Effective and Equitable Congestion Pricing: New York City and Beyond

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Abstract

In this paper, we argue that the New York City congestion pricing scheme that was launched on January 5, 2025 has a major shortcoming: it has a much more severe impact on the drivers of personal vehicles than on the passengers of taxis and ride-hailing vehicles or on the clients of delivery services. In addition to being inequitable, this shortcoming also makes the congestion pricing scheme relatively ineffective at solving the traffic congestion problem inside the Central Business District, due to the fact that the drivers of personal vehicles constitute a minority of traffic there. We provide empirical evidence from the launch of the current plan, and propose a simple modification to the scheme that addresses this shortcoming.

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1 Introduction

On January 5, 2025, the city of New York launched the first congestion pricing scheme in the United States. While this is an important initial step toward solving the notorious traffic congestion problem in the New York City, we argue that it has a major shortcoming: it has a much more severe impact on the drivers of personal vehicles than on the passengers of taxis and ride-hailing vehicles or on the clients of delivery services. In addition to being inequitable, this shortcoming also makes the congestion pricing scheme relatively ineffective at solving the traffic congestion problem inside the Central Business District, due to the fact that the drivers of personal vehicles constitute a minority of traffic there. We propose a simple modification to the scheme that addresses this shortcoming. To the extent that the congestion pricing plan implemented in New York City would serve as an example and a blueprint for future congestion pricing plans in other cities in the United States and the rest of the world, it is especially important to "get it right."

The core parts of New York's *current long-term plan* are as follows.[1] Cars entering the Central Business District (CBD, the part of Manhattan south of the 60th street) during peak hours (5am–9pm on weekdays and 9am–9pm on weekends) would be charged $15 for crossing into the congestion pricing zone, once per day. Larger vehicles (excluding transit or commuter services) would be charged $24–$36, depending on their sizes. Toll rates during overnight off-peak hours would be reduced by 75%. Passengers of taxis and app-based for-hire vehicles (FHVs) would be exempted from the $15 charge, and would instead pay an additional surcharge of $1.25 for taxis and $2.50 for FHVs, 24 hours a day, on any trip to, from, or within the CBD. As explained in the recommendation by the Traffic Mobility Review Board (2023), on which New York's congestion pricing plan was based, "The recommended tolls of $1.25 for yellow taxis, green cabs and black cars, and $2.50 for app-based FHVs, were determined by dividing the daily base auto toll rate ($15) by the average number of trips that taxis and FHVs make in the CBD today, which are 12 and 6, respectively" (p. 23).

As we argue in this paper, the key shortcoming of this plan is that as designed, it charges different types of travelers dramatically different amounts per "unit of congestion" that they generate. Commuters who drive into the CBD in the morning, work during the day, and drive home in the evening in effect pay $7.50 per trip ($15 daily fee spread over two trips). Taxi passengers pay only $1.25 per trip—one sixth of that amount—even if one ignores the fraction of the time that

[1] See `https://www.mta.info/document/138931` for a full schedule on how the tolls are set by different years, starting from the *launched plan* implemented on January 5, 2025. The long-term plan we describe is the one starting from 2031.

taxis create congestion when driving empty. An Amazon, FreshDirect, UPS, or FedEx delivery vehicle that might enter the CBD before 5am to avoid paying the full peak-hour toll would pay the off-peak rate of $6 (25% of the $24 regular rate for package delivery trucks) that would cover a full day of driving around CBD delivering packages, inducing vastly more congestion than one commuter or taxi trip.[2] And an Instacart delivery customer pays zero, despite the congestion that this delivery creates.

These dramatic differences between "per-unit-of-congestion" prices for different types of vehicles are undesirable for two reasons. First, they are patently inequitable. It is not clear why a nurse from Queens driving to work in Manhattan should pay six times as much as a business traveler taking a taxi there from La Guardia, or one or two orders of magnitude more than a customer having a truck drive to his or her house to have an Amazon package delivered. The basic economic logic of Pigouvian taxation says that these prices should be the same (at least if they cover similar distances over similarly congested areas in Manhattan), and while in principle there may be other reasons for price discrimination or redistribution based on various group characteristics (e.g., income levels), it is not at all clear that they would align directionally with the price differences above, and even with such considerations, the magnitudes of suitable "per-unit" price differences are unlikely to be so dramatic.

Second, and perhaps more critically, such a toll scheme is unlikely to be effective at solving the traffic congestion problem. The key observation behind this second claim is that the private vehicles that would be substantially affected by the scheme constitute only around one third of all vehicles traveling in the CBD. In Section 5, we provide direct empirical evidence on this observation. Besides our empirical evidence, Traffic Mobility Review Board (2023, p. 11) also reports that private autos and motorcycles are responsible for only 35% of traffic in the CBD, while taxis and FHVs are responsible for 52%, with the rest being split approximately equally among buses, trucks, and commercial vans. Similarly, a recent study conducted by the former Commissioner of NYC's Department of Transportation Lucius Riccio estimates that of the 2,000 vehicles recorded in randomly selected locations in Midtown New York City, only 32.7% were personal cars, while 50.5% were taxis and FHVs.[3] So even if the scheme is effective at reducing the number of private vehicles in Manhattan, it will barely affect the remaining two thirds of the traffic, and is thus unlikely to meaningfully relieve traffic congestion (in fact, with less congestion from pri-

[2] A typical delivery driver makes 100–200 stops per day (https://www.aboutamazon.com/news/transportation/photos-day-in-the-life-amazon-delivery-driver, https://www.businessinsider.com/im-a-ups-delivery-driver-what-my-job-is-like-2022-2, https://www.quora.com/How-many-stops-does-a-UPS-DHL-FedEx-delivery-truck-make-daily-in-NYC-With-how-many-packages-avg).

[3] https://www.gothamgazette.com/city/11828-congestion-pricing-for-hire-vehicles-midtown-traffic

vate vehicles, the number of miles driven by taxis, FHVs, and delivery vehicles may increase). This observation is consistent with the experience of London's congestion pricing scheme, which exempts taxis from the toll and charges FHVs only once per day, thus making a "per unit of congestion" toll for such vehicles minimal and ineffective.[4] Despite raising the daily fee on private vehicles from £5 at the scheme's introduction in 2003 to its current rate of £15, the city still suffers from heavy traffic congestion. E.g., a 2024 study by the navigation company TomTom has awarded London the dubious honor of being the most congested city in the world (out of 387 for which TomTom has collected traffic data).[5] Of course, it is possible that without London's congestion pricing scheme, traffic there would have been even worse, but it is nevertheless safe to say that the scheme has failed to solve London's traffic congestion woes.

So is there a solution? Textbook economic reasoning does offer a solution: Pigouvian taxation, going back to Pigou (1920). The regulator should simply charge each vehicle for the externality it imposes on others, and the problem is solved. However, a moment's reflection makes it clear that such a scheme, taken literally, is too complex and impractical. First, the externality varies by the specific location in the CBD, the specific time and day of the week, weather conditions, traffic conditions on the neighboring roads, traffic accidents and special events, vehicle size, and so on. This leads to a massive, highly multidimensional space of prices, which is both very hard to compute and hard to communicate to the drivers. Second, imposing such a pricing scheme would require tracking all cars in real time, which raises potential privacy issues and imposes additional technological implementation costs. While not insurmountable on its own, this issue adds to the political costs of congestion pricing that are already very substantial. Finally, such a scheme would directly violate the 2019 law passed by the New York State authorizing the congestion pricing program, which says, "no toll may be established and charged on passenger vehicles [...] more than once per day for purposes of entering the central business district."[6]

In this paper, we propose a congestion pricing scheme that is equitable (different vehicle types pay tolls commensurate with the externalities that they impose), practical (technologically, it is only a minor deviation from New York's current long-term congestion pricing plan, and it can be launched quickly), and consistent with the current New York state law. The scheme can be viewed as an approximation of the idealized Pigouvian pricing discussed in the previous paragraph, and is based on two observations. The first observation, which we have already mentioned, is that personal cars are responsible for only around a third of traffic in the CBD, while taxis, FHVs, delivery

[4] https://tfl.gov.uk/modes/driving/congestion-charge/discounts-and-exemptions

[5] https://www.tomtom.com/newsroom/explainers-and-insights/tomtom-traffic-index-2024-london-is-slowest/

[6] Traffic Mobility Act, 2019, https://www.nysenate.gov/legislation/laws/VAT/T8A44-C

trucks, and other commercial vehicles are responsible for the remaining two thirds. The second observation is that driving patterns are very different between typical personal and commercial vehicles. A typical commuter in a personal vehicle drives to the CBD in the morning, spends the day at his or her workplace, and then drives back home in the evening. Similarly, a typical evening or weekend visitor drives into the CBD, spends time there while the car is parked (and thus does not create any traffic congestion), and then drives back out of the CBD. So the amounts of congestion caused by different commuters are comparable. By contrast, different commercial vehicles have dramatically different driving patterns inside the CBD, with some circling throughout the CBD for much of the day (e.g., delivery vehicles) and others driving through it several times per day (e.g., Uber drivers) on trips of varying lengths.

These observations lead us to the following proposed congesting pricing scheme. For personal vehicles, the scheme is the same as the current long-term plan: such vehicles will pay a certain daily amount for entering the CBD (as discussed below, given the other modifications in the plan, this amount can be lower than in the current long-term plan while achieving similar revenue and traffic reduction goals). Given their relatively small share in the overall traffic volume and the relative similarity of their driving patterns, this is a reasonable approximation of the "idealized" Pigouvian taxation, and has the additional practical benefits of being very simple to communicate to the drivers, not requiring tracking the vehicles throughout the CBD, and not requiring changes to the current law. For commercial vehicles, however, the scheme is different. Given the dramatic differences in their driving patterns, the scheme charges these vehicles on a per-trip or per-mile basis, during peak times. In Section 3, we discuss specific calculations for the per-day tolls for personal vehicles and the per-trip or per-mile tolls for commercial vehicles, based on the principle that on average, the different types of vehicles should pay comparable amounts per unit of congestion that they create. Logistically, introducing per-trip or per-mile tolls is also much easier for commercial vehicles than for personal ones. FHVs and taxis already track trips and mileage on passenger trips, so no additional infrastructure is required. (We discuss the issue of "empty miles," when these vehicles travel without passengers, in Section 2.) For delivery vehicles (Amazon, FedEx, UPS, etc.), their movements are likewise tracked in real time by the companies (e.g., Amazon, FedEx, and UPS have customer apps that display real-time locations of their deliveries), and thus the information can be easily collected. The remainder of commercial vehicles constitute only a small fraction of the overall traffic, and can be required to either install a tracking device and pay per mile (possibly after some initial grace period, not necessarily immediately at the launch of the plan) or be folded under the "pay-per-day" case without substantially affecting the overall congestion levels.

The current long-term NYC congestion pricing scheme does impose fees on taxis and FHVs, but they are very different from the ones in the scheme that we propose. First, as already discussed above, they are much smaller in magnitude (roughly speaking, following the principle of "same congestion fee for the same amount of congestion created," an average taxi or FHV trip should pay a half of the daily fee paid by a commuter, i.e., \$7.50 per trip rather than \$1.25 or \$2.50, plus, as we discuss below, an additional increment due to the "empty miles" that taxis and FHVs drive; see Section 2 for detailed calculations). Second, unlike the current long-term proposal, ours would charge these congestion fees only during peak travel times (Section 3.1). There is no need to charge a congestion fee to a passenger taking an Uber from a bar at 1am. By contrast, the current long-term proposal would charge the same congestion fees to FHVs and taxis throughout the day.[7] Finally, as we argue in Section 3.2, per-mile rather than per-trip tolls on taxis and FHVs are better aligned with the negative externalities they create: a congestion fee for a short trip of a few blocks should be substantially lower than that for a long trip that crosses the entire CBD and thus creates a lot more congestion.

The last part of our proposal does not directly affect economic incentives "on the margin," but instead highlights the point that parts of the additional revenues generated from the modified (and generally higher) tolls on taxis/FHVs and delivery vehicles can be deployed to alleviate their impact on some of the key constituents affected by those changes, in a way that does not "undo" their incentives that help relieve congestion. One such key constituency are the owners of taxi medallions, whose values are likely to be negatively affected by the increased tolls. This reduction in medallion values is an important concern, and a commonly voiced suggestion to address it is to exempt taxis from the congestion fee or charge them a substantially reduced one. Of course, a major problem with such an exemption is that since taxis are a substantial part of traffic in the CBD, it would severely lower the effectiveness of the overall congestion scheme (in particular, the number of taxi trips in the CBD would not just remain the same, but would likely rise, as passengers would substitute in higher numbers from FHVs to taxis; see, e.g., Leccese (2024) for evidence of this effect after such an "asymmetric" exemption in Chicago). Our proposal is to instead compensate medallion holders in a lump-sum fashion (e.g., a fixed per-medallion payment per year for a certain number of years, or a reduction in various annual fees that taxi operators and medallion owners are required to make), with the amount commensurate with the estimated negative impact on the value of the medallion. This approach allows regulators to make medallion holders "whole" without negatively impacting the overall effectiveness of the congestion pricing scheme.

[7]Note that taxis and FHVs already pay certain per-trip congestion fees for trips south of the 96th street. Such fees may also be in principle replaced by a time-varying fee. Our current analysis focuses only on the modifications to the current long-term proposal, but would be straightforward to extend to the other congestion fees.

And to maintain the overall financial soundness of the congestion pricing plan, this compensation can be taken from just the overall congestion pricing fees collected from the taxi rides. We provide further details in Sections 2 and 3. Similarly, increased revenues generated from higher tolls on delivery vehicles can be deployed in a "lump-sum" fashion to expand programs like the NYC DOT's Off-Hour Deliveries Incentive Program pilot, which "provide[s] financial incentives for businesses to shift deliveries to off-peak hours" by "fund[ing] tools and strategies to make overnight deliveries feasible for businesses, [including] the installation of low-noise equipment for delivery vehicles (such as newer hand pallet trucks and backup alarms), building security retrofits to enable unattended deliveries, and safety equipment such as security cameras."[8]

In the last part of the paper, we discuss empirical evidence from before and after the initial launch of the NYC congestion pricing scheme on January 5, 2025. The *launched plan* is a scaled-down version of the long-term plan (with all fees reduced by 40% across the board: e.g., regular drivers are charged $9 instead of $15). However, because all tolls and fees for all types of vehicles are reduced by the same percentage, the relative magnitudes remain the same, and thus our argument is unaffected. We supplement early reports and publicly available data on speeds and travel times in and around the CBD with our own data on the composition of traffic by vehicle type, for two pairs of dates and two locations, both before and after the launch. Our vehicle classification data was hand-collected by workers whom we hired to video-record the traffic using their mobile phones. Of course, traffic may equilibrate further over time, and the initial observations are only indicative of the long-term effects. Nevertheless, the early reports and data strongly point toward several conclusions. First, decreases in travel times inside the CBD are much weaker and less consistent than those on bridges and tunnels leading into the CBD. Consistent with this finding, inside the CBD, regular cars constitute a much lower overall fraction of traffic than they do on bridges and tunnels (there is no contradiction: as discussed earlier, personal cars travel inside the CBD much less *per crossing into the CBD* than do other types of vehicles). Third, the introduction of congestion pricing on January 5 impacted regular cars more substantially than it did other types of vehicles. Of course, the last observation is not surprising given the calculations we make in the first part of the paper; nevertheless, the empirical observations are an important confirmation of our theoretical predictions. Overall, these observations are consistent with our argument that the congestion pricing plan is not only inequitable but is also likely to be relatively ineffective within the congestion pricing zone, even if it has substantial effects on bridges and tunnels.

[8] See `https://ohdnyc.com/` and `https://www.nyc.gov/html/dot/html/pr2024/reduce-truck-deliveries.shtml` for details.

The remainder of the paper is organized as follows. We begin with "basic" calculations in Section 2, considering the simplest changes to the current long-term plan: keeping the overall structure of the plan unchanged, but changing the specific amounts of the per-day fee for personal cars and the per-trip fees for taxis and FHVs. In Section 3, we discuss two additional changes: imposing congestion tolls on taxis and FHVs only during peak traffic times and replacing per-trip tolls with per-mile ones. In Section 4, we discuss the tolling of delivery vehicles. In Section 5, we discuss empirical evidence from the launch of the current congestion pricing scheme. Section 6 concludes.

2 Basic Calculations

We start out with the basic calculations to illustrate the effects of our alternative plan and compare them to those of the baseline current long-term plan. Our model in this section is deliberately streamlined, to make our calculations as transparent as possible. In particular, we focus on just two parts of traffic, personal vehicles and taxis/FHVs, leaving aside commercial vans and trucks of various sizes (incorporating those vehicles is discussed in Section 4). We also consider a "per-trip" toll on taxi and FHV riders in the alternative plan, to make the comparison between the current long-term plan and the alternative one as direct and transparent as possible.

2.1 Data

We get the current number of daily taxi and FHV trips from the NYC Taxi & Limousine Commission's Trip Record database.[9] On average, before the introduction of tolls, there were approximately 235 thousand daily FHV trips and 85 thousand taxi trips that start or end (or both) in the CBD.

We assume that FHVs and taxis are occupied 50% of the time. This assumption is based on the estimates from Cramer and Krueger (2016), who report utilization rates of taxi and Uber drivers between 48.3% and 51.2% in New York City.[10]

The number of personal cars is not readily available and needs to be estimated. In the first, pre-launch draft of the paper,[11] we estimated this number by starting with the New York Metropolitan Transportation Council's report (NYMTC, 2022, Tables 16 and 17), which reported the numbers

[9] `https://www.nyc.gov/site/tlc/about/tlc-trip-record-data.page`

[10] Buchholz (2021) estimates that taxis in New York City are vacant 47% of the time. Castillo (2023) reports that in Houston, Uber drivers are available to be matched 45.2% of the time, are on the way to pick up a rider 17% of the time, and are actually taking a rider to the destination 37.8% of the time.

[11] `https://web.stanford.edu/~ost/papers/nyc.pdf`

of vehicles (except buses) entering and exiting the CBD. Averaging the two numbers, we got 623 thousand vehicles entering/exiting the CBD per day. We then used a study by the NYC Department of Transportation, which reported that 56% of these vehicles were personal cars (NYCDOT, 2019, p. 16). Multiplying the two numbers, we got an estimate of approximately 350 thousand personal cars entering the CBD every day.

After the launch of congestion pricing on January 5, 2025, the MTA started reporting counts of vehicle entries into the CBD.[12] For the 63-day period between January 5 and March 8, the MTA reports 17,019,799 entries in the "Cars, Pickups and Vans" category (excluding taxis and FHVs), or approximately 270,156 cars per day. Using our elasticity calculations discussed below, this corresponds to 293,787 cars pre-launch. For our calculations below, we proceed with the approximation of 300,000 cars entering the CBD in the absence of congestion pricing.

Thus, in the calculations below, we assume that there are approximately 600 thousand personal car trips and $(235+85)\cdot 2 = 640$ thousand FHV and taxi trips (including empty ones) per day in the CBD. These numbers are broadly consistent with the estimates cited in the Introduction (from the Traffic Mobility Review Board (2023) who report that private autos and motorcycles are responsible for 35% of traffic in the CBD while taxis and FHVs are responsible for 52%, and from Riccio who estimates that 32.7% of traffic is due to private autos and 50.5% is due to FHVs), but do have a relatively higher share of personal car trips than in those estimates. The discrepancy may be due to data issues, or possibly due to different average lengths of trips between personal cars and FHVs/taxis. It may also be due to the fact that cars with the special FHV license plates provide delivery services (Instacart, Amazon Flex, Gopuff, some of the restaurant meal deliveries, and so on) in addition to carrying passengers, and while both types of trips appear in the Traffic Mobility Review Board (2023) and Riccio data, only passenger trips are recorded in the NYC Taxi & Limousine Commission's Trip Record database. To the extent that our input numbers possibly overestimate the relative amount of personal car travel and underestimate the relative amount of FHV/taxi travel, our estimates about the impacts of switching from the current long-term plan to the alternative ones that we discuss are conservative: If the true relative amounts of personal vs. FHV/taxi traffic in the CBD are closer to the 2:3 ratio, our conclusions become only stronger.

The next input in our calculations are the elasticities of demand for driving and hiring a taxi/FHV. For driving, Lehe and Devunuri (2022) report demand elasticities of -0.55, -0.67, and -0.53 from the introduction of cordon pricing in London, Stockholm, and Gothenburg, respectively. For FHVs and taxis, there are several recent studies estimating elasticities of demand.

[12] `https://catalog.data.gov/dataset/mta-congestion-relief-zone-vehicle-entries-beginning-2025`

Castillo (2023) reports the elasticity of -0.633 from running a pricing experiment at Uber in five Latin American cities. Goldszmidt et al. (2020) report the elasticity of -0.59 from running similar pricing experiments at Lyft in several cities in the United States. Cohen et al. (2016) use variation in prices in Uber's four largest U.S. markets and estimate the elasticity of demand to fall between -0.4 and -0.6. Almagro et al. (2024) use price variation due to a surcharge on ride-hailing trips in Chicago and obtain the elasticity estimate of -1.42. Buchholz (2021) estimates price elasticities of demand for taxis in New York City to range between -1.074 and -2.220 (Table 7). For the calculations in Sections 2.2 and 2.3, we use the same elasticity of -0.6 for both taxis/FHVs and personal driving. In Section 2.4, we explore a range of parameter values, and show that the key conclusions are robust to the specific choice of elasticity parameters.

2.2 Current Long-term Plan

We start out by calculating the estimates for the current long-term plan.

First, we discuss our calculations for personal cars. The nominal toll on these vehicles under the plan is $15 (starting in 2031), but due to various credits and reductions (e.g., discount for using a tolled bridge or tunnel; exemptions for some groups; lower toll during off-peak hours), the effective average toll will be lower. To estimate the effective toll, we use the recently reported crossings and revenue data from the first 27 days of the program (January 5–January 31). During this period, MTA reported the overall revenue of $48.66 million from the congestion pricing program, with 68% coming from passenger vehicles.[13] At the same time, there were 7,232,734 crossings of personal cars into the CBD. These numbers imply that per crossing, an average personal car driver paid an effective toll of $4.57—i.e., approximately 50% of the "nominal" toll, currently set at $9.00. We thus proceed with the assumption that the "effective" toll will be equal to half of the "nominal" toll.[14]

Another parameter we need for our calculations is the average base cost of driving into the city before the toll, which includes the costs of fuel, parking (which in Manhattan is substantial[15]), wear and tear of the car, and the existing tolls on some of the bridges and tunnels. We estimate this baseline number to be $30.

Assuming constant elasticity of demand, with the toll, we get the average predicted daily

[13] `https://www.mta.info/press-release/mta-releases-revenue-congestion-relief-zone-tolling-showing-program-line-projections`

[14] In the pre-launch version of this paper, we assumed that the ratio would be equal to two thirds.

[15] E.g., parking aggregator company SpotHero reports that the average parking rate for a Broadway show is $30 and the cost of a monthly parking spot is on average $19 per day (`https://spothero.com/artist/broadway`, `https://spothero.com/city/monthly/nyc-parking`).

number of personal vehicles equal to

$$300,000\left(\frac{30+7.5}{30}\right)^{-0.6}=262,407,$$

with the corresponding annual toll revenue from personal drivers equal to

$$262,407\times 365\times \$7.5=\$718,338,883$$

Next, there are 85,000 paid taxi trips per day that involve the CBD. The average price of a taxi trip is approximately \$25.[16] With the per-trip toll of \$1.25 and a similar calculation to the one above, we get the predicted post-toll daily number of taxi trips as

$$85,000\left(\frac{25+1.25}{25}\right)^{-0.6}=82,548,$$

with the corresponding annual toll revenue from taxi passengers equal to

$$82,548\times 365\times \$1.25=\$37,662,420.$$

Finally, there are 235,000 daily paid FHV trips that involve the CBD. The average price is \$40. With the per-trip toll of \$2.50, the predicted post-toll daily number of FHV trips is then

$$235,000\left(\frac{40+2.50}{40}\right)^{-0.6}=226,606,$$

with the corresponding annual toll revenue from FHV passengers equal to

$$226,606\times 365\times \$2.50=\$206,777,544.$$

2.3 Alternative Plans

As discussed in the Introduction, the current long-term plan disproportionately affects personal cars relative to the passengers of taxis and FHVs. The calculation in Section 2.2 makes this asymmetry clear: despite making fewer trips, the drivers of personal cars would pay \$718 million in tolls per year, while the passengers of taxis and FHVs would only pay a third of that, \$244 million. The reduction in traffic is also disproportionate: the number of personal car commutes

[16] Based on the NYC Taxi & Limousine Commission's Trip Record Data for 2024.

would drop by 13% (38 thousand round trips per day), while the number of taxi and FHV trips would drop by only 3% (11 thousand paid trips). So how can the plan be made more equitable? As we discussed in the Introduction, our proposal for modifying the toll structure on taxis and FHVs involves three changes: the higher absolute level, the time-varying structure (high during peak times, zero during off-peak times), and the per-mile rather than per-trip computation of the fee. In this section, we focus just on the first of these three changes, for simplicity, transparency, and immediate comparability with the current long-term plan. We discuss the other two changes in Section 3.

What should the toll on taxis and FHVs be to have a comparable payment "per unit of congestion generated" to that of personal cars? Note that $15 cordon fee pays for two trips: one trip to CBD in the morning, and one trip from CBD in the evening. So the per-trip fee is $7.50. However, to be comparable on the "per unit of congestion" basis, the fee on taxis and FHVs needs to be higher than that, because in addition to the trips for which they are paid (and on which the congestion fee is imposed), taxis and FHVs also drive a fraction of the time empty—and that needs to be taken into account. Using the estimate of "empty miles" of 0.50 that we reported Section 2.1 (i.e., a typical taxi in the CBD is empty 50% of the time), to be commensurate with the personal car cordon fee, the per-paid-trip congestion fee on taxis and FHV should also be equal to $\frac{\$7.50}{.5} = \$15$. We call this congestion pricing scheme "Plan 1."

With this toll level, the predicted daily number of taxi trips drops to

$$85,000 \left(\frac{25+15}{25} \right)^{-0.6} = 64,113,$$

while the corresponding annual toll revenue from taxi passengers increases to

$$64,113 \times 365 \times \$15 = \$351,019,352,$$

i.e., an almost tenfold increase relative to the current long-term plan! The number of FHV trips drops to

$$235,000 \left(\frac{40+15}{40} \right)^{-0.6} = 194,127,$$

while the corresponding annual toll revenue from FHV passengers increases to

$$194,127 \times 365 \times \$15 = \$1,062,846,060,$$

i.e., a more than fivefold increase relative to the current long-term plan.

With the per-trip toll of $15, both the overall toll revenue and the overall trip reduction for taxis and FHVs are commensurate with those of personal cars: both types of vehicles pay comparable tolls "per unit of congestion." However, this is only part of the story. The second observation is that, unsurprisingly, the overall toll revenue grows dramatically, by more than $1 billion per year. This means that if the tolls on taxis and FHVs are set at the level commensurate with that of personal cars, the latter *can be substantially reduced* while the overall congestion pricing plan's revenue goals will continue to be met.[17] Our second alternative plan (which we call "Plan 2") illustrates this possibility.

Consider setting both the cordon toll for personal cars and the per-trip toll on taxis and FHVs at $9 (instead of $15 – a 40% reduction). In other words, given the current congestion pricing toll rates in place 2025, consider leaving the tolls on personal cars unchanged and instead just raising the rates on taxis and FHVs to the $9 per-trip level (vs. the currently planned $1.25 and $2.50 levels). Repeating the above calculations with this lower toll level,[18] we get

Number of personal cars	$300,000 \left(\frac{30+4.5}{30}\right)^{-0.6}$	=	275,869,
Revenue from personal cars	$275,869 \times 365 \times \$4.50$	=	\$453,114,467,
Number of taxi trips	$85,000 \left(\frac{25+9}{25}\right)^{-0.6}$	=	70,680,
Revenue from taxi passengers	$70,680 \times 365 \times \$9$	=	\$232,183,287,
Number of FHV trips	$235,000 \left(\frac{40+9}{40}\right)^{-0.6}$	=	208,059,
Revenue from FHV trips	$208,059 \times 365 \times \$9$	=	\$683,473,346.

Compared to the current long-term plan, Plan 2 reduces the overall number of trips by a substantially higher amount (35% higher); charges a lot less to the commuters ($9 vs. $15); and raises substantially higher toll revenue ($1.369 billion vs. $963 million per year). This increase in revenue makes it possible to meet the same congestion pricing revenue goals as what the current long-term plan would have achieved, *and* in addition to compensate the owners of taxicab medallions for the reduction in their value due to the introduction of congestion pricing (with 13,500 medallions, the extra revenue would be sufficient to compensate each one up to $\frac{\$1.369B-\$0.963B}{13500} \approx \$30,000$ per year, which would be much higher than the total current annualized value of a medallion, let alone the reduction in its value from the introduction of tolls). The regulators could also lower

[17] The plan's revenue goals are mandated by law; see §1704-A of the New York State Senate's Traffic Mobility Act, `https://www.nysenate.gov/legislation/laws/VAT/1704-A`.

[18] As in Section 2.2, we assume that due to various exemptions and discounts, the effective average toll on personal cars is one half of the nominal one, i.e., $4.50.

registration and other annual fees for taxicab drivers. Of course, it is important to make sure that these would be fixed-type fees that would not affect the taxi drivers' marginal incentives to drive in the CBD during congested times. There would also be sufficient extra revenue to increase the funding to such programs as the NYC DOT's Off-Hour Deliveries Incentive Program discussed in the Introduction, whose budget is currently only $6 million.[19]

2.4 Robustness to Elasticity Assumptions

In this section, we explore the robustness of the above calculations to alternative assumptions on the values of demand elasticities. Specifically, we consider three alternative specifications: uniformly less elastic demand ($\nu_p = -0.3$, $\nu_t = -0.3$, where ν_p denotes the elasticity of demand from personal car drivers and ν_t denotes the elasticity of demand from taxi and FHV passengers), uniformly more elastic demand ($\nu_p = -1.2$ and $\nu_t = -1.2$), and less elastic demand from personal car drivers and more elastic demand from taxi and FHV passengers ($\nu_p = -0.3$ and $\nu_t = -1.2$).

Table 1 summarizes the results for Plan 2 ($9 toll applied to both personal cars and taxi/FHV trips) for the baseline specification above with $\nu_p = -0.6$ and $\nu_t = -0.6$, along with the three alternative specifications of elasticity parameters. Note that the row "Total number of trips" adds up the number of personal cars, the number of paid taxi trips, and the number of paid FHV trips, and then multiplies the sum by 2, to account for the fact that each personal car takes two trips per day and for the empty trips by taxis and FHVs. The last two rows of the table show the differences in the total numbers of trips and the total revenues under Plan 2 vs. the current long-term plan.

Our main conclusions are robust across these alternative assumptions on elasticities of demand: the alternative toll plan that charges taxis and FHVs equitably in comparison to personal cars is both more effective in reducing traffic and generates higher toll revenue than the current long-term plan, despite charging a much lower cordon crossing fee of $9 instead of $15.

3 Time- and Distance-Based Tolls on Taxis and FHVs

Plans 1 and 2 discussed in Section 2 are most directly comparable to the current long-term plan, changing only the levels of various tolls, but not their structure.

However, there are additional improvements and modifications that we can make.

First, as does the current long-term plan, Plans 1 and 2 charge the congestion pricing fee to taxis and FHVs 24 hours per day. When the level of those fees is low, like in the current long-

[19] `https://www.nyc.gov/html/dot/html/pr2024/reduce-truck-deliveries.shtml`

Table 1: Alternative Elasticity Specifications

	(-0.6, -0.6)	(-0.3, -0.3)	(-1.2, -1.2)	(-0.3, -1.2)
Number of personal cars	276	288	254	288
Revenue from personal cars	$453	$473	$417	$473
Number of paid taxi trips	71	78	59	59
Revenue from taxi trips	$232	$255	$193	$193
Number of paid FHV trips	208	221	184	184
Revenue from FHV trips	$683	$726	$605	$605
Total number of trips	1,109	1,173	993	1,061
Total revenue	$1,369	$1,454	$1,215	$1,271
Δ trips vs. current long-term plan	-34	-18	-63	-97
Δ revenue vs. current long-term plan	$406	$437	$351	$267

Note: Numbers of cars and trips are in thousands. Revenues are in millions.

term plan, this does not introduce a big distortion during off-peak hours. However, once the fees are set at the level of $9 or $15, the distortion (relative to the ideal Pigouvian taxes, which are close to zero when there is no congestion) becomes substantial. Moreover, it violates the "similar payment for similar amount of congestion" principle when compared with personal car drivers, who pay 75% less when they drive into the CBD during off-peak hours. Thus, one improvement to Plans 1 and 2 is to only charge the tolls on taxis and FHVs during peak hours.

Second, there are existing *New York State*-imposed congestion surcharges on taxis and FHVs that were introduced in 2019: $2.75 on FHVs and $2.50 on taxicabs, for all trips south of the 96th street in Manhattan.[20] This implies two changes that we need to make to our calculations. First, the additional tolls that we need impose on taxis and FHVs are $6.50 and $6.25 per trip, respectively (to bring the total to $9, the level commensurate with the toll on personal vehicles). Second, when performing our revenue calculations, we need to take into account the fact that the reduction in peak-our taxi and FHV trips induced by the new tolls will lead to a reduction in revenues from the existing tolls.

Finally, when the level of fees is low, they do not introduce a big distortion to demand for short vs. long trips. However, once the level of fees becomes substantial, the relative effects become very different. A $15 surcharge on a short trip that would otherwise by itself cost $15 has a very different effect vs. the same surcharge applied to a, say, $70 trip from the JFK airport to Manhattan. So this pricing structure not only violates the "similar payment for similar amount of congestion" principle, but also skews the overall passenger trip composition toward those who take long trips—and create more congestion. So another improvement to the plans is to replace

[20] `https://www.nyc.gov/site/tlc/about/congestion-surcharge.page`

the per-trip fee on taxis and FHVs with the commensurate (on average) per-mile fee, that more accurately reflects the amount of congestion caused by such trips.

In this section, we present calculations showing the effects of these changes. In Section 3.1, we keep the per-trip fee structure, but eliminate the toll on FHVs and taxis during off-peak hours. In Section 3.2, we further replace the per-trip fee structure with the per-distance one. In both sections, we focus on Plan 2 with the $9 toll.

3.1 Removing Taxi and FHV Tolls during Off-Peak Hours

In the NYC TLC Trip Record Data, approximately 20% of taxi trips and 25% of FHV trips take place during off-peak hours. Under Plan 3, we set the toll for those trips to zero, while keeping the rest the same as in Plan 2. Adjusting the calculations from Section 2.3,[21] and adjusting for the existing tolls already in place, we get

Number of taxi trips	$0.8 \cdot 85,000 \left(\frac{25+6.50}{25}\right)^{-0.6} + 0.2 \cdot 85,000$	=	76,195,
Number of peak-hour taxi trips	$0.8 \cdot 85,000 \left(\frac{25+6.50}{25}\right)^{-0.6}$	=	56,195,
Revenue from taxi passengers	$56,195 \times 365 \times \$6.50$	=	\$140,440,642,
Reduction in state tolls	$(76,195 - 85,000) \times 365 \times \$2.50$	=	−\$8,034,368,
Number of FHV trips	$0.75 \cdot 235,000 \left(\frac{40+6.25}{40}\right)^{-0.6} + 0.25 \cdot 235,000$	=	220,297,
Number of peak-hour FHV trips	$0.75 \cdot 235,000 \left(\frac{40+6.25}{40}\right)^{-0.6}$	=	161,547,
Revenue from FHV trips	$161,547 \times 365 \times \$6.25$	=	\$368,528,399,
Reduction in state tolls	$(220,297 - 235,000) \times 365 \times \$2.75$	=	−\$14,758,442.

Adding the $453 million revenue from personal car tolls, the total annual revenue from this modified program is $939 million. This is lower than the $962 million number, by $23 million. However, so far we have only considered tolls on personal cars, taxis, and FHVs. As we discuss in Section 4, adjusting the tolls for delivery vehicles results in a much higher additional surplus than $23 million.

[21] With time-varying tolls, these calculations implicitly assume away time substitution by FHV and taxi passengers. The magnitude of this effect is unlikely to meaningfully affect our conclusions, so we do not take it into account in our calculations.

3.2 Distance-Based Tolls

The final dimension that we consider is distance-based tolling of taxis and FHVs. Setting the toll at the per-trip level disproportionately affects short-distance passengers, much more so than those who travel over a long distance, thus distorting the incentives and shifting the outcome away from the socially optimal one. In this section, we evaluate the viability of replacing the per-trip toll with a per-distance one. Specifically, in our Plan 3, the toll on taxis and FHVs was set at the \$6.50 and \$6.25 level during peak hours (and zero during off-peak hours), in addition to the pre-existing \$2.50 and \$2.75 tolls that we do not change (because they fall under a different program and are governed by a different set of laws). With the average within-CBD taxi and FHV trip distance of approximately 2 miles, the corresponding distance-based tolls are \$3.25 and \$3.13 per mile (still only during peak hours). To evaluate the effect of this shift on the outcomes, we proceed as follows (Plan 4), using the NYC TLC Trip Record Data, which contains such details as the length of the trip and the fare paid.

Separately for taxis and for FHVs, we break all trips into 21 buckets of trip lengths: 0–0.5 miles, 0.5–1 mile, ..., 9.5–10 miles, and more than 10 miles.[22] For each bucket, we compute the average toll and the average trip length (and thus the corresponding distance-based toll), and perform the computations similar to those above. We then aggregate the results across all buckets.

For example, there were 9,495 within-CBD taxi trips in the (0.5–1] miles bucket. The average length of such trips was 0.79 miles, and the average total fare was \$15.03. With the fixed \$6.50 toll, the number of such trips would drop to 7,653—a 19% reduction. By contrast, with the distance-based toll of 0.79·\$3.25=\$2.57, the number of such trips drops much less, to 8,637—only a 9% reduction.

Conversely, there were 2,429 within-CBD taxi trips in the (2.5–3] miles bucket. The average length of such trips was 2.74 miles, and the average total fare was \$25.88. With the fixed \$6.50 toll, the number of such trips would drop to 2,123. With the distance-based toll of 2.74·\$3.25=\$8.9, the number drops more, to 2,034.[23]

[22] Perhaps surprisingly, there is a positive, though small, number of trips fully within the CBD that are more than 10 miles long. Less surprisingly, there are many long trips that either start or end in the CBD, but not both.

[23] One additional detail is that each bucket contains two types of trips: within-CBD trips, for which both the origin and the destination are within the CBD, and the remaining ones, for which either the origin or the destination, but not both, are within the CBD. For the former, we simply assume that the entire length of the trip is within the CBD and would be tolled at the \$4.50 per mile rate. For the latter, for trips longer than 5 miles, we assume that 2.5 miles of the trip was within the CBD (and thus would be tolled at that rate), and for trips shorter than 5 miles, we assume that half of the length of the trip was within the CBD and would be tolled. To get the cutoff value of 5 miles (or equivalently the cap of 2.5 miles in the CBD for trips with exactly one end in the CBD), we perform the following calculations. We know from the data that for a taxi or FHV trip fully within the CBD, the average distance is 2 miles. Intuitively, this should mean that for an average trip with exactly one end within the CBD, the distance that trip

Aggregating across all the buckets and both taxis and FHVs, we find that the overall toll revenue from taxi and FHV passengers would remain virtually unchanged if we switched from the fixed-toll Plan 3 to the distance-based Plan 4. The total number of paid daily trips would increase relative to the fixed per-trip toll. By contrast, the total number of *miles* on such trips would *decreases*, because of the composition effect (more shorter trips, fewer longer trips). Thus, switching from the fixed to the distance-based toll plan dampens the reduction in the number of FHV and taxi trips while simultaneously boosting the reduction in the total distance of such trips, further easing the overall traffic congestion while continuing to meet the program's revenue goals.

4 Delivery Vehicles

Aside from personal vehicles and taxis/FHVs, another substantial source of traffic in Manhattan are commercial trucks, vans, and other vehicles, in particular those performing delivery services. The reason for singling out delivery services (over other commercial vehicles—e.g., a plumber traveling to a job site) is that by the nature of its service, a delivery vehicle generates a disproportionate amount of traffic congestion per day (while, to continue with the example, the plumber only uses the vehicle to get to the job site, and then spends a considerable amount of time actually performing the plumbing service while the vehicle is parked and is not creating any congestion).

For delivery trucks, the current long-term plan will charge a $24 or $36 daily toll (depending on their size), with a 75% discount if they enter the CBD before the beginning of peak tolling period (5am on the weekdays and 9am on the weekends). As discussed in the Introduction, the problem with this approach is that with the fee being split across many deliveries, it is inequitable (compared to the per-unit-of-congestion toll paid by personal car drivers) and is unlikely to be effective. Moreover, to the extent that it tries to give incentives to the delivery vehicles to shift deliveries to off-peak hours, it would only succeed in shifting the *initial* deliveries of a given truck to the pre-peak hours: a truck that enters the CBD at 4:50am on a weekday and performs the

should cover within the CBD should be higher than 2 miles (because the distance between two randomly chosen points within the CBD is shorter than between a randomly chosen point within the CBD and a randomly chosen point on its boundary, where the trip enters or exists the CBD). To estimate the exact adjustment factor, we perform the following calculations. Take a disc or a square. For the distance, consider either the Euclidean distance or, quite fittingly, the Manhattan distance (`https://en.wikipedia.org/wiki/Taxicab_geometry`). For each of the four cases, suppose the size of the underlying geometric object is such that the distance between two randomly chosen points within it is 2 miles. What is then the distance between a randomly chosen point within the object and a randomly chosen point on its boundary? In all four cases, the answer is in the 2.47–2.5 miles range, so we use 2.5 miles in our estimates.

deliveries (and thus creates congestion) during much of the peak 5:00am–9:00pm time window would still pay the dramatically reduced toll.

Before providing estimates of how much a per-mile toll on delivery vehicles would raise, and how that would compare with the expected revenue from the current long-term plan, we briefly discuss two additional important points.

First, there is the issue of double- (and on occasion, triple-[24]) parking, which is of course hugely detrimental to the effective flow of traffic. While already prohibited, double-parking by delivery vehicles in New York City continues to be prevalent, with companies viewing the fines as a "cost of doing business."[25] So unlike most other vehicles, delivery trucks often create traffic congestion even when they are not actively moving, and per-mile (or per-trip, or per-day) tolls cannot address this issue. A logical way to address it is through increased levels and enforcement of parking fines. Note that the level (and the level of enforcement) of these fines may in principle vary by time and location to focus on the most congested areas during peak times: a delivery truck double-parked on a wide avenue between the hours of 2am and 3am does not create much if any traffic congestion, while the same truck double-parked on a narrow street between the hours of 6pm and 7pm is likely to create large negative externalities.

Second, unlike most other types of traffic, delivery vehicles can be much more flexible in terms of *when* deliveries happen: e.g., it is much easier for Amazon to ship packages between the hours of 9pm and 5am than it is for a typical office worker to shift his or her work hours to the 9pm–5am time window. This observation makes it easier and less disruptive to the lives of New Yorkers to impose high per-mile tolls and high and actively enforced parking fines on delivery vehicles during peak hours, while at the same time not imposing any congestion fees on deliveries that take place during off-peak periods. And as discussed in the Introduction, parts of the revenue from these tolls and fines can be used to help delivery drivers, fleet owners, and recipients of those deliveries to implement technologies that make these overnight deliveries more convenient and safe and less costly.

We now provide some basic estimates of additional revenues that could be raised by charging trucks and delivery vehicles on a per-mile basis, beyond the current long-term plan. Our proposal would also lead to fewer miles traveled in the CBD by these vehicles during peak hours, although we do not provide quantitative estimates of the degree of this reduction.

[24] https://www.uppereastsite.com/fresh-direct-takes-over-upper-east-side-nyc-block-with-triple-parked-trucks-barrier-cones/

[25] https://www.freightwaves.com/news/todayspickup/ups-fedex-parking-fines, https://nyc.streetsblog.org/2019/05/02/the-dot-quandary-double-parking-isnt-illegal-except-when-it-actually-is.

Following the "same toll amount per unit of induced congestion" principle, our plan would set the fee at $2.25 per mile, adjusted for vehicle size. The $2.25 per mile number comes from an estimate that a typical paid trip on a taxi or FHV within the CBD is two miles long, and involves the same number of "empty miles." Thus, the $9 toll on personal vehicle cordon crossing and taxi/FHV trip translates into the $9/4 = $2.25 per mile amount. To adjust for vehicle size, we impose the same multiplicative factors as the current long-term plan, which charges the $24 entry fee to single-unit trucks and the $36 entry fee to multi-unit trucks (vs. $15 to personal cars).

Under the reduced-rate plan launched on January 5, the MTA generated $48.66 million in revenue for the January 5–January 31 time period. Of that amount, 9% was from trucks.[26] These numbers correspond to $\frac{365}{27} \times 0.09 \times \$48.66 = \$59.2$ million per year. Given that the current reduced rates are 60% of the long-term planned rates, this amount corresponds to approximately $\frac{\$59.2}{0.6} = \$98.7$ million per year from trucks. (This calculation ignores the fact that with higher tolls, the number of trucks may go down, but for realistic values of elasticity parameters, the number remains in the same ballpark.)

Consider now the per-mile plan, with the toll charged only during peak hours. In the MTA CBD entries data for 2025,[27] for the first nine weeks of the congestion pricing program (January 5–March 8), there were 7,972,797 CBD entries by taxis and FHVs, 1,003,904 entries by single-unit trucks, and 83,718 entries by multi-unit trucks. Assuming that per entry, on average, trucks drive the same amount within the CBD as do taxis and FHVs, and using the estimated numbers of peak-time taxi and FHV trips from Section 3.1 (59,195 taxi trips and 161,547 FHV trips), we get the estimated annual revenue from trucks:

$$(59,195 + 161,547) \times 365 \times \$9 \times \left(\frac{1,003,904}{7,972,797} \times \frac{24}{15} + \frac{83,718}{7,972,797} \times \frac{36}{15} \right) = \$164,364,701.$$

Thus, the per-mile plan would generate more than $60 million per year more from trucks than would the current long-term plan—and would also give them stronger incentives to shift deliveries to off-peak hours.

In addition to trucks, many deliveries take place using personal cars via freelance delivery services like Instacart, Amazon Flex, and Gopuff, as well as restaurant delivery services like DoorDash, Uber Eats, and Grubhub (as we discuss below, while many restaurant deliveries are done on e-bikes, scooters, and mopeds, a non-negligible fraction involves cars). Under the current

[26] https://www.mta.info/press-release/mta-releases-revenue-congestion-relief-zone-tolling-showing-program-line-projections

[27] https://catalog.data.gov/dataset/mta-congestion-relief-zone-vehicle-entries-beginning-2025

long-term plan, such deliveries would not be subject to congestion tolls in any way, despite creating meaningful congestion. Under our proposed plan, as discussed above, they would pay $2.25 per mile.

Like some of the other variables that we discuss above, data on the number of freelance deliveries in the CBD are not readily available, but we can obtain ballpark estimates using related publicly available datasets. The New York City Department of Consumer and Worker Protection (DCWP) collects and reports data on the aggregate numbers of restaurant deliveries in the city.[28] In 2024, there were on average 2,514,838 restaurant delivery trips per week in the city, i.e., 130,771,576 for the year. Of these deliveries, 22.4% (29,292,833 trips) are done by car, with the average length of a car trip being 3.1 miles, including both pickup and delivery.[29] This number of trips covers the entire New York City. The population of the CBD is 622,495,[30] which is 7.5% of the 8.258 million residents of New York City (all numbers are as of 2023). Conservatively (since in addition to its residents, the CBD is the hub of commerce and tourism in New York), this translates into $29,292,833 \times 0.075 \times 3.1 = 6,810,584$ miles for freelance delivery services, which, at $2.25 per mile, translates into an additional $15.3 million per year.

To get a ballpark estimate of the number of non-restaurant deliveries, we use the overall annual order numbers of the two leading non-restaurant and restaurant platforms, Instacart and DoorDash. The former had 290M orders in 2024, while the latter had 2.5B.[31] Extrapolating this ratio to all delivery apps, and to the CBD, we get $130,771,576 \times .075 \times \frac{290}{2500} = 1,137,713$ non-restaurant deliveries, corresponding to 3.5M miles (assuming the same 3.1 miles per delivery) and an additional $7.9 million per year in toll revenue.

Taken together, our numbers suggest that switching to per-mile tolling for trucks and delivery vehicles would generate almost $90 million more than the current long-term plan—and as discussed above, this estimate is likely to be conservative.

[28] See https://www.nyc.gov/site/dca/workers/Delivery-Worker-Public-Hearing-Minimum-Pay-Rate.page and https://www.nyc.gov/assets/dca/downloads/xlsx/Restaurant-Delivery-App-Data-Quarterly.xlsx.

[29] See Tables 3 and 4 in https://www.nyc.gov/assets/dca/downloads/pdf/workers/Delivery-Worker-Study-November-2022.pdf.

[30] The CBD encompasses ZIP codes 10001–10020, 10022, 10036, 10038, and 10280.

[31] See https://www.businessofapps.com/data/instacart-statistics/ and https://www.businessofapps.com/data/doordash-statistics/.

5 Evidence from the Launch of the Current Plan

As mentioned in the Introduction, the scaled down plan was launched on January 5, 2025. While of course it will take a while for the overall system to fully equilibrate, the initial results are already quite striking, and consistent with our arguments above.

The first piece of evidence comes from the Congestion Pricing Tracker created by Joshua Moshes and Benjamin Moshes, and publicly available at `https://www.congestion-pricing-tracker.com/`. By requesting estimated travel times using Google Maps API, every 15 minutes, both before and after the launch of congestion pricing, the tool makes it possible to obtain suggestive evidence of the impact of congestion pricing on travel times on a variety of routes. Routes 1–5 in the tool are fully within the congestion pricing zone (and thus contain a relatively higher fraction of taxis and FHVs relative to personal cars). By contrast, routes 6, 7, 9, 10, 11, 12, and 13 begin outside the congestion zone and then enter it over bridges and tunnels, thus having a relatively lower fraction of taxis and FHVs and a relatively higher fraction of personal cars. These relative magnitudes are due to the fact that taxis and FHVs typically make many more trips within the congestion zone "per crossing the cordon" than do personal cars. Below we also present direct evidence on these claims about relative numbers of different types of vehicles at various points in Manhattan.

The results from the Congestion Pricing Tracker are striking. The tracker's maintainers wrote on the site on January 31, 2025:

> Looking back at the past four weeks, one surprise for us has been how much our takeaways on the program have not changed since the first day. Throughout the month, we have continued to see dramatic decreases in traffic on bridge and tunnels, smaller increases in traffic on some spillover routes, and marginal decreases or no change on within-congestion zone routes.

A month later, on March 3, they provided an update:

> We are seeing a decrease in traffic within the congestion zone a little more definitively, particularly along Routes 1–3 (our north–south route through the entire congestion zone, and two east–west routes through midtown). Traffic on Route 1 is down from an average of 50 minutes pre-congestion pricing at 5pm on Mondays to about 37 minutes after the program began. This effect is certainly milder than the one we have seen on bridges and tunnels into the congestion zone, and is not omnipresent. Route 4–5 (our east–west routes in lower Manhattan) have still seen traffic at identical levels

compared to pre-congestion pricing, and even for Routes 1–3 the effects are not as pronounced on Tuesdays and Wednesdays.

Figures 1 and 2 below, taken from the Tracker, illustrate these points for two representative routes. Figure 1 shows the daily pattern of commute times on Thursdays on Route 11, Williamsburg Bridge (one of the entry points to the congestion pricing zone). The overall reduction in traffic on the bridge is clear and unambiguous, with travel times during the middle of the day dropping in half. Figure 2 shows the daily pattern of commute times on Thursdays on Route 3, from Chelsea to Kips Bay—fully within the congestion pricing zone. The reduction in travel times is much smaller and less clear.

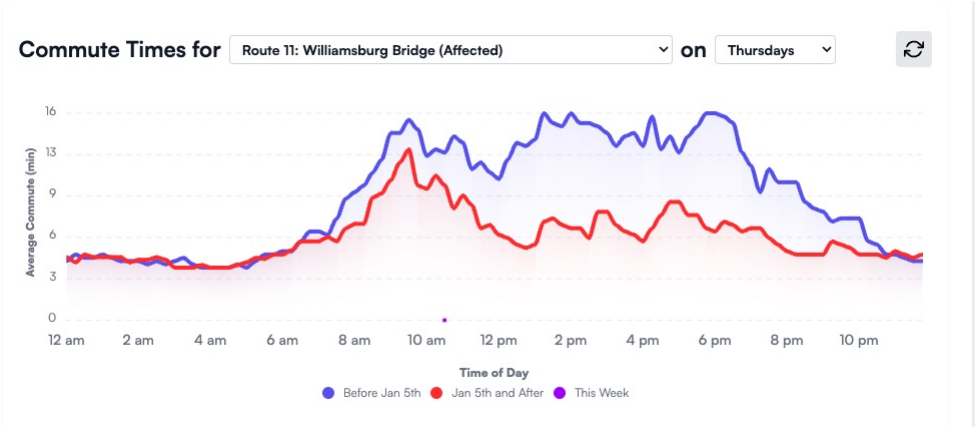


Figure 1: Travel times on Williamsburg Bridge (entering Manhattan)

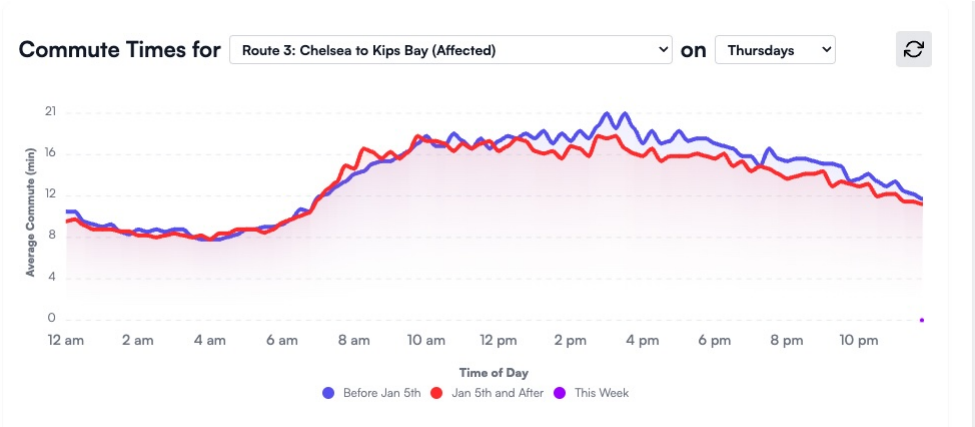


Figure 2: Travel times from Chelsea to Kips Bay

These observations from congestion-pricing-tracker.com are consistent with the recent study by Cook et al. (2025), who find that travel times for trips within the CBD decreased by approximately 8% after the introduction of congestion pricing, while the effects on bridges and tunnels were much more dramatic (e.g., speeds doubled in the Lincoln Tunnel and increased by more than 50% on the Williamsburg Bridge and the Queensboro Bridge). They are also consistent with the initial analysis reported by the MTA (`https://www.mta.info/document/163411`), which finds large and unambiguous improvements in travel times at entry points ("Trip times across river crossings into the CBD continue to be much faster than last January") and positive but much less uniform improvements within the CBD ("Travel times on streets in the CBD are by and large better than last January" and "Mixed, but still positive, improvements on the avenues and excluded roadways").

Our last piece of evidence comes from our own data collection efforts. After the congestion pricing plan was announced in the middle of November 2024 (after being "indefinitely paused" in June), we hired workers on the GigSmart platform to record videos of traffic inside the congestion pricing zone (at the intersection of 5th Avenue and 44th Street) and at an entry point (Williamsburg Bridge), and also asked them to read out loud the types of vehicles that they are recording (regular cars, FHVs, taxis, and so on). A special feature of vehicle licensing in New York is that all for-hire vehicles are required to obtain special license plates that start with a "T", end with a "C", and have the description "T&LC" written at the bottom of the license plate (other than these features, these plates look identical to the regular license plates). Figure 3 shows an example of a T&LC license plate. Thus, one can immediately recognize for-hire vehicles by looking at their license plates. In the Appendix, we include sample instructions we gave to the workers on how to record the videos and classify the vehicles.



Figure 3: Taxi and Limousine Commission license plate

Our first batch of videos comes from Tuesday, December 10, and Tuesday, December 17, both before the holidays and before congestion pricing went into effect. Our second batch of videos comes from the Tuesday, January 28 and Tuesday, February 4 (likewise away from the holidays, sufficiently far away from the MLK and Presidents' Day weekends to ensure regular traffic patterns). On all of these days, there was no precipitation and the temperatures were comparable.

Table 2: Frequencies of different vehicle types

Location	% Personal	% Uber/Lyft	% Taxi	% Commercial
Williamsburg Bridge				
Tue, Dec 10 (6am – 7am)	63.8%	13.2%	2.7%	20.3%
Tue, Jan 28 (6am – 7am)	56.1%	18.7%	3.4%	21.9%
Fifth Ave. (at 44th St.)				
Tue, Dec 17 (8am – 9am)	26.6%	35.6%	13.2%	24.6%
Tue, Feb 4 (8am – 9am)	19.0%	40.0%	15.1%	25.9%
Lexington Ave. (at 59th St.)				
Dec 10–20 (8am – 4pm)	40%	24%	16%	20%
Jan 6–10 (8am – 4pm)	34%	22%	23%	20%

We transcribed the videos using the MacWhisper application and the Large v3 Turbo model by OpenAI. We then counted the frequencies of relevant words in the transcripts.[32]

Table 2 shows the data from our videos for these locations, for the same time intervals. We also include in the table data from a similar exercise performed by Bloomberg[33] at a CBD entry point inside Manhattan (Lexington Avenue at 59th Street, the company's headquarters) on workdays during mid-December and early January.

We make two observations from these data. First, personal vehicles constitute a minority of traffic within the CBD, both before the introduction of congestion pricing and after. Second, in all three pairs of data sets, the share of personal vehicles decreased substantially after the introduction of congestion pricing on January 5. This is in line with our calculations that show that the relative price impact of the congestion pricing scheme is much higher on the drivers of personal cars vs. the passengers of taxis, for-hire services, and commercial vehicles, violating the Pigouvian intuition of "similar payment for similar amount of externalities."

6 Conclusion

Congestion pricing has the potential to improve traffic and generate revenue in New York City and many other congested cities worldwide. However, to be equitable and effective, it needs to follow the "similar tolls for similar amounts of congestion" principle. We provide empirical evidence from the launch of the NYC congestion pricing scheme on January 5, 2025 to support our argument. We discuss how to modify New York's current long-term congestion pricing plan to closer follow this principle, and show that such a change would make it possible to substantially

[32] For a sample video, see `https://youtu.be/ouIw3Uj7UlM`.

[33] `www.bloomberg.com/graphics/2025-nyc-congestion-pricing-week-one-traffic-mix-shifts/`

lower the cordon fee paid by the drivers of personal cars while achieving the current long-term plan's revenue and traffic reduction goals, and generating additional revenue that can be used to alleviate the effects of congestion pricing on the holders of taxicab medallions and other business owners.

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A Sample Instructions

The assignment is to record videos for a Stanford research project on traffic in Manhattan. The shift is 4 hours, and will provide videos of traffic at the Manhattan end of the Williamsburg Bridge, cars entering Manhattan. You need a modern smartphone (Android or iPhone).

Some tips:
- Make sure you have enough free storage on your phone before you start (around 20-25GB).
- Bring an extra powerbank to make sure you can record for that amount of time.
- You may want to bring a selfie stick or a tripod to make it easier to hold the phone.
- Dress warm (including comfortable gloves if necessary), so that you can be recording outside for 4 hours. If rain is expected, bring an umbrella.
- For this shift (in just one location), you may want to bring a foldable chair.

For an example of the kind of video that we need see here: [redacted]

Instructions:
- Begin the shift on the date/time specified on the GigSmart Platform. Please be on time!
- Go to the end of the Williamsburg Bridge, entering Manhattan (near Delancey and Clinton). Pick a location from which you can clearly see and record the cars entering Manhattan from the bridge and can clearly read their license plates. Start with a short (1-2 minute) video, recording the traffic coming toward you from the bridge.

- Record the video in landscape mode.
- Record in HD, set framerate to 30. Do not record 4k or 60 framerate
(these videos will be too large).
- As in the example video, start out by saying out loud the current date and time. Then say out loud the kinds of vehicles coming toward you, based on the front license plate or the visual appearance of the vehicle. This part is very important: we will use your verbal classification to count the numbers of types of vehicles at various intersections in Manhattan. (We will then use the video recordings themselves to further subdivide the different types of vehicles, but you do not need to worry about that when saying the different types of vehicles out loud.) Try your best to keep your classification as accurate as possbile for the entire 4 hour session.
-- For a yellow (or green) taxi, say "yellow" or "green".
-- For Uber/Lyft vehicles, say "TLC". These vehicles can be identified by the license plate, which starts with a "T", ends with a "C", and has a "T&LC" sign at the bottom.
-- For commercial vehicles, say "Commercial". These vehicles can be identified by the license plate that says "Commercial" at the bottom.
-- For personal cars/vans/SUVs, say "Regular"
-- If the vehicle does not have a front license plate, say "No plate"
-- It's OK to say aggregate numbers (e.g., "Two yellows, regular, commercial, two regulars, etc.")
- After you are done recording the short 1-2 minute video, upload it to [redacted]

- After the test video is uploaded, start recording the longer videos.
Record for approximately 10 minutes. This is the first 10-minute video. Take a short break, and then record another 10-minute video, at the same location. That's the second video. Take another break, and then keep going until you record 16 10-minute videos (4 videos or so per hour, with approximately 5-minute breaks in between). At the beginning of each 10-minute video, say the current date and time.

As with the test video, please upload your 16 videos to [redacted]

Ideally, if there is WiFi or you have a fast cell phone connection, try to upload the videos one (or a few) at a time, as soon as you take them. But if it's inconvenient, feel free to upload all 16 at the end, as soon as possible after you are done recording all of them.

Thank you!