Let’s think separately about:

- Responsiveness
- Automation
More riders per vehicle hour *physically possible*

Fewer riders per vehicle hour *physically possible*
What makes more riders per vehicle hour physically possible?

• Asking people to walk
• Asking people to travel at a different time
• Taking people on longer ride-alongs
• Limiting the options for one end of the trip (e.g. a rail station)
• For paratransit, day-before reservations.
• …in other words, more rigidity!

*Responsiveness to individual desires trades-off against the maximum possible rides per vehicle hour.*
Average: 28 riders per vehicle hour

Record: 6.5 riders per vehicle hour
Productivity and Frequency

Data from 26 cities

Boardings per Revenue Hour

Midday Frequency (minutes)
Why care about vehicle hours?

- Vehicle hours are your contribution to congestion
  - And energy use, curb space use, emissions, etc.
Why care about vehicle hours?

- Vehicle hours are your contribution to congestion
  - And energy use, curb space use, emissions, etc.

- With human drivers, vehicle hours govern operating cost.
Operating cost per vehicle hour ÷ Riders per vehicle hour = Operating cost per rider
Operating cost per vehicle hour $\div$ Budget = Vehicle hours

Higher frequencies, later nights, longer routes

Reach more low-density, unwalkable, distant areas
What happens as distance becomes cheaper?

If AVs increase the supply of “boxes,” by making distance cheaper, what happens to the height of the wall?

➢ Do vulnerable people stay where they are today, or do they move?
Thank you
What can “equity” mean in this context?
Transit can never be perceived as equitable.

Density (+walkability +linearity)
Transit can never be perceived as equitable.
Transit can never be perceived as equitable.
Unless you count roads!

Density (+walkability +linearity)

Service investment per sq. mile

Tokyo

Per Rider Equity

Per Capita Equity

Geographic Equity
<table>
<thead>
<tr>
<th>Problem</th>
<th>Technology Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Emissions</td>
<td>Electric vehicles</td>
</tr>
<tr>
<td>• Efficient use of energy</td>
<td></td>
</tr>
<tr>
<td>• Efficient use of human effort</td>
<td>Autonomous vehicles (Private, shared or transit)</td>
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<tr>
<td>• Safety</td>
<td></td>
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<tr>
<td>• Efficient use of space</td>
<td>More fixed routes, bigger vehicles</td>
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<tr>
<td>• Bad information</td>
<td>Good information</td>
</tr>
</tbody>
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Fig. 5. Revenue per ton-mile, all modes together. Source: Bureau of Transportation Statistics Annual Reports
Fig. 6. Ton-miles of freight over time. Source: Bureau of Transportation Statistics Annual Reports