BARCLAYS

Cross-Asset Research
10 December 2019

Ride Hailing

Data Says UnCurb Your Enthusiasm

INDUSTRY FOCUS

Macro Strategy
Jeffrey Meli **
+1 212 412 2127
jeff.meli@barclays.com
BCI, US

Data Science
Adam Kelleher **
+1 212 526 5697
adam.kelleher@barclays.com
BCI, US

Investment Sciences
Ryan Preclaw
+1 212 412 2249
ryan.preclaw@barclays.com
BCI, US

Equity Research: U.S. Internet
Ross Sandler
+1 415 263 4470
ross.sandler@barclays.com
BCI, US

Deepak Mathivanan
+1 415 274 5351
deepak.mathivanan@barclays.com
BCI, US

**This author is a member of the Fixed Income, Currencies and Commodities Research department and is not an equity or debt research analyst.

Macro View – NYC ride-hailing data points to social benefits and low price elasticity

A proprietary analysis of 2.4bn individual taxi and ride-hailing rides in New York City (the only city for which extensive data is available) shows that ride hailing's explosive growth more than doubled total trips, and exposed significantly underserved latent demand.

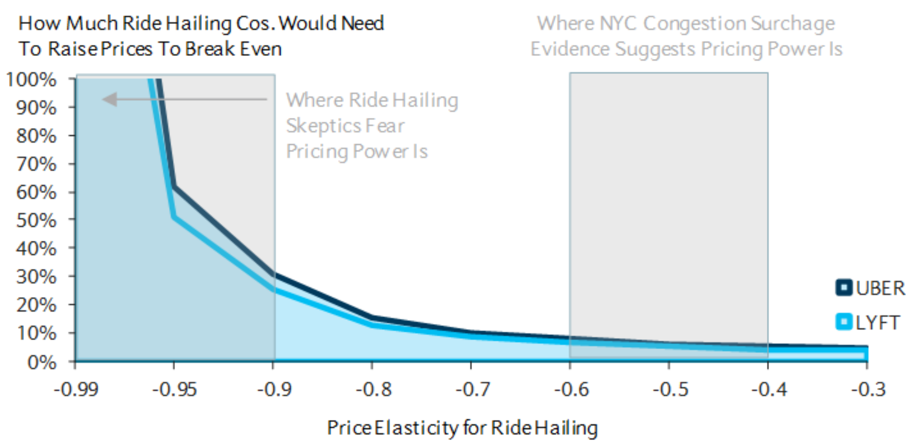
A natural experiment arising when NYC launched a congestion charge allows us to estimate that the elasticity of demand for ride hailing is -0.4 to -0.6, allowing UBER or LYFT to increase net revenue by raising prices (despite any effects on volume). For comparison, our estimate places it at the low end of industries, similar to legal services (-0.4) or physician services (-0.6), and less elastic than the demand for restaurants (-2.3), autos (-1.2 to -1.5 in the short-run), or foreign travel (long-run -4.0).

The social impact of the ride-hailing business has also been a net positive, in our view. Despite a correlation to gentrification (which may strike observers and policy makers as problematic), **ride hailing increased rides in the least gentrified (and most underserved) neighborhoods 50x**, and filled a gap in transportation infrastructure.

Equity View – Path to profitability intact despite regulatory roadblocks

Concerns about regulation and the path to profitability are a big reason why UBER/LYFT trade at a sharp EV/Rev discount. **Our estimate of elasticity suggests Uber and Lyft can price to achieve positive operating profit with only a modest impact on volumes, disproving a key piece of the bear case.** With only a 5-8% price increase in 2020 required for EBITDA profitability, the businesses should also have capacity to absorb regulatory challenges, given that price implications are likely to vary by jurisdiction.

FIGURE 1
Ride Hailing Appears to Be Less Elastic Than Bearish Investors Fear



Note: Gross price increase required to achieve $0 Adjusted EBITDA. Source: Barclays Research

FOR ANALYST CERTIFICATION(S) PLEASE SEE PAGE 24.

FOR IMPORTANT FIXED INCOME RESEARCH DISCLOSURES, PLEASE SEE PAGE 24.

FOR IMPORTANT EQUITY RESEARCH DISCLOSURES, PLEASE SEE PAGE 25.

EQUITY RESEARCH VIEW

Investment Sciences
Ryan Preclaw
+1 212 412 2249
ryan.preclaw@barclays.com
BCI, US

Equity Research: U.S. Internet
Ross Sandler
+1 415 263 4470
ross.sandler@barclays.com
BCI, US

Deepak Mathivanan
+1 415 274 5351
deepak.mathivanan@
barclays.com
BCI, US

Ride-Hailing Data Offers Insights at a Moment of Challenge

App-based ride-hailing companies have been one of the most successful, and most controversial, groups of start-ups of the past decade. Uber, the first mover in the sector, has grown from zero to >$15bn in annual revenue in only about a decade; it has also generated controversy, in part by clashing with local regulations as it developed its business.[1]

While the controversies resulted in relatively few meaningful disruptions to the business in past years, 2019 has seen a surge of significant regulatory actions with potential to fundamentally challenge the business model. In November 2019 alone:

- London, one of Uber's largest markets, withdrew the company's license to operate after discovering flaws in Uber's IT systems[2] (Uber continues to operate there while it appeals the decision)
- New Jersey levied a $649mn fine on Uber related to how it classifies its employees[3]
- San Francisco approved a $0.57 per ride tax on ride-hailing rides[4]

As the number of jurisdictions contemplating or enacting regulation of the ride-hailing industry grows, a natural question for investors is what, if any, effect this would have on the use of ride-hailing apps.

We can use data from New York City, one of the ride-hailing industry's largest and more important markets (~13% of U.S. trips), to analyze the risks (and opportunities) for the sector. The city publishes detailed ride-level logs of ride-hailing and taxi trips, including significant history. We are able to examine how ride hailing changed access to rides, and how that access was distributed through the city.

We download c.2.4bn rides from 2010 to 2019, across all major providers of taxi services[5], from the NYC Taxi and Limousine Commission. In order to understand the drivers of ridership across different parts of the city, we merge this with demographic data from the US Census, the IRS, and New York City Open Data. This requires mapping pick-up and drop-off locations into the Neighborhood Tabulation Areas (NTAs) used by New York City, which are based on Census Tracts used by the US Census department (and which themselves can be mapped to zip codes). The result is a comprehensive ride-hailing dataset that can be used to answer important questions about how the introduction of app-based ride hailing has changed transportation in New York City.

Congestion surcharge and the elasticity of demand

The introduction of a congestion surcharge on hailed rides and taxis provides a natural experiment to estimate the price elasticity of demand for ride hailing. The surcharge on for-hire vehicles entering the "Congestion Zone" (CZ, effectively the lower two-thirds of Manhattan, see below) took effect on February 2, 2019[6]. We use data from before and after the surcharge to estimate the price sensitivity of demand for ride hailing. We find that ride-hailing demand is relatively inelastic – the surcharge raised the price of the average ride within the "Congestion Zone" by c.23%, and resulted in a decline in rides of 10% versus the prior

[1] How Uber Conquers a City in Seven Steps, The Guardian, April 12, 2017
[2] Uber stripped of London license over passenger safety risk, Sky News, November 25, 2019
[3] Uber Fined $649 Million for Saying Drivers Aren't Employees, New York Times, November 14, 2019
[4] Seattle approves new 57-cent tax on Uber, Lyft rides, San Francisco Chronicle, November 26, 2019
[5] One caveat being unlicensed providers, see below.
[6] It was initially planned to go into effect on January 1st, but an appeal delayed the actual start.

trend, suggesting an elasticity of about -0.4; a comparable estimate based on rides traveling into the CZ from outside suggests an elasticity of -0.5 to -0.6.

New York City, particularly lower Manhattan, is a good proxy for most metros as it has ample transportation options and low switching costs; hence, if ride-hailing price increases were to become onerous, consumers would likely trade-out. For this reason, the -0.4 to -0.6 elasticity illustrated below gives us additional confidence in the stickiness of UBER and LYFT's service to society.

Gains from ride hailing are widely distributed throughout the city

While much of the regulatory concern about ride-hailing apps has been focused on driver welfare, we believe that rider welfare is also an important consideration. The introduction of ride-hailing apps dramatically increased the number of rides in New York, indicating that the existing taxi system was leaving a substantial amount of demand unfilled.

The biggest gains in rides occurred outside of Manhattan. From a demographics perspective, it is the case the neighborhoods that have gentrified captured the largest number of new rides. However, due to the sheer magnitude of the increase in ride hailing, even the least gentrified neighborhoods added tens of millions of annual rides. Our analysis of time of day and day of week usage patterns suggests that the consumers of ride hailing in these historically underserved neighborhoods are more likely to use ride hailing during working hours, and more likely to travel within the boroughs rather than into Manhattan, than users from wealthier neighborhoods. This suggests that ride hailing is filling an important gap in the New York City transit system, which is designed (particularly the subways) to get passengers into and out of central Manhattan. We believe regulators should consider these rider welfare issues when designing new rules or fees. The limitation of the surcharge to the most heavily-trafficked parts of Manhattan has allowed growth of intra-borough rides to continue.

Elasticity Estimates Suggest That Ride-Hailing Companies Could Flip the Profitability Switch if They Believed That Was the Best Strategy

That elasticity estimate suggests that ride-hailing companies are well positioned to achieve profitability.

In our view, one of the most enduring concerns about Lyft and Uber's business models has been the idea that they may be unable to achieve a price/volume combination that results in profitability. For example:

> " 'I think both Lyft and Uber are struggling with a way to convert revenue growth into profits. So you are paying $100 billion for a company that still doesn't have a viable business model. That's scary', Damodaran says."
>
> *Wall Street's valuation guru: From Uber to Pinterest, all the major IPOs this year are overpriced, CNBC, April 23, 2019*

However, if price elasticities in their most mature markets are in the area of -0.4, it suggests that ride-hailing companies are still pricing within a zone where they have substantial ability to increase their profitability by raising prices. At that level, a 1% increase in prices would result in a 0.6% increase in revenues (because volumes fall 0.4% from what they would have been without the price change). Figure 2 demonstrates how important the difference between a moderate and high elasticity is; at -0.4, Uber only need to raise prices 5% to reach profitability, but at -0.9 it would need to raise them 30%. And while the elasticity may prove to be higher in the long run, or might be different if prices were already dramatically higher than they are now, they are close enough to profitability that they should be in position to do what they need. UBER and LYFT's pricing power is also supported by the fact that the price change needed for operating profitability is much less than the one for which we made the elasticity estimate – they would be working within already observed ranges if they chose to flip the profitability switch today. While they might not choose to do so, because in management's view their long-term strategy is better served by investing for growth, they appear to have the flexibility to do it if they want.

Another factor to consider is that 2020 will likely see natural trip volume growth for UBER in the US, as the company laps the 2019 reduction in volume from removing shared rides subsidies. **This, combined with the elasticity noted above, could mean upside to gross bookings (GBs), revenue, and EBITDA – and significant upside for whichever metric UBER decides to flex the most.**

FIGURE 2

Price Elasticity Is Key to Whether Ride-Hailing Companies Can Become Profitable

Estimate Category	Moderate Elasticity	High Elasticity
Uber 2020E Gross Rides Bookings	$58,253	$58,253
Uber 2020E Adj. EBITDA	-$1,795	-$1,795
Illustrative Elasticity	-0.4	-0.9
Uber Price Increase to Get to Breakeven	5.1%	30.8%
Because the Price Increase Would Raise This Much Revenue if Rides Stayed Constant	$2,992	$17,950
But We'll Lose This Much Revenue from Rides Lost to the Price Increase	-$1,197	-$16,155

Source: Barclays Research estimates

Regulation Is a Risk, But Not an Existential One

We see three focal point regulatory trends, each offering different potential risks to the ride-hailing companies:

1. **Existential risks to the industry or company.** This is the risk represented by the London license revocation, where regulators could simply decide to ban the companies altogether.

   We think this risk is almost non-existent in practice for the industry, and remote even for a given company, because ride hailing has generated significant benefits to a broad cross-section of passengers. In New York, ride hailing more than doubled the total annual rides. And while there is likely some policy risk from the fact that a higher share of those rides appear to have been gained in gentrifying areas, non-gentrifying areas have gained even more relative to their starting point – a greater than 50x increase in annual rides originating in those neighborhoods. So it seems unlikely that there is a constituency for an outright ban at this point.

2. **Congestion and use policies.** These are exemplified by the San Francisco fee, and a congestion surcharge implemented in New York City at the beginning of 2019. These are charges intended to improve quality of life in cities by forcing consumers to internalize the cost of congestion created by ride hailing, and generating revenue for investments in congestion-reducing infrastructure like mass transit.

   While rides are likely to decrease in response to higher fees, we do not believe the magnitude of the fees enacted or under consideration is sufficient to alter the growth trajectory of ride-hailing companies. Based on New York's data, we estimate that Uber's price elasticity is in the area of -0.4 (so a 10% increase in prices reduces volumes by 4%). In the case of NYC, the congestion surcharge was about 23% of the average ride. That was large enough that in the more mature area of the city, growth swung from ~+5% before to about -5% after the surcharge. However, in the higher growth outer boroughs (which look more like Uber's other markets), the change was only enough to reduce growth in rides affected by the surcharge (i.e., those entering the CZ), not swing it to a decline. Further, ride-hailing companies continued to gain share from traditional taxis, which even further limited the absolute effect on their volumes. As such, even fairly widespread congestion charges are not likely to derail the company's growth paths.

3. **Worker protection policies.** As in New Jersey, or a new California law (AB5) intended to require gig economy workers to be treated as employees, these laws are intended to protect workers. One way of framing the long-run implications of these policies would be that eventually ride-hailing companies would need to price their services so that drivers are making more than minimum wage, after covering their costs (like fuel and depreciation).

   Similar to the above, this could reduce the growth rate of rides, but, as with congestion charges, we do not expect the effect to be large enough to jeopardize the path to profitability for Uber and Lyft. Estimates of gross hourly earnings are around $16-17 nationally, with variation depending on local minimum wages for Uber and Lyft. If we assume $5/hour for fuel and depreciation, and a pass through to drivers of 75% of gross bookings, and minimum wages ranging from $7.25 to $15, it would imply required price increases of 0-20% to reach that standard. Given that those are in the same range as the potential congestion charges, the elasticity results suggest the same outcome: these regulations are not likely to derail growth in the industry.

Of course, even if each risk is manageable in isolation, they could be difficult to manage all together. The nature of the risks though is that they are not likely to arrive together, nor are all of them equally applicable to every place where Uber and Lyft operate. For the employment risk, there is significant diversity in the minimum wage they would face, and the companies already suggest that drivers make more in locations where the minimum wage is higher. Second, the congestion and use charges are most likely to apply in dense cities. Even in New York, the congestion charge applies to only 56% of the rides[7]. Many cities are much less likely than NYC to use that type of regulation. Even those that do may make the charge less onerous – in San Francisco, for example, the proposed charge is only one-fifth as high as in New York.

New Regulatory Attention Is Challenging Ride Hailing, and Uber in Particular

NYC: Make It Here, Make It Anywhere

While it's convenient that New York City has publicly available data for the purposes of our trip and pricing analyses elsewhere in this report, we believe trends – in terms of regulation, pricing, and user behavior – in this market can be extrapolated as a "road map" for the potential evolution of other markets. First, NYC is a "top 5" market for Uber (24% of 2018 Rides GB's came from Uber's top 5 markets), with more than 450k daily trips, 70k+ unique dispatched vehicles each month, three major international airports in close proximity to the central business district, and commensurate population density – key facets of any mature market. Second, traffic and cost-of-ownership considerations limit vehicle ownership in NYC vis-à-vis other markets, making ride-hailing, taxis, and public transit (e.g., bus, subway and trains) viable and widely accepted modes of transportation. Third, NYC has a recent history of proactively regulating to protect employees (i.e., drivers) at the expense of corporate interests, while also actively addressing congestion. Consequently, we think it's fair to conclude that New York City is a very relevant case study for the implications of regulation and fare increases on ride-hailing demand.

To that end, the consequences from the January 2019 lower-Manhattan congestion pricing and driver utilization threshold requirements have been topical among investors – and will likely be acutely in focus going forward following the recent announcement that peer Juno (private, not

[7] Including airport trips, which we generally exclude from charts showing ride shares by origin in this report.

covered) is exiting NYC altogether and filing for bankruptcy. Uber CEO Dara Khosrowshahi hasn't been shy about sharing his thoughts on recent NYC regulations, stating that:

> *"A lot of the changes that are – have been introduced or potentially introduced in New York City, we just don't agree with…If you look at our business in New York, it's pretty healthy, and it continues to grow. The problem is that we are growing fastest in areas of the city where you've got consumers who can afford significantly higher prices and the price increases that we have had to put forward in the city, while areas like East New York or Wakefield, Bronx or Central Harlem are not growing because consumers there can't afford the increases in prices, and as a result, we're making kind of mobility unavailable to them. So I think anyone who thinks that the changes that -- who tells you that the changes in New York City are good is full of malarkey, frankly." (UBER 2Q19 Earnings Call, 8/8/2019)*

More recently, Mr. Khosrowshahi added that while the company is "happy to work" with regulators on gig worker protections and other sensible regulations, recent price increases in NYC have hurt consumers, particularly those users in underserved neighborhoods:

> *"…as far as our New York City growth, we have seen significant price increases in New York City to the consumer out there. But the business is certainly growing from a booking standpoint, <u>those price increases are slowing down trip growth</u>. Although for -- if you look at the last 6 months, trip growth is still up on a year-on-year basis in New York for the 6-month period. <u>We are definitely seeing the increased prices affect neighborhoods that might be in transit deserts that are more price sensitive. And we don't think that's a good thing for New York</u>, and it's certainly not a good thing for those neighborhoods. But the New York, call it, example shows a business that continues to grow, and it's quite resilient to the environment around it." (UBER 3Q19 Earnings Call, 11/4/2019)*

It's not yet clear to us what the full implications of recent regulations in NYC are for the ride-hailing space, although initial data suggests that i) it's negative for consumers in terms of price and consequently demand, as evidenced by decelerating y/y trip volume growth, ii) negative for competitive dynamics, given Juno's recent market exit, and iii) it potentially has negative consequences for underserved transportation neighborhoods where ride-hailing has added employment and new transit options over the past 5+ years. It remains to be seen how NYC regulation will evolve over the medium-term, but with a rather pro-driver administration in place at present (Bill Heinzen, acting commissioner of NYC's Taxi and Limo Commission recently stated that "…if you're not able to pay your drivers a fair wage and are not able to operate in a way that's environmentally responsible, then you probably shouldn't be operating in New York City."[8]), it's unlikely that it will become easier – or less expensive – to operate ride-hailing businesses in New York.

Regulation in Other Major Markets

While the NYC ride-haling environment can be categorized as challenging, in our view, other major markets are going through their own regulatory evolutions, with some developments proving constructive and others creating challenges for ride-hailing; all of these regulations generally fall within three key areas: rider safety, driver pay/benefits/protections, or fees/taxes to manage congestion/fund road infrastructure.

Uber's other top five markets outside of NYC include London (the company's most profitable market), San Francisco, Los Angeles, and Sao Paulo (Brazil); collectively, these five cities

[8] Bloomberg, 11/20/2019, https://www.bloomberg.com/news/articles/2019-11-20/ride-hailing-startup-juno-battered-by-regulation-lawsuits?srnd=markets-vp

comprise one-quarter of the company's GBs. The brief update on regulatory developments in these markets are as follows:

- **London.** Outside of New York, London is perhaps the most topical market from a regulatory perspective, as Transport for London ("TfL"), the local transit regulatory agency, recently chose to not renew Uber's license to operate in London, having determined some Uber business practices to be "not fit and proper." Uber is appealing the ruling and is allowed to operate through the duration of the appeals process. The appeal may evolve into court proceedings, which could take eight months or more for a resolution. Uber had been subject to a similar suspension in London in 2017, and after a nine-month legal process, was given a 15-month operator license (through September 2019) and subsequent two-month license.
- **San Francisco and Los Angeles.** These two markets are the most pertinent as it relates to California's recently passed AB-5 Bill, making it more difficult for ride-hailing companies to classify drivers as independent contractors. The Bill goes into effect January 1, 2020; however, both Uber and Lyft argue that they comply with the "ABC" test for independent contractor classification. Further, both continue to work with Governor Newsom's office negotiating an exemption for ride-hailing and/or middle-ground compromises, including potential benefits/employee-like protections for independent contractors. Uber and Lyft have proposed establishing a $21/hour minimum wage for drivers (after netting out hourly vehicle depreciation) in the state, and have pooled $90 million, with contributions from food delivery businesses, to put forth a 2020 ballot initiative in the state to exempt these businesses from AB-5.
- **Sao Paulo.** Uber has faced regulatory pressure in Brazil, along with peers 99, Cabify, and others, over the last several years, in an effort to improve passenger safety, according to regulators. These regulations have included driver verification/certification, annual vehicle inspections, and age restrictions on vehicles.

Notably, each of these top five markets have levied per-trip and/or mileage-based taxes/fees and have mandated that the companies disclose trip data to local authorities. Beyond these markets, key cities, such as Toronto (per-trip and minimum passenger fare), Mexico City (per-trip fees), Mumbai (passenger emergency alert systems), and Chicago (congestion fees, per-trip fees, mandated accessible service) have implemented various regulations, with potential driver pay protection and congestion fees potentially coming in the future[9].

Not all regulatory developments – or ongoing discussions with regulators – are negative, however. Uber has noted that in markets such as France, the company has already implemented greater benefits for drivers, which has been well received by drivers and regulators.

[9] https://wagner.nyu.edu/files/faculty/publications/RUDIN_EHAIL_REPORT.pdf

MACRO STRATEGY

Macro Strategy
Jeffrey Meli **
+1 212 412 2127
jeff.meli@barclays.com
BCI, US

Data Science
Adam Kelleher **
+1 212 526 5697
adam.kelleher@barclays.com
BCI, US

***This author is a member of the Fixed Income, Currencies and Commodities Research department and is not an equity or debt research analyst.*

The Data on Ride Hailing

The local authorities that are responsible for regulating taxis and ride hailing in New York City recently began publishing highly detailed data about taxis, ride hailing, and other modes of local transportation.

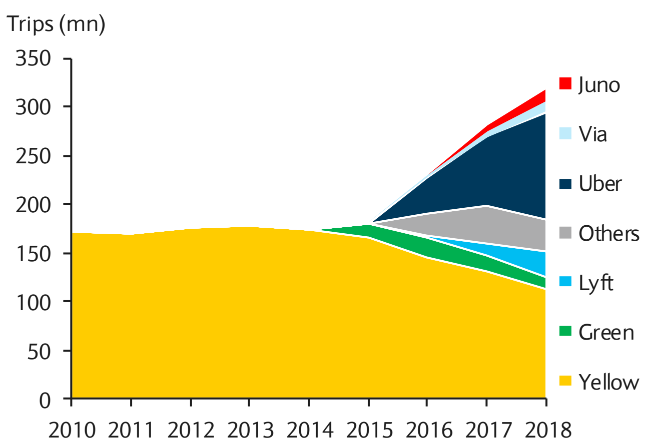
The primary data we use are provided by the New York City Taxi and Limousine Commission (TLC), created in 1971. It is the agency responsible for licensing and regulating New York City's medallion (yellow) taxis, street hail livery (green) taxis, for-hire vehicles (FHVs), commuter vans, and paratransit vehicles. The TLC collects trip record information for each taxi and for-hire vehicle trip completed by TLC licensed drivers and vehicles. This data is published monthly and can be downloaded from the TLC website. It is quite orderly, and requires little cleaning and pre-processing.

The specific fields collected have expanded over time and are slightly different for yellow and green taxis than for FHVs (see the data appendix). But broadly speaking, we are able to download data on pickup and (more recently) drop-off location, duration of the ride, fare (for yellow and green taxis only), and whether or not the ride was shared (FHVs only, capturing pooled versus individual rides).

It is a large dataset, with approximately 2.4 billion total individual rides, with between 175-400mn rides annually (Figure 3). There is a notable inflection in the data at the point when ride-hailing apps were introduced, with the number of recorded rides more than doubling since. The data indicates that as of the most recent release, there were about 135,000 vehicles, and more than 180,000 drivers, providing rides in New York, with about 10x more vehicles offering app-hailed rides than taxi rides (Figure 4).

FIGURE 3

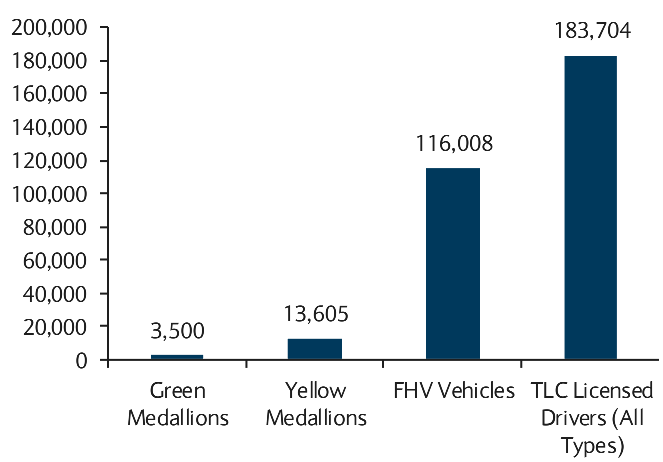
Volume of rides was steady for years, then grew rapidly with introduction of ride-hailing apps



Note: FHV vehicles include livery and app-based ride hailing.
Source: TLC, Barclays Research

FIGURE 4

In New York City, There Are Nearly 10x More Vehicles Licensed to Offer Scheduled Rides Than Street Pickups



Source: TLC, Barclays Research

As mentioned above, on February 1st 2019, New York City instituted a surcharge on for-hire vehicles entering a newly-defined "Congestion Zone" comprised of any part of Manhattan below 96th Street. In our analysis we will often differentiate between rides that involved this zone versus those that remained exclusively within the boroughs or upper Manhattan. Using pickup location, we can determine which rides originated in the congestion zone. For the more recent data (starting from the beginning of 2018), we can also determine which of the rides that originated outside the congestion zone entered it, and thus incurred the surcharge.

Before apps: Quantity and price were fixed, with availability limited to the highest-density areas

The New York City taxi industry has existed since the late 1890s. The number of taxis was largely unregulated until the Great Depression, when an excess of drivers led to long hours and low pay, leading to the creation of the medallion system that is still in use. The number of yellow cabs is limited to the number of available medallions. Originally, there were just under 12,000 medallions; it was not until the late 1990s that the number began to grow – currently, there are over 13,000 medallions available.

The fares for yellow cabs are computed according to a specific formula that combines distance, time (including time in traffic), an initial charge, and a number of location- and time-specific fees. Although the fare formula is updated intermittently (to raise prices or add new fees), at any given time, the price of a yellow cab ride is fixed: it is not adjusted to reflect demand or availability.

Therefore, quantity and price are fixed. As is obvious from Figure 3, the total number of rides was effectively constant in the pre-Uber era, when yellow cabs were the only option available.

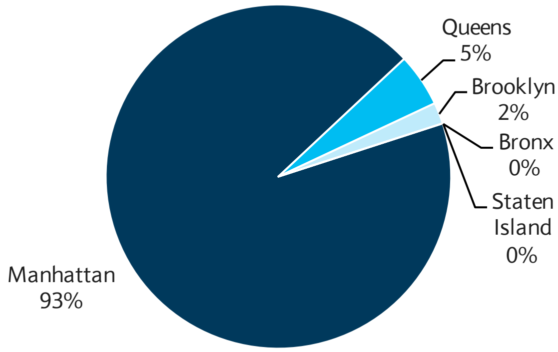
A second consequence is that cabs had only two levers to maximize revenue: ensure that utilization was as high as possible and that the trip types were as efficient as possible, meaning that they generated the most revenue per hour. Both of these pushed cabs to focus almost exclusively on the lower two-thirds of Manhattan.

- High Demand. The full-time population of Manhattan, plus tourists and the influx of workers during the week, was sufficient to absorb all of the available supply of yellow cab rides. Aiding this was the relatively high incomes in Manhattan.
- High Density. In the pre-app era, cabs found passengers through street hails. This method is effective only when the population density is high enough to limit the amount of time a cab is driving empty, looking for a passenger. Even though there was plenty of demand for cabs outside of Manhattan (given the use of ride-hailing apps we document below), it was not efficient for cabs to try to meet that demand – they could get filled more easily Manhattan with less time trawling for passengers. At 67k people per square mile, Manhattan is nearly three times as dense as New York City as a whole and the densest county in the US.
- The fare formula favors many short trips over a smaller number of long ones, due to the fixed fees. Longer trips to far-flung locations generated lower hourly revenue, leading to a preference for filling the demand for convenient short-distance rides in Manhattan.

The result is that in 2010 93% of trips originated in Manhattan (Figure 5). Most of these were within lower Manhattan – 97% of the Manhattan trips originated in what is now known as the congestion zone. Queens was the next largest borough at 5%. Away from that, almost no rides originated in the boroughs[10]. This is despite the fact that Manhattan was less than 20% of the population of New York City in 2010.

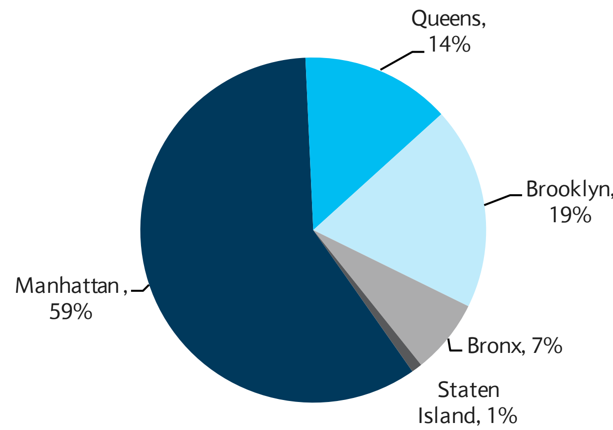
[10] Note that the official statistics underrepresent the number of rides that originated outside the congestion zone in 2010. Before the advent of ride-hailing apps, unlicensed cabs were available, although by their nature we have no data on their prevalence. We do not believe this alters any of our analysis. They functioned primarily outside of the congestion zone, and so would not affect our elasticity calculations. We are likely overstating somewhat the increase in rides attributable to ride-hailing apps, but we believe the scale of the rides gained outside the CZ overwhelms the prior availability of unlicensed cabs. The benefits of app-based hailing in lower density areas remains a key differentiator.

FIGURE 5
2010 Rides Mostly Originated in Manhattan…



Source: TLC, Barclays Research

FIGURE 6
…But by 2018, a Much Greater Share Was Originating in Other Boroughs



Source: TLC, Barclays Research

Advent of ride-hailing apps exposed the latent demand

As Figure 3 shows, there was explosive growth in the number of rides hailed in New York after the introduction of ride-hailing apps. This had more than doubled by 2018, with a CAGR of c.21% from 2015 to 2018. This rate of growth far outpaced that of the city population (which had cumulative growth of only about 5% over that period).

The number of yellow cab rides fell more than 30%, despite the growth in the total number of rides. Assuming that cabs were fully utilized before app-based ride hailing, 30% of the capacity of cabs was unused in 2018. This is behind the well-documented decline in the earnings of cab drivers and the decline in the value of taxi medallions, which peaked at over $1mn but are now below $200k.

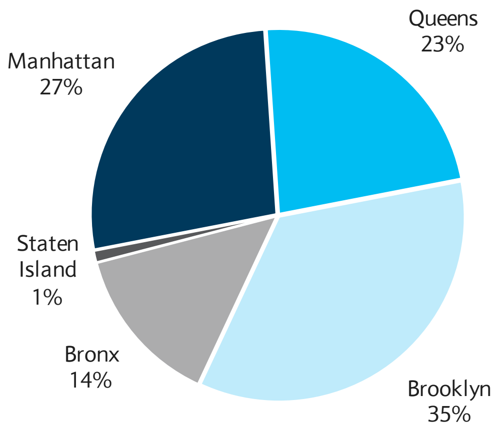
Uber (especially) and Lyft (to a lesser extent) explain all the growth in rides. Uber alone accounted for over 95% as many rides in 2018 as yellow cabs did in 2010: 163mn compared with 169mn. Overall, app-based ride hailing accounted for more rides in 2018 than yellow cabs did in 2010.

The distribution of rides also changed dramatically. In Figure 6, we compute this for 2018: it is clearly more widespread than was the case in 2010. Although Manhattan still has the majority of rides (59%), Brooklyn and Queens have significant shares as well.

We compute the share of the new rides by borough in Figure 7. Brooklyn captured the largest share of the new rides (35%), and the share captured by Queens (24%) was similar to that of Manhattan (27%). Within Manhattan, a significant share of the new rides was outside the congestion zone, meaning the parts of Manhattan that were traditionally underserved gained rides similarly to the boroughs (Figure 8).

FIGURE 7

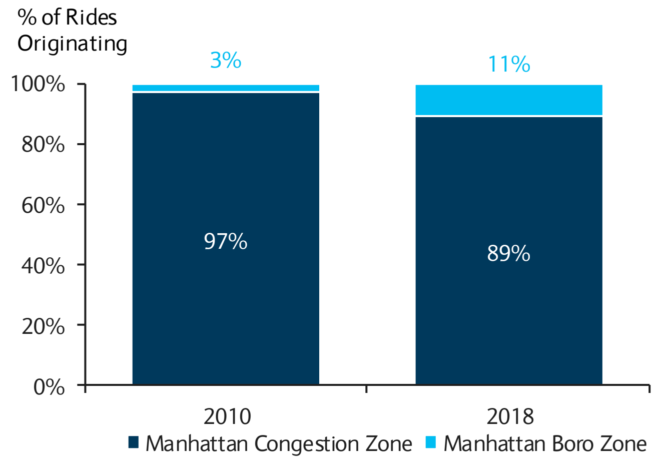
The Gains In New Rides Were Distributed Much More Evenly than the Initial Ride Share (Except Staten Island)



Source: TLC, Barclays Research

FIGURE 8

Even Within Manhattan, The Share of Rides Shifted to Previously Less Served Areas

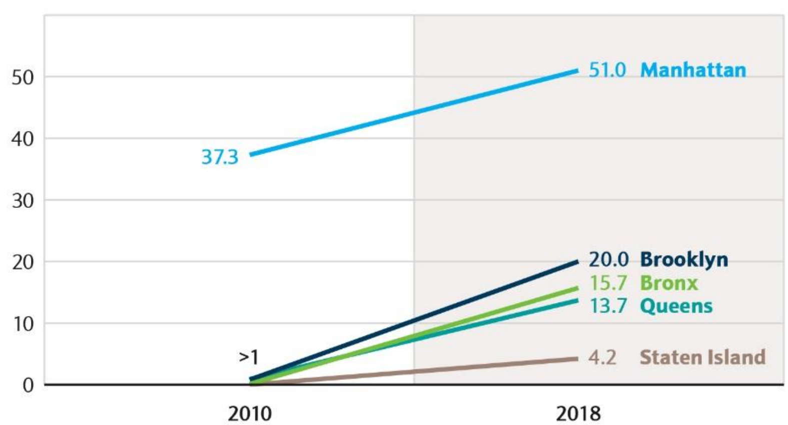


Source: TLC, Barclays Research

Another way to see the how the gains were more evenly distributed is through the lens of trips per capita. In 2010, Manhattan had 37 pickups per person, while every other borough had fewer than 1 pickup per person (Figure 9). However, by 2018, every borough had risen to a measurable number of pickups. And while they all remained below where Manhattan had been in 2010, in percentage terms compared to their starting points each outer borough had growth many multiples higher than Manhattan[11].

FIGURE 9

Rides Per Capita Increased From 2010 to 2018 in Every Part of New York, but the Outer Boroughs Experienced Much More Dramatic Increases



Source: TLC, Barclays Research

Also of note is the fact that Staten Island gained so few rides. Staten Island is the borough that is most like typically suburban density. The lack of rides even after the introduction of apps speaks to the dependency of ride-hailing on a more urban environment.

[11] Rides per capita in Manhattan must be interpreted differently from that in the other boroughs. Rides taken by both tourists and the influx of workers during the week are likely to bias upwards that metric. However, the change in rides per capital after the introduction of ride-hailing apps still gives a sense of the scale of the usage.

NYC Congestion Surcharge and Price Elasticity

The congestion surcharge that took effect in New York City on February 1, 2019, provides a natural experiment for how changes in price could affect the demand trends we documented in the previous section. The surcharge adds a fee to trips in taxis and for-hire vehicles (ride-hailing) that start, end or pass through the congestion zone (defined as Manhattan below 96th Street). The congestion surcharge is:

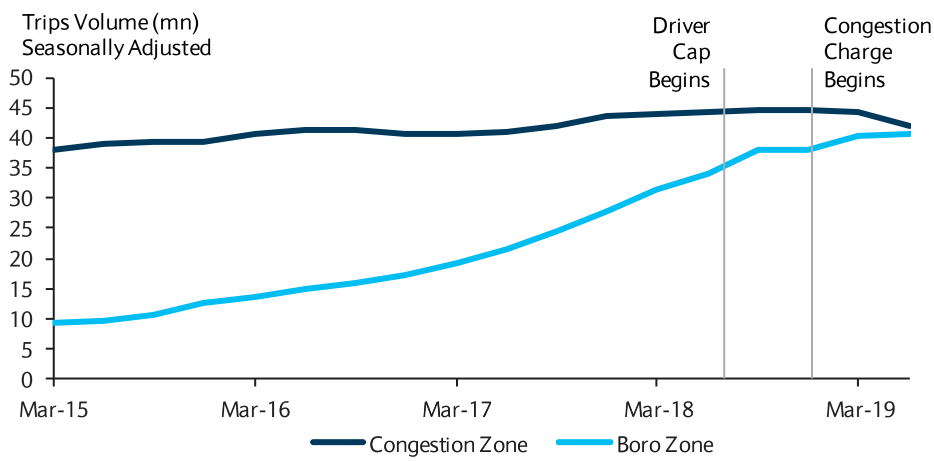
- $2.50 for non-shared trips in taxicabs
- $2.75 for non-shared trips in for-hire vehicles, including green taxis
- $0.75 for shared trips in any type of vehicle.

In addition, NYC enacted a moratorium on new FHV licenses starting in mid-2018. The initial duration of the moratorium was one year, but it has since been extended.

To assess the effect of the surcharge and cap on licenses on demand, we first separate trips that originated in the congestion zone from those that originated elsewhere in the city, which we designate as the "boro zone" (Figure 10).[12] The congestion zone was a relatively mature market even in 2015, since it was already growing more slowly before the new regulations took effect. It is also clear that the new regulations had an effect: the number of rides actually fell in 2019. Trips originating in the boro zone were growing very rapidly before the regulation took effect and seemed to slow somewhat afterwards.

FIGURE 10

The Driver Cap Flattened Growth, but the Congestion Charge Tipped the Congestion Zone from Growth to Decline



Source: TLC, Barclays Research

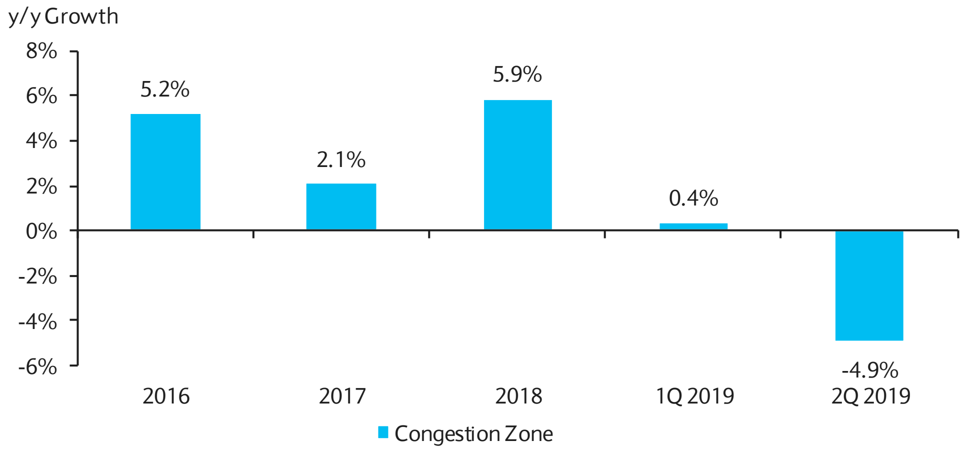
In Figure 11, we plot the y/y growth of rides within the congestion zone. In the years preceding the regulation, growth averaged 4.4%. In Q2 19, rides fell 4.9%. We focus on Q2 as opposed to Q1 for two reasons. First, although the surcharge was supposed to take effect in January, it was appealed and went into effect only on February 1, 2019. Second, we want to give consumers time to adjust behavior in response to the new fee. The difference between the average pre-surcharge growth rate and the rate in Q2 19 suggests a reduction in rides of 9.3% versus trend.

[12] This is a slight abuse of notation. "Boro zone" is formally defined by the Taxi & Limousine Commission (TLC) as the locations in the city where green cabs are allowed to pick up passengers, which is everywhere except Manhattan south of 96th street on the east side and south of 110th Street on the west side. This official designation differs only slightly from our use of the term, in that the official boro zone does not contain the 15 blocks between 96th Street and 110th Street on the west side, whereas we do include those blocks because they are outside the congestion zone.

To convert this into an elasticity, we need to divide this drop in demand by the change in price. The average ride originating in the congestion zone cost $10.80 in 2018. That means a $2.50 cab surcharge represents a 23% price increase.[13] This results in an elasticity of -0.4: a 10% change in price results in about a 4% decline in demand.

FIGURE 11

After Averaging 4.9% from 2016-18, Growth in the Congestion Zone Was -5% in 2Q19 (the First Quarter That Fully Experienced the Congestion Surcharge)



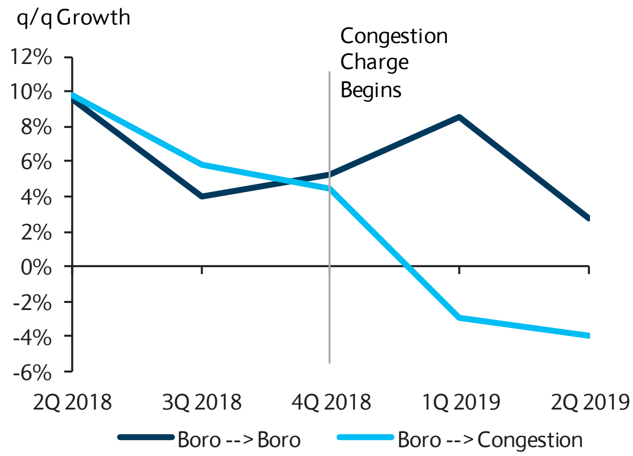
Source: TLC, Barclays Research

We can also estimate elasticity using rides that originated in the boro zone. Although we only have ride-hailing data including destinations starting at the beginning of 2018, we can see that prior to the surcharge, quarterly growth rates were similar for trips that stayed in the boro zone and those that entered the congestion zone. However, after the surcharge came into effect, the growth of those that entered the CZ dropped. In our view, the appropriate counterfactual estimate (what would have been, but for the surcharge) is to apply the boro zone growth rate to the congestion zone data. That gives us an estimate of the rides that are "missing" because of the congestions charge, about 11% in 1Q19, and 6.5% in 2Q (Figure 12). Then, we combine that with an average estimated cost of boro → CZ rides of $20.34 (based on applying a model of taxi costs to FHV rides), implying a price increase of 13.5%. This results in an elasticity estimates ranging from -0.48 in 2Q19 (the first full quarter where the surcharge was in place) to -0.64 (both quarters combined).

[13] We use the cab as opposed to FHV surcharge because our fare information is limited to cabs.

FIGURE 12

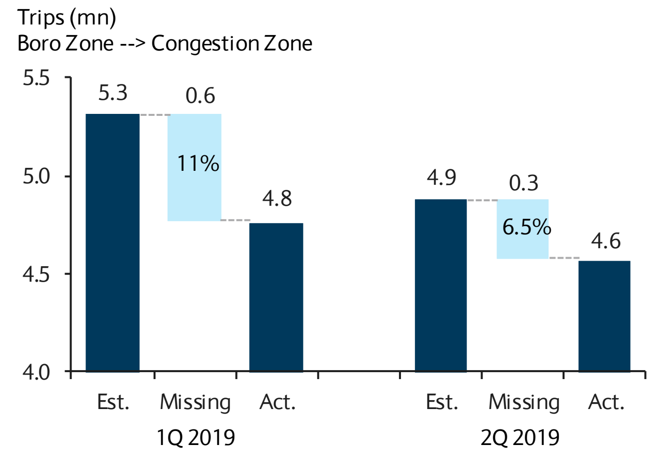
Boro Zone Rides Hit by the Congestion Charge had Their Growth Path Diverge from Unaffected Rides



Source: TLC, Barclays Research

FIGURE 13

Boro Zone Rides Affected by the Surcharge Had a Big Growth Decline in 2Q 19



Note: Est. is the count of Boro→Congestion Zone rides, if they had grown at the quarterly growth rate as Boro → Boro rides. Source: TLC, Barclays Research

Together, these results suggest that the demand for ride-hailing is relatively inelastic, between perhaps -0.4 to -0.6, versus a typical industry elasticity of about -1.[14] It is also in line with academic estimates of the elasticity of Uber demand.[15] However, the fees in New York, along with those being contemplated in other jurisdictions, are relatively large as a percent of the typical cost of a ride, which means the absolute magnitude of the effect on rides is still material; certainly, a 10% decline in rides is a meaningful one-time hit.

Challenges and caveats

One challenge is that our analysis only addresses the short-term elasticity. We do not yet know what the longer-term effects of the surcharge will be. If growth rates rebound to their prior levels, then the longer-term effects would be limited. However, if growth rates permanently shift lower, the long-term elasticity would be higher and the implications more severe. We will need at least several more quarters of data to assess this. That said, given the initial data, we conclude that the demand for ride-hailing is relatively inelastic compared with other consumer goods and that the quantum of fees is unlikely to be sufficiently high to disrupt the growth stories of the largest ride-hailing companies.

Another concern about our analysis is the extent to which it is appropriate to extrapolate results from New York City to the rest of the country (or world). First, we note that the top 5 markets for Uber represent 24% of gross revenues, and all of those markets are large cities. That said, there are some reasons why the elasticity in New York could be lower than in other areas. Driving oneself from place to place is incredibly inconvenient, given parking costs and availability, so riders are much less likely to substitute in that manner. In addition, the mix of riders in Manhattan includes a significant number of business travellers and tourists, both of whom might have lower elasticities than full-time residents.

However, the arguments in the other direction are at least as compelling. Riders in New York have a host of viable alternatives that are not available in other cities – the subway system, the bus system, Citi Bikes – that are cheaper than ride-hailing and convenient. These should make the elasticity in New York City higher than in other cities. Given how high daily usage

[14] Price Elasticity of Demand, Anderson, McLellan, Overton, Wolfram, November 13, 1997

[15] See *https://www.ftc.gov/system/files/documents/public_comments/2018/08/ftc-2018-0048-d-0124-155312.pdf*. This was done using data before the surcharge, and the benefit of our work is that it looks at a large price change driven by regulation.

of these alternatives is, we think that if anything, the elasticity in New York is an upper bound on that in other cities.

Finally, we only have fare information for taxis, and thus cannot be sure that Uber and other ride-hailing companies did not, at least temporarily, absorb some of the surcharge and thus limit its effect on ridership. Indeed, FHVs did gain share against yellow cabs: their 47% share of the trips originating in the CZ in Q2 2018 grew to 55% in Q2 2019. This gain in share more than compensated for the overall decrease in rides, such that FHV rides actually increased over that period. However, FHVs have been taking share from yellow cabs since 2015, and the most recent shifts are only a continuation of that trend, indicating that FHVs did not respond by absorbing the surcharge. From a timing perspective, Uber's IPO occurred in Q2 2019, and the resulting focus on profitability was likely to reduce its willingness to absorb further costs, in our view.

Ride-hailing benefitted all neighborhoods, mitigating regulatory risks

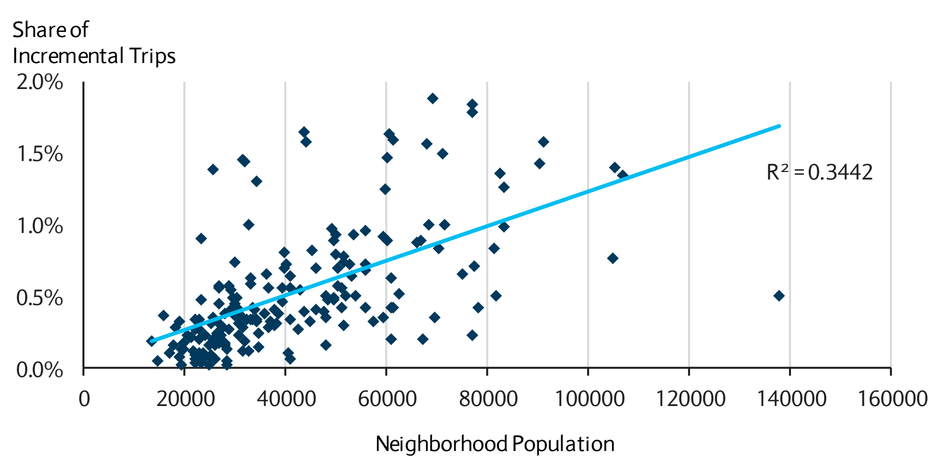
Most of the concerns raised by regulators about ride-hailing have been focused on two issues: driver welfare (e.g., average hourly wages) and congestion. We believe that an important dimension that has not received adequate attention is rider welfare. The dramatic increase in rides in New York City strongly suggests a significant increase in rider welfare; there was clearly demand for ride-hailing that the taxi system was unable to meet.

An interesting question is how these benefits in rider welfare have been distributed through the city. We know from Figures 8 and 9 that neighborhoods in the boroughs gained substantial rides, but not which neighborhoods. In fact, there is a large amount of variation. To examine this more closely, we compute the share of the total gain in rides that went to each neighborhood[16].

The most important characteristic explaining gains by neighborhood is population; more populous areas gained a larger share of the new rides (Figure 14). That said, population explains only about one-third of the variation in rides, so there is clearly more to explore. We define the residuals from the regression shown in Figure 14 as the gains net of population.

FIGURE 14

Neighborhoods with More People Gained More Trips from Ride-Hailing



Source: TLC, Barclays Research

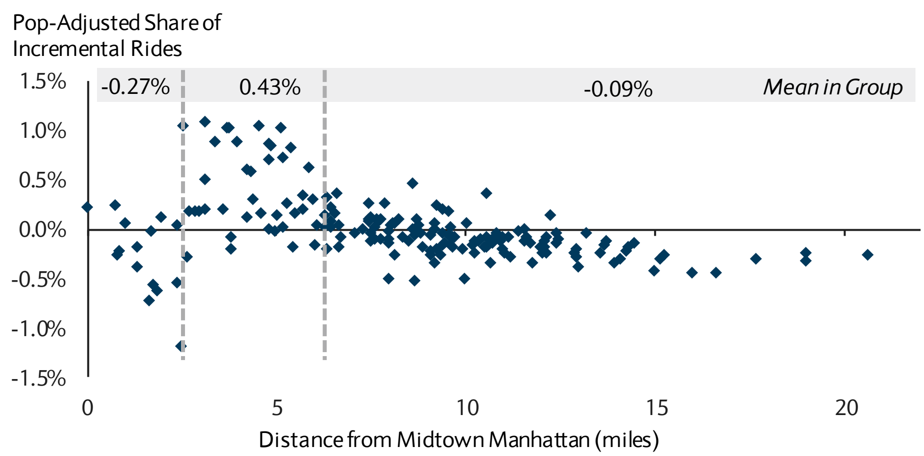
[16] We use Neighborhood Tabulation Areas (NTAs) to estimate neighborhood level demographics like income, education, rent, and ethnic mix.

The population-adjusted gains in rides have an interesting relationship to distance from midtown Manhattan. As seen in Figure 15, the areas closest to midtown Manhattan generally gained fewer rides than we would have expected, given their population. Most of these are themselves in Manhattan; they gained fewer rides because they were already well served by taxis before the advent of app-based ride hailing. They still gained rides in absolute terms, just fewer than we would have expected, given how populous they are. Similarly, neighborhoods very far from Manhattan also gained fewer rides than suggested by their population. These are, for the most part, less dense and more suburban-like than other parts of the city (e.g., Staten Island) and, thus, have less latent demand for ride-hailing (residents may be more likely to own cars, etc.).

The most interesting results are for the neighborhoods 3-7 miles from midtown Manhattan. On average, these areas over-indexed versus population by more than any other neighborhoods. This makes sense since these areas tend to be the densest and are most likely to have residents who work in Manhattan and, thus, have high demand for ride-hailing. But these also had the most variation in population-adjusted gains. Some areas had massive gains, whereas others' gains were more muted, or even negative.

FIGURE 15

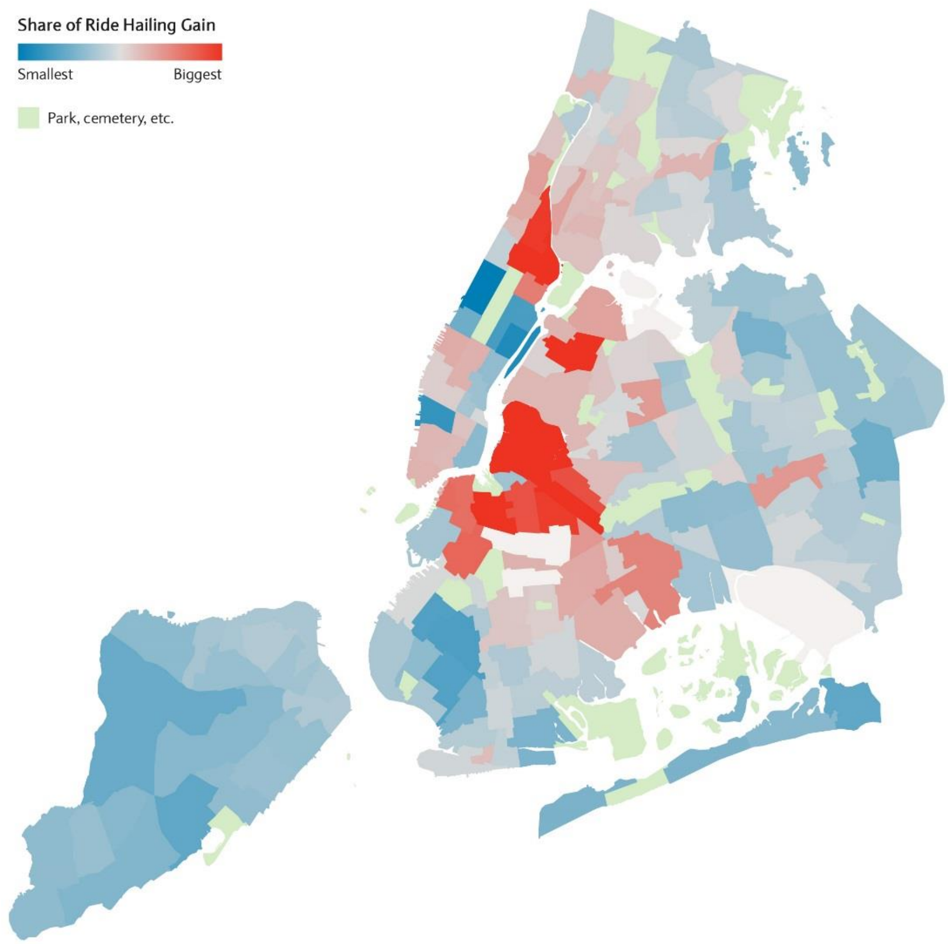
Neighborhoods Just Outside Midtown Manhattan's Business District had the Biggest Share of Gains of Incremental Rides



Source: TLC, Barclays Research

FIGURE 16

The Neighborhoods That Had The Most Outsized Gain in Share of App Rides Were Those Just Outside The Congestion Zone



Source: MTA, Barclays Research

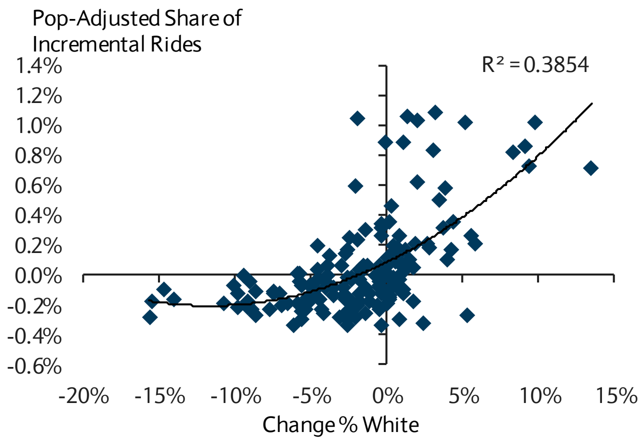
In Figure 16, it is clear that the areas with the most gains formed a tight ring around Manhattan. While this makes sense for the reasons given above, there is another possible driver: gentrification. The areas of Brooklyn and Queens that gained the most rides are also those that are synonymous with changing demographics in the boroughs.

This raises a natural question of how much of the gains in rides to the areas outside Manhattan were driven by (or even helped facilitate) these demographic shifts. To answer this, we explore the relationship between population-adjusted gains in rides with a host of demographic metrics: average income, access to transit (buses and subways), rent levels, and education levels. On the one hand, the factors that appear to be most significant are the change in the % of white residents and the % change in median rent. These are also the factors that a recent report by New York University's Furman Center identifies as key measures of gentrification.[17] As Figures 17 and 18 show, both measures have strong explanatory power and can distinguish which neighborhoods gained more, or less, than their population adjusted share. That is true for the full dataset (as shown in the figures) and for the different sub-groups within the data.

[17] "State of New York City's Housing & Neighborhoods," NYU Furman Center, https://furmancenter.org/research/sonychan

FIGURE 17

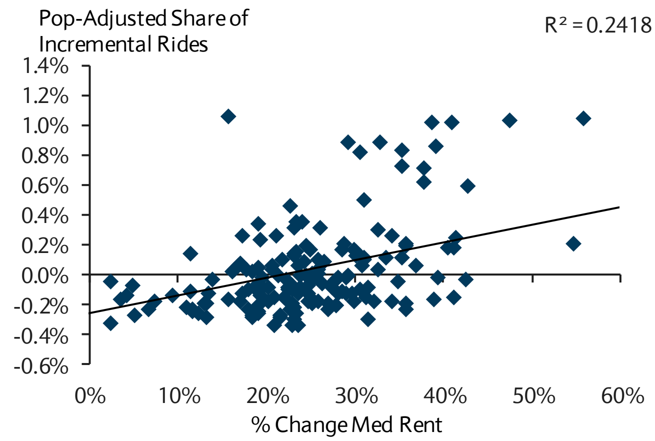
Relative Gains in Ride-Hailing Correlate to Gentrification Indicators such as Change in Ethnic Composition…



Source: New York City Open Data, TLC, Barclays Research

FIGURE 18

…And Growth in Neighborhood Median Rent

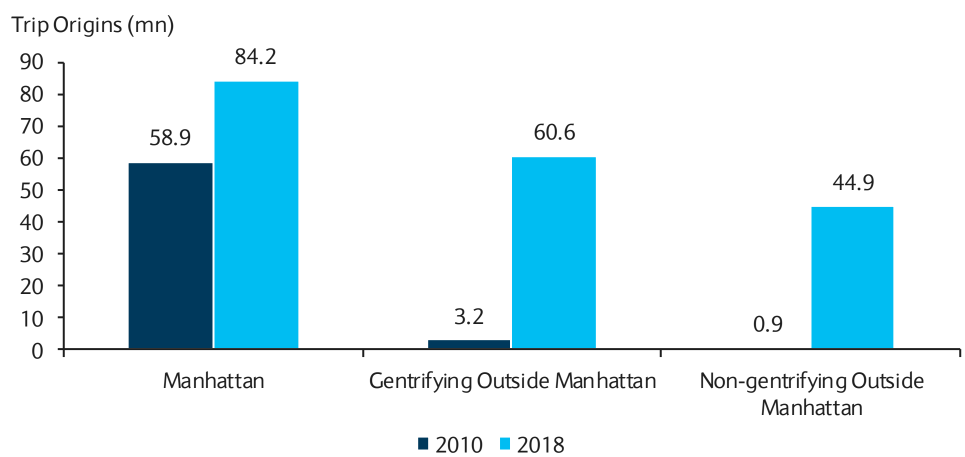


Source: New York City Open Data, TLC, Barclays Research

On the other hand, even after for accounting for these variables, there were still substantial gains that went to neighborhoods that did not experience gentrification. The issue is that the overall gain in rides – nearly 130mn per year – is so large that even those neighborhoods that benefited somewhat less than average still experienced significant gains. As Figure 19 shows, although the gentrifying neighborhoods were the origin for almost one-third more rides as non-gentrifying areas, the latter were almost completely shut out of ride access before ride-hailing, but have had ride origins grow about 50x. That brings them to a volume that is 75% of what Manhattan had prior to ride-hailing (and about 50% of the current volume), versus only 1.5% of Manhattan volume in 2010.

FIGURE 19

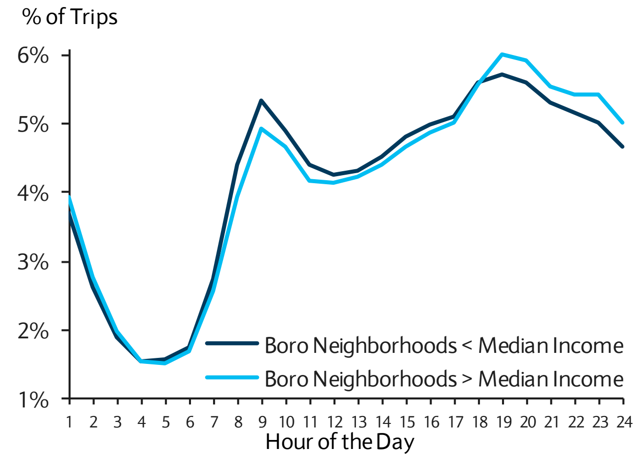
Although Gentrifying Areas Gained a Higher Number of Trips, the Non-Gentrifying Neighborhoods Made Even Bigger Gains Compared with Their Starting Point



Source: New York City Open Data, TLC, Barclays Research

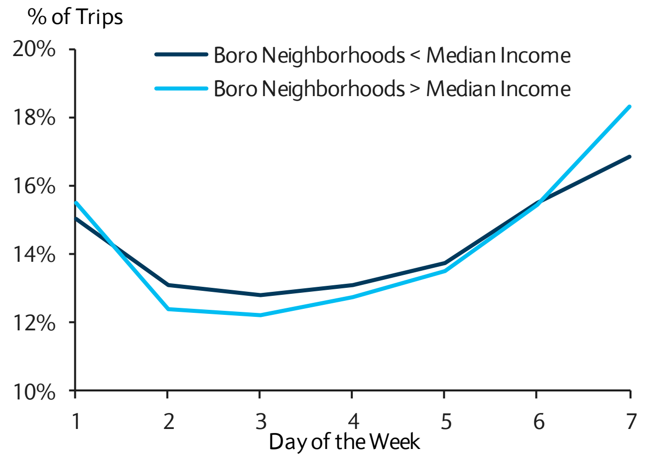
It is also the case that riders originating in the non-gentrifying neighborhoods use ride-hailing differently than those in gentrifying areas. First, they are more likely to use it during the workweek, especially working hours. This suggests that ride-hailing is less associated with leisure travel and more associated with work, with a distinct lower peak around the late evening hours and the weekends (Figures 20 and 21).

FIGURE 20
Rides by hour



Source: New York City Open Data, TLC, Barclays Research

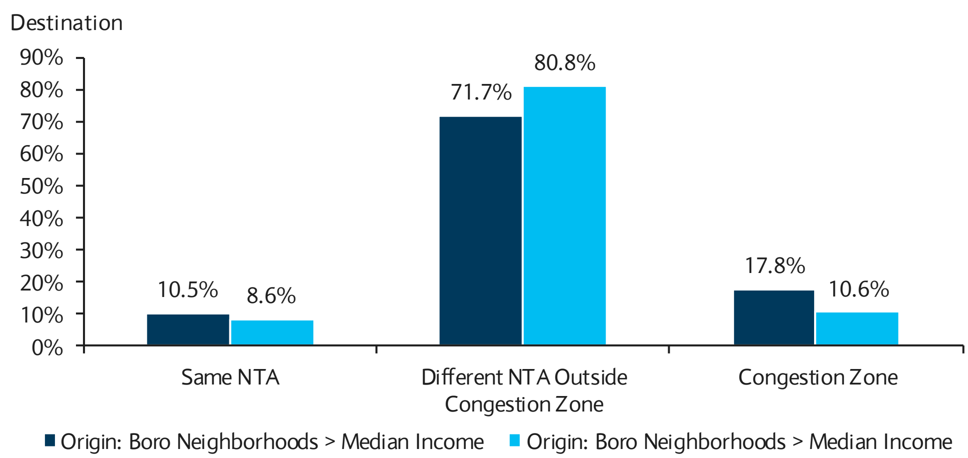
FIGURE 21
Rides by day of week



Source: New York City Open Data, TLC, Barclays Research

Second, these riders are less likely to use ride-hailing to enter the congestion zone (Figure 22). They are more likely to use it to travel to other neighborhoods within the boros. This is possibly linked to New York City's mass transit design, which (particularly the subways) is aimed at taking people into and out of Manhattan. The lines are not designed to move passengers around the boroughs (for example, only one of 25 subway lines does not enter Manhattan). The ride-hailing patterns we see suggest that workers in the non-gentrifying areas may be more likely to work outside of Manhattan and, thus, are less likely to be well served by the existing mass transit options. If true, this suggests that ride-hailing is filling an important gap in the transit infrastructure for a population that likely has few alternative options.

FIGURE 22
Riders in the less gentrified areas are less likely to enter the congestion zone and more likely to travel within the boros



Source: New York City Open Data, TLC, Barclays Research

Regulators should be particularly careful not to disrupt these gains. In the example of New York City, the current congestion zone fees are well designed in this regard; they do not apply to the types of rides typically taken in the neighborhoods that had the least access to ride-hailing before apps. However, blanket bans such as threatened in London obviously do threaten these gains.

IMPLICATIONS FOR UBER & LYFT SHARES

Equity Research: U.S. Internet
Ross Sandler
+1 415 263 4470
ross.sandler@barclays.com
BCI, US

Deepak Mathivanan
+1 415 274 5351
deepak.mathivanan@
barclays.com
BCI, US

Increased Regulation Likely Means Increased Market Share for Uber

Admittedly, it's challenging to anticipate the timing and potential impact of future regulation in specific markets, and by extension the implications for Uber and Lyft shares. Even for regulations that have already been passed, the absolute and relative impact (i.e., one company is impacted more than the other) is tough to parse out.

On the one hand, headlines about Uber potentially losing its operating license in London are company-specific, and in that instance have minimal implications for Lyft as it only operates in North America. On the other hand, regulation in NYC can have a mixed impact – fare hikes by way of congestion surcharges impact both companies equally, while driver utilization thresholds likely impede smaller competitors to a greater degree than larger competitors, given greater driver "liquidity" and rider demand making utilization thresholds easier to achieve.

Over the last six months, and in the context of AB-5 in California, investors frequently ask which company is "worse off" – Lyft, given that it is over-indexed to that market vs. Uber and given its smaller scale to absorb higher costs, or Uber, as it has more absolute drivers in that market and is already "fighting" numerous regulatory battles worldwide? Overall, while we do think it's tough to parse out the impact on a relative basis, here's how we think about potential regulation:

- City/market specific regulation (or headlines) will generally weigh more on the shares of the company that is over-indexed to that specific location (i.e., a "sell first, ask questions later" type response). Regulation in international markets will likely weigh more on Uber given its global footprint (more than 60 countries), as Lyft is just in North America.
- Taxes/fees, such as congestion pricing, should negatively impact trip volumes equally on players, notwithstanding city-specific considerations mentioned immediately above.
- Regulation to improve rider safety, driver earnings, or driver protections, are likely to more negatively impact Lyft than Uber, as Lyft has greater geographic concentration and is subscale vs. Uber, making it more challenging to absorb increased costs or implement new technology (e.g., in-app facial recognition for driver verification).
- Driver utilization thresholds likely favor the largest player in a given market.
- Mandating drivers convert from independent contractors (1099s) to W-2s will hurt all gig economy companies, but relatively benefit the largest player in a given market, as we anticipate that the incumbent will mandate driver exclusivity once drivers are employees.

Net/net, while we cannot make a blanket statement that one company will benefit more than another under every potential future new regulation, overall, we do think increased regulation will further consolidate market share to Uber vs. Lyft, with smaller players more apt to be squeezed out of markets altogether as suboptimal scale makes it more challenging to compete profitably in a more stringent regulatory environment.

DATA APPENDIX

Macro Strategy
Jeffrey Meli **
+1 212 412 2127
jeff.meli@barclays.com
BCI, US

Data Science
Adam Kelleher **
+1 212 526 5697
adam.kelleher@barclays.com
BCI, US

***This author is a member of the Fixed Income, Currencies and Commodities Research department and is not an equity or debt research analyst.*

Key Notes About NYC Trip Data

The taxi trip data is sent by the technology service providers (TSPs) that provide electronic metering in each cab and FHV trip data from the app, community livery, black car, or luxury limousine company, or base, who dispatched the trip.

Some key notes about working with the TLC data:

- The granular data are of individual rides, including for taxis (2010 on), green taxis (2013 on), ride hailing vehicles (2015 on), and livery services (2015 on). A timeline of when different data were collected and available is in Figure 23. There are separate tables in the same dataset covering vehicles licensed to provide rides for each type and currently licensed drivers.
- The TLC data do not provide all the features of interest in examining ride-hailing data, so we also use the following data for additional features:
  - Population data from New York City open data portal
  - Income data from IRS

FIGURE 23
Timeline of TLC Data Key Events

- **2009** New York Taxi and Limousine Commission (TLC) begins to receive taxi trip data from Technology System Providers (TSPs)
- **2013** Green Taxis are added to the fleet. They may only pick up above W 110 St / E 96th St in Manhattan and in the boroughs
- **2015** TLC begins receiving FHV trip data from all bases, including app bases
- **2016** TLC begins publishing FHV trip data from all bases, including app bases. Initial fields are dispatching base, pickup date/time, pickup location
- **2017** TLC begins to receive and publish drop-off date/time and location from all FHV bases
- **2018** TLC adds surcharge to trips that start or end in the "yellow zone", Manhattan below 96th Street. Chicago starts tracking ride hailing data in November.
- **2019** TLC creates new license class, High Volume For Hire Services (HVFHS), for companies doing 10,000 + trips per day through their bases. The license class has additional reporting requirements that create parity with the information received from taxi trips. As of Feb 2019, the companies doing 10k+ trips per day were Uber, Lyft, Via, and Juno. On Jan 1, 2019 TLC launched "Congestion Charge" for trips that touch the "Congestion Zone" of Manhattan below 96th Street. Chicago began publishing ride hailing data in April.

Source: TLC, Barclays Research

The features available for a given ride are listed in Figure 24. There are some differences between the data that are available for taxis and for ride-hailing, but the key fields - time and location of pickups and drop-offs – are available for both.

FIGURE 24

Data Fields Available for Taxis and FHV Vehicles in New York City

Yellow and Green Taxi Fields	
Field Name	**Description**
tpep_pickup_datetime	The date and time when the meter was engaged.
tpep_dropoff_datetime	The date and time when the meter was disengaged.
Passenger_count	The number of passengers in the vehicle.
	This is a driver-entered value.
Trip_distance	The elapsed trip distance in miles reported by the taximeter.
PULocationID	TLC Taxi Zone in which the taximeter was engaged
DOLocationID	TLC Taxi Zone in which the taximeter was disengaged
Fare_amount	The time-and-distance fare calculated by the meter.

FHV (App-Based Ride Hailing) Fields	
Field Name	**Description**
Dispatching_base_num	The TLC Base License Number of the base that dispatched the trip (we can map this bases to Uber/Lyft/Juno/Via)
Pickup_datetime	The date and time of the trip pick-up
DropOff_datetime	The date and time of the trip drop-off
PULocationID	TLC Taxi Zone in which the trip began
DOLocationID	TLC Taxi Zone in which the trip ended
SR_Flag	Indicates if the trip was a part of a shared ride chain offered by a High Volume FHV company (e.g. Uber Pool, Lyft Line). For shared trips, the value is **1**. For non-shared rides, this field is **null**.

Source: TLC

FIGURE 25

Sample Trip Data Point

Taxis

tpep_pickup_datetime	tpep_dropoff_datetime	trip_distance	PULocationID	DOLocationID	fare_amount
2018-01-01 00:21:05	2018-01-01 00:24:23	.50	41	24	4.5
2018-01-01 00:44:55	2018-01-01 01:03:05	2.70	239	140	14
2018-01-01 00:08:26	2018-01-01 00:14:21	.80	262	141	6
2018-01-01 00:20:22	2018-01-01 00:52:51	10.20	140	257	33.5
2018-01-01 00:09:18	2018-01-01 00:27:06	2.50	246	239	12.5

FHV

Pickup_DateTime	DropOff_datetime	PUlocationID	DOlocationID	SR_Flag	Dispatching_base_number
2018-01-30 21:06:50	2018-01-30 21:15:34	56	129	None	B02884
2018-01-30 21:20:36	2018-01-30 21:35:29	129	112	None	B02884
2018-01-30 21:04:45	2018-01-30 21:16:34	47	42	None	B02884
2018-01-30 21:11:51	2018-01-30 21:40:35	49	131	None	B02884
2018-01-30 21:43:39	2018-01-30 21:49:59	98	121	None	B02884

Source: TLC

Some key notes about working with the data:

- Some observations prior to 2018 are missing values for pick-up and drop-off locations. To avoid introducing any bias related to the process by which some data are not included, we use the those from 2018 forward for most of our analysis.

- The locations of pickups and drop-offs are provided by latitude/longitude coordinate prior to 2015, but in later data are coded to one of 263 taxi zones.
  - To add information about the populations of these areas, we mapped them as closely as possible to Neighborhood Tabulation Areas (NTAs), which are aggregations of census tracts used by the New York City government in providing population aggregates on its open data portal. We also mapped NTAs and taxi zones to zip code boundaries to join other data, such as income data from the IRS.
  - We start by aggregating ride volumes at the NTA level (we use neighbourhood and NTA interchangeably in this text). Because the boundaries of NTAs and taxi zones do not match exactly, for each NTA we sum all the rides for the taxi zones that are entirely within an NTA. Then, we split them in any taxi zone between any NTAs that overlap with it, proportionate to the amount of overlap.
  - Some taxi zones do not correspond to population centers and therefore do not have meaningful population features. These areas include JFK and LaGuardia airports, parks, cemeteries, Riker Island, and rides that originated or concluded outside New York City.

ANALYST(S) CERTIFICATION(S):

In relation to our respective sections we, Ryan Preclaw, Ross Sandler, Jeffrey Meli and Adam Kelleher, hereby certify (1) that the views expressed in this research report accurately reflect our personal views about any or all of the subject securities or issuers referred to in this research report and (2) no part of our compensation was, is or will be directly or indirectly related to the specific recommendations or views expressed in this research report.

FICC: IMPORTANT DISCLOSURES

Barclays Research is produced by the Investment Bank of Barclays Bank PLC and its affiliates (collectively and each individually, “Barclays”).

All authors contributing to this research report are Research Analysts unless otherwise indicated. The publication date at the top of the report reflects the local time where the report was produced and may differ from the release date provided in GMT.

Availability of Disclosures:

For current important disclosures regarding any issuers which are the subject of this research report please refer to https://publicresearch.barclays.com or alternatively send a written request to: Barclays Research Compliance, 745 Seventh Avenue, 13th Floor, New York, NY 10019 or call +1-212-526-1072.

Barclays Capital Inc. and/or one of its affiliates does and seeks to do business with companies covered in its research reports. As a result, investors should be aware that Barclays may have a conflict of interest that could affect the objectivity of this report. Barclays Capital Inc. and/or one of its affiliates regularly trades, generally deals as principal and generally provides liquidity (as market maker or otherwise) in the debt securities that are the subject of this research report (and related derivatives thereof). Barclays trading desks may have either a long and / or short position in such securities, other financial instruments and / or derivatives, which may pose a conflict with the interests of investing customers. Where permitted and subject to appropriate information barrier restrictions, Barclays fixed income research analysts regularly interact with its trading desk personnel regarding current market conditions and prices. Barclays fixed income research analysts receive compensation based on various factors including, but not limited to, the quality of their work, the overall performance of the firm (including the profitability of the Investment Banking Department), the profitability and revenues of the Markets business and the potential interest of the firm’s investing clients in research with respect to the asset class covered by the analyst. To the extent that any historical pricing information was obtained from Barclays trading desks, the firm makes no representation that it is accurate or complete. All levels, prices and spreads are historical and do not necessarily represent current market levels, prices or spreads, some or all of which may have changed since the publication of this document. Barclays Research Department produces various types of research including, but not limited to, fundamental analysis, equity-linked analysis, quantitative analysis, and trade ideas. Recommendations and trade ideas contained in one type of Barclays Research may differ from those contained in other types of Barclays Research, whether as a result of differing time horizons, methodologies, or otherwise.

In order to access Barclays Statement regarding Research Dissemination Policies and Procedures, please refer to *https://publicresearch.barcap.com/S/RD.htm*. In order to access Barclays Research Conflict Management Policy Statement, please refer to: *https://publicresearch.barcap.com/S/CM.htm*.

All pricing information is indicative only. Unless otherwise indicated, prices are sourced from Refinitiv and reflect the closing price in the relevant trading market, which may not be the last available price at the time of publication.

Types of investment recommendations produced by Barclays FICC Research:

In addition to any ratings assigned under Barclays’ formal rating systems, this publication may contain investment recommendations in the form of trade ideas, thematic screens, scorecards or portfolio recommendations that have been produced by analysts in FICC Research. Any such investment recommendations produced by non-Credit Research teams shall remain open until they are subsequently amended, rebalanced or closed in a future research report. Any such investment recommendations produced by the Credit Research teams are valid at current market conditions and may not be otherwise relied upon.

Disclosure of other investment recommendations produced by Barclays FICC Research:

Barclays FICC Research may have published other investment recommendations in respect of the same securities/instruments recommended in this research report during the preceding 12 months. To view all investment recommendations published by Barclays FICC Research in the preceding 12 months please refer to *https://live.barcap.com/go/research/Recommendations*.

Legal entities involved in producing Barclays Research:

Barclays Bank PLC (Barclays, UK)

Barclays Capital Inc. (BCI, US)

Barclays Bank Ireland PLC, Frankfurt Branch (BBI, Frankfurt)

Barclays Bank Ireland PLC, Paris Branch (BBI, Paris)

Barclays Bank Ireland PLC, Milan Branch (BBI, Milan)

Barclays Securities Japan Limited (BSJL, Japan)

Barclays Bank PLC, Hong Kong branch (Barclays Bank, Hong Kong)

Barclays Capital Canada Inc. (BCCI, Canada)

Barclays Bank Mexico, S.A. (BBMX, Mexico)

Barclays Securities (India) Private Limited (BSIPL, India)

FICC: IMPORTANT DISCLOSURES CONTINUED

Barclays Bank PLC, India branch (Barclays Bank, India)

Barclays Bank PLC, Singapore branch (Barclays Bank, Singapore)

Barclays Bank PLC, DIFC Branch (Barclays Bank, DIFC)

EQUITY: IMPORTANT DISCLOSURES

Barclays Research is produced by the Investment Bank of Barclays Bank PLC and its affiliates (collectively and each individually, “Barclays”). All authors contributing to this research report are Research Analysts unless otherwise indicated. The publication date at the top of the report reflects the local time where the report was produced and may differ from the release date provided in GMT.

Availability of Disclosures:

Where any companies are the subject of this research report, for current important disclosures regarding those companies please refer to https://publicresearch.barclays.com or alternatively send a written request to: Barclays Research Compliance, 745 Seventh Avenue, 13th Floor, New York, NY 10019 or call +1-212-526-1072.

The analysts responsible for preparing this research report have received compensation based upon various factors including the firm’s total revenues, a portion of which is generated by investment banking activities, the profitability and revenues of the Markets business and the potential interest of the firm’s investing clients in research with respect to the asset class covered by the analyst.

Research analysts employed outside the US by affiliates of Barclays Capital Inc. are not registered/qualified as research analysts with FINRA. Such non-US research analysts may not be associated persons of Barclays Capital Inc., which is a FINRA member, and therefore may not be subject to FINRA Rule 2241 restrictions on communications with a subject company, public appearances and trading securities held by a research analyst’s account.

Analysts regularly conduct site visits to view the material operations of covered companies, but Barclays policy prohibits them from accepting payment or reimbursement by any covered company of their travel expenses for such visits.

Barclays Research Department produces various types of research including, but not limited to, fundamental analysis, equity-linked analysis, quantitative analysis, and trade ideas. Recommendations contained in one type of Barclays Research may differ from those contained in other types of Barclays Research, whether as a result of differing time horizons, methodologies, or otherwise.

In order to access Barclays Statement regarding Research Dissemination Policies and Procedures, please refer to https://publicresearch.barcap.com/S/RD.htm. In order to access Barclays Research Conflict Management Policy Statement, please refer to: https://publicresearch.barcap.com/S/CM.htm.

Materially Mentioned Stocks (Ticker, Date, Price)

Lyft, Inc. (LYFT, 09-Dec-2019, USD 45.42), Equal Weight/Positive, CE/J

Uber Technologies Inc. (UBER, 09-Dec-2019, USD 27.68), Overweight/Positive, A/CD/CE/D/J/K/L/M/N

Unless otherwise indicated, prices are sourced from Bloomberg and reflect the closing price in the relevant trading market, which may not be the last available price at the time of publication.

Disclosure Legend:

A: Barclays Bank PLC and/or an affiliate has been lead manager or co-lead manager of a publicly disclosed offer of securities of the issuer in the previous 12 months.

B: An employee or non-executive director of Barclays PLC is a director of this issuer.

CD: Barclays Bank PLC and/or an affiliate is a market-maker in debt securities issued by this issuer.

CE: Barclays Bank PLC and/or an affiliate is a market-maker in equity securities issued by this issuer.

D: Barclays Bank PLC and/or an affiliate has received compensation for investment banking services from this issuer in the past 12 months.

E: Barclays Bank PLC and/or an affiliate expects to receive or intends to seek compensation for investment banking services from this issuer within the next 3 months.

FA: Barclays Bank PLC and/or an affiliate beneficially owns 1% or more of a class of equity securities of this issuer, as calculated in accordance with US regulations.

FB: Barclays Bank PLC and/or an affiliate beneficially owns a long position of more than 0.5% of a class of equity securities of this issuer, as calculated in accordance with EU regulations.

FC: Barclays Bank PLC and/or an affiliate beneficially owns a short position of more than 0.5% of a class of equity securities of this issuer, as calculated in accordance with EU regulations.

FD: Barclays Bank PLC and/or an affiliate beneficially owns 1% or more of a class of equity securities of this issuer, as calculated in accordance with South Korean regulations.

GD: One of the analysts on the fundamental credit coverage team (or a member of his or her household) has a financial interest in the debt or equity securities of this issuer.

EQUITY: IMPORTANT DISCLOSURES CONTINUED

GE: One of the analysts on the fundamental equity coverage team (or a member of his or her household) has a financial interest in the debt or equity securities of this issuer.

H: This issuer beneficially owns more than 5% of any class of common equity securities of Barclays PLC.

I: Barclays Bank PLC and/or an affiliate is party to an agreement with this issuer for the provision of financial services to Barclays Bank PLC and/or an affiliate.

J: Barclays Bank PLC and/or an affiliate is a liquidity provider and/or trades regularly in the securities of this issuer and/or in any related derivatives.

K: Barclays Bank PLC and/or an affiliate has received non-investment banking related compensation (including compensation for brokerage services, if applicable) from this issuer within the past 12 months.

L: This issuer is, or during the past 12 months has been, an investment banking client of Barclays Bank PLC and/or an affiliate.

M: This issuer is, or during the past 12 months has been, a non-investment banking client (securities related services) of Barclays Bank PLC and/or an affiliate.

N: This issuer is, or during the past 12 months has been, a non-investment banking client (non-securities related services) of Barclays Bank PLC and/or an affiliate.

O: Not in use.

P: A partner, director or officer of Barclays Capital Canada Inc. has, during the preceding 12 months, provided services to the subject company for remuneration, other than normal course investment advisory or trade execution services.

Q: Barclays Bank PLC and/or an affiliate is a Corporate Broker to this issuer.

R: Barclays Capital Canada Inc. and/or an affiliate has received compensation for investment banking services from this issuer in the past 12 months.

S: This issuer is a Corporate Broker to Barclays PLC.

T: Barclays Bank PLC and/or an affiliate is providing equity advisory services to this issuer.

U: The equity securities of this Canadian issuer include subordinate voting restricted shares.

V: The equity securities of this Canadian issuer include non-voting restricted shares.

Risk Disclosure(s)

Master limited partnerships (MLPs) are pass-through entities structured as publicly listed partnerships. For tax purposes, distributions to MLP unit holders may be treated as a return of principal. Investors should consult their own tax advisors before investing in MLP units.

Guide to the Barclays Fundamental Equity Research Rating System:

Our coverage analysts use a relative rating system in which they rate stocks as Overweight, Equal Weight or Underweight (see definitions below) relative to other companies covered by the analyst or a team of analysts that are deemed to be in the same industry (the “industry coverage universe”).

In addition to the stock rating, we provide industry views which rate the outlook for the industry coverage universe as Positive, Neutral or Negative (see definitions below). A rating system using terms such as buy, hold and sell is not the equivalent of our rating system. Investors should carefully read the entire research report including the definitions of all ratings and not infer its contents from ratings alone.

Stock Rating

Overweight - The stock is expected to outperform the unweighted expected total return of the industry coverage universe over a 12-month investment horizon.

Equal Weight - The stock is expected to perform in line with the unweighted expected total return of the industry coverage universe over a 12-month investment horizon.

Underweight - The stock is expected to underperform the unweighted expected total return of the industry coverage universe over a 12-month investment horizon.

Rating Suspended - The rating and target price have been suspended temporarily due to market events that made coverage impracticable or to comply with applicable regulations and/or firm policies in certain circumstances including where the Investment Bank of Barclays Bank PLC is acting in an advisory capacity in a merger or strategic transaction involving the company.

Industry View

Positive - industry coverage universe fundamentals/valuations are improving.

Neutral - industry coverage universe fundamentals/valuations are steady, neither improving nor deteriorating.

Negative - industry coverage universe fundamentals/valuations are deteriorating.

Below is the list of companies that constitute the “industry coverage universe”:

U.S. Internet

Activision Blizzard, Inc. (ATVI)	Alibaba Group Holding Ltd. (BABA)	Alphabet Inc. (GOOGL)
Amazon.com, Inc. (AMZN)	Baidu, Inc. (BIDU)	Booking Holdings Inc. (BKNG)
Chewy, Inc. (CHWY)	eBay, Inc. (EBAY)	Electronic Arts, Inc. (EA)

EQUITY: IMPORTANT DISCLOSURES CONTINUED

Expedia Inc. (EXPE)	Facebook, Inc. (FB)	GoDaddy Inc. (GDDY)
Groupon, Inc. (GRPN)	GrubHub, Inc. (GRUB)	GSX Techedu Inc. (GSX)
IAC/InterActiveCorp (IAC)	JD.com, Inc. (JD)	Lyft, Inc. (LYFT)
Match Group, Inc. (MTCH)	MercadoLibre (MELI)	NetEase, Inc. (NTES)
Peloton Interactive, Inc. (PTON)	Pinduoduo Inc. (PDD)	Pinterest, Inc. (PINS)
Revolve (RVLV)	Shopify (SHOP)	Snap, Inc (SNAP)
Spotify Technology S.A. (SPOT)	Stitch Fix (SFIX)	Take-Two Interactive Software (TTWO)
Tencent Holdings Ltd. (TCEHY)	Trip.com Group Ltd. (TCOM)	Tripadvisor Inc. (TRIP)
Twitter, Inc. (TWTR)	Uber Technologies Inc. (UBER)	Weibo Corporation (WB)
Wix.com Ltd. (WIX)	Yelp, Inc. (YELP)	Zillow, Inc. (ZG)
Zynga Inc. (ZNGA)		

Distribution of Ratings:

Barclays Equity Research has 1608 companies under coverage.

44% have been assigned an Overweight rating which, for purposes of mandatory regulatory disclosures, is classified as a Buy rating; 50% of companies with this rating are investment banking clients of the Firm; 76% of the issuers with this rating have received financial services from the Firm.

39% have been assigned an Equal Weight rating which, for purposes of mandatory regulatory disclosures, is classified as a Hold rating; 45% of companies with this rating are investment banking clients of the Firm; 69% of the issuers with this rating have received financial services from the Firm.

15% have been assigned an Underweight rating which, for purposes of mandatory regulatory disclosures, is classified as a Sell rating; 30% of companies with this rating are investment banking clients of the Firm; 64% of the issuers with this rating have received financial services from the Firm.

Guide to the Barclays Research Price Target:

Each analyst has a single price target on the stocks that they cover. The price target represents that analyst's expectation of where the stock will trade in the next 12 months. Upside/downside scenarios, where provided, represent potential upside/potential downside to each analyst's price target over the same 12-month period.

Top Picks:

Barclays Equity Research's "Top Picks" represent the single best alpha-generating investment idea within each industry (as defined by the relevant "industry coverage universe"), taken from among the Overweight-rated stocks within that industry. Barclays Equity Research publishes "Top Picks" reports every quarter and analysts may also publish intra-quarter changes to their Top Picks, as necessary. While analysts may highlight other Overweight-rated stocks in their published research in addition to their Top Pick, there can only be one "Top Pick" for each industry. To view the current list of Top Picks, go to the Top Picks page on Barclays Live (https://live.barcap.com/go/keyword/TopPicks).

To see a list of companies that comprise a particular industry coverage universe, please go to https://publicresearch.barclays.com.

Types of investment recommendations produced by Barclays Equity Research:

In addition to any ratings assigned under Barclays' formal rating systems, this publication may contain investment recommendations in the form of trade ideas, thematic screens, scorecards or portfolio recommendations that have been produced by analysts within Equity Research. Any such investment recommendations shall remain open until they are subsequently amended, rebalanced or closed in a future research report.

Disclosure of other investment recommendations produced by Barclays Equity Research:

Barclays Equity Research may have published other investment recommendations in respect of the same securities/instruments recommended in this research report during the preceding 12 months. To view all investment recommendations published by Barclays Equity Research in the preceding 12 months please refer to *https://live.barcap.com/go/research/Recommendations*.

Legal entities involved in producing Barclays Research:

Barclays Bank PLC (Barclays, UK)

Barclays Capital Inc. (BCI, US)

Barclays Bank Ireland PLC, Frankfurt Branch (BBI, Frankfurt)

Barclays Bank Ireland PLC, Paris Branch (BBI, Paris)

Barclays Bank Ireland PLC, Milan Branch (BBI, Milan)

Barclays Securities Japan Limited (BSJL, Japan)

Barclays Bank PLC, Hong Kong branch (Barclays Bank, Hong Kong)

Barclays Capital Canada Inc. (BCCI, Canada)

Barclays Bank Mexico, S.A. (BBMX, Mexico)

EQUITY: IMPORTANT DISCLOSURES CONTINUED

Barclays Securities (India) Private Limited (BSIPL, India)

Barclays Bank PLC, India branch (Barclays Bank, India)

Barclays Bank PLC, Singapore branch (Barclays Bank, Singapore)

Barclays Bank PLC, DIFC Branch (Barclays Bank, DIFC)

IMPORTANT DISCLOSURES CONTINUED

Lyft, Inc. (LYFT / LYFT)	Stock Rating	Industry View
USD 45.42 (09-Dec-2019)	**EQUAL WEIGHT**	**POSITIVE**

Rating and Price Target Chart - USD (as of 09-Dec-2019)

Source: IDC, Barclays Research

Currency=USD

Publication Date	Closing Price	Rating	Adjusted Price Target
30-Oct-2019	44.11		51.00
08-Aug-2019	62.10		63.00
04-Jun-2019	59.17	Equal Weight	55.00

Source: Bloomberg, Barclays Research

Historical stock prices and price targets may have been adjusted for stock splits and dividends.

Link to Barclays Live for interactive charting

CE: Barclays Bank PLC and/or an affiliate is a market-maker in equity securities issued by Lyft, Inc..

J: Barclays Bank PLC and/or an affiliate is a liquidity provider and/or trades regularly in the securities by Lyft, Inc. and/or in any related derivatives.

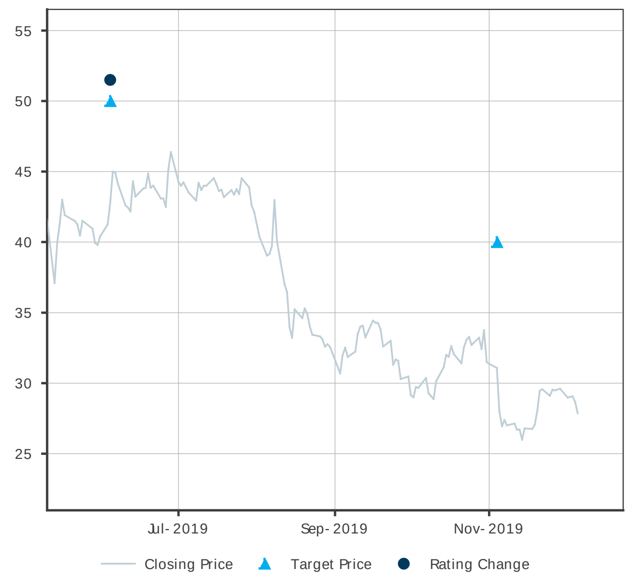
Valuation Methodology: $51 PT based on 3x our FY20/21E revenue estimates.

Risks which May Impede the Achievement of the Barclays Research Valuation and Price Target: Decelerating booking growth, high cash burn, and limited capital reserves may make it more challenging to fund incremental growth investments. Lyft's lower utilization and scale may also be a structural disadvantage. An upside risk is that Lyft's single-service, US market focus may enable it to take share and achieve above peer level ANR growth, potentially driving upside to estimates and the stock.

IMPORTANT DISCLOSURES CONTINUED

Uber Technologies Inc. (UBER / UBER)	Stock Rating	Industry View
USD 27.68 (09-Dec-2019)	**OVERWEIGHT**	**POSITIVE**

Rating and Price Target Chart - USD (as of 09-Dec-2019)



Source: IDC, Barclays Research

Currency=USD

Publication Date	Closing Price	Rating	Adjusted Price Target
04-Nov-2019	31.08		40.00
04-Jun-2019	42.75	Overweight	50.00

Source: Bloomberg, Barclays Research

Historical stock prices and price targets may have been adjusted for stock splits and dividends.

Link to Barclays Live for interactive charting

A: Barclays Bank PLC and/or an affiliate has been lead manager or co-lead manager of a publicly disclosed offer of securities of Uber Technologies Inc. in the previous 12 months.

CD: Barclays Bank PLC and/or an affiliate is a market-maker in debt securities issued by Uber Technologies Inc..

CE: Barclays Bank PLC and/or an affiliate is a market-maker in equity securities issued by Uber Technologies Inc..

D: Barclays Bank PLC and/or an affiliate has received compensation for investment banking services from Uber Technologies Inc. in the past 12 months.

J: Barclays Bank PLC and/or an affiliate is a liquidity provider and/or trades regularly in the securities by Uber Technologies Inc. and/or in any related derivatives.

K: Barclays Bank PLC and/or an affiliate has received non-investment banking related compensation (including compensation for brokerage services, if applicable) from Uber Technologies Inc. within the past 12 months.

L: Uber Technologies Inc. is, or during the past 12 months has been, an investment banking client of Barclays Bank PLC and/or an affiliate.

M: Uber Technologies Inc. is, or during the past 12 months has been, a non-investment banking client (securities related services) of Barclays Bank PLC and/or an affiliate.

N: Uber Technologies Inc. is, or during the past 12 months has been, a non-investment banking client (non-securities related services) of Barclays Bank PLC and/or an affiliate.

Valuation Methodology: Our $40 PT is based on a 3x EV/revenue multiple on an average of our 2020E/2021E revenue estimates.

Risks which May Impede the Achievement of the Barclays Research Valuation and Price Target: Limited valuation support suggests multiple could re-rate lower given high cash burn in event broader equity markets decline. Decelerating gross bookings growth, despite modest 2% market penetration, may suggest anticipated long runway of market penetration may not fully materialize. Take rate declines may not inflect as quickly as expected, pressuring margins and contributing to negative estimate revisions. Global scale may not be as meaningful for a localized business. Market share losses in some countries may persist.

Japan: This material is being distributed to institutional investors in Japan by Barclays Securities Japan Limited. Barclays Securities Japan Limited is a joint-stock company incorporated in Japan with registered office of 6-10-1 Roppongi, Minato-ku, Tokyo 106-6131, Japan. It is a subsidiary of Barclays Bank PLC and a registered financial instruments firm regulated by the Financial Services Agency of Japan. Registered Number: Kanto Zaimukyokucho (kinsho) No. 143.

Asia Pacific (excluding Japan): Barclays Bank PLC, Hong Kong Branch is distributing this material in Hong Kong as an authorised institution regulated by the Hong Kong Monetary Authority. Registered Office: 41/F, Cheung Kong Center, 2 Queen's Road Central, Hong Kong.

All Indian securities-related research and other equity research produced by Barclays' Investment Bank are distributed in India by Barclays Securities (India) Private Limited (BSIPL). BSIPL is a company incorporated under the Companies Act, 1956 having CIN U67120MH2006PTC161063. BSIPL is registered and regulated by the Securities and Exchange Board of India (SEBI) as a Research Analyst: INH000001519; Portfolio Manager INP000002585; Stock Broker/Trading and Clearing Member: National Stock Exchange of India Limited (NSE) Capital Market INB231292732, NSE Futures & Options INF231292732, NSE Currency derivatives INE231450334, Bombay Stock Exchange Limited (BSE) Capital Market INB011292738, BSE Futures & Options INF011292738; Depository Participant (DP) with the National Securities & Depositories Limited (NSDL): DP ID: IN-DP-NSDL-299-2008; Investment Adviser: INA000000391. The registered office of BSIPL is at 208, Ceejay House, Shivsagar Estate, Dr. A. Besant Road, Worli, Mumbai – 400 018, India. Telephone No: +91 2267196000. Fax number: +91 22 67196100. Any other reports produced by Barclays' Investment Bank are distributed in India by Barclays Bank PLC, India Branch, an associate of BSIPL in India that is registered with Reserve Bank of India (RBI) as a Banking Company under the provisions of The Banking Regulation Act, 1949 (Regn No BOM43) and registered with SEBI as Merchant Banker (Regn No INM000002129) and also as Banker to the Issue (Regn No INBI00000950). Barclays Investments and Loans (India) Limited, registered with RBI as Non Banking Financial Company (Regn No RBI CoR-07-00258), and Barclays Wealth Trustees (India) Private Limited, registered with Registrar of Companies (CIN U93000MH2008PTC188438), are associates of BSIPL in India that are not authorised to distribute any reports produced by Barclays' Investment Bank.

This material is distributed in Singapore by the Singapore branch of Barclays Bank PLC, a bank licensed in Singapore by the Monetary Authority of Singapore. For matters in connection with this material, recipients in Singapore may contact the Singapore branch of Barclays Bank PLC, whose registered address is 10 Marina Boulevard, #23-01 Marina Bay Financial Centre Tower 2, Singapore 018983.

This material is distributed to persons in Australia by Barclays Bank PLC. None of Barclays Bank PLC, nor any other Barclays group entity, holds an Australian financial services licence and instead relies on an exemption from the requirement to hold such a licence. This material is intended to only be distributed to "wholesale clients" as defined by the Australian Corporations Act 2001. This material is distributed in New Zealand by Barclays Bank PLC, but it has not been registered, filed or approved by any New Zealand regulatory authority or under or in accordance with the Financial Markets Conduct Act of 2013, and this material is not a disclosure document under New Zealand law.

Middle East: Nothing herein should be considered investment advice as defined in the Israeli Regulation of Investment Advisory, Investment Marketing and Portfolio Management Law, 1995 ("Advisory Law"). This document is being made to eligible clients (as defined under the Advisory Law) only. Barclays Israeli branch previously held an investment marketing license with the Israel Securities Authority but it cancelled such license on 30/11/2014 as it solely provides its services to eligible clients pursuant to available exemptions under the Advisory Law, therefore a license with the Israel Securities Authority is not required. Accordingly, Barclays does not maintain an insurance coverage pursuant to the Advisory Law.

This material is distributed in the United Arab Emirates (including the Dubai International Financial Centre) and Qatar by Barclays Bank PLC. Barclays Bank PLC in the Dubai International Financial Centre (Registered No. 0060) is regulated by the Dubai Financial Services Authority (DFSA). Principal place of business in the Dubai International Financial Centre: The Gate Village, Building 4, Level 4, PO Box 506504, Dubai, United Arab Emirates. Barclays Bank PLC-DIFC Branch, may only undertake the financial services activities that fall within the scope of its existing DFSA licence. Related financial products or services are only available to Professional Clients, as defined by the Dubai Financial Services Authority. Barclays Bank PLC in the UAE is regulated by the Central Bank of the UAE and is licensed to conduct business activities as a branch of a commercial bank incorporated outside the UAE in Dubai (Licence No.: 13/1844/2008, Registered Office: Building No. 6, Burj Dubai Business Hub, Sheikh Zayed Road, Dubai City) and Abu Dhabi (Licence No.: 13/952/2008, Registered Office: Al Jazira Towers, Hamdan Street, PO Box 2734, Abu Dhabi). This material does not constitute or form part of any offer to issue or sell, or any solicitation of any offer to subscribe for or purchase, any securities or investment products in the UAE (including the Dubai International Financial Centre) and accordingly should not be construed as such. Furthermore, this information is being made available on the basis that the recipient acknowledges and understands that the entities and securities to which it may relate have not been approved, licensed by or registered with the UAE Central Bank, the Dubai Financial Services Authority or any other relevant licensing authority or governmental agency in the UAE. The content of this report has not been approved by or filed with the UAE Central Bank or Dubai Financial Services Authority. Barclays Bank PLC in the Qatar Financial Centre (Registered No. 00018) is authorised by the Qatar Financial Centre Regulatory Authority (QFCRA). Barclays Bank PLC-QFC Branch may only undertake the regulated activities that fall within the scope of its existing QFCRA licence. Principal place of business in Qatar: Qatar Financial Centre, Office 1002, 10th Floor, QFC Tower, Diplomatic Area, West Bay, PO Box 15891, Doha, Qatar. Related financial products or services are only available to Business Customers as defined by the Qatar Financial Centre Regulatory Authority.

Russia: This material is not intended for investors who are not Qualified Investors according to the laws of the Russian Federation as it might contain information about or description of the features of financial instruments not admitted for public offering and/or circulation in the Russian Federation and thus not eligible for non-Qualified Investors. If you are not a Qualified Investor according to the laws of the Russian Federation, please dispose of any copy of this material in your possession.

IRS Circular 230 Prepared Materials Disclaimer: Barclays does not provide tax advice and nothing contained herein should be construed to be tax advice. Please be advised that any discussion of U.S. tax matters contained herein (including any attachments) (i) is not intended or written to be used, and cannot be used, by you for the purpose of avoiding U.S. tax-related penalties; and (ii) was written to support the promotion or marketing of the transactions or other matters addressed herein. Accordingly, you should seek advice based on your particular circumstances from an independent tax advisor.