

# The (possible) Future of Urban Transportation

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# Thought experiment: Put multiple modes of transportation in each box.

|                       | Public | Private - within urban area* |
|-----------------------|--------|------------------------------|
| Mass transit          |        |                              |
| Low occupancy vehicle |        | E.g. Horses                  |

\*Excludes modes primarily with originations or destinations outside urban area, like airplanes or freight.

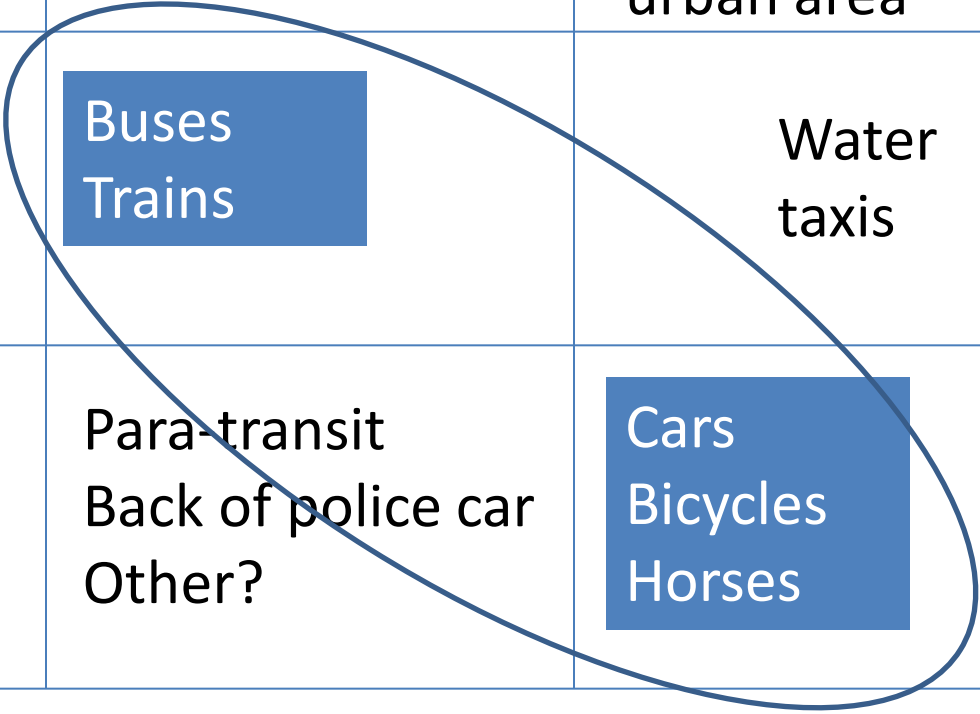
# Modes of transportation by characteristics

|                       | Public                                  | Private                    |
|-----------------------|---|----------------------------|
| Mass transit          | Buses<br>Trains                         | Water taxis                |
| Low occupancy vehicle | Para-transit<br>Back seat of police car | Cars<br>Bicycles<br>Horses |

- Did you come up with something like this?
- Which boxes were the easiest to populate with examples?
- Which were the hardest?

# Modes of transportation by characteristics: Past and present

|                       | Public                                       | Private - within urban area |
|-----------------------|--|-----------------------------|
| Mass transit          | Buses<br>Trains                              | Water taxis                 |
| Low occupancy vehicle | Para-transit<br>Back of police car<br>Other? | Cars<br>Bicycles<br>Horses  |



# Modes of transportation by characteristics: *The future?*

|                       | Public          | Private                    |
|-----------------------|-----------------|----------------------------|
| Mass transit          | Buses<br>Trains | TBD                        |
| Low occupancy vehicle | TBD             | Cars<br>Bicycles<br>Horses |

- In the future, the TBD characteristics of transit modes may become blurry.
- Or change back and forth almost instantaneously.

# The characteristics of ideal transportation

1. Takes you from exactly where you want to start to exactly where you want to go (door-to-door) exactly when you want to go.
2. Fast
3. Low hassles
4. For less \$
5. And it's all good\*



\*In econometrics-speak, maximizes positive externalities and minimizes negative externalities

# Ideal transportation checklist: “Beam me up, Scotty”

| Criteria Checklist   | Star Trek<br>Transporter Beam |
|----------------------|-------------------------------|
| 1. Door-to-Door      | Yes                           |
| 2. Fast (Relatively) | Yes                           |
| 3. Low Hassles       | Yes                           |
| 4. For Less \$       | Yes                           |
| 5. And it's All Good | Yes                           |
| a. Economy           | Yes                           |
| b. Environment       | Yes                           |

# Ideal transportation checklist:

## Private cars

| Criteria Checklist   | Private Cars | Private Car Notes                                   |
|----------------------|--------------|---|
| 1. Door-to-Door      | Yes          | The big advantage                                   |
| 2. Fast (Relatively) | Sometimes    | Fast in off-peak, custom routes; stuck in rush hour |
| 3. Low hassles       | No           | Missed exit, lost, road rage, accidents, parking    |
| 4. For Less \$       | No           | Pay for everything                                  |
| 5. And it's All Good | No           |   |
| a. Economy           | No           | Just me and my car, clogging up the road            |
| b. Environment       | No           | Cough, cough  |



# What's the first thing you visualize when you read "public mass transit"?



## Mission statements:

- New York City: "The MTA preserves and enhances the quality of life and economic health of the region we serve through the cost-efficient provision of safe, on-time, reliable and clean transportation services."
- Los Angeles: "Metro is responsible for the continuous improvement of an efficient and effective transportation system for Los Angeles County."
- Washington, D.C.: "Metro operates and maintains a safe, reliable and effective transit system that enhances mobility, improves the quality of life, and stimulates economic development in the Washington metropolitan area."
- Hmmmm.
  - Nothing there about the mode of transportation...
  - We sometimes think of the means as the end.

# Ideal transportation checklist: Public mass transit

| Criteria Checklist   | Public Buses | Public Trains | Public Transit Notes   |
|----------------------|--------------|---------------|--|
| 1. Door-to-Door      | No           | No            | Transit-Oriented Development (TOD) capacity                            |
| 2. Fast (Relatively) | Sometimes    | Sometimes     | Dedicated lanes, express, traffic signal priority                      |
| 3. Low hassles       | Sometimes    | Sometimes     | Chauffeured, payment easy, reliability                                 |
| 4. For Less \$       | Yes          | Yes           | Full-fare still cheap; reduced fare                                    |
| 5. And it's All Good | Sometimes    | Sometimes     |  |
| a. Economy           | Yes          | Yes           | May allow more cars to fit on the road--and that has economic benefits |
| b. Environment       | Depends      | Depends       | Depends on how many riders are on the vehicle                          |

# Ideal transportation checklist: Electric vehicles

| Criteria Checklist   | Electric Vehicles Compared to Private Cars and Public Transit | Electric Vehicles Compared to Private Cars and Public Transit Notes  |
|----------------------|---|--|
| 1. Door-to-Door      | <b>Yes</b>  | No advantage   |
| 2. Fast (Relatively) | <b>Sometimes</b>  | No advantage   |
| 3. Low hassles       | <b>Mixed bag</b>  | Lower maintenance; Charging availability challenges                  |
| 4. For Less \$       | <b>HUGE unknown</b>   | Challenges of scaling up charging infrastructure                     |
| 5. And it's All Good | <b>Mixed bag</b>  |  |
| a. Economy           | <b>No advantage</b>   | No advantage   |
| b. Environment       | <b>Yes!...but</b>   | Huge local pollution advantage, potential global pollution advantage |

Thought experiment: If every vehicle in the U.S. was electric, how many new nuclear power plants would be needed and at what cost? (power plants and transmission infrastructure)

- Back of the envelope: 240 new nuclear power plants and associated infrastructure at a cost of one trillion dollars.
  - Could be less, could be more

# Ideal transportation checklist: Ride-sharing

| Criteria Checklist   | Ride-sharing (a flavor of taxi) | Ride-sharing Notes                                     |
|----------------------|---------------------------------|--|
| 1. Door-to-Door      | Sometimes                       | Door-to-door IF driver takes job                       |
| 2. Fast (Relatively) | Sometimes                       | Same as cars   |
| 3. Low hassles       | Yes                             | No parking, maintenance time                           |
| 4. For Less \$       | Moderately                      | Between private cars and public transit; surge pricing |
| 5. And it's All Good | Sometimes                       |  |
| a. Economy           | Yes                             | Debatable  |
| b. Environment       | Moderately                      | More use per car than private cars                     |

# Unpacking modern ride-sharing: What makes it different?

| Category                  | Component of Transit         | Traditional Taxi                      | Uber                            |
|---------------------------|------------------------------|---------------------------------------|---------------------------------|
| Transit                   | Hailing                      | On curb or phone                      | App                             |
|                           | Ride                         | Sit in back seat. Go.                 | Almost exactly the same         |
| Payment and Incentives    | Payment terms                | On board at destination               | Before boarding by app          |
|                           | Price                        | Set                                   | Variable by demand (surge)      |
|                           | Taxes                        | Defined                               | Work-in-progress                |
|                           | <b>Incentives</b>            | <b>No (some exceptions)</b>           | <b>No (or work-in progress)</b> |
| Driver and qualifications | Driver-employer relationship | Employee                              | Contractor (“gig”)              |
|                           | Licensure                    | Medallions                            | Drivers license                 |
| Vehicle ownership         | Operations and Maintenance   | Taxi company                          | Driver                          |
|                           | Capital investment           | Driver must buy car from taxi company | Driver provides personal car    |
| Environmental impact      | Energy efficiency, pollution | Almost exactly the same               |                                 |

**Are there incentives that can apply the advantages of ride-sharing to positively impact urban transportation overall, including economic and environmental externalities?**

# Ideal transportation checklist: Autonomous vehicles

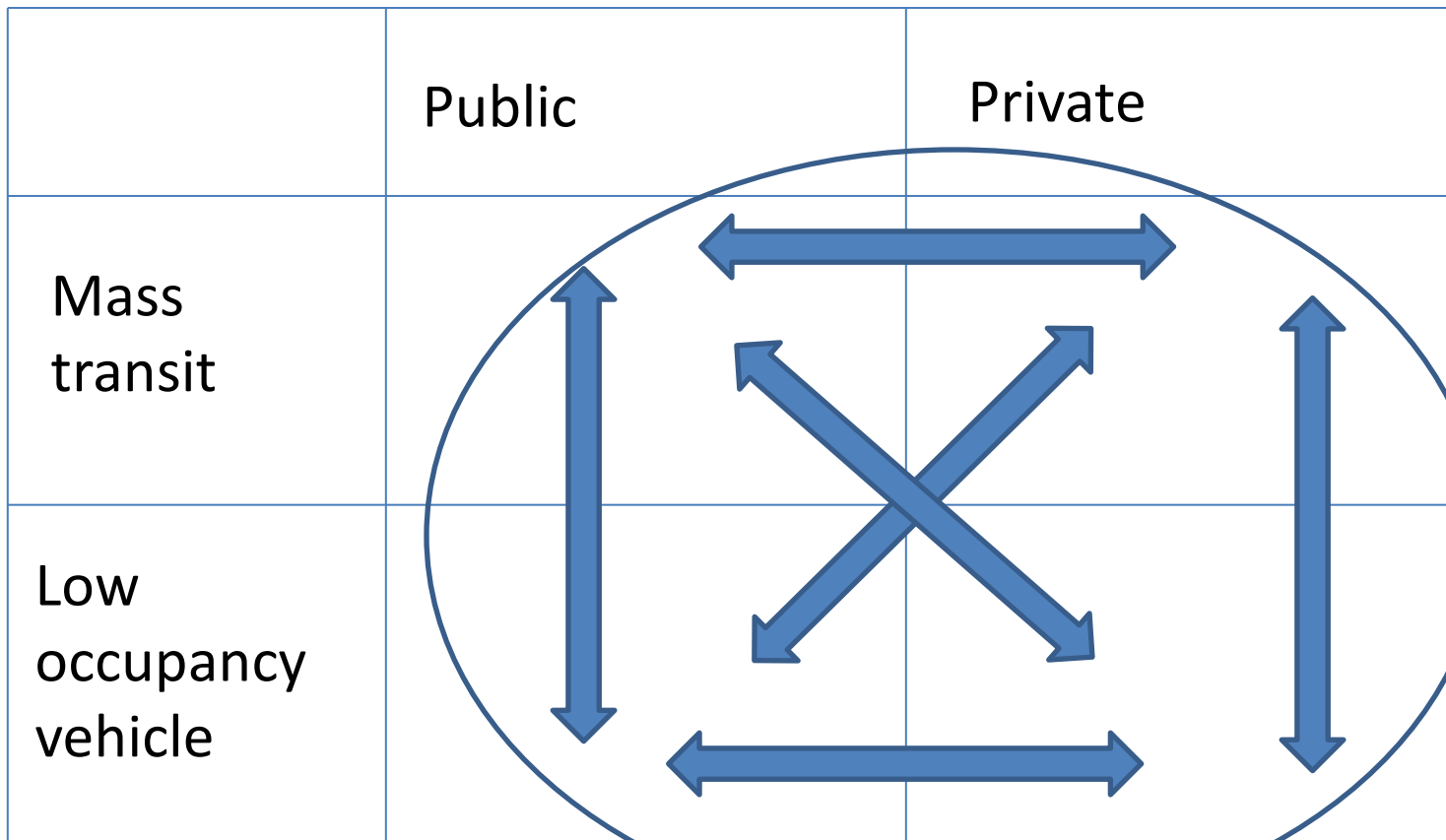
| Criteria Checklist   | Private A.V.s | Private A.V.s Notes                               |
|----------------------|---------------|---|
| 1. Door-to-Door      | Yes           | Passengers choice                                 |
| 2. Fast (Relatively) | Yes?          | Maybe a little better than private cars           |
| 3. Low hassles       | Mixed bag     | Don't have to drive; still have to park, maintain |
| 4. For Less \$       | Moderately    | Lower insurance costs?                            |
| 5. And it's All Good | Maybe         |   |
| a. Economy           | Maybe         | A little collective efficiency, maybe             |
| b. Environment       | Mixed bag     | A little collective efficiency, maybe             |

# Ideal transportation checklist: Ride-sharing, A.V., Incentive, EV mash-up

| Criteria Checklist   | Uber-ish, A.V.s, w/ Incentives | Ride-sharing, A.V.s, w/ Incentives Notes   |
|----------------------|--------------------------------|--|
| 1. Door-to-Door      | Yes                            | Yes.   |
| 2. Fast (Relatively) | Yes?                           | Potentially collective efficiency of movement (potential to drive fast bumper-to-bumper without accidents) |
| 3. Low hassles       | Yes?                           | Any hassles?   |
| 4. For Less \$       | Yes?                           | But who buys AV up front?  |
| 5. And it's All Good | Yes?                           |  |
| a. Economy           | Yes?                           | *But...what about the people?  |
| b. Environment       | Yes?                           | Optimizes number of passengers per weight of vehicle, aerodynamics of groups of vehicles driving together  |



*Future urban transportation (maybe):  
Transporter beam-like transit, seamlessly  
flexible, with incentives to achieve public  
service and sustainability goals*



Transit that can change boxes instantly , depending on real-time rider demand and incentives.

Who says riders have to be people? 😊