

AVs and Transit

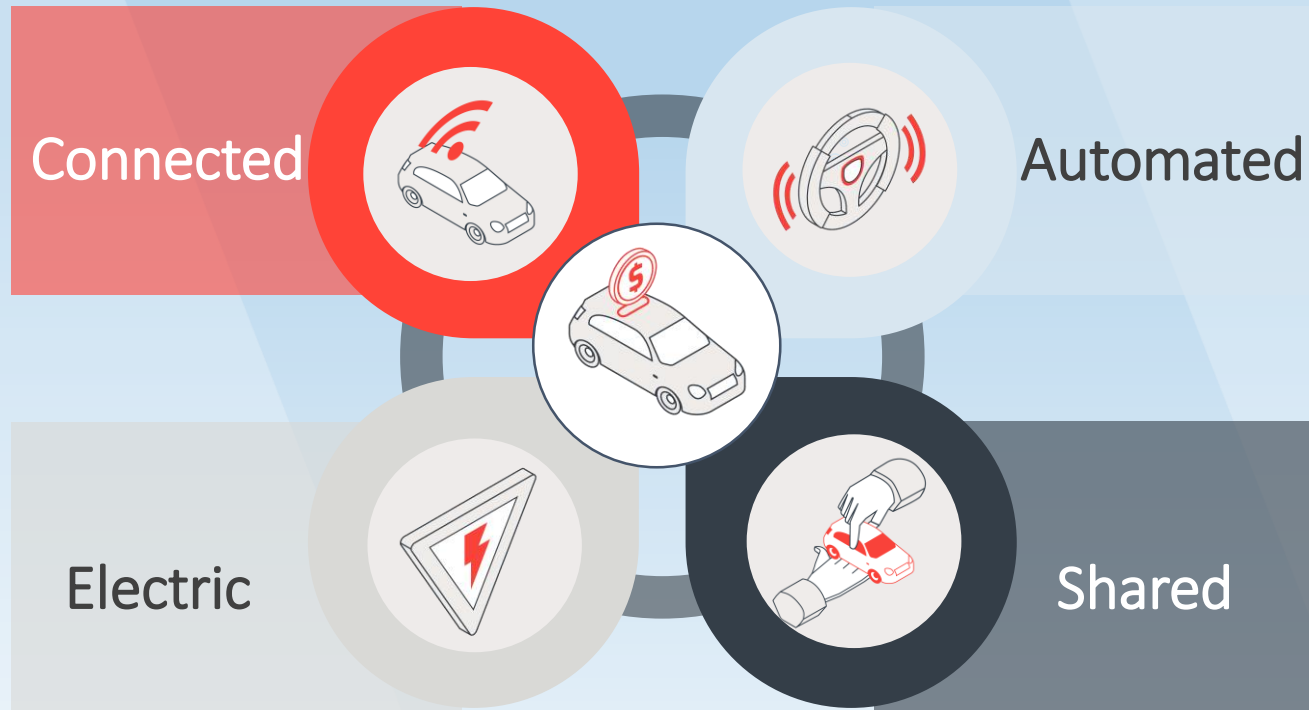
Stephen Buckley, P.E., AICP

NACV Summit

June 12, 2018



New Mobility



Source: WSP, 2017.



Source: Google, 2014.

The Promise of AVs

- Improved road safety
- More equitable access for all
- Economic benefits of less lost productivity
- Increased travel options
- Reduced stress of driving
- Reduced fuel consumption and emissions
- Reduced collisions, reducing incident-related congestion
- *In the future*, potentially greater capacity, reducing recurring congestion



Key Factors



**Speed of
Technological
Advancement**



Economics



**Public
Acceptance**



Political Support



**Market for a
Shared Model**

Two Paths



Private Ownership Model

Driven by Auto Industry
Incremental Moves in Functionalities
Mostly Privately Owned
Here Today



Shared Mobility Model (MaaS/TaaS/Robo-taxis)

**Initially Driven by Tech and Ride-Hailing
Companies**
Jump to Fully Automated
Transportation-as-a-Service
A few (or many, many) years away

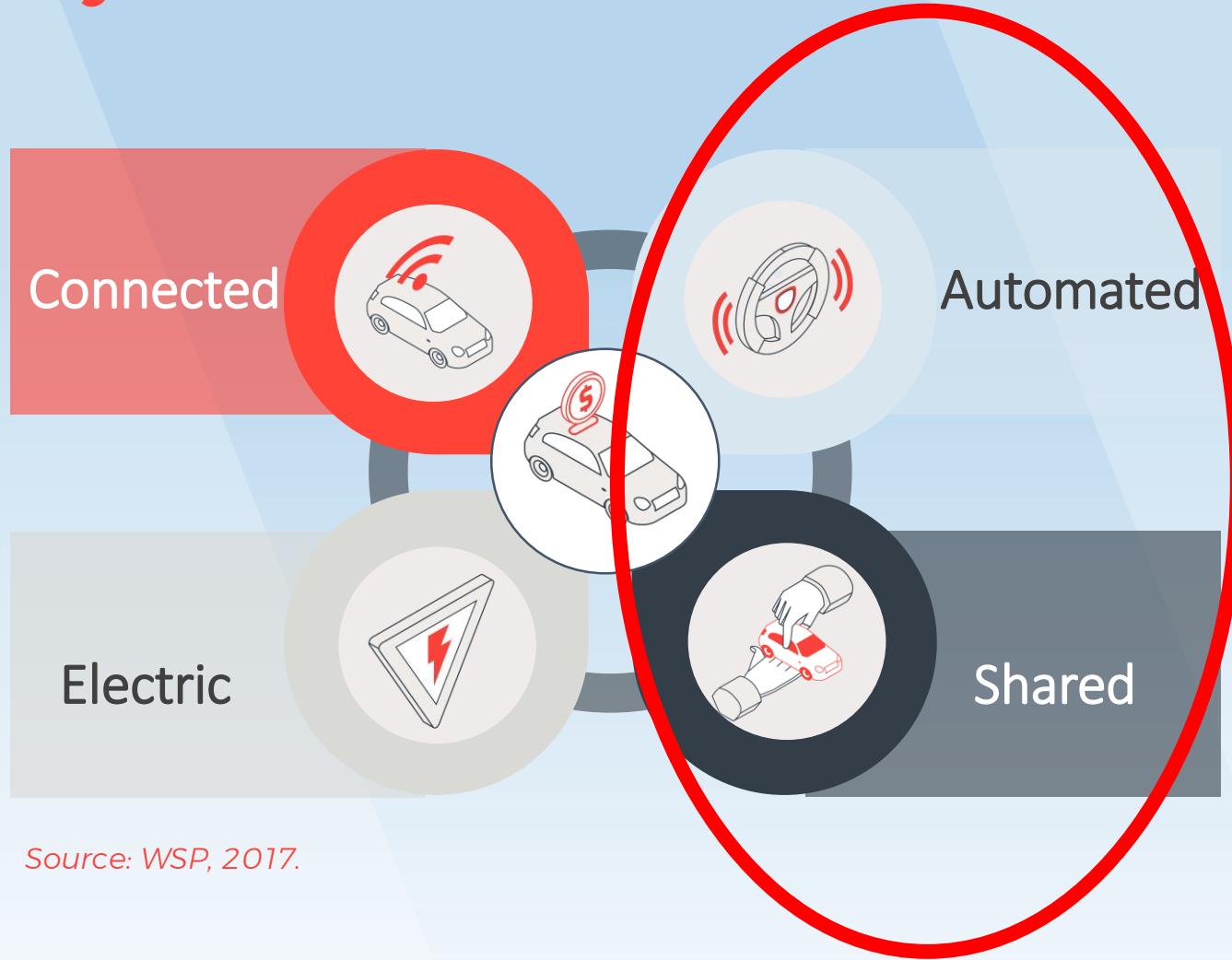
New Mobility



Source: WSP, 2017.

UBER
lyft

New Mobility



Source: WSP, 2017.





Recent Trends in Transit Ridership

Ridership Trends

Transit ridership fell in 9 of 10 largest markets in 2017

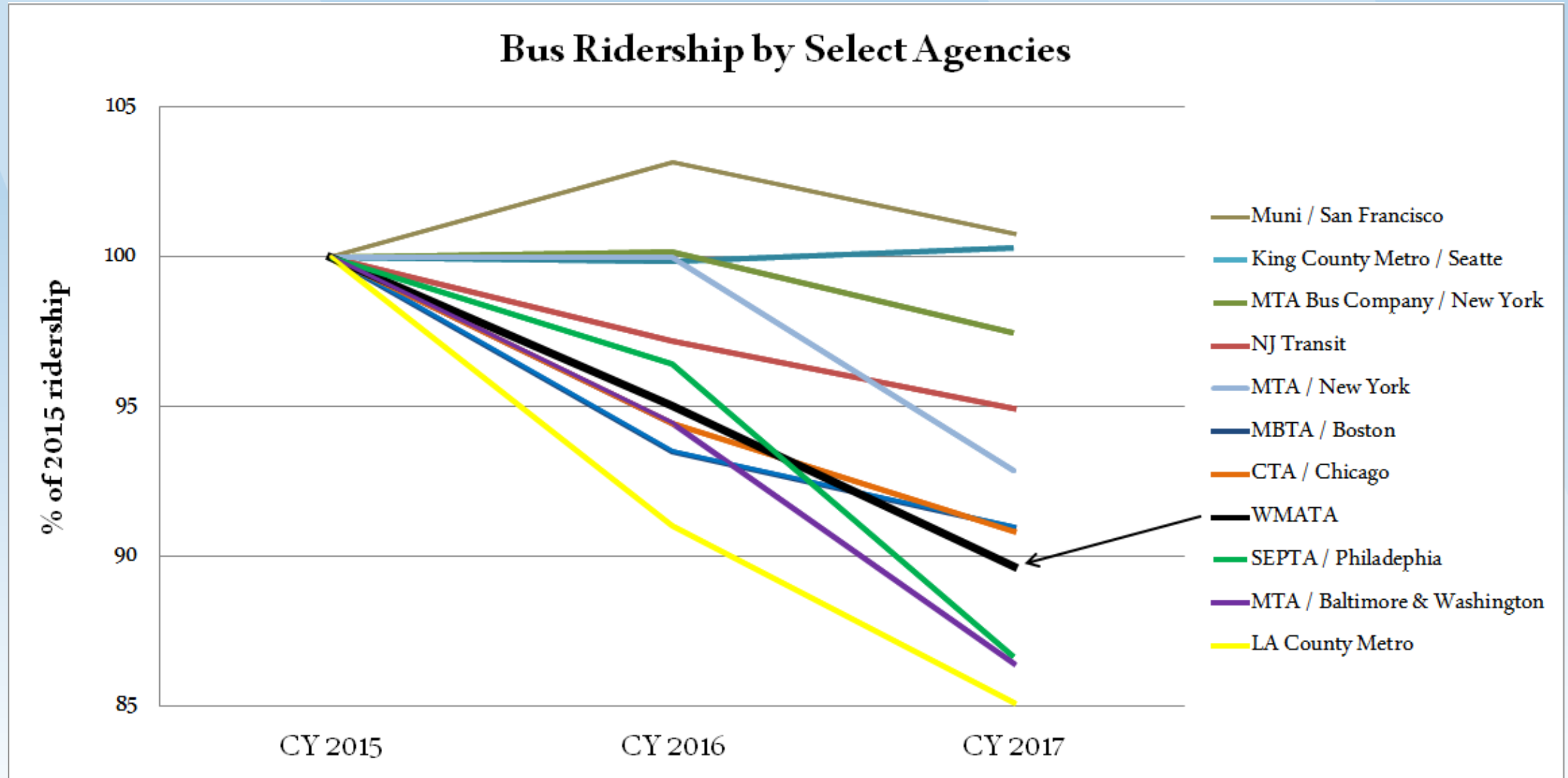
Researchers attributed the decline to ride-hailing services, cheap fuel, and the increase of car ownership, among other factors.



Source: TransitCenter, National Transit Database

GABRIEL FLORIT/THE WASHINGTON POST

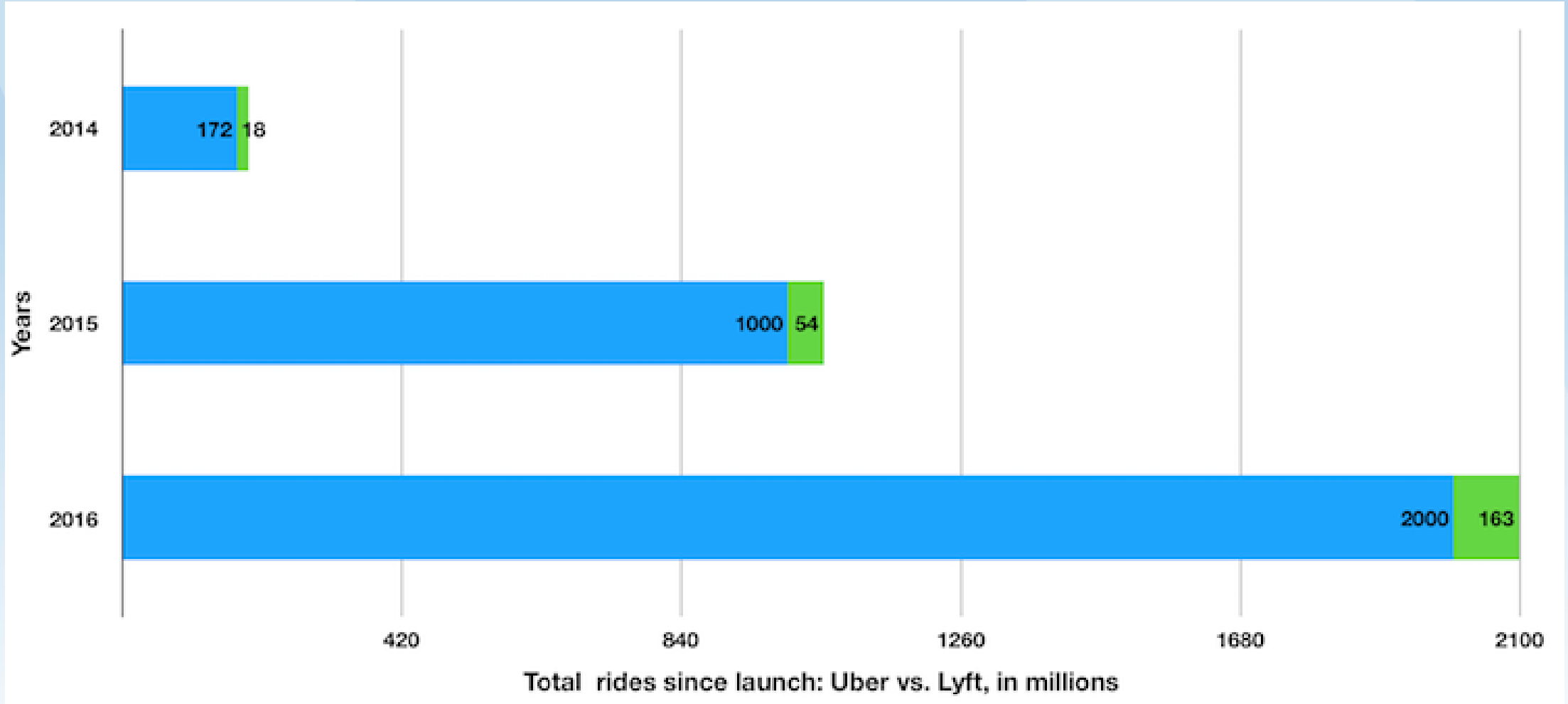
Ridership Trends





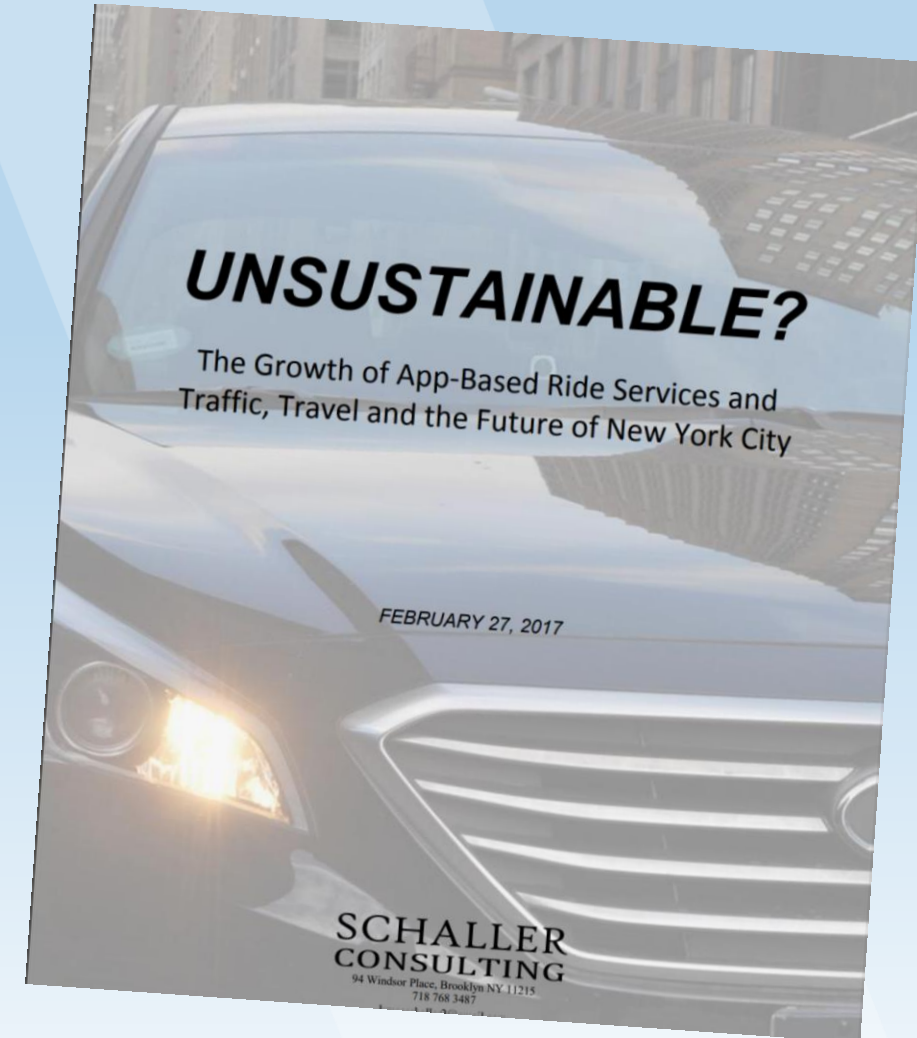
*Impacts of
Ride-hailing on Transit*

Annual TNC Trips



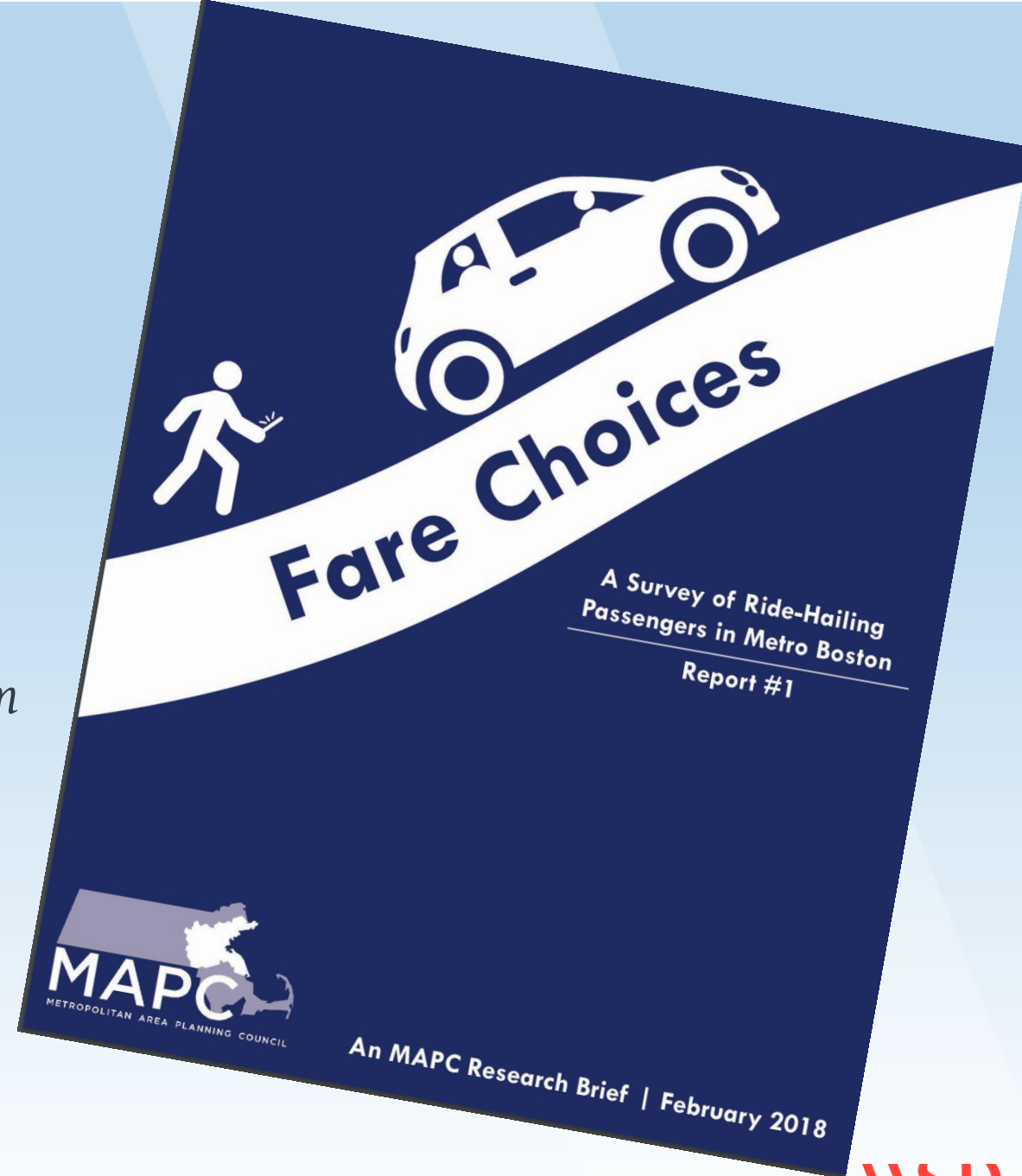
Ride-hailing and Transit

- Conventional wisdom is that Ride-hailing services are cannibalizing transit ridership
- With automation, prices will likely decrease, making (automated) ride-hailing even more attractive



Fare Choices

- In line with the narrative:
 - most users are under the age of 35,
 - most use the service on a weekly basis,
 - most don't own a car.
- Less predictably:
 - a substantial number of trips are by people from households earning less than \$38,000 per year
 - NOT linking to transit
 - high off-peak usage



Fare Choices: Complement or Competition?

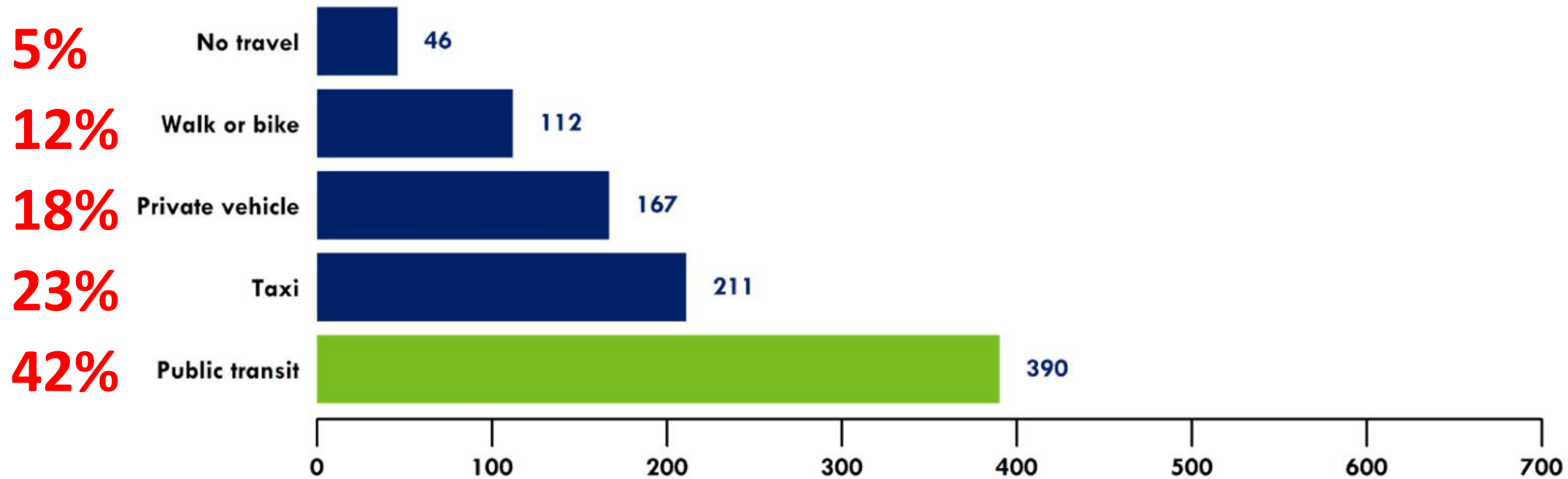


Figure 11. Travel mode being substituted by ride-hailing services for sampled trips.

Fare Choices: Private to Shared?

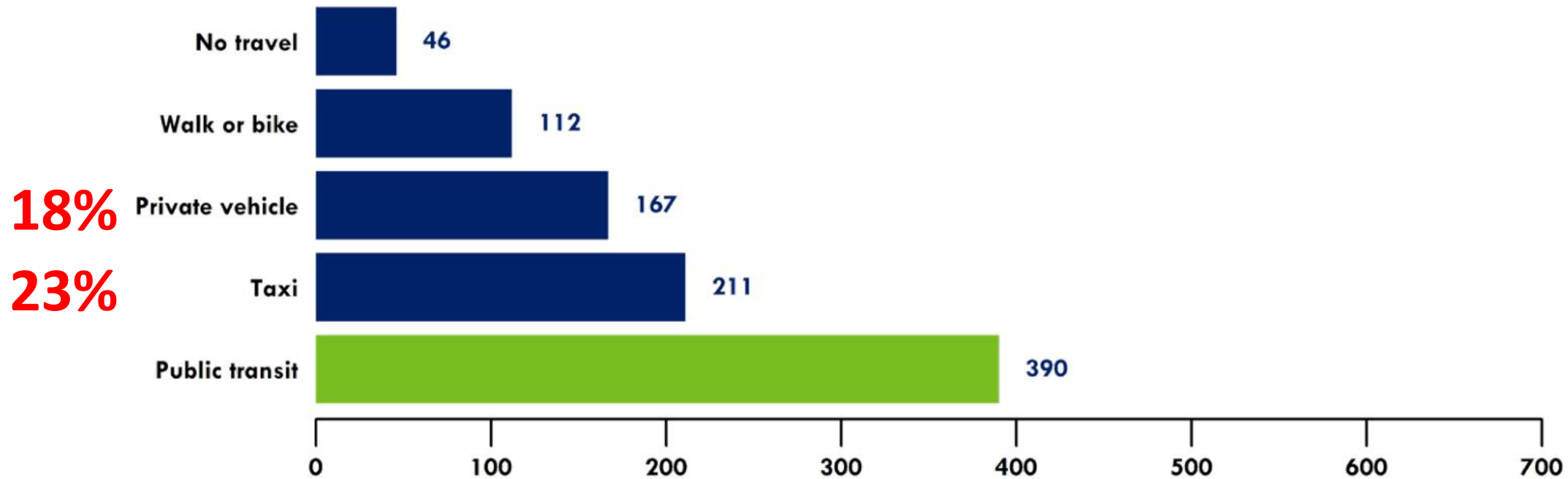


Figure 11. Travel mode being substituted by ride-hailing services for sampled trips.

41% of trips were previous in vehicles

Fare Choices: New Vehicle Trips?

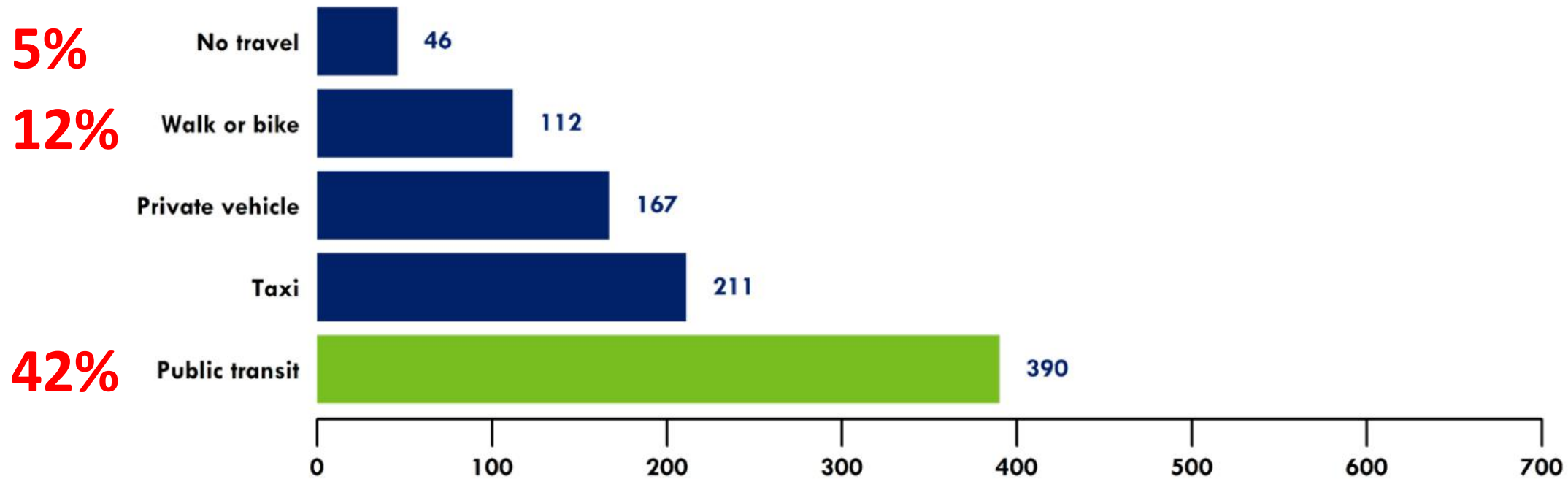


Figure 11. Travel mode being substituted by ride-hailing services for sampled trips.

59% of trips were previous not in vehicles

Fare Choices: Shift from Transit Trips?

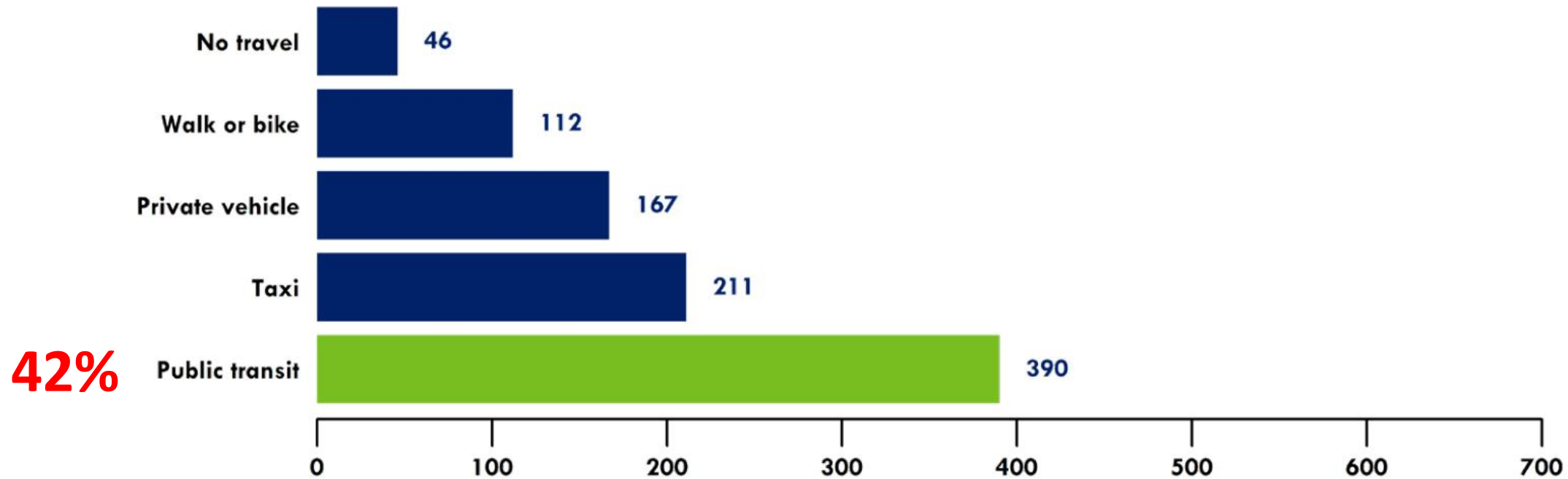
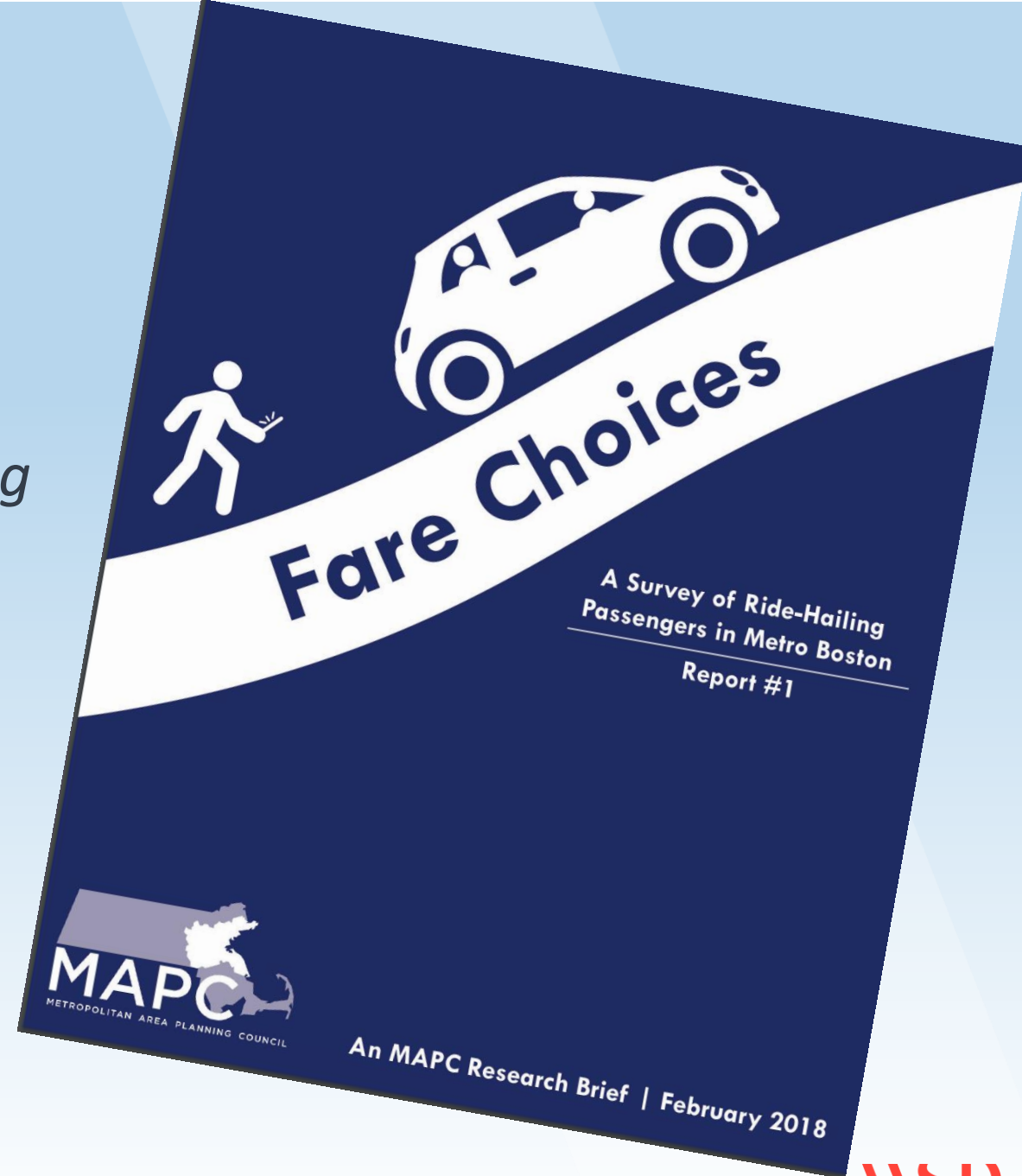


Figure 11. Travel mode being substituted by ride-hailing services for sampled trips.

42% of trips were previous on transit

Fare Choices

- Key Findings:
 - 59% of all ride-hailing trips are adding additional cars to the road system
 - 42% of passengers would have used public transit for their trip



TCRP Research Report 195 Pre-Publication Draft—
Subject to Revision

Broadening Understanding of the Interplay
Between Public Transit, Shared Mobility,
and Personal Automobiles

Sharon Feigon
Colin Murphy
Shared-Use Mobility Center
Chicago, Illinois

Submitted January 2018

DISCLAIMER

The opinions and conclusions expressed or implied in this document are those of the researchers who performed the research. They are not necessarily those of the program sponsors; the Transportation Research Board; or the National Academies of Sciences, Engineering, and Medicine. The information contained in this document was taken directly from the submission of the authors. This material has not been edited by the Transportation Research Board.

SPECIAL NOTE: This document IS NOT an official publication of the Transportation Research Board or the National Academies of Sciences, Engineering, and Medicine. A final, edited version of this document will be released at a later date.

The National Academies of
SCIENCES • ENGINEERING • MEDICINE


TRANSPORTATION RESEARCH BOARD

TRR 195: Key Findings

1. The heaviest TNC use across the regions in this study is during evening hours and weekends.
2. Most TNC trips in the study regions are short and concentrated in downtown core neighborhoods. Across the five regions represented in the TNC trip data, the mean TNC trip was between 2 and 4 miles.
3. There is no clear relationship between the level of peak-hour TNC use and longer-term changes in the study regions' public transit usage.
4. Among survey respondents, people who use transit or commute by driving solo do so as part of a routine; TNCs are used on a more occasional basis.
5. **Transit travel and wait times were top concerns of survey respondents who replaced transit trips with TNC trips.**
6. TNC usage takes place in communities of all income levels.
7. TNC use is associated with decreases in respondents' vehicle ownership and single-occupancy vehicle trips.



Understanding Recent Ridership Changes

Trends and Adaptations



Erosion of Time Competitiveness

Reduced Affinity

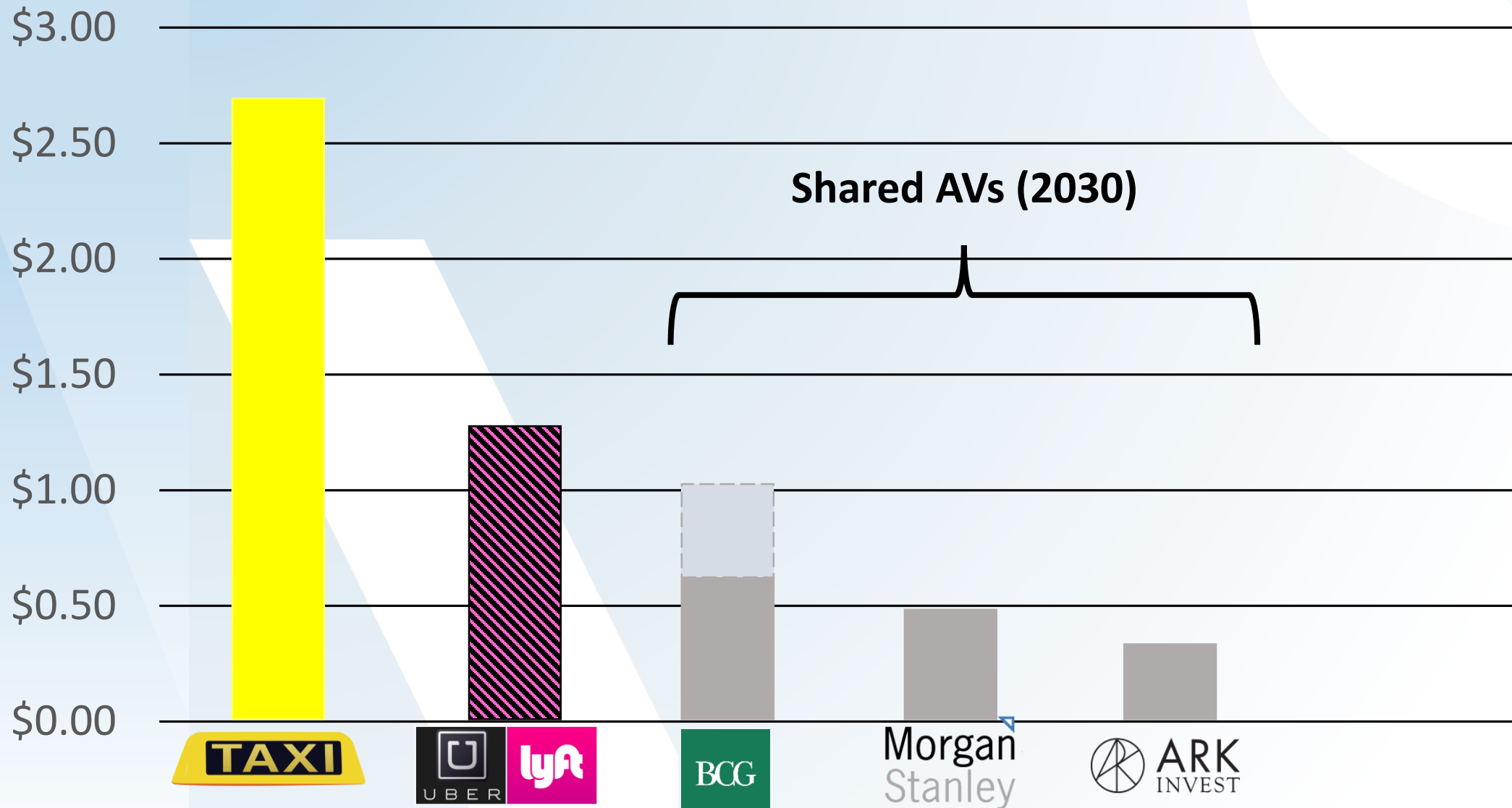
Erosion of Cost Competitiveness

External Factors



*Should Transit Be
Concerned?*

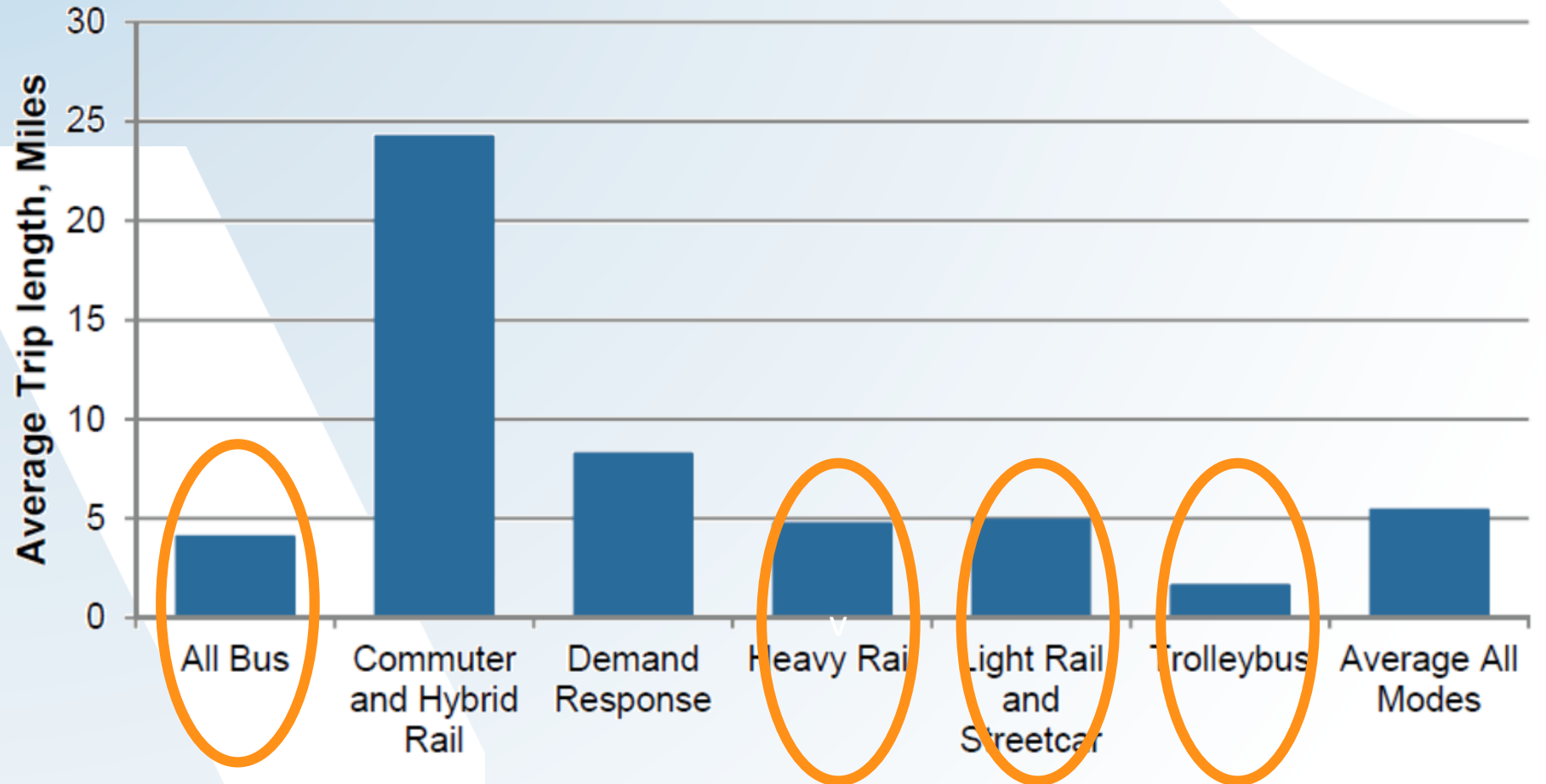
Cost Per Mile



Source: <http://uberestimate.com/prices/Philadelphia/> (April 14, 2018); ARK Investment Management (2015); Morgan Stanley (2016); World Economic Forum/Boston Consulting Group (2016)

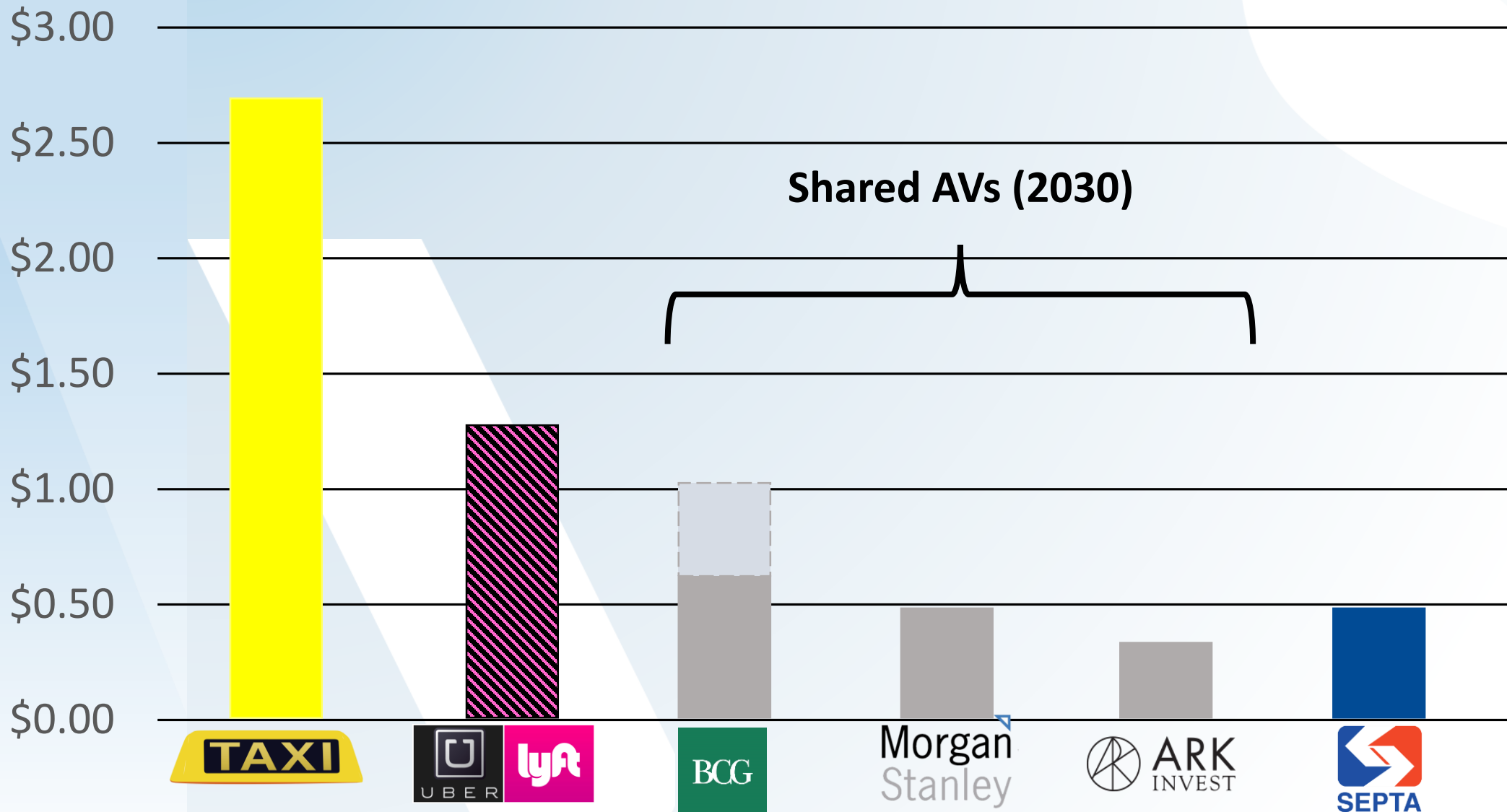
Average Length of Transit Trips

Figure 3: Average Unlinked Passenger Trip Length, 2011



Source: APTA 2011 Fact Book

Cost Per Mile

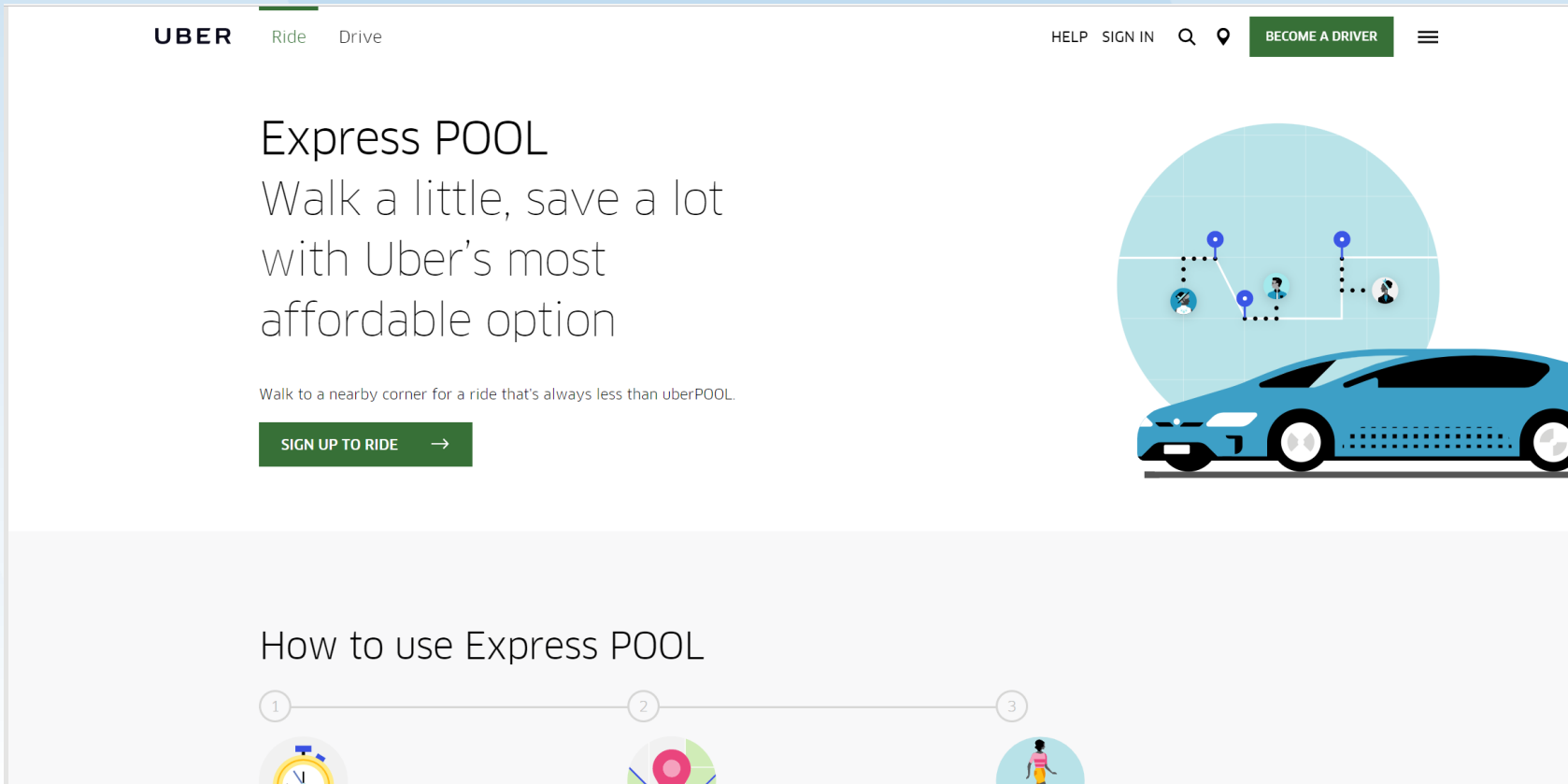


Source: <http://uberestimate.com/prices/Philadelphia/> (April 14, 2018); ARK Investment Management (2015); Morgan Stanley (2016); World Economic Forum/Boston Consulting Group (2016)

Launched in February

With new Express Pool option, Uber customers walk a block or two to catch a ride

- Chicago Sun Times, February 26, 2018



The screenshot shows the Uber website's landing page for the Express POOL service. At the top, the Uber logo is on the left, and navigation links for 'Ride' and 'Drive' are in the center. On the right, there are links for 'HELP', 'SIGN IN', a search icon, a location pin icon, a 'BECOME A DRIVER' button, and a hamburger menu icon. The main content area features the heading 'Express POOL' followed by the text 'Walk a little, save a lot with Uber's most affordable option'. Below this is a sub-headline: 'Walk to a nearby corner for a ride that's always less than uberPOOL.' and a green button labeled 'SIGN UP TO RIDE' with a right-pointing arrow. To the right of the text is an illustration of a blue Uber car with a circular graphic above it showing a map with location pins and a path, representing the 'walk to a nearby corner' concept. At the bottom, there is a section titled 'How to use Express POOL' with a three-step process indicated by numbered circles (1, 2, 3) and corresponding icons: a clock for step 1, a location pin for step 2, and a person walking for step 3.



How Close are AVs?

Waymo Miles Driven



Source: Waymo, November 27, 2017.

Things are Heating Up.....

GM WILL LAUNCH ROBOCARS WITHOUT STEERING WHEELS NEXT YEAR

Lex Davies, Wired, January 18, 2018

<https://www.wired.com/story/gm-cruise-self-driving-car-launch-2019/>

WAYMO LAUNCHES ITS SELF-DRIVING ARMADA

ARIAN MARSHALL, Wired.com, Jan. 30, 2018

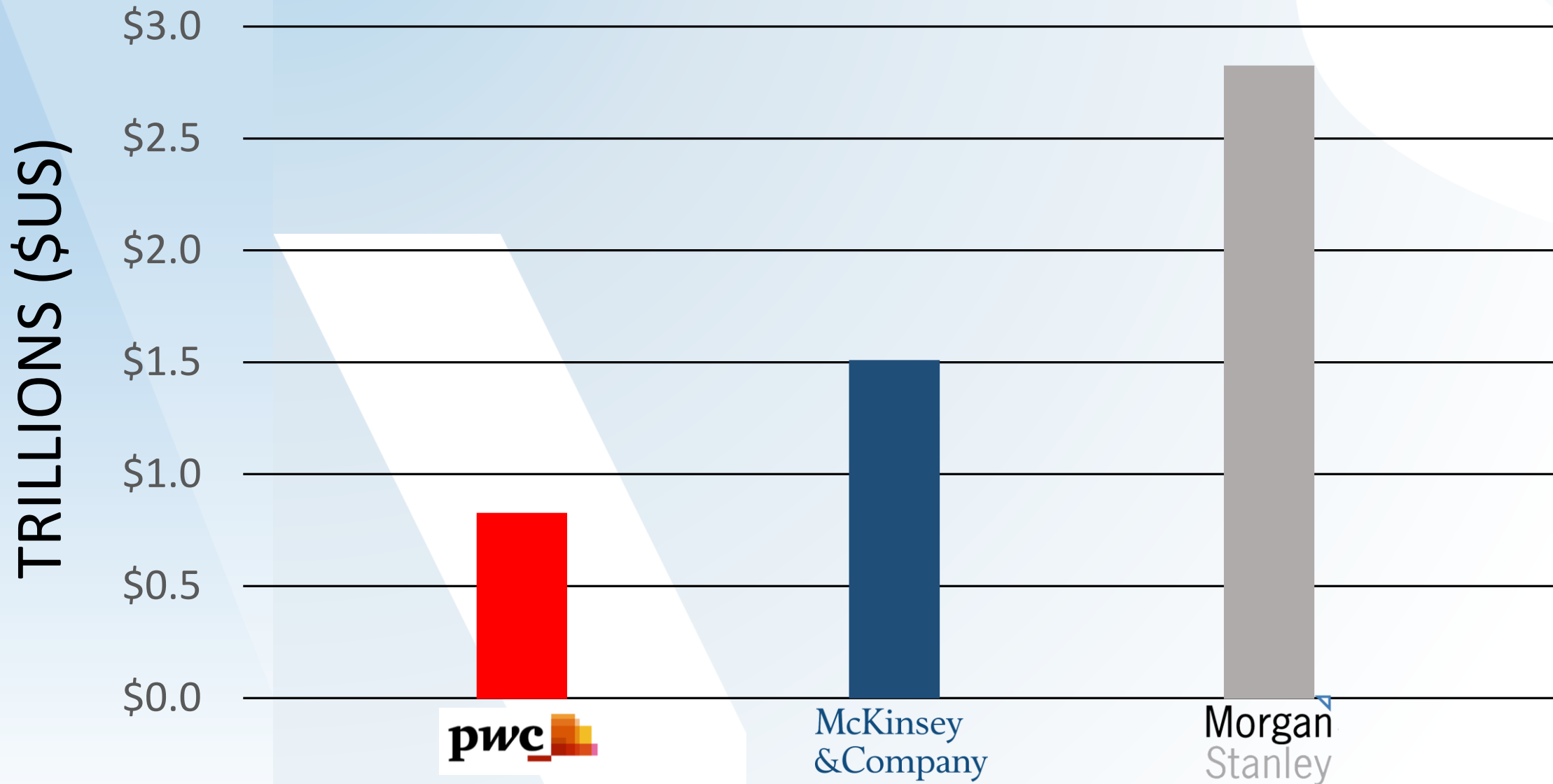
<https://www.wired.com/story/waymo-launches-self-driving-minivans-fiat-chrysler/>

Tesla will start rolling out its 'full self-driving' package in August, Elon Musk says

Andrew J. Hawkins, The Verge, June 11, 2018, 1:58pm

<https://www.theverge.com/2018/6/11/17449076/tesla-autopilot-full-self-driving-elon-musk>

Market Value of Shared Mobility in 2030



Things are Heating Up.....

Uber orders up to 24,000 Volvo XC90s for driverless fleet

Darrell Etherington, TechCrunch November 21, 2017

Waymo to buy 'thousands' of minivans for self-driving vehicle service

Detroit Free Press, Jan. 30, 2018

Waymo Orders Up to 20,000 Jaguar SUVs for Driverless Fleet – WSJ

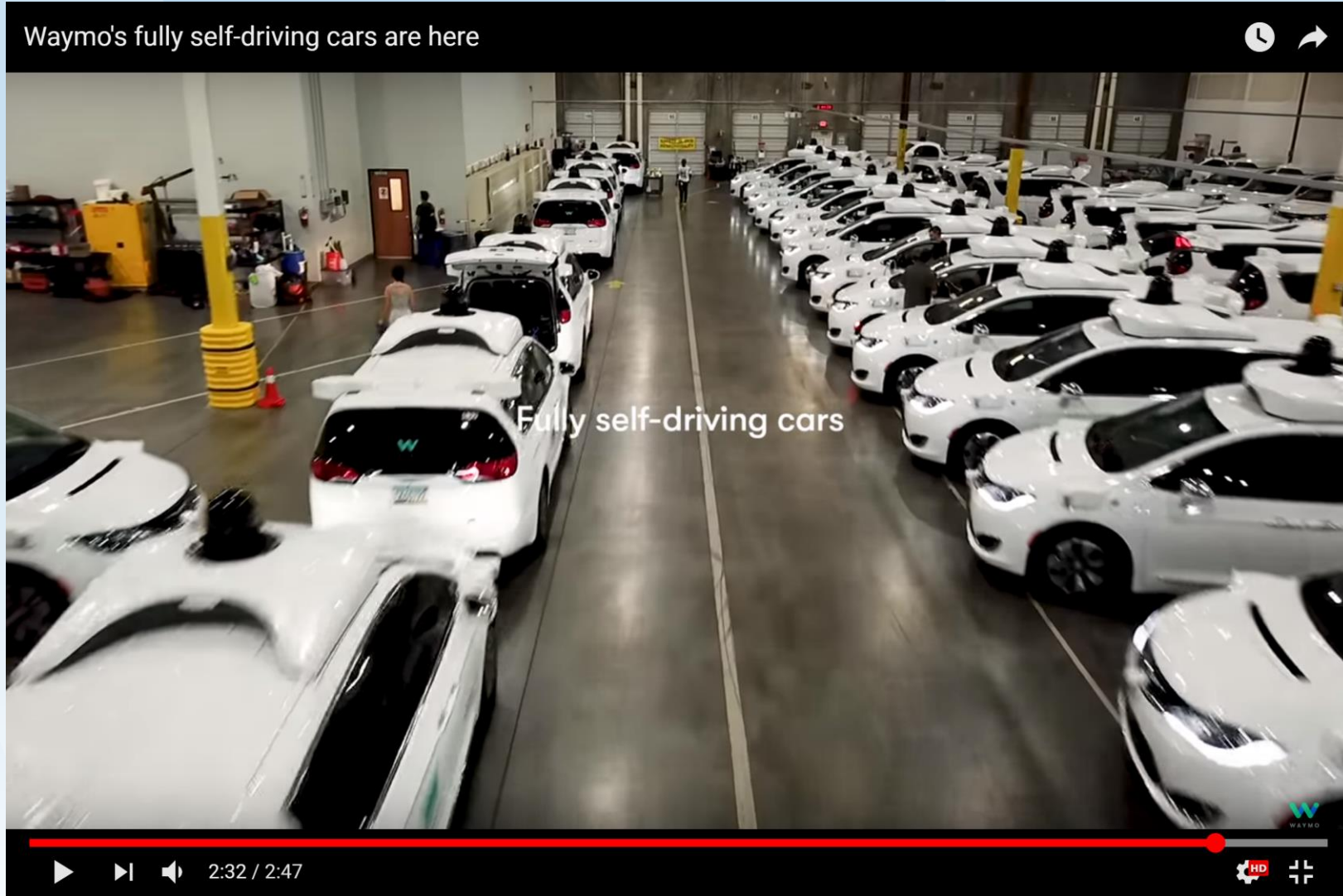
Wall Street Journal, March 27, 2018

Launched in March



<https://www.youtube.com/watch?v=QqRMTWqhwezM>

Launched in October



Launched in March



EasyMile autonomous shuttle bus makes history in California

AUVSI (3/7/2018)

An EasyMile autonomous shuttle bus became the first vehicle to operate on California's roads without a driver behind the wheel on Tuesday, March 6. The vehicle operated on the roads of San Ramon, California. With its historic journey, EasyMile's autonomous shuttle bus became the first vehicle to take advantage of recently approved regulations governing the driverless testing and public use of autonomous vehicles on California roads.

“An EasyMile autonomous shuttle bus became the first vehicle to operate on California’s roads without a driver behind the wheel....”

- AUVSI, March 7, 2018



*What Might this
Mean for Transit?*

What Might this Mean for Transit?

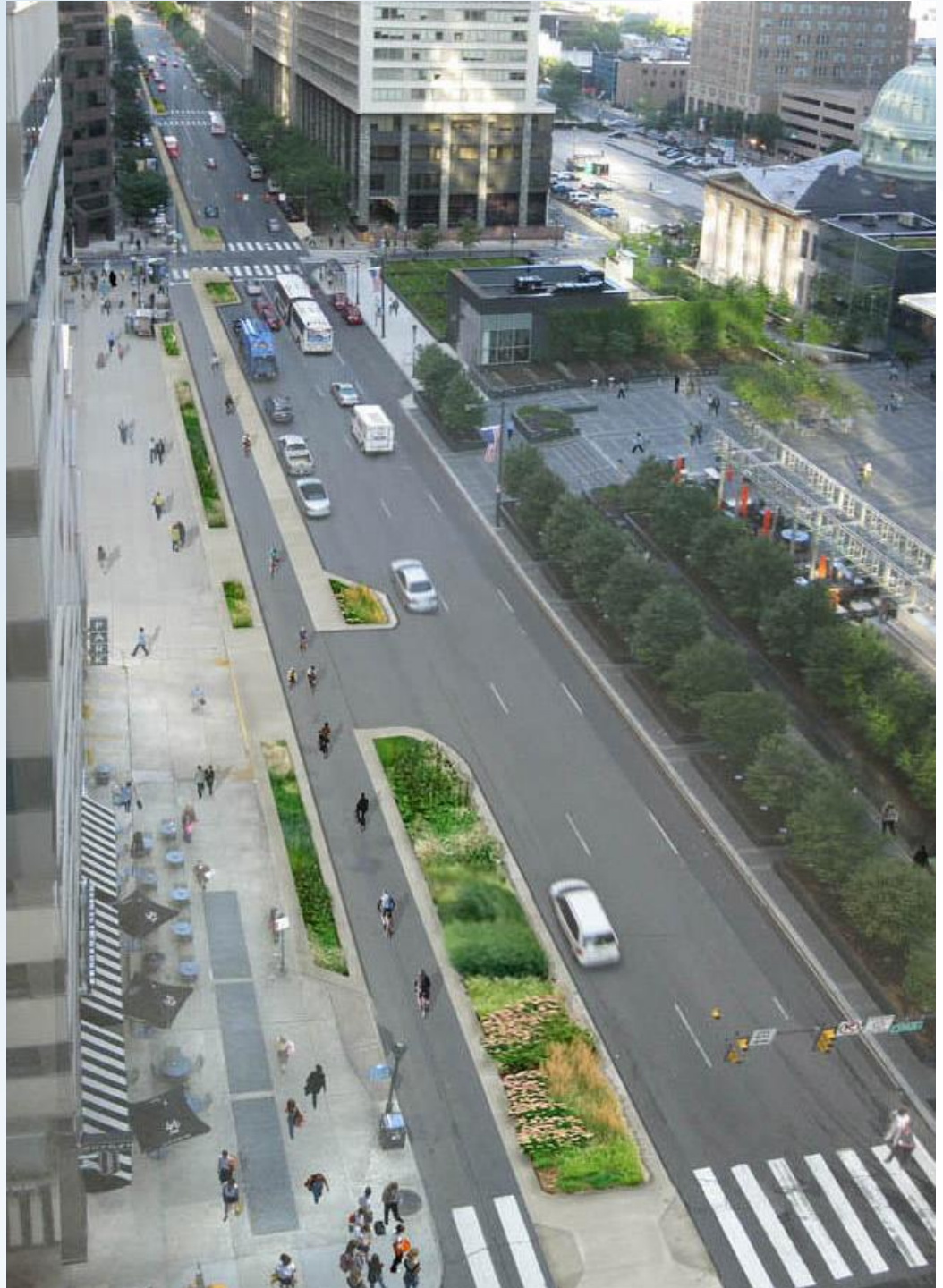
– Challenges

- Continued pressures on ridership and farebox*
- Redefining your mission*
- Workforce transition and (re)development*

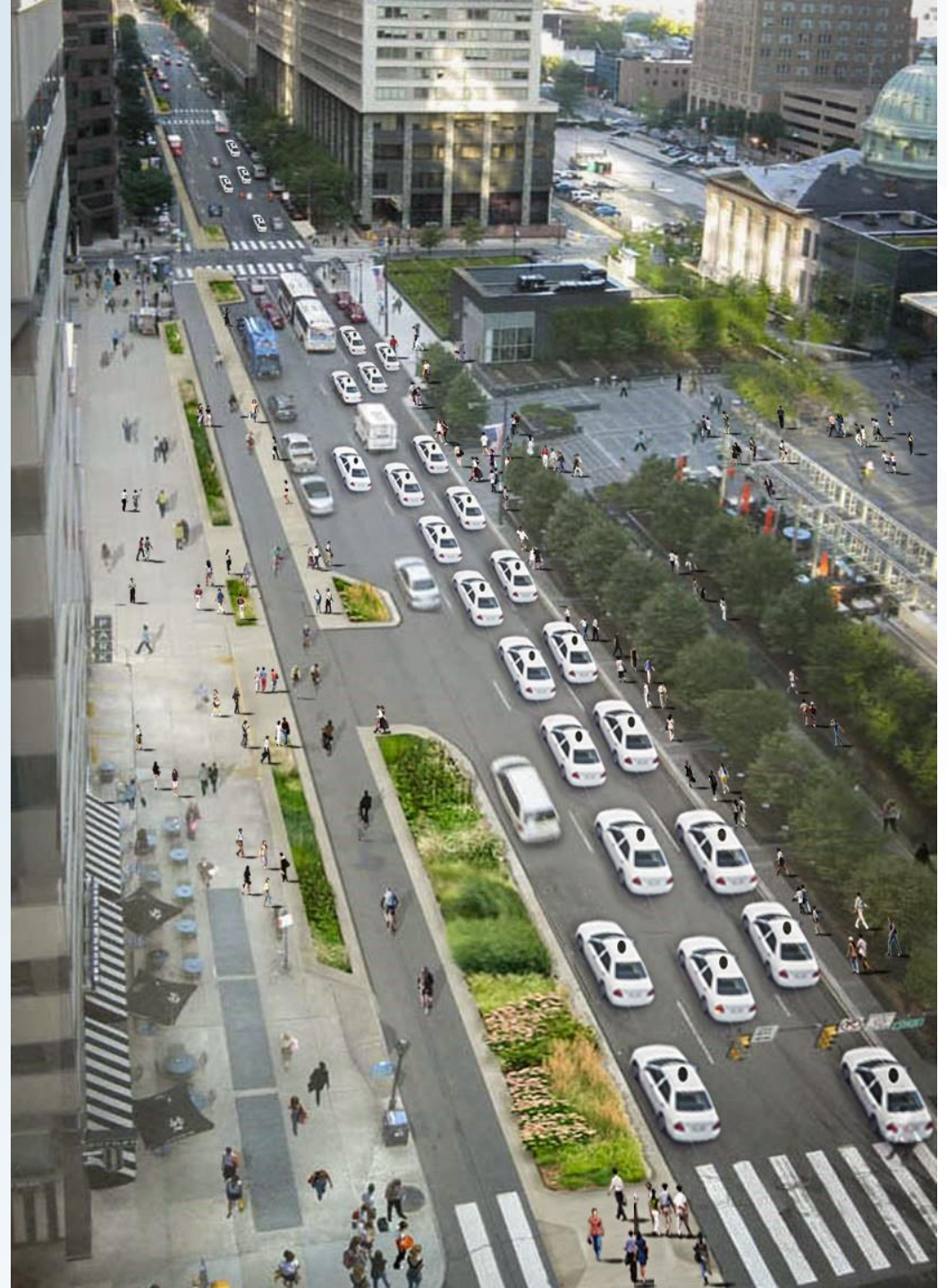
– Opportunities

- Potential reduction in labor costs*
- Opportunities for use of micro-transit*
- Opportunities to partner with private producers*

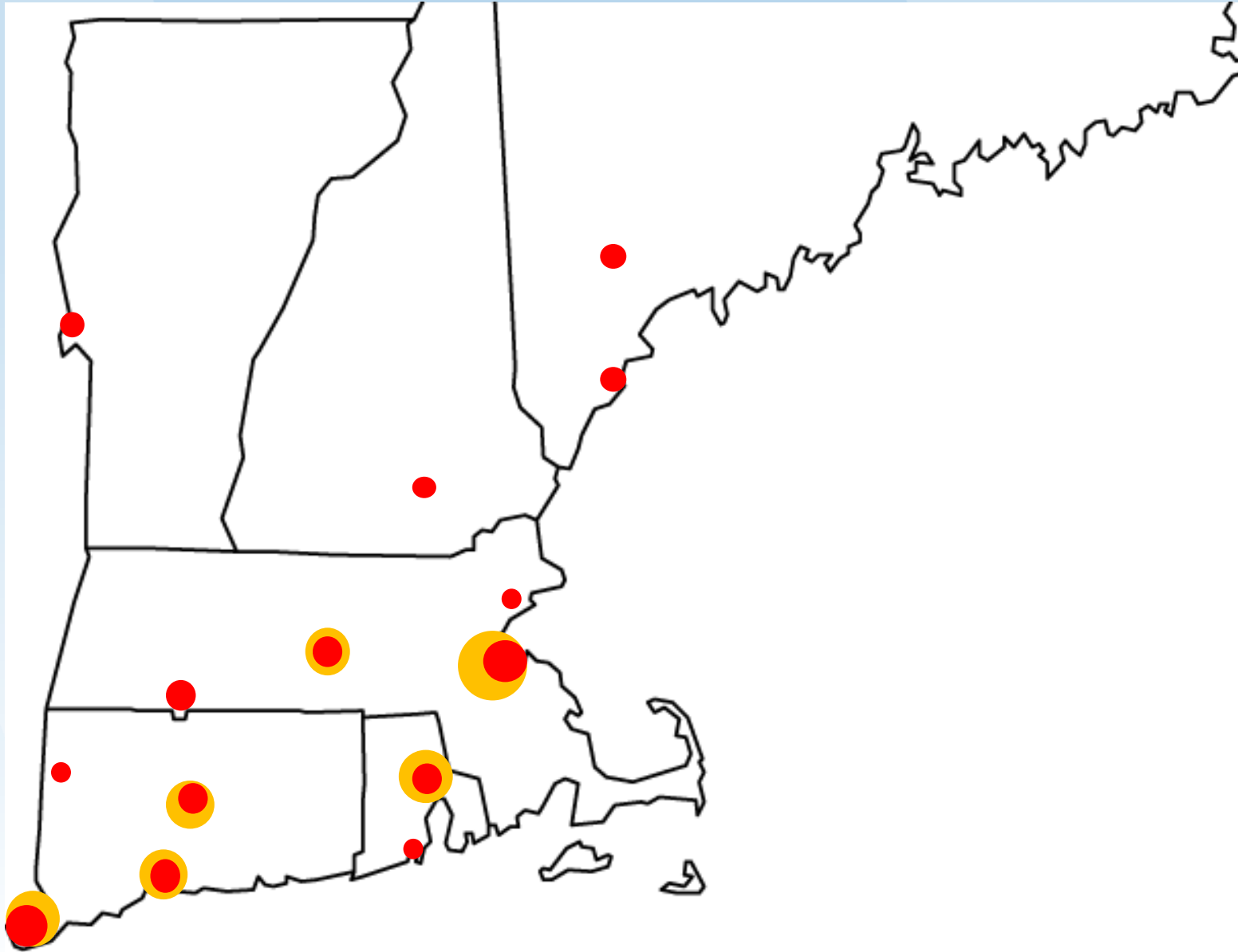
Operational Realities



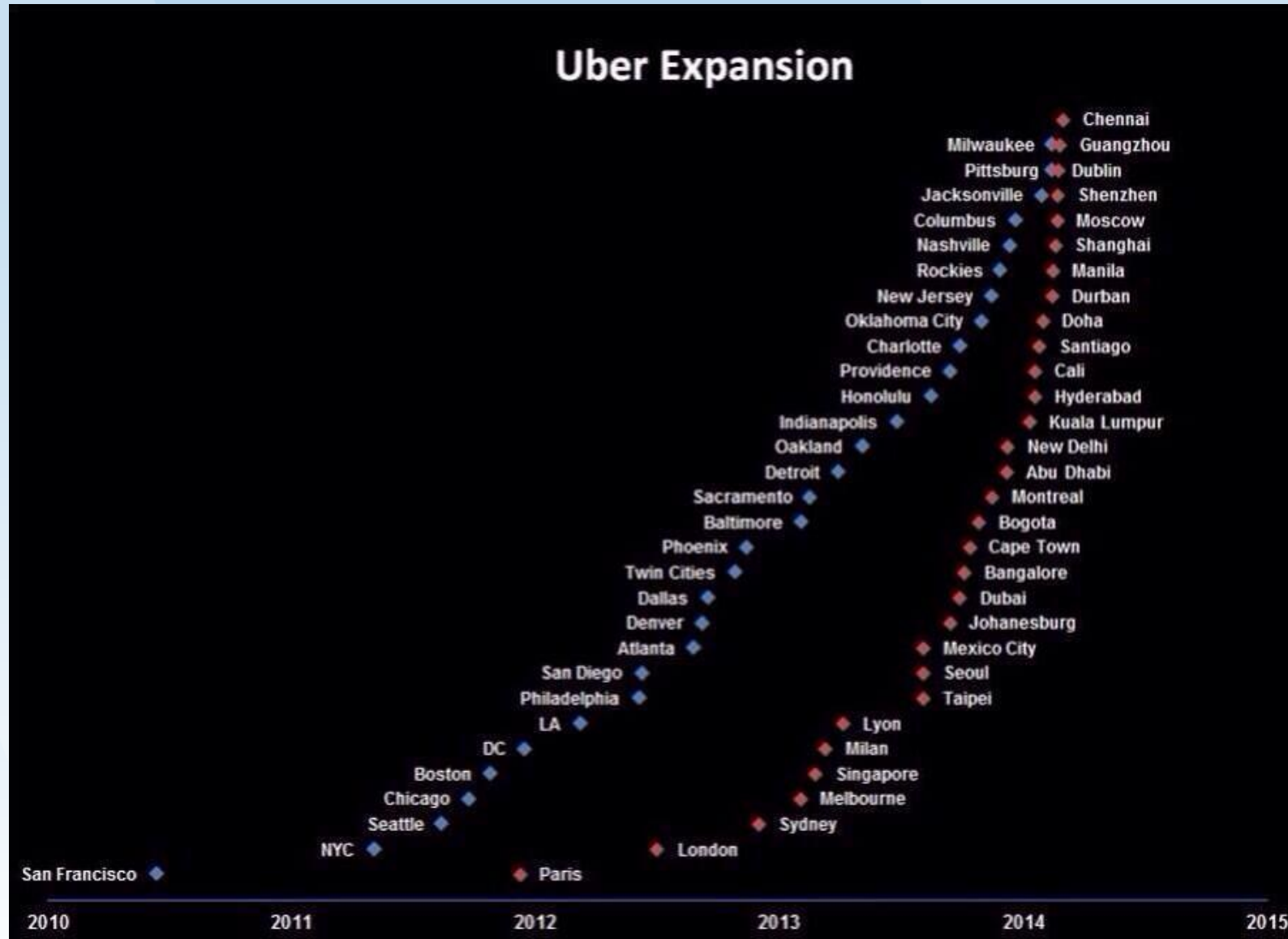
Operational Realities



How Might Fleets Deploy?



How Might Fleets Deploy?



Wildcards



**Catastrophic
Event**

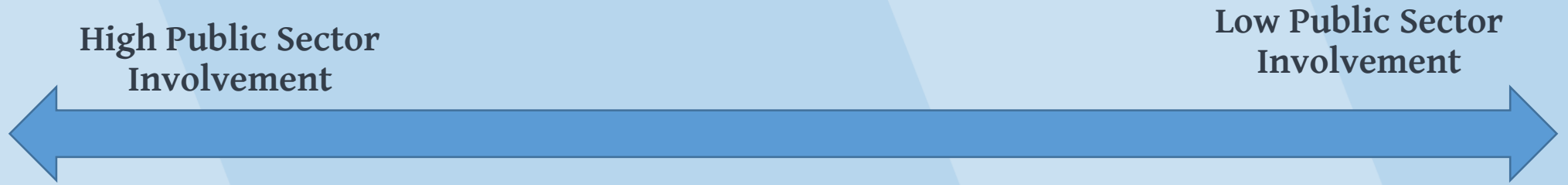


**Public Backlash
Regarding
Data and Privacy**



*The Public-Private
Disconnect*

The Models



Ownership

Public Fleet

Private Fleet

Private Individual

Dispatch and Control

Centralized Public

Centralized Private

Coordinated Private

Individual Private

Operational Restrictions

Heavily Restricted

Concessioned Routes

Concessioned Areas

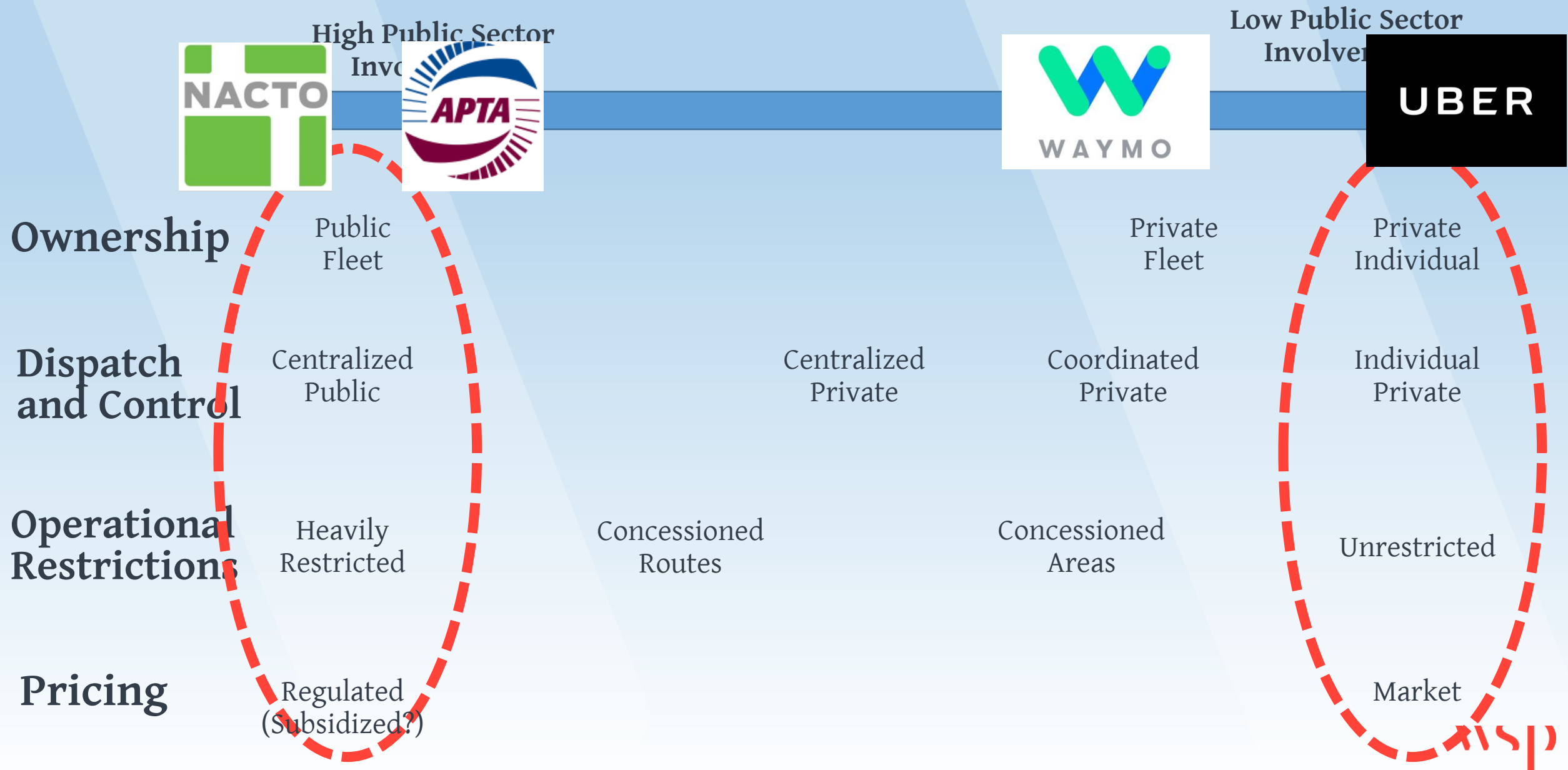
Unrestricted

Pricing

Regulated (Subsidized?)

Market

The Disconnect



How Might this Play Out?

Willing Partner



Unwillingly Regulated



Death Fight



Why Transit Agencies Need to Act Now....

- We are seeing declines in ridership, particularly with surface transit
- Even minor losses in farebox revenue may begin a downward spiral
- When AVs arrive, ride-hailing prices may drop considerably (30-40%), further challenging the cost competitiveness of transit
- Need to proactively address issues with mission, governance and labor

Resources

wsp

New Mobility Now

A Practical Guide _____

wsp



Beyond Speculation

Automated Vehicles and Public Policy

An Action Plan for Federal, State, and Local Policymakers

Resources



Fare Choices

A Survey of Ride-Hailing
Passengers in Metro Boston

Report #1



An MAPC Research Brief | February 2018



TCRP Research Report 195 Pre-Publication Draft—
Subject to Revision

Broadening Understanding of the Interplay
Between Public Transit, Shared Mobility,
and Personal Automobiles

Sharon Feigon
Colin Murphy
Shared-Use Mobility Center
Chicago, Illinois

Submitted January 2018

DISCLAIMER

The opinions and conclusions expressed or implied in this document are those of the researchers who performed the research. They are not necessarily those of the program sponsors; the Transportation Research Board; or the National Academies of Sciences, Engineering, and Medicine. The information contained in this document was taken directly from the submission of the authors. This material has not been edited by the Transportation Research Board.

SPECIAL NOTE: This document IS NOT an official publication of the Transportation Research Board or the National Academies of Sciences, Engineering, and Medicine. A final, edited version of this document will be released at a later date.

The National Academies of
SCIENCES • ENGINEERING • MEDICINE



TRANSPORTATION RESEARCH BOARD

Resources

Seattle Department of Transportation

NEW MOBILITY PLAYBOOK



Version 1.0

September 2017



Seattle
Department of
Transportation



Resources

SMART DRIVING CARS

<http://smartdrivingcar.com/GreenLight-092316>

Friday, September 23, 2016

NHTSA Federal Automated Vehicles Policy: Accelerating the Next Revolution In Roadway Safety

September 2016, "Executive Summary...For DOT, the excitement around highly automated vehicles (HAVs) starts with safety. (p5)

...The development of advanced automated vehicle safety technologies, including fully self-driving cars, may prove to be the greatest personal transportation revolution since the popularization of the personal automobile nearly a century ago. (p5)

...The benefits don't stop with safety. Innovations have the potential to transform personal

Resources

The screenshot displays the American Planning Association (APA) website. At the top left is the APA logo and the text "American Planning Association" with the tagline "Making Great Communities Happen". To the right are links for "About APA", "Join", "Log In", and a shopping cart icon. A search bar is located below these links. A dark blue navigation bar contains several menu items: "Membership", "Knowledge Center", "Conferences and Meetings", "AICP", "Policy and Advocacy", "Career Center", "In Your Community", "Connect with APA", and "APA Foundation".

The main content area is divided into two columns. The left column, titled "Knowledge Center", lists several categories: "APA e-Learning", "Publications", "Planning Advisory Service", "Applied Research" (highlighted in green), "Current Research Projects", "Completed Projects", "Green Communities Center", "Hazards Planning Center", "Planning and Community Health Center", "Inquiry Answer Service", and "Research KnowledgeBase".

The right column shows a breadcrumb trail: "Home > Knowledge Center > Applied Research >". Below this is a row of social media icons for Facebook, Twitter, LinkedIn, Pinterest, Tumblr, Email, and Print. The main heading is "KNOWLEDGEBASE COLLECTION" followed by "Autonomous Vehicles".

The text under "Autonomous Vehicles" reads: "Autonomous and connected vehicle technology is expected to transform the nation's transportation system over the coming decades, with major implications for the planning and design of cities and regions. Autonomous vehicles (AV), also known as driverless or self-driving cars, have been sharing city streets for several years."

Below this is another paragraph: "This technology is moving very quickly, with the 11 largest automakers planning to have fully-autonomous vehicles on highways between 2018 and 2021 (arriving somewhat later in urban driving conditions). AV technology, as defined by the International Society of Automotive Engineers, ranges from a baseline of no automation, up to five levels of increasing autonomy:"

- Level one, driver assistance (e.g., adaptive cruise control)
- Level two, partial automation (e.g., Tesla's autopilot)
- Level three, conditional automation (e.g., human drivers serve as backup for an autonomous system that operates under certain conditions)

Intelligent Transportation Systems Joint Program Office



Integrating Ridesharing into Transit Operations (November 9, 2017)

The U.S. Department of Transportation (USDOT) will be hosting a webinar which will discuss how to integrate ridesharing opportunities into transit operations. This webinar will allow interested stakeholders to learn about different approaches for rideshare-transit integration.

Participants will hear from Uber and Via regarding their partnerships and integration with transit operations.

Traditional transit operations are designed to maximize the number of people served and optimize the service provided to as many of those people as possible. However, if a potential rider lives or works outside a half mile radius from the nearest stop, the rider usually forgoes transit use. Ridesharing (and other Mobility on Demand) services have been rapidly growing to bridge this first-mile/last-mile gap in transit coverage. Our speakers will discuss the integration of their ride sharing platforms with traditional transit operations.

This webinar is sponsored by the USDOT Intelligent Transportation Systems Joint Program Office (ITS JPO) and is free and open to the public.

To learn more about the ITS JPO, please visit: www.its.dot.gov.

If you have any questions about this webinar, please contact Kevin Viita (ITS America) at kviita@itsa.org.

Date & Time:
Thursday, November 9, 2017
1:00 PM - 2:00 PM ET

Presenters:

Actions You MUST be Taking....

- Educate your team and political leadership on what is happening
- Begin to revisit your vision, mission, principles and goals
- Begin to discuss models, and how they support your goals
- Create a road map, and revisit it every year
- Understand potential impacts to your revenue
- Begin to think about the details
- Pilot and test to build capacity

SHARE, SHARE, SHARE!

Key Takeaways.....

- This is coming fast – you can guide it or respond to it
- Government has a chance to shape this, but needs to move
- While ride-hailing companies have been saying the right things, they are profit-driven and will follow the market

*“The best way to predict
the future is to create it.”*

AVs and Transit

Stephen Buckley, P.E., AICP

NACV Summit

June 12, 2018

