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To: Professor Yinger
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Re: Coronavirus, Public Transit, and Building System Resilience

Introduction

The weaknesses of the public transportation systems of two of the largest cities in the United States – New York City and Boston – have been apparent for many years. The recent spread of the novel coronavirus has further exposed these issues and demonstrated the urgency with which upgrades to the system are needed. As the U.S. continues to fight the spread of the virus, city and state leaders should ensure that updates to the transit system are included in their plans, increasing their resiliency and improving their ability to respond to the next crisis.

PART I: Issues facing public transit in Boston and New York

The MBTA in Boston is facing serious issues. A long legacy of underfunding has resulted in a backlog of deferred maintenance on old equipment that remains in service. A lack of sufficient capacity results in overcrowding and a general lack of reliability. Recently, a serious derailment caused massive delays for commuters and further eroded customer confidence in the service.¹ In February 2020, only 41% of survey respondents felt the T provides reliable service. In the last year, the average passenger rating of the T declined from 3.16 out of 5 to 2.94 out of 5.² As customer faith in transit erodes, people turn to single passenger cars to get to work. This generates significant negative externalities in terms of pollution and congestion and creates a vicious cycle with bus transit: as more people leave the T to drive, congestion increases, which further erodes the buses' ability to run on time. These externalities significantly affect low income riders who disproportionately utilize bus transportation and are less likely to own a personal car.

The MTA has suffered similar issues of underfunding, outdated equipment, and insufficient capital investment. Overcrowding and unreliability of service are common complaints. The MTA remains one of the least accessible major subways in the world; fewer than a quarter of subway stations have elevators.³ However, significant improvements were underway during Andy Byford's two-year tenure as head of the MTA. January 2020, Byford's last month at the agency, saw the lowest number of delays in seven years, with 83% of trains on time.⁴ The New York City subways face similar middling levels of customer satisfaction as Boston, but are on an upward sloping trajectory: "The number of pleased subway passengers zoomed from 34.8% in 2018 to 49.3% last year; for bus riders, the increase was less dramatic — 49.8%, up from 43.8%."⁵ With Byford's recent exit and a leaderless MTA facing a crisis scenario, the ability to retain and expand upon these newfound gains is uncertain.

PART II: Effects of COVID19 on Boston and New York

The first positive test of covid19 in Boston was confirmed on March 1st. The number of positive cases increased rapidly and by March 10th, Governor Charlie Baker declared a state of emergency.⁶ By March 24th, the governor ordered all non-essential workers to stay home.⁷ Many essential workers in Boston

need the T to access their jobs and others who lack private transportation options still need to access essential services. The T continued providing service at reduced levels while enhancing their cleaning and sterilization procedures.⁸ To protect drivers, buses were changed to back-door boarding unless seniors or persons with disabilities needed to use the accessibility options that are only available at the front of the bus. All non-essential workers were heavily discouraged from utilizing transit.⁹

Rough estimates from the MBTA show that transit ridership on subway lines has decreased from 69%-91% of its regular levels. Bus ridership has also decreased significantly – from 59%-68% of its normal levels – but less than subway riders.¹⁰ Subway riders are more likely to have higher incomes and therefore may work in industries where they can work from home. Bus riders typically have lower income and may be working in essential services which may be why the decline is less sharp. The T estimates that they lost \$55 million per month during the pandemic, which is about half of what the T collects in a typical month.¹¹ Shifting to back-door boarding essentially made all bus lines free to ride as the only fare payment points are at the front of the bus. The declines are likely to be greater in subsequent months. Many regular transit riders purchase calendar-based monthly passes at the beginning of each month which the T is not refunding.¹²

Fares typically account for about one-third of the T's operating revenue.¹³ About half of the T's revenue is from part of the MA sales tax¹⁴ which the state anticipates will be significantly lower due to impacts from business closures.¹⁵ Overall, the T expects to lose \$231 million this fiscal year. The T expects to be able to cover some of these losses with federal funds: the T's Chief Financial Officer expects that the T will be eligible for \$840 million in CARES funding. Reducing service below normal levels has helped reduce the deficit somewhat, though increasing sterilization and purchases of personal protective equipment have increased costs. The T also plans to monitor hiring and spending in the next few months.¹⁶

In New York City, coronavirus response measures lagged as well. On March 9th, with 100 coronavirus cases across New York State, the city's messaging was that public transit "remained safe" and that "people should go about their everyday lives - use the subway, take the bus."¹⁷ By the end of the next week, official policy had drastically changed. Cleaning schedules were increased, nonessential workers were asked to avoid public transit, and buses began the same backdoor-only boarding process as the MBTA, which allowed drivers to remain at a safer distance from passengers.¹⁸

Initially, the MTA did not allow workers to wear masks while on duty, arguing that "since a mask is not part of the authorized uniform and not medically recommended at this time they may not be worn by uniformed MTA employees."¹⁹ After pushback from the Transport Workers' Union, the agency reversed its position. The efficacy of masks in protecting the general population against the virus is still being debated, but transit workers' fears are not unfounded. In the last week of March, 574 transit workers called out sick, three times the average sick rate; an additional 2200 transit workers are currently under quarantine and unable to work.²⁰ As of May 5th, with New York City at the center of the global pandemic, over 100 transit workers have died of coronavirus complications.²¹ While reduced ridership has allowed fewer trains and busses to run, there have still been scattered reports of crowding, with passengers unable to safely socially distance. However, due to the steep drop in available drivers, the chair of the MTA acknowledged that the city does not have the ability to add additional service to

combat this crowding.²² On April 30th, Governor Cuomo announced that the MTA would take the drastic step to shut down its subway service from 1 AM to 5 AM each night, in order to ensure that trains can be thoroughly cleaned and disinfected on a more regular basis.²³ Instead, during those hours additional busses will run along train routes and to essential hubs like hospitals and warehouses.²⁴ He also announced additional temperature checks and regular coronavirus tests would be administered to transit workers, to better track and limit the virus's spread in these essential personnel.²⁵

As of March 25th, subway ridership in NYC was down an estimated 90% from the same time last year, translating to financial losses of \$125 million per week.²⁶ The MTA is also paying \$500,000 in death benefits to the families of workers who passed away from coronavirus, over \$50 million in total as of May 5th.²⁷ While the MTA is expected to receive \$3.8 billion in federal funds from the recent stimulus package, the agency is estimating that its deficit for the year will be over \$6.5 billion. Officials are hoping for a second round of additional federal aid to bridge the gap, as well as planning to do additional borrowing and pulling funds from the capital improvement plan budget; all new capital construction spending has been frozen indefinitely.²⁸

PART III: Building a More Resilient Transit System

Emergency Management Planning

The most immediate and directly relevant suggestion for building more resilient transit systems is to have in place robust emergency management plans that account for a broad range of scenarios, from the commonplace to the extreme. These plans should have clear implementation triggers and step-by-step implementation and escalation guidelines. Both New York City and Boston have Departments of Emergency Management that transit agencies should be coordinating with and leveraging the expertise of.

According to The City, a local NYC news outlet, the MTA has had a pandemic response preparedness plan since at least 2012; many cities established one after the swine flu pandemic of 2009.²⁹ This plan does include planning for key response components, including mapping service reductions, limiting transit worker contact with the public, and increased disinfection of public transit.³⁰ The plan also called for keeping a six-week supply of protective equipment; MTA officials say they have maintained this stockpile, but transit workers reported struggling to get access to protective equipment for over a month before the MTA began providing masks to all their workers.³¹ In addition to issues with personal protective equipment, the main failures of New York's emergency response plan are its belated and haphazard enactment, and its reliance on the presumed assistance of a strong national response.³²

Boston, in contrast, has no standard written emergency guidelines at all, which has resulted in uneven responses to events as common as severe snowstorms.³³ While the MBTA has taken many of the measures considered to be best practice in controlling the spread of the virus, some key measures have been missed, including limiting the passenger capacity of buses. Much has fallen to the transit union to manage, including obtaining sufficient supplies of protective equipment and keeping workers informed of COVID19 updates. A comprehensive emergency preparedness plan will allow Boston to act more swiftly and consistently during the next crisis situation that arises – key values in an emergency.

Contactless Payment Systems

One essential component of New York's transit modernization plan is the shift to contactless payment systems like those of London's Oyster Card and Sydney's Opal Card. These tap-to-pay systems allow commuters to bypass swiping traditional MetroCards and use a bank card, phone app, or "tappable" MetroCard to enter the subway. The NYC system, OMNI, has so far been installed along three of the city's subway lines and on 30 bus routes; installation was expected to be complete throughout the system by 2023, but now is likely on hold due to the MTA capital projects freeze.³⁴

Tap-to-pay systems are an important part of building resilient transit. They are easier to sanitize and create fewer contact points for spreading germs. They save passengers time and limit congestion at entry points. This is especially true for buses, as tap-to-pay will allow for all-door boarding on every bus; this is estimated to significantly speed up bus routes end-to-end.³⁵ OMNI will be supported on Metro North and the Long Island Railroad, creating a more seamless regional transit experience. Transit advocates also hope that OMNI access could lead to policy changes that promote equity in transit. London has established a system that caps maximum fares per day, week, or month.³⁶ Passing a similar policy in NYC would allow low-income New Yorkers to take advantage of the benefits of a 30-day MetroCard without having to pay the monthly \$121 upfront.

Boston has had a rudimentary version of contactless payment called the CharlieCard since 2006. The CharlieCard is an incomplete adoption of the system though; it is available for the subway and may be used on buses but it does not link with the city's commuter rail. Nor does it allow direct payment at entry via credit cards or smartphones. CharlieCards can be reloaded online but the online addition only registers if the card is tapped on a fare machine in a subway terminal, not on a bus. Riders who only take buses must reload their CharlieCard with cash only via the onboard bus payment machine which is often malfunctioning.³⁷ A contract for \$723 million was signed in 2017 to make these modern system updates, dubbed AFC2.0.³⁸ Delays and uncertainty plagued this deal, as deadlines were pushed and pilot programs failed to materialize. In May 2019, the MBTA's General Manager announced that, due to "policy and technological complexities", the project was "adjusting its timelines" and declined to share new estimates for project completion, essentially shelving Boston's switch to full contactless payment indefinitely.³⁹

Driver Only Operation

Another key piece of transit modernization is to move to Driver Only Operation (DOO) on subways. New York City is one of the last major subway systems to require every train to have both a driver and a separate conductor to manage train doors. The London Underground, by contrast, is entirely single-manned, as are most Japanese and German subway lines. Boston completed its own shift to Driver Only Operation in 2012.⁴⁰ In a system where labor costs and healthcare spending are 46% of total expenditures, the current practice of overstaffing is costing New York unnecessary millions each year.⁴¹ While union representatives argue that two-person trains are required as an issue of safety, the worldwide shift towards DOO has not proven that to be the case. New York is neither a larger train system, nor does it carry more daily passengers than successful DOO systems like Paris, so there is no reason to think the MTA's record would be an exception to implementation results seen elsewhere.⁴²

Since its shift to single-manned trains, Boston has saved an estimated \$1.6 million annually, with no negative effects on passenger welfare or safety.⁴³ Single-manned trains are also easier to staff when many MTA workers are out sick, resulting in fewer disruptions to service.

Updating Signals and Infrastructure

Outdated infrastructure, including old signals, undermine the speed and efficiency of trains. Signals regulate the amount of space that is required between trains which limits the number of trains that can pass through a station in a given amount of time. Both New York and Boston utilize old signal technology that divides subway tracks into blocks of 1,000 feet. Trains are given buffers of one or two blocks ahead and behind to ensure safe separation. Train dispatchers know that the train is within one block but cannot identify its exact location on the track. Because of this, extra space is maintained before and after the train just in case the estimate of the train's true location is wrong. However, as ridership on the subway has increased in recent years, overcrowding has increased because the number of trains per hour cannot be safely increased with the current signals. The outdated technology also prevents train dispatchers from reacting to dynamic situations. A delay on one train quickly cascades down the line, worsening overcrowding and creating new delays.⁴⁴ Signal problems cause approximately 13% of all subway delays in NYC and are the second most common reason for weekday delays.⁴⁵ They caused about 30% of all subway delays in Boston.⁴⁶

Updating the infrastructure and technology of subway signals increases passenger safety, increases the efficiency of trains, and reduces delays. These updates are not without costs, however. Besides the signals themselves, additional track changes and train updates are required. This construction is time intensive and often requires subway lines to be closed for work to be completed. It is rare for ridership to be low enough for these diversions to occur without inconveniencing passengers.⁴⁷ Given the decline in ridership due to COVID19 and the expected federal assistance to cover operating costs, the MBTA and the MTA should devote their capital reserves to updating their signal infrastructure. This increases the safety of passengers as well as operators. Fewer staff are needed to operate each train which reduces labor costs and potential exposure during public health crises. Improving signals also improves reliability which benefits riders during non-emergency situations as well.

Congestion Pricing

COVID19 has caused a dramatic reduction in car traffic in addition to reductions in transit ridership. Though experts believe that the drastic changes to the economy will continue for many months, private car traffic may resume more quickly than transit ridership once the economy reopens. Those who are able may use their personal cars or ride share services to avoid sharing space on public transit. To prevent a resurgence of choking traffic (Boston is ranked 1st in the nation in traffic and New York City is ranked 4th)⁴⁸ and to diversify the revenue sources for their transit agencies, Boston and New York should speed action toward implementing a congestion price. This is a long-term solution meant to reduce the negative externalities of driving while also helping to resolve long-standing maintenance and capacity issues that public transit faces. Currently, transit and traffic are stuck in a negative feedback loop: congestion slows down transit which frustrates passengers. Passengers choose to drive instead of taking transit. Congestion therefore gets worse which further slows transit. Under a congestion price,

people are induced to take transit, highway congestion decreases, transit moves faster and is more reliable, and ultimately revenues increase. The congestion price ensures capacity can be expanded to accommodate the new riders whose revenues become a larger part of the operating budget.⁴⁹

Congestion pricing has been successfully implemented in various forms in major cities around the world. London implemented a congestion fee in 2003; motorists entering the central city during peak hours must pay a flat rate of just over \$14. There are exceptions made for certain vehicles, including those used by people with disabilities, low emissions vehicles, and those of residents.⁵⁰ In just one year, London added 29,000 new bus riders and now two-thirds of all trips into the central city are made on public transit. In the first ten years, car traffic in the city center has dropped 39%, and by 2017, the congestion price generated over \$185 million dollars in net revenue.⁵¹ However, the exemption for ride share vehicles is literally and figuratively slowing the benefits of this charge. Average traffic speeds have declined and buses have lost ridership, largely due to the impact of ride sharing services like Uber and Lyft.⁵² Boston and New York should ensure that taxis and ride shares must also pay a congestion price, particularly when private ride share companies subsidize their prices to keep fares artificially low. Lastly, congestion pricing is often labeled regressive as it varies by time but not by income. While congestion prices might fall harder on lower-income road users, the lowest income residents stand to gain the greatest benefit as they are most likely to commute by bus whose reliability will improve with declines in congestion. And revenue generated by the pricing can be refunded back to low-income drivers who are significantly impacted.⁵³ Congestion pricing can be difficult to implement politically - the New York State Legislature has approved a congestion price though its implementation has been delayed into late 2020⁵⁴ - but it is a wise alternative whose success is supported by evidence around the world.

Conclusion

As this crisis continues to unfold and tax revenues plummet, cities and states are going to have to make tough budgetary choices. No level of cuts to service will be draconian enough for localities to make up the deficit on their own; massive assistance from the federal government will be required under any feasible plan. However, with crisis also comes opportunity, and the chance to reevaluate collective priorities. In our warming world, strengthening mass transit is more important than ever, but it will require creative leadership and vision to enact the important changes outlined above.

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Kenneth Small is a Research Professor and Professor Emeritus in Economics at the University of California, Irvine. Access Magazine is an online publication that reports on research conducted by the University of California Transportation Center and the University of California Center on Economic Competitiveness to translate academic articles into accessible prose.

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The Conversation is an independent, non-profit news source that publish easily understood news articles written by experts in their field.

⁵² Ibid.

⁵³ Manville, Michael, "Is congestion pricing fair to the poor?" August 14, 2017, <https://medium.com/100-hours/is-congestion-pricing-fair-to-the-poor-62e281924ca3>

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⁵⁴ McKinley, Jesse and Vivian Wang, "New York State Budget Deal Brings Congestion Pricing, Plastic Bag Ban and Mansion Tax," *New York Times*, March 31, 2019, <https://www.nytimes.com/2019/03/31/nyregion/budget-new-york-congestion-pricing.html>

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