHARGES WOULD WORK

Universal connectivity will make it possible to charge the ride-hail companies for the minutes and seconds that their affiliated vehicles are occupying the FHV Congestion Surcharge Zone without a passenger — both time waiting for passengers and time spent travelling to pick up the passenger.

Ideally, the per-minute empty-time charge would be higher when traffic congestion is most severe, and lower at other times. In this report I assume a premium charge from 6 am to 8 pm on weekdays, with a lower charge at other times. This two-tier price system aligns the empty-time charge in reasonable proportion to the traffic congestion caused by the vehicles’ presence in the zone.

In contemplating the idea of an empty-time charge, it is useful to bear in mind just how much time ride-hail vehicles spend without a passenger. The TLC estimates that as a concomitant of a typical 20-minute fare trip that traverses the Manhattan core, a ride-hail vehicle has spent

an average additional 8.3 minutes waiting for the pickup notification and 5.6 minutes traveling to the pickup spot. Because of the combined 13.9 minutes of unoccupied time, only about 60 percent of ride-hail vehicle time in the Manhattan core is spent conveying passengers; the other 40 percent is spent empty. The empty 40 percent includes time traveling and time sitting, both of which contribute to clogging Manhattan streets and slowing down others who are trying to get around.

Sitting time — literally, empty ride-hail vehicles sitting in the FHV Congestion Surcharge Zone waiting to be hailed by a passenger— doesn't figure in the usual measure of traffic volumes, which is vehicle miles traveled (VMT). Nevertheless, sitting time by ride-hail vehicles still manifests as an impediment to traffic circulation. Even a vehicle sitting curbside in Manhattan is almost always compelling another vehicle to double-park and interfere with traffic flow, or to continue cruising in search of a spot. As a general matter, then, ride-hail vehicles contribute, like any other vehicles, to traffic congestion even when they are not in motion.

As noted, during most weekday hours the time that a ride-hail vehicle spends travelling to pick up its next passenger imposes congestion costs of around two dollars per minute, or a total of ten dollars or more, considering the average 5.6 minutes in transit to the pick-up point. As for vehicle time spent sitting, while it tends to be less congestion-causing than traveling to the passenger, it also contributes to slowing traffic.

To approximate the congestion impact from a sitting ride-hail vehicle for this report, the average congestion impact of a moving vehicle was, based on expert opinion, conservatively downgraded by one-half to three-quarters. In other words, I assign to a sitting ride-hail vehicle only a quarter to a half of the congestion impact from the same vehicle in motion in the same area at the same time.

With that convention, I have estimated that during a typical weekday hour, just the sitting ride-hail vehicles in the CBD constitute the congestion equivalent of around 1,000 vehicles in constant motion. This is an effective vehicular mass that, according to my modeling, slows overall traffic in the Manhattan core by one to two percent during the 6 am – 8 pm weekday peak.

## CALCULATING AN APPROPRIATE EMPTY-TIME CHARGE

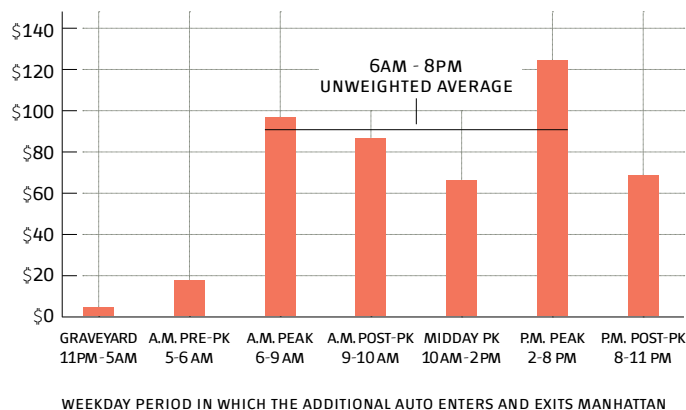
In this section we examine trips to the CBD made in private autos. Calculations from my modeling indicate that the slowdown in traffic due to a single auto trip into and out of the CBD from 6 am – 8 pm on weekdays currently imposes average congestion costs on other road users of \$93 (see Fig. 5). In contrast, it is anticipated that when congestion pricing commences, driving an auto into the congestion pricing zone in the peak period will incur a charge of around \$13. Comparing the congestion toll for a car trip with that trip’s congestion cost imposed on other drivers, we find that *private car drivers are likely to be paying a congestion toll equaling only around 14 percent of the congestion costs they impose on others* ( $\$13/\$93 = 14\%$ ).

This cost relationship can serve as a yardstick for determining appropriate empty-time charges for ride-hail vehicles. We saw earlier, in Fig. 3, that during weekday peak hours (6 am – 8 pm), a minute of driving an automobile in the Manhattan Central Business District imposes between \$1.80 and \$2.30 of delay costs on all other road users. If the same 14 percent ratio is applied to those delay costs, then per-minute congestion charges for ride-hail trips at peak times should be between \$0.25 and \$0.32 (since 14 percent of \$1.80-\$2.30 computes to \$0.25-\$0.32).

However, that range applies to ride-hail (or other) vehicles in motion. As a conservatism — and not a minor one — I propose to treat 100% of ride-hail vehicles’ empty time as sitting time. This convention then dictates applying just 3/8 of the above cost range, based on the approximation that a sitting vehicle in Manhattan causes between a quarter and a half of the congestion caused by a moving vehicle.

FIGURE 5

Collective Delay Costs Borne  
by Other Drivers due to an Additional  
Auto Round-Trip to CBD (Weekdays)



Multiplying the \$0.25 – \$0.32 per minute range by 3/8 yields an empty-time charge of 9.4 to 12 cents per minute, which averages (with a slight upward rounding) to 11 cents. This suggests that an 11 cent a minute peak charge for ride-hail vehicles’ empty time would be an appropriate fee to charge based on their impact in the Surcharge Zone. During off-peak hours — 8 pm – 6 am weekdays, and all 24 hours on holidays and weekends — the per-minute empty-time charge would be halved, to 5.5 cents.

This empty-time charge would not penalize ride-hail companies for their vehicles’ empty time but rather address and mitigate the costs resulting from that time. It would also provide benefits to ride-hail vehicle drivers and passengers through street decongestion, redesign, and repair.

## EMPTY-TIME CHARGES WOULD BE PAID BY THE RIDE-HAIL COMPANIES (NOT THE DRIVERS)

The lump-sum FHV congestion surcharges implemented by New York State in February 2019 — \$2.50 for trips in yellow cabs, \$0.75 per passenger for trips in “shared” or “pooled” ride-hail vehicles, and \$2.75 for ordinary trips in ride-hail vehicles that touch the FHV Congestion Surcharge Zone (south of 96th St) — are assessed on a per-trip basis, with the surcharge automatically added to the trip fare. This form of per-trip assessment isn’t practicable for the empty-time charge, however, since the unoccupied-vehicle time on which it is based can’t be allocated to an individual trip.

The proposal presented here would instead charge the ride-hail companies directly on an aggregate monthly basis. If, say, vehicles affiliated with Uber are empty in the Surcharge Zone for a total of 2,000 hours during a one-hour period, Uber would be charged for 2,000 hours multiplied by the per-minute charge in effect during that hour. In the case of vehicles affiliated with more than one company, the empty time would be charged to the platform that registered the vehicle’s previous fare.

The charges could be substantial. A charge of 11 cents per empty minute in the zone equates to \$6.60 per hour. Based on my estimate that ride-hail vehicles operating on the three major platforms (Lyft, Uber, and Via) currently spend 2,800 combined hours empty in the CBD during each weekday daytime hour, their total empty-time charge could reach as high as \$18,500 an hour (calculated as 2,800 x \$6.60).

In response to such prospective charges, the ride-hail companies would likely adapt their fare structures to capture the revenue needed to offset their impact. Since it isn’t practicable for the companies to add a given trip’s

associated empty-time charge to the next fare — as the volatility would undermine the ride-hail companies’ fare predictability — the fare adjustments would probably be made on an aggregate basis, presumably reflecting past empty time associated with similar trips.

Continuing with the illustrative empty-time charge of 11 cents peak and 5.5 cents off-peak, the average ride-hail trip that touches the FHV Congestion Surcharge Zone could see a fare increase of approximately \$1.00 per ride during peak hours (6 am – 8 pm weekdays) and 30-35 cents at other times. These relatively modest increments may nevertheless nudge the takers of some of those trips to substitute other means — subway, bus, bicycle, or a closer destination — for trips in the Surcharge Zone currently made in ride-hail vehicles.

To further reduce their empty-time charges, it is likely that the ride-hail companies would cut down on their stockpiling of affiliated vehicles in the FHV Congestion Surcharge Zone. For example, the companies could lower commission rates for fare trips in the Surcharge Zone and raise them for trips in the outer boroughs. This would incentivize drivers to spend more time outside Manhattan, where the empty-time charge would not apply. The ride-hail companies could also use the geo-fencing capability of their vehicles’ smart tracking devices to limit the number of drivers affiliated with their platform who are in the Surcharge Zone at any time.

Any impacts on drivers from these manipulations should be constrained by New York City’s [driver pay standard](#). Beginning in February 2019, the ride-hail vehicle companies have been [required to pay](#) their affiliated drivers minimum amounts intended to correspond to a living wage. With vehicle connectivity, the TLC will be able to monitor the impact of the empty-time charge on fares, congestion and driver pay.



## COMPARING THE CRUISING CAP AND AN EMPTY-TIME CHARGE

In 2019, TLC issued regulations to reduce ride-hail vehicles' cruising time within the FHV Congestion Surcharge Zone. The empty-time charge proposed here would replace, not supplement, the cap on the vehicles' cruising time.

The Cruising Cap — a drawdown from the current estimated 41 percent of time that ride-hail vehicles spend idle in Manhattan — was scheduled to take effect in 2020. The first stage, originally set to begin last February but delayed by litigation, required the ride-hail companies to reduce their vehicles' idle time averages to 36 percent. In the second stage, meant to begin last August, the average was to be reduced to 31 percent.

Because the empty-time charge would achieve the purpose of the Cruising Cap, the Cruising Cap should be phased out once the charge has gone into effect.

### LITIGATION BLOCKING CRUISING CAP ON RIDE-HAIL VEHICLES

On December 23, 2019, a NY State Supreme Court judge annulled rules adopted by the Taxi and Limousine Commission in August 2019 requiring that the three ride-hail vehicle companies (Lyft, Uber, and Via) maintain their vehicles' idle time hours in the Manhattan Congestion Surcharge Zone at a maximum of 31 percent of their total hours traveling in that zone.

The rules were set to take effect in 2020 in two stages: an idle time maximum of 36 percent beginning in February, succeeded by a 31 percent maximum in August. The judge deemed them "arbitrary and capricious" because the particular percentage targets weren't rigorously derived or factually supported. The judge also cited the TLC's failure to share its economic modeling with Uber, which originated the litigation as plaintiff. In early 2020, the City filed notice that it intended to appeal the decision.

## CRUISING CAP IMPLEMENTATION CHALLENGES

Cutting the percent of time that ride-hail vehicles are idle in the FHV Congestion Surcharge Zone to 31 percent (from the pre-pandemic estimated 41 percent), as the August 2019 TLC rule intended, would mitigate congestion if implemented and sufficiently enforced. To effectuate it, the ride-hail companies would need to trim their vehicles' idle hours by 35 percent, according to my calculations. Reducing ride-hail vehicle idle time to that extent would add two-thirds of a percentage point to the gain in weekday CBD vehicle speeds expected from congestion pricing, boosting it to 17.4 percent from 16.7 percent, according to my modeling.

However, a number of potentially thorny implementation and enforcement issues stand in the way of actually achieving even that modest gain.

### CRUISING CAP COMPLIANCE IS BEING LEFT TO THE RIDE-HAIL COMPANIES

No mechanism has been prescribed to measure compliance with the idle-time cap and for the TLC to monitor it. The TLC's August 7, 2019 "Notice of Promulgation and Statement of Basis and Purpose of Rules" required the ride-hail companies (Lyft, Uber, Via) to report their affiliated drivers' aggregate idle time fractions to the TLC on a monthly basis. However, the TLC Notice and Statement was silent on the procedures for counting idle time (the numerator of the mandated fraction) and non-idle time (which figures in the denominator), giving the ride-hail companies broad discretion to devise their own calculation and reporting procedures.

## TLC LACKS THE CAPACITY TO MONITOR COMPLIANCE

Fully corroborating each company's compliance with the Cruising Cap will require substantial resources. The TLC will have to scrutinize the movements and passenger status (empty vs. occupied) of tens of thousands of ride-hail vehicles for up to the 700 hours in a typical month. Sifting this data to authenticate the ride-hail companies' adherence to the Cruising Cap will be a herculean task even if the companies operate in good faith — a presumption belied by their past proclivity of bending or ignoring regulations. Without real-time connectivity to the estimated 60,000 ride-hail vehicles operating here, city officials will be forced to rely on company-generated and filtered data supplied after the fact.

## PRESCRIBED FINES ARE INSUFFICIENT

TLC's [Cruising Cap rules](#) prescribe fining the ride-hail companies \$350 for each 100 excess hours that the company's vehicles are idle — "excess" relative to the 36% idle-time cap that was to begin in February 2020 and 31% commencing last August. This fine is not insubstantial; it equates to 5.83 cents for each minute of idle time, a rate slightly greater than half of the 11 cent/minute charge offered for discussion in this report. But any administrative penalty is only as robust as the mechanism for assessing it; absent the connectivity being recommended here, and the transparency that comes with it, the companies are being positioned to be the prime and perhaps sole arbiters of their adherence to the cap. With market share on the line, giving the ride-hail companies prime authority over their own compliance is not a prudent arrangement.

## INCENTIVES TO SKIRT COMPLIANCE ARE POWERFUL

The close tie-in between vehicle stockpiling and rapid fulfillment of customer requests establishes a dynamic whereby each company could rationally fear being the sole operator to cut back on empty vehicles. This kind of stalemate borne of mutual distrust pops up in many venues, from overfishing and climate pollution to the nuclear arms race, and is often referred to as the "Prisoner's Dilemma." Solutions to these stalemates invariably require transparency.

### MANHATTAN ZONES

Three overlapping (actually, nested) geographical zones are noted in this report:

- 1 **Central Business District Zone** into (and perhaps out of) which car and truck trips were to be charged beginning in 2021: Manhattan south and inclusive of 60th Street.
- 2 **FHV Congestion Surcharge Zone** for which trips in yellow cabs or ride-hail vehicles are currently assessed the FHV congestion surcharges: Manhattan south of 96th Street.
- 3 **Taxi Exclusion Zone** in which only yellow cabs may pick up street hails: Manhattan south of E 96th Street on the east side and Manhattan south of W 110th Street on the west side.

The companies, for their part, adamantly contested the TLC’s Cruising Cap. Following a challenge by Uber, a State Supreme Court judge struck down the new TLC rules, calling the City’s regulations “arbitrary and capricious.” While the City may appeal the decision, the Court’s ruling blocked implementation of the cap for the time being.

There are still other ways the ride-hail companies could comply with the Cruising Cap without necessarily shrinking the number of idle hours by the full calculated 35 percent. For example, they could comply mathematically by

increasing the number of fare trips they carry by slightly more than one-half while holding idle hours constant.

While that particular scenario may appear extreme, it points to the possibility that the companies could satisfy the cap without drastically curtailing their vehicles’ idle hours. It also underscores the ungainly nature of the Cruising Cap. The convoluted design targeting a *fraction* (idle-time percentage) rather than a *quantity* (idle-time hours) leaves the cap particularly vulnerable to gaming.

AN 11-CENT EMPTY-TIME CHARGE WOULD OUTPERFORM THE CRUISING CAP

I have estimated the congestion-reduction benefits of an 11 cents per minute peak (5.5¢ off-peak) empty-time charge and of the mandated 31% cap on the share of ride-hail vehicle time that the vehicles are empty. Both

measures apply only to time that the vehicles are in the FHV Congestion Surcharge Zone. Both are modeled as additions to congestion pricing.

TABLE 1:  
EMPTY-TIME CHARGE  
COMPARED WITH  
CRUISING CAP

	CONGESTION PRICING BASELINE	ADD CRUISING CAP TO BASELINE	ADD EMPTY-TIME CHARGE TO BASELINE
START DATE	2021 (OR LATER)	STAGE 1, FEB. 2020 STAGE 2, AUG. 2020	2021 (OR LATER)
COMPLIANCE / ADMINISTRATION	MTA’s Triborough Bridge & Tunnel Authority	Company reporting monitored by TLC	TLC via connectivity with in-vehicle GPS
SPEED IMPROVEMENT IN CBD	16.7%	17.4% (Δ = 0.7%)	19.4% (Δ = 2.7%)
ANNUAL NET BENEFIT	\$3,170,000,000	\$3,210,000,000 (Δ = \$40m)	\$3,330,000,000 (Δ = \$160m)

Delta symbol (Δ) denotes difference from baseline. CBD speed increases are averages for 6am-6pm weekdays. Annual net benefit monetizes several dozen benefit and cost categories from congestion pricing including time savings, environmental enhancements, (negative) value of unwanted mode shifts, and costs of the tolls and charges themselves. Congestion Pricing Baseline assumes \$13.00 inbound tolls for private cars (6am-8pm weekdays and noon-10pm weekends and holidays), \$4.00 at other times, higher tolls for

trucks. It also assumes current FHV surcharges in Surcharge Zone of \$2.50 for trips in yellow cabs, \$0.75 per passenger for trips in “shared” or “pooled” ride-hail vehicles, and \$2.75 for ordinary trips in ride-hail vehicles. Cap on Cruising Time assumes ride-hail companies reduce their vehicles’ idle time in Surcharge Zone to 31% by reducing idle hours by 35%. Empty-Time Charge is 11¢ per minute during 6am-8pm weekdays, 5.5¢ other times.

## POTENTIAL FUTURE APPLICATIONS

### PER-MINUTE FHV SURCHARGING: A POTENTIAL NEXT STEP

The principles embodied by my empty-time charge proposal could also be applied by New York State to reformulate its current “lump-sum” congestion surcharges. Modeling with the BTA spreadsheet suggests that surcharging ride-hail vehicles and yellow cabs alike per minute in the Surcharge Zone would reduce gridlock in Manhattan considerably more than the current “lump-sum” congestion-surge system that took effect in 2019. That is because per-minute charging would impinge more heavily on trips that cause the most congestion, in contrast to the lump-sum charges that make no distinction between trips that touch (and therefore clog) the zone for an hour and those that do so just for a minute.

These surcharges would be separate from the empty-time charges proposed here for ride-hail vehicles. They would replace the existing New York State charges on both ride-hail vehicles and taxicabs (\$2.50 for trips in yellow cabs, \$0.75 per passenger for trips in “shared” or “pooled” ride-hail vehicles, and \$2.75 for ordinary trips in ride-hail vehicles). From a technical standpoint, this transitioning from lump-sum to per-minute congestion surcharging could be implemented using the connectivity infrastructure for the empty-time charge discussed on pp. 8-10.

As a modeling exercise, I calculated per-minute surcharge rates (applicable only to time in the FHV Congestion Surcharge Zone with a passenger) that would yield surcharge revenues equaling those from the lump-sum surcharges: these came to 20 cents a minute for trips in yellow cabs and 25 cents a minute for trips in ride-hail vehicles. Charges for shared rides would be 6.8 cents per minute, maintaining the current 3/11 ratio between shared and regular ride-hail surcharges; all rates would be halved during evenings and nights and on weekends and holidays.

Our baseline assumed congestion pricing, since tolls to drive into the Manhattan CBD were expected to go into effect either shortly after the empty-time charge was instituted, or at the same time. This choice of baseline isn’t critical; the key takeaways in Table 1 are the two regulatory scenarios’ differences from the congestion pricing baseline.

The comparison in Table 1 is conservative, i.e., tilted to cast the Cruising Cap in a favorable light, since it assumes that the ride-hail companies fully implement the mandated drawdown in idle-time percent to 31 percent; and that they do so solely by reducing their vehicles’ idle hours in the Surcharge Zone (rather than by increasing the number and/or duration of their fare trips there).

The table shows at a glance the advantages of switching regulation of ride-hail empty time in the FHV Congestion Surcharge Zone to an empty-time charge in place of the pending cap:

- While either policy improves CBD travel speeds beyond the baseline of congestion pricing, the boost in average speeds from the empty-time charge is nearly four times as great as the gain from the Cruising Cap: 2.7 percentage points vs. 0.7 points.
- The empty-time charge’s much bigger bite out of CBD traffic means much greater time-saving benefits for all users of Manhattan streets and roads, including passengers and drivers of ride-hail companies.

The empty-time charge would provide the City with an estimated \$80 million a year to ameliorate conditions caused by ride-hail vehicle idling and stockpiling. Investing these funds in street redesign and repair programs could speed up trips, further benefiting CBD street users including ride-hail vehicle passengers.

## A TEMPLATE FOR PACKAGE DELIVERIES

Replacing ride-hail vehicles' Cruising Cap with per-minute empty-time charges would not merely be consequential for the ride-hail industry. It could also serve as a means to unlock vital and beneficial reforms in goods delivery.

Deliveries associated with e-commerce are a growing source of traffic congestion in New York City. Daily package deliveries to New York City households tripled to more than 1.1 million from 2009 to 2017, according to an October 2019 New York Times A-1 story, [1.5 Million Packages a Day: The Internet Brings Chaos to N.Y. Streets](#).

And while the full congestion impact from the rise in deliveries hasn't been quantified, the proliferation of UPS, USPS, FedEx, Amazon, and other delivery vehicles is unmistakable, as is their usurpation of curb, sidewalk, and street space. Food-delivery businesses such as Peapod and Fresh Direct have also expanded their footprints. The Times' warning that this "could be just the beginning" reverberated in press accounts and on social media and does not feel like hyperbole.

The impacts of delivery services have proliferated in part because governments have shied from proper enforcement and charging these services directly for their use of road and curb space. Yet package delivery, like ride-hail service, is built around "fleet" vehicles that could be digitally metered efficiently and inexpensively. Pricing for street space used by these services could reduce their street footprint and induce efficiencies.

FIGURE 2:  
WEST 52 ST., WEDNESDAY, DEC. 4, 2019, EARLY AFTERNOON.  
PHOTO BY COUNCILMEMBER BRAD LANDER



Per-minute charging of ride-hail vehicles' empty time in the FHV Congestion Surcharge Zone could serve as a template for similar charging of package delivery. The precedent of assessing ride-hail vehicles at least a portion of their congestion costs could smooth the political path to charging delivery fleets for theirs. Moreover, just as for-hire vehicles are likely to be exempted from the pending congestion-pricing cordon fee (since they are already subject to their unique congestion surcharge system), an empty-time charge for deliveries could be designed specifically for the trucking industry to ensure that it effectively reduces congestion without impeding critical business operations or imposing barriers to entry for smaller operators.



## CONCLUSION

New York City is on the cusp of a transportation revolution — one that will remake not just our streets and subways but our notions of who and what our cities are for. Long-held certitudes are being questioned, and the air is alive with possibility.

How we regulate ride-hail companies will be key in this makeover. Prior to the pandemic, vehicles affiliated with Lyft, Uber, and Via were accounting for nearly a third of motor traffic in the Manhattan core and were a leading cause of worsened traffic and congestion.

City and state government responded. In 2019 New York State began collecting “congestion surcharges” on trips in yellow cabs and ride-hail vehicles in Manhattan below 96th Street — a down payment of sorts on congestion pricing. The city proposed new rules to cap ride-hail vehicles’ “idle time” in Manhattan as well.

These measures were fair-minded and positive. But we can and must impose more effective policies. This report lays out an achievable next step to check rampant and unproductive stockpiling of ride-hail vehicles in the most heavily congested (and transit-rich) part of the city.

The plan proposed here would supplant the cap on ride-hail vehicles’ empty time with a more effective and transparent empty-time charge for each minute that the vehicles occupy the FHV Congestion Surcharge Zone without a passenger.

Such a charge is more tamper-proof than the policy it would replace. It would eliminate more gridlock by charging the ride-hail industry in proportion to the unnecessary congestion it creates. And it would inaugurate a true form of congestion pricing, one that New York and other cities would be positioned to extend to delivery and fleet vehicles and, perhaps eventually, all car and truck traffic.

2021 can be a crucial pivot point for transportation in New York City — a year in which we begin to advance from unfettered congestion and auto-dominated streets to a more pluralistic and humane system that lets New Yorkers more easily access and navigate our great city. Charging ride-hail companies for their vehicles’ empty time in Manhattan can be a constructive and progressive element in this transition.

## CHARLES KOMANOFF

Komanoff began his career in policy analysis under Mayor John Lindsay, specializing in electricity economics and air pollution. He rose to prominence in the late 1970s with penetrating analyses of cost escalation in the U.S. nuclear power industry, leading to expert-witness assignments for New York, California and a dozen other states in litigation to shield ratepayers from reactor cost overruns.

From 1986 to 1992, as volunteer president of Transportation Alternatives, Komanoff led spirited campaigns that overturned a midtown bicycle ban, won access to area roads and bridges, and framed cycling as key to livable cities. Shortly after, he turned his attention to the societal costs of motor vehicle use and policies to internalize these costs through congestion pricing.

In 2007, with the sponsorship of legendary civic activist Theodore W. Kheel, Charles began developing his Balanced Transportation Analyzer — the kaleidoscopic spreadsheet model used by transit advocates and state officials to optimize congestion pricing.

Komanoff's work also includes books (*Power Plant Cost Escalation*, *Killed By Automobile*, *The Bicycle Blueprint*), scholarly articles, and journalism for outlets ranging from Streetsblog to The New York Times. An honors graduate of Harvard and married parent of two grown sons, Charles lives in lower Manhattan.

Web site: [WWW.KOMANOFF.NET](http://WWW.KOMANOFF.NET)

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## Appendix: Calculations

### HOW WE DERIVED THIS REPORT'S FACTS AND FIGURES

#### THE BALANCED TRANSPORTATION ANALYZER AND ITS ROLE IN THIS REPORT

Most of the quantitative findings in this report are derived from data or analysis generated by the Balanced Transportation Analyzer (BTA), an Excel spreadsheet that the author (Komanoff) began constructing in 2007 to analyze and optimize congestion pricing proposals for New York City. The BTA now contains 78 worksheet "tabs" that are stocked with up-to-date baseline travel data and are internally linked by over 100,000 equations and algorithms. The various tabs communicate with each other to process hypothesized policy options (e.g., congestion tolls, FHV surcharges) to yield pertinent outputs such as toll revenues, changes in vehicle volumes and speeds, and travel-time savings.

The consultants who advised NY Gov. Andrew Cuomo's "Fix NYC" task force used the BTA from October 2017 into 2019 to evaluate congestion pricing options. The task force's final report included these comments:

*The traffic and revenue estimates of various tolling strategies were performed using the Balanced Transportation Analyzer, or BTA. This spreadsheet model, developed by Charles Komanoff, provides a framework for assessing the extent to which zone pricing can both generate revenue and improve traffic conditions in the Central Business District (CBD). The BTA was chosen as the tool for this study because it offers four key advantages in supporting the zone pricing analysis:*

- *As a spreadsheet model, it can rapidly evaluate and compare multiple tolling strategies.*
- *The model draws from a broad array of well-documented sources of traffic and transportation data.*
- *It is transparent. The underlying data is clearly identified and the assumptions governing the use of this data are highlighted.*
- *It yields the outputs that are most relevant to our analysis — namely, increase in revenue, improvement in average vehicular speed, and reduction in congestion.*

The BTA is continually updated. The figures in this report are drawn from the March 3, 2020 edition. The most recent edition is always available on the Internet via this link:

[http://www.nnyn.org/kheelplan/BTA\\_1.1.xls](http://www.nnyn.org/kheelplan/BTA_1.1.xls).

Most of the derivations in this report were performed with the model running the "Fix NYC, Komanoff Prediction," which is my best effort to simulate what I believe will be the actual congestion pricing plan implemented in 2021. The many assumptions that make up this scenario may be seen in the BTA's **Policy Levers** tab, Column H.

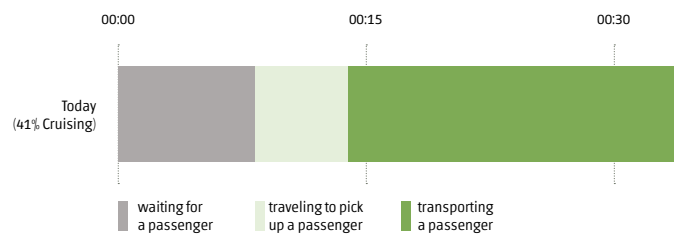
Some figures in the current BTA may differ slightly from the values presented in this report, due to changes in data or modifications

of scenarios, formulas and algorithms. Some cell or row references may have changed as well. For help resolving inconsistencies, please contact the author.

#### SUPPORT AND DERIVATION OF QUANTITATIVE ASSERTIONS IN THIS REPORT

*The Taxi and Limousine Commission (TLC) estimated in 2019 that to complete a typical 20-minute fare trip in the Manhattan core, a ride-hail vehicle spends 8.3 minutes waiting for the pickup notification and 5.6 minutes traveling to the pickup. (p. 3)*

See graphic below, copied from TLC-DOT June 2019 report, [Improving Efficiency and Managing Growth in NYC's For-Hire Vehicle Sector](#), p. 9. The figures in the graphic — 20.00 minutes of fare time, 8.3 minutes of waiting time, and 5.6 minutes traveling to pickup point — are in minutes and seconds and apply to "Manhattan core."



#### Key Findings

See pp. 25-26, where we unpack Table 1, for derivation of figures in this section.

*[The proposed idle-time charge would] reduce the presence [in the CBD] of empty ride-hail vehicles by nearly 10 percent. (p. 5)*

With the BTA running scenario #4 (Fix NYC, Komanoff prediction) add the proposed hovering charge of 11 cents a minute by entering that quantity (as \$0.11) in Cell H189 of the **Policy Levers** tab. (Note that this will cause Cells H190 and H191, which convey off-peak hovering surcharges, to display one-half of that peak value, or \$0.055.) The projected change in the number of empty ride-hail vehicle hours in the CBD during the weekday peak (6 am – 8 pm) is shown in Cell J370 of the **UberLyft** tab: 9 percent (shown rounded off from 9.4%) — that's the "nearly 10 percent" in the text.

**All other "key findings" are derived and supported elsewhere in this Appendix (primarily in the discussion of Table 1).**

*The three major ride-hail companies — Lyft, Uber and Via — now account for nearly a third of all vehicle-miles traveled in the Manhattan CBD. (p. 6)*

Please refer to the BTA's **Motor Vs** tab. The upper-left hand portion of that tab, Rows 1-134, Columns A-N, establishes baseline conditions of vehicular traffic within the the CBD. The raw weekday VMT figures, in Row 118, shows 1,072,925 daily miles for "Uber/Lyft" (a category that included Juno until it went out of business, as well as Via) out of a total of 3,385,172 miles for all vehicles (including cars, taxicabs, buses and trucks). When the "Uber/Lyft" figure is adjusted to account for those vehicles' deliberately stationary time in the CBD, it rises to 1,156,503 miles and the total rises correspondingly to 3,468,750 miles (this is shown in Row 130). The percentages for "Uber/Lyft" are 32 percent unadjusted and 33 percent when the Uber/Lyft share is adjusted as described.

*Their [ride-hail vehicles'] share is second only to private autos. (p. 6)*

The same BTA tab (**Motor Vs**) and rows just cited show yellow cabs' daily VMT in the CBD to be 637,974 — far less than the roughly 1.1 million daily miles for ride-hail vehicles.

*The iconic estimate, attributed to the [Partnership for New York City](#), is that traffic congestion costs New Yorkers \$20 billion a year in lost time, decreased productivity, and increased exposure to pollution and vehicular danger. (p. 6)*

The link is to a Partnership press release dated Jan. 17, 2018, "Traffic Congestion Will Cost Metro Area \$100 Billion by 2022," which in turn links to a one-page pdf, [\\$100 Billion Cost of Traffic Congestion in Metro New York](#). The document, though skeletal, is credited to the widely respected consultancy HDR, which has a long history of analyzing NY-area traffic and its costs.

*Within the CBD, the introduction of just one vehicle driven for a single minute imposes two and a half minutes of total cumulative travel delays on all other vehicles within the zone — slightly less during midday (10 am – 2 pm) and somewhat more during the long 2-8 pm afternoon-evening peak. The only exceptions are overnight and early morning, at which times the incremental delay is slight. (p. 7)*

These figures are drawn from the BTA's **Delays** tab, which makes use of the BTA's "speed-volume" equation relating vehicle volumes to vehicle speeds. The tab first calculates average vehicle speeds in the CBD for different periods of the day based on their relative travel volumes, subject to the constraint that the volume-weighted average speed equals the 8 am - 6 pm CBD average speed of 7.0 mph. (That figure was reported in NYC DOT's [2018 New York City Mobility Report](#) (August 2019), pp 18-19, and was sourced to 2018 GPS records maintained by NYC medallion taxicabs.)

Next, the tab increments the number of vehicle trips into the CBD by a small hypothetical amount — 100 trips — and, using the BTA's speed-volume equation, calculates the slightly lower vehicle speeds that would result from the slightly increased traffic volumes. Comparing the hypothetical lower speeds with the calculated actual speeds reveals the additional hours spent in traffic to which the additional 100 trips would subject the vehicles already operating in those periods.

The line graph of delay costs keyed to Figure 3's right axis draws on percentage shares of CBD vehicles by type (private car, for-hire vehicle, different truck types, etc.) and estimated dollar values of time for each type given in the BTA's **Value of Time** tab. The statements in the text about delay costs in minutes and dollars associated with an additional minute of vehicle driving are based on calculations shown in **Delays** but may also be verified by visual observation of the graphs.

*It appears that the State-imposed lump-sum congestion surcharges on trips in the FHV Congestion Surcharge zone by taxicabs and ride-hail vehicles that went into effect in 2019 have begun to instill a similar feedback loop [lower usage] among users of for-hire vehicles. (p. 7)*

FIGURE 1  
FHV Trip Volumes, Manhattan Taxi Zone  
● APP-BASED VEHICLES ● YELLOWS

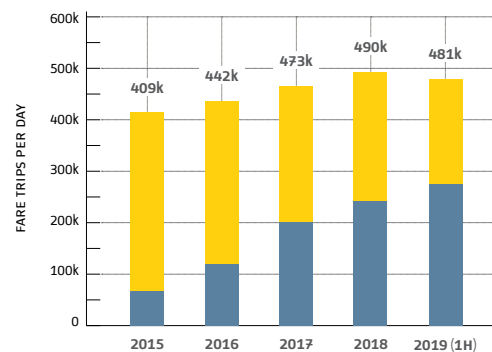


Figure 1 shows a drop in the first half of 2019 in the total number of for-hire vehicle trips (yellows + ride-hails) that touch the FHV Congestion Surcharge zone, compared to 2018. Though the drop is slight — just 9,000 thousand trips per day, or 2 percent — it nevertheless stands out as a reversal of the robust growth (an estimated 81,000 trips per day) to 2018 from 2015, the first year with accessible data of FHV trip volumes broken down by location. While it is possible that other factors — improved train service, for example — may have played a part in the 2019 downturn, the advent of the FHV congestion surcharges at the beginning of February 2019 was almost certainly a key cause.

*The TLC estimates that as a concomitant of a typical 20-minute fare trip that traverses the Manhattan core, a ride-hail vehicle has spent an average of 8.3 minutes waiting for the next pickup notification and 5.6 minutes traveling to the pickup. Because of the combined 13.9 minutes of unoccupied time, only about 60 percent of ride-hail vehicle time in the Manhattan core is spent conveying passengers; the other 40 percent is spent empty. (pp. 10-11)*

The minute figures were sourced earlier to the joint TLC-DOT June 2019 report, [Improving Efficiency and Managing Growth in NYC's For-Hire Vehicle Sector](#).

*I have estimated that during a typical weekday hour, just the sitting ride-hail vehicles in the CBD constitute the congestion equivalent of around 1,000 vehicles in constant motion. This is an effective vehicular mass that, according to my modeling, is today slowing overall traffic in the Manhattan core by one to two percent during the 6 am – 8 pm weekday peak. (p. 11)*

Derivation of this assertion employs the **UberLyft** tab of the BTA and centers on the estimate, in Cell J362, that during an average hour during the weekday 6 am – 8 pm peak, 2,941 ride-hail vehicles are in the CBD without a fare. Following is the lengthy chain of arithmetic and logic that gives rise to that figure:

- 2,941 is calculated as 4,232 hours by Ubers, Lyfts and Vias with fare in the CBD in an average hour (Cell J360), multiplied by 69.5%: the ratio of average minutes per trip cycle without a passenger (13.9 minutes, Cell J289, and as seen in TLC-DOT graphic), to average minutes per trip cycle with a passenger (20.0 minutes, Cell J285, also as seen in graphic).
- The 4,232 hour figure above was calculated by dividing 28,882 miles with a fare in an average hour during the weekday peak by the average speed of 6.8 mph in that period, which is from Cell F1044 of the **Motor Vs** tab. The 28,882 figure is in Cell J358 of the **UberLyft** tab.
- In turn, the 28,882 miles figure is calculated by dividing 404,348 total weekday peak miles (Cell J356 of **UberLyft**) by 14, the number of hours in the weekday peak period.
- The 404,348 figure is calculated by dividing 437,650 total weekday peak miles by Ubers, Lyfts and Vias with a fare in the vehicle (Cell J307), by one plus an “effective congestion adder” of 8.2% that I added to actual app-based vehicles’ VMT during the weekday peak period, to reflect the congestion equivalent of stationary app-based vehicles.
- The 8.2% figure can be seen in Cell J295 of the **UberLyft** tab. It, in turn, is the product of two numbers: 20.6%, which appears in Cell J291; and 40%, which appears in Cell J293. The former 20.6% figure is the model’s estimate of the percentage of time in the CBD that app-based vehicles spend stationary (its derivation can

be traced elsewhere in the **UberLyft** tab); the 40% figure is my estimate of the traffic-congesting estimate of a stationary app-based vehicle vis-a-vis one that is in motion. (It is assumed to be 40% in peak hours and 34% in off-peak hours, yielding a weighted average of 37.5%, to correspond to my assumption stated in the main text, that the ratio of a stationary vehicle’s congestion causation to a moving vehicle’s congestion causation is between 25% and 50%.)

Those 2,941 ride-hail vehicles that are in the CBD without a fare in any given hour during the long weekday peak equate to 1,176 vehicles “in constant motion,” as we say in the text. The 1,176 figure is calculated by applying our 40% estimate of the traffic-congesting estimate of a stationary ride-hail vehicle vis-a-vis one that is in motion, during peak hours (or, if you prefer, 1,103 moving vehicles, calculated by multiplying the 2,941 figure by 37.5%).

To determine the congestion impact of 1,000 vehicles in constant motion during the 14-hour weekday peak, we again consult the BTA, this time setting it to run the “Baseline” scenario, which we do by using the pull-down menu in the box appearing in Cell K27 of the **Results** tab. This scenario duplicates current (pre-congestion tolling) traffic; when it is running, the various outputs in the **Results** tab — revenues, travel-speed improvements, and so forth — should appear as zeroes.

Now consult Row 175 of the **Motor Vs** tab, Columns I through L, which displays estimated hourly vehicle-miles traveled during the 6 am – 8 pm weekday peak. A weighted average of Cells I175 through L175 is approximately 172,000, indicating that VMT in the Central Business District averages 172,000 miles per hour during the long weekday peak period. Now consider adding 1,000 vehicles constantly circulating during each of those 14 hours. The weighted average speed during those periods is 7.16 mph (that figure is calculated from Cells I210 through L210), indicating that 1,000 vehicles circulating constantly in an hour would travel 7,160 miles in an hour.

Now consider the ratio of 7,160 (hourly VMT corresponding to 1,000 circulating vehicles) to 172,000 miles (baseline hourly VMT). That ratio, 4.2%, indicates that adding 1,000 circulating vehicles equates to expanding peak-period VMT by an average of 4.2 percent.

Now proceed to the **Policy Levers** tab. The last set of policy levers, in Rows 269-272, are the means by which the BTA can estimate the impact of added traffic levels on CBD travel speeds.

Since the traffic level addition that we wish to model is expressed as a percent (4.2%), we set Cell E269 to “A” (denoting that the BTA will be modeling a percentage increase in traffic), and set Cell E270 to 4.2%.

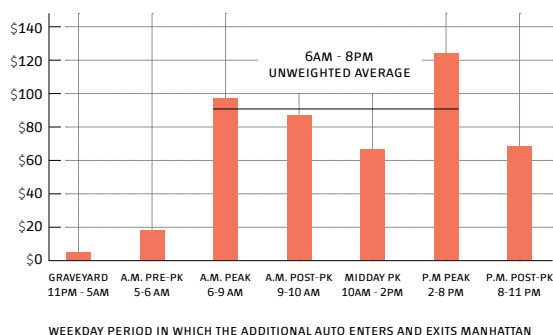
Now go to the **Results** tab. In the “Dashboard” section, the large cell beginning at B14 should read “minus 1.5%,” indicating that the VMT



increase being modeled — 4.2% — causes average travel speeds to fall by 1.5%. In the text, we characterized that as “slowing overall traffic in the Manhattan core by one to two percent.”

*Calculations from my modeling indicate that the slowdown in traffic due to a single auto trip into and out of the CBD from 6 am – 8 pm on weekdays currently imposes average congestion costs on other road users of \$93. (p. 12)*

**FIGURE 5** Collective Delay Costs Borne by Other Drivers due to an Additional Auto Round-Trip to CBD (Weekdays)



The process used to support this statement parallels the one outlined earlier for estimating the congestion costs created by an “additional” auto traveling for one minute within the Manhattan Central Business District. Here, however, the unit of measure is an entire automobile trip in and out of the CBD rather than simply one minute’s worth of a trip within the CBD.

The result of that process, which is developed step-by-step in the BTA’s Delays tab, is the graph above.

*It is anticipated that when congestion pricing commences next year, driving an auto into the congestion pricing zone in the peak period will incur a charge of around \$13. (p. 12)*

The January 2018 report by Gov. Andrew Cuomo’s Fix NYC panel noted that:

*The Panel considered a one-way pricing zone E-ZPass charge of \$11.52 for passenger vehicles [from] 6am to 8pm. This charge is identical to the two-way charge of \$5.76 suggested by Move NY, and aligned with average E-ZPass toll rates for automobiles at the MTA and PANYNJ tolled tunnels.*

In March 2019 the MTA tunnel toll was raised to \$6.12, an increase of 6.25 percent. MTA bridge and tunnel tolls are increased biennially; another 6.25 percent increase in 2021 would raise that level to \$6.50 one-way, or \$13 round trip. This suggests that the round-trip congestion charge is likely to be in the vicinity of \$13.

Note also that, by statute, the congestion tolls must raise a minimum of \$1 billion annually, after netting the costs of administering (collecting) the tolls. Analysis in the BTA indicates that a \$13 round-trip toll charged 6 am – 8 pm on weekdays and from noon to 10 pm on weekends, supplemented by a \$4 round-trip toll at all other hours of the week and year, would generate precisely \$1 billion a year. (This may be seen by setting the model to run the Fix NYC, CK Prediction scenario by using the pull-down menu in Cell K27 of the **Results** tab referenced earlier. From consulting the **Results** dashboard, we see in Cell E14 that predicted net toll revenues are exactly \$1,000 million (\$1 billion).)

*Comparing the congestion toll for a car trip with that trip’s congestion cost imposed on other drivers, we find that private car drivers are likely to be paying a congestion toll equaling only around 14 percent of the congestion costs they impose on others (\$13/\$93 = 14%). (p. 12)*

Dividing the anticipated peak-hour congestion toll of \$13 by the average \$93 congestion cost created by that trip yields 14 percent.

*Continuing with the illustrative empty-time charge of 11 cents peak and 5.5 cents off-peak, the average ride-hail trip that touches the FHV Congestion Surcharge Zone could see a fare increase of approximately \$1.00 per ride during peak hours (6 am – 8 pm weekdays) and 30-35 cents at other times. (p. 13)*

The fare increase figures may be seen by consulting the **Revenues** tab when the BTA is running the BTA’s Fix NYC, CK Prediction scenario. Cells L78, M78 and N78 show the average ride-hail vehicle congestion surcharges that have been in effect since February 2019. The figures shown, \$2.20, \$2.18 and \$2.19, are, respectively, the average impacts of the surcharges during weekday peak, weekday off-peak and weekend hours. (The figures are less than the mandated solo ride surcharge of \$2.75 because they incorporate the discounted surcharges of \$0.75 for pooled rides.)

Now modify this scenario to reflect the empty-time charges under consideration. This is done in the **Policy Levers** tab, by entering a value of \$0.11 in Cell H189 (which automatically changes Cells H190 and H191 from the prior value of zero to \$0.055, reflecting the 50% off-peak discounts). With these changes, the values in the **Revenues** tab, cells L78, M78 and N78, become \$3.17, \$2.47 and \$2.53, respectively. Comparing these figures to the \$2.20, \$2.18 and \$2.19 values noted in the prior paragraph yields respective increments of \$0.97, \$0.29 and \$0.34, supporting the statement in the text that the empty-time charges would result in fare increases of approximately \$1.00 per ride during peak hours and 30-35 cents at other times.

*The [TLC] Cruising Cap — a drawdown from the current estimated 41 percent of time that ride-hail vehicles now spend idle in Manhattan*

— was scheduled to take effect in 2020. The first stage, originally set to take effect last February but delayed by litigation, required the ride-hail companies to reduce their vehicles' idle time average to 36 percent. In the second stage, meant to begin last August, the average was to be reduced to 31 percent. (p. 14)

The above rules are stated (and their rationale presented) in an untitled TLC document whose filename roughly equates to "Proposed Rules High-Volume For-Hire Services, Cruising, August 7 (2019)." The document (pdf) is available via [this link](#).

To effectuate [the mandated reduction in ride-hail vehicles' idle-time fraction to 31 percent, from 41 percent], the ride-hail companies would need to trim their vehicles' idle hours by 35 percent. (p. 14)

Idle hours not only make up the numerator of the ride-hail vehicles' idle-time fraction; they also figure in the denominator, since that is total hours (passenger hours + idle hours). Thus, the appealingly simple notion that idle hours would need to come down by only around one-fourth (since 31% is roughly three-fourths of 41%) isn't mathematically correct. A bit of algebra yields the result that idle hours must fall by 35 percent to push the idle-time fraction to 31% from the current 41%.

Reducing ride-hail vehicle idle time [to 31 percent, from 41 percent] would add two-thirds of a percentage point to the gain in weekday CBD vehicle speeds expected from congestion pricing, boosting it to 17.4 percent from 16.7 percent. (p. 14)

The 16.7% figure is the BTA model's estimate of the average change in CBD vehicle speeds on weekdays from 6 am to 8 pm when the model is running the Fix NYC, Komanoff Prediction, which is my best effort to simulate what I believe will be the actual congestion pricing plan implemented in 2021. It can be seen in the dashboard part of the BTA's **Results** tab, at Rows 14-15.

The 17.4% figure appears when that scenario is altered by squeezing out just enough idle time to reduce the current 41% idle-time average to 31%. That may be simulated in the model by going to the **Policy Levers** tab, finding Policy Lever 38 ("Is UberLyft idle time in taxi zone capped at 31%?") and setting it to YES for Scenario #4. This triggers a series of calculations in Row 479, Cells BI through BP of the model's **Motor Vs** and **Motor Vs Weekends** tabs, which subtract, from the model's estimates of baseline VMT, the necessary number of ride-hail vehicle idle hours to reduce the average idle-time share to 31%.

This fine [\$350 for each 100 excess hours that the company's vehicles are idle] is not insubstantial; it equates to 5.83 cents for each minute of idle time. (p. 15)

The 5.83 cent per minute figure is calculated by dividing \$350 (the fine per 100 excess hours) by the product of 100 hours times 60 minutes per hour.

[The ride-hail companies] could comply mathematically [with the idle-time cap] by increasing the number of fare trips they carry by slightly more than one-half while holding idle hours constant. (p. 16)

This is a straightforward calculation. To have a 41% idle-time average there must be 69.5 idle hours for each 100 fare hours. To have a 31% idle-time average while holding the number of idle hours constant at 69.5, the 100 fare hours must rise to 155 — a 55 percent increase.

TABLE 1:

EMPTY-TIME CHARGE COMPARED WITH CRUISING CAP	CONGESTION PRICING BASELINE	ADD CRUISING CAP TO BASELINE	ADD EMPTY-TIME CHARGE TO BASELINE
START DATE	2021 (OR LATER)	STAGE 1, FEB. 2020 STAGE 2, AUG. 2020	2021 (OR LATER)
COMPLIANCE / ADMINISTRATION	MTA's Triborough Bridge & Tunnel Authority	Company reporting monitored by TLC	TLC via connectivity with in-vehicle GPS
SPEED IMPROVEMENT IN CBD	16.7%	17.4% (Δ = 0.7%)	19.4% (Δ = 2.7%)
ANNUAL NET BENEFIT	\$3,170,000,000	\$3,210,000,000 (Δ = \$40m)	\$3,330,000,000 (Δ = \$160m)

## Support and Derivation of Figures in Table 1

**Improvement in CBD speeds:** The 16.7% "base" improvement is the model's estimate of the gain in CBD weekday speeds (6 am – 6 pm) when the selected scenario is #4 (Fix NYC, Komanoff Prediction). It may be seen in the **Results** tab, Cell B14. The figure becomes 17.4% when that scenario is altered to simulate the Cruising Cap by squeezing out just enough idle time to reduce the current 41% idle time average to 31%. That may be done in the model by going to the **Policy Levers** tab, finding Policy Lever 38 ("Is UberLyft idle time in taxi zone capped at 31%?") and setting it to YES for the scenario currently being run in the model. That will set in motion a sequence of calculations that subtract the appropriate number of app-based vehicle idle hours from the baseline VMT in the model's **Motor Vs** and **Motor Vs Weekends** tabs.

The procedure for instead adding the empty-time charge for ride-hail vehicles is simpler. First, make sure the BTA is running scenario #4, Fix NYC, Komanoff prediction. Then, in **Policy Levers**, add a hovering charge of 11 cents a minute by entering that quantity (as \$0.11) in Cell H189. (Note that this will cause Cells H190 and H191, which convey off-peak hovering surcharges, to display one-half of that peak value, or \$0.055.) The results, shown in the **Results** tab, correspond to the figures in the right-most column of the table above.

*Annual Net Benefit:* Continuing with the table, the annual net benefit figures for the three scenarios are shown in the **Results** tab dashboard. A breakdown/derivation of the respective figures is given in the BTA's **Cost-Benefit** tab.

*The empty-time charge would provide the City with an estimated \$80 million a year. (p. 17)*

This may be seen by comparing the values of **Results** tab Cell E16 (the "middle" row of the three entries under "Annual net revenue available to improve travel") between the BTA's Fix NYC, Komanoff Prediction scenario without and with the idle-time surcharge. The value without is \$1,480 million, and the value with is \$1,570 million. The difference, \$90 million, must be netted by \$10 million (the increase in congestion toll revenues between the two scenarios), since those revenues would go to the state, not the city. The result is the \$80 million figure in the text.

*As a modeling exercise, I calculated per-minute surcharge rates (applicable only to time in the FHV Congestion Surcharge Zone with a passenger) that would yield surcharge revenues equaling those from the lump-sum surcharges: these came to 20 cents a minute for trips in yellow cabs and 25 cents a minute for trips in ride-hail vehicles. (p. 17)*

These figures were derived through trial-and-error with the BTA spreadsheet, testing various values of hypothetical per-minute congestion surcharges that would yield the annual revenues now estimated to be generated by the state surcharges on yellow taxi and ride-hail vehicles fare trips that cross the FHV Congestion Surcharge Zone.

Those revenues, roughly \$200 million a year from yellow taxi trips and \$265 million from ride-hail vehicles, may be seen in the BTA's **Revenue** tab at Row 69.

Now zero out those revenues by zeroing out the surcharge figures of \$2.50 for yellow cabs (Cell H144 of the BTA's **Policy Levers** tab), \$2.75 for ride-hail vehicles (Cell H169) and \$0.75 for pooled trips in ride-hail vehicles (Cell H180). This should cause the revenue figures in Row 69 of the **Revenue** tab to read zero.

Continuing, input per-minute congestion surcharges of \$0.20 for yellow cabs and ride-hail vehicles (and 3/11 of that amount, or \$0.055, for pooled ride-hail vehicles), in **Policy Levers** cells H146, H171 and H182, respectively. Also enter the value 50% (replacing 100%) in cells H151, H152, H176 and H177, to discount off-peak surcharges by one-half. This yields annual projected revenues of \$196 million and \$264 million for yellow cabs and ride-hail vehicles, as shown in Row 69 of the **Revenue** tab.