*Osher Lifelong Learning Institute - Berkeley*

# Contemporary Economic Policy Issues

**Fall, 2020**

**Jon Haveman, Ph.D.**
**National Economic Education Delegation**

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## National Economic Education Delegation

- **Vision**
  - One day, the public discussion of policy issues will be grounded in an accurate perception of the underlying economic principles and data.
- **Mission**
  - NEED unites the skills and knowledge of a vast network of professional economists to promote understanding of the economics of policy issues in the United States.
- **NEED Presentations**
  - Are **nonpartisan** and intended to reflect the consensus of the economics profession.

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# Course Outline

- **What Economists Know About Important Policy Issues**
  - Week 1 (9/21): Coronavirus Economics
  - Week 2 (9/28): Economic Mobility (Oana Tocoian, UCSD)
  - Week 3 (10/5): Economics of Immigration
  - Week 4 (10/12): Racial Inequities – Black/White Wealth Gap
  - Week 5 (10/19): U.S. Policy History and Discrimination
  - Week 6 (10/26): Health Economics (Veronika Dolar, SUNY, Old Westbury)
  - Week 7 (11/2): Infrastructure Economics (Mallika Pung, Univ. New Mexico)
  - **Week 8 (11/9): Autonomous Vehicles**



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# Driving Change – Autonomous Vehicles' Big Impact

**National Economic Education Delegation**

**Jon Haveman, Ph.D.**

*November 9, 2020*



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# Credits and Disclaimer

- **This slide deck was authored by:**
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# Outline

- **Where does the AV path lead?**
- **Transition**
- **Policy/Planning Issues**
- **Major Economic/Development Changes**
- **Environmental Implications**



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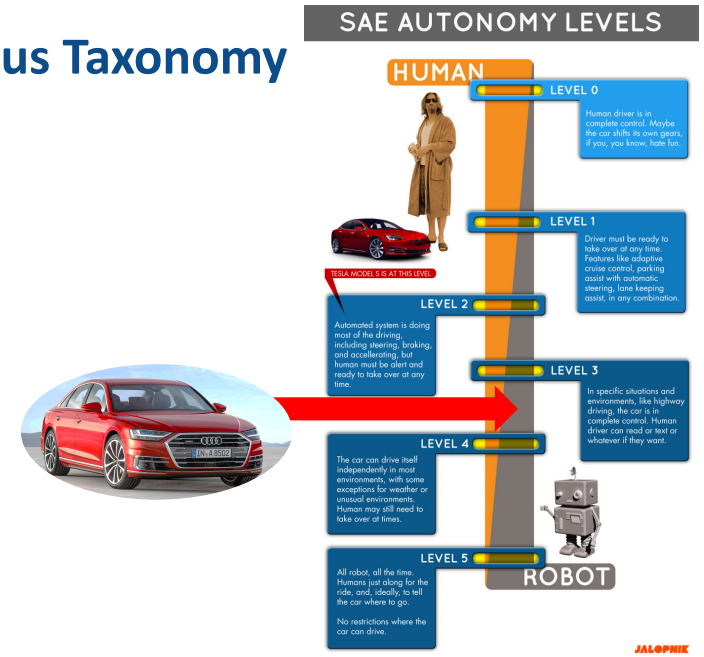
# Autonomous Taxonomy

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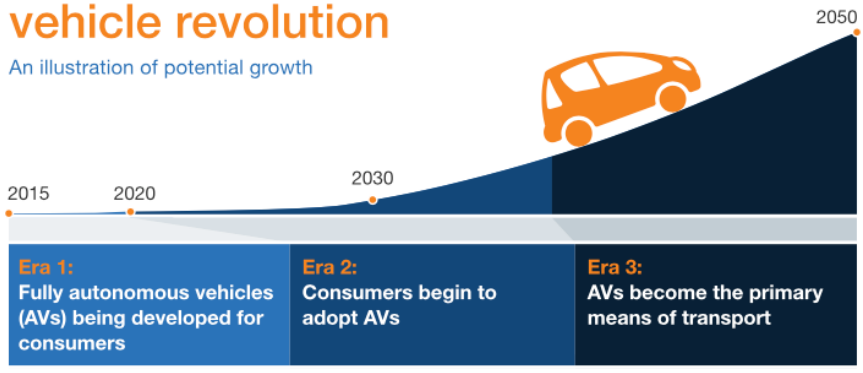
# Growth Path




McKinsey & Company

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## McKinsey isn't Always Spot On

- **"In 1980, McKinsey & Company was commissioned by AT&T to forecast cell phone penetration in the U.S. by 2000.**
  - The consultant's prediction, 900,000 subscribers,
  - was less than 1% of the actual figure, 109 Million."
    - Professor Angel Lozano, 2014



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## Two Important Questions:

1. **When will Transportation as a Service (TaaS) be available?**
2. **How quick will the transition be?**



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## WHEN?
## What do the headlines say?

NVIDIA to introduce level-4 enabling system by 2018

Audi to introduce a self-driving car by 2020

Volkswagen expects first self driving cars on the market by 2019

First autonomous Toyota to be available in 2020

Elon Musk now expects first fully autonomous Tesla by 2019, approved by 2021

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## Wildly Optimistic, But…
## 40+ Corporations Working On Autonomous Vehicles

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# WHEN?
## What is possible?

- By 2025
- Potentially 95% of VMT by 2035.
- Last 5% is going to be very difficult to achieve.
- Is this possible?
  - Horses to cars: 10 years – early 1900s
  - But adoption of EVs is so slow!
  - Adoption of AVs will be rapid.

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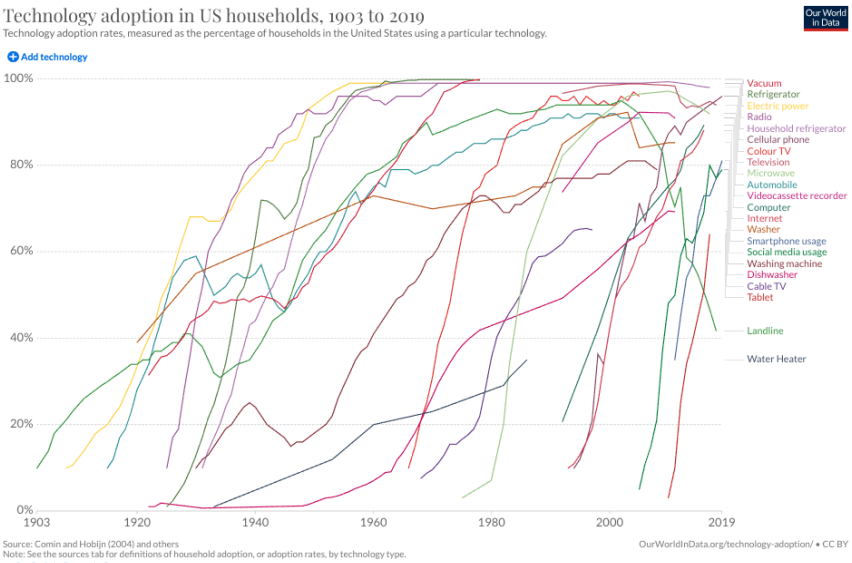
# Rate of Technology Adoption – Faster!

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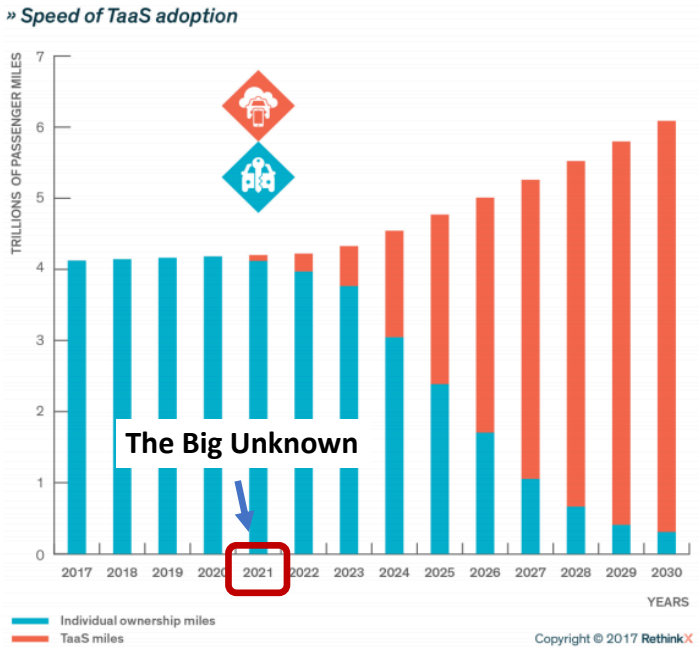
Forecast

Timing may be off.

But the point is:

RAPID ADOPTION!

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**Waymo's self-driving cars are now available on Lyft's app in Phoenix**

**Hyundai plans to launch a free robot taxi service in California**

**Singapore's self-driving cars can now be hailed with a smartphone**

*NuTonomy joins forces with 'the Uber of Southeast Asia'*

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# Trucking – Highly Fertile Ground

- **Long haul trucking is likely the first place we will see it adopted.**
  - Reduces costs associated with drivers.
  - End run around limits on hours of driving.
- **Where does it stand?**
  - Lots of trials underway.
  - TuSimple – actively building a long haul network.
  - Waymo – focused more on last mile/local delivery.



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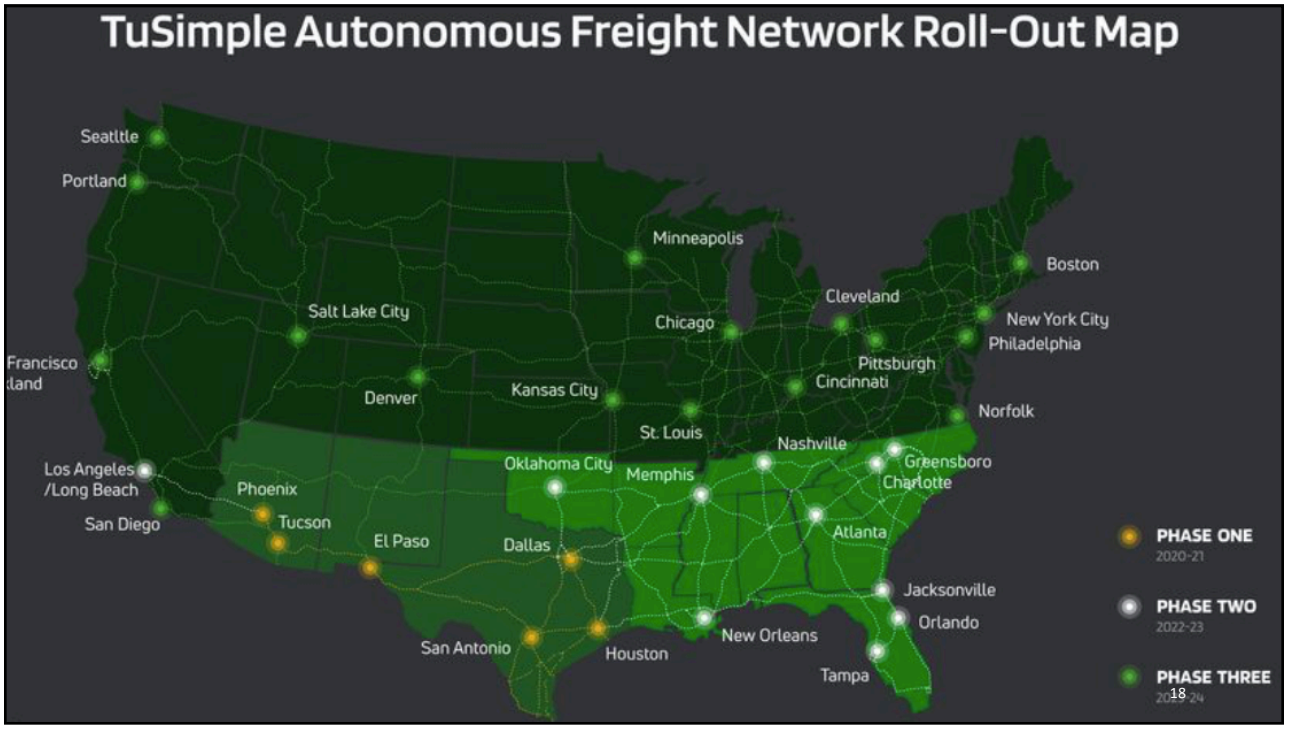


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# What will the future look like?

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This:


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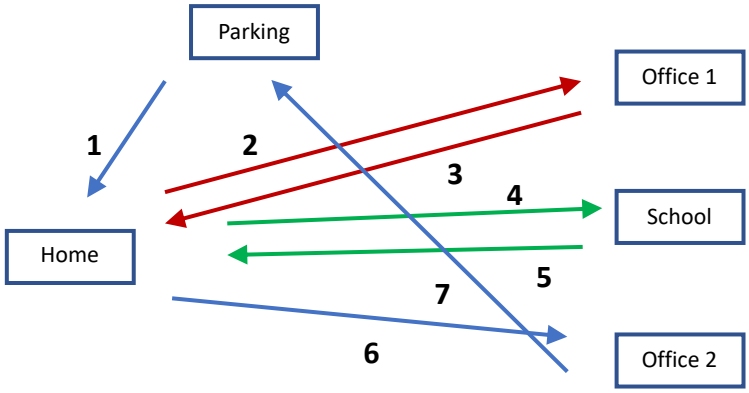
## But, will it be:




## Hell

- **Primarily individual private car ownership**
  - Much as today
- **Combustion engines**
- **Why Hell?**
  - Dramatically increased VMT and pollution
  - Potentially increased congestion
  - Parking

## Two Adults and a Child: Morning Miles




***And this is just the morning…..***



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## Heaven


- **Vehicle ownership will be very limited**
  - Private ownership for those with specialized vehicle needs.
  - Fleet ownership will serve everybody else.
- **Engines: electric**
- **Insurance: product liability**
- **Not clear when we will get there, but this is the likely model.**
  - 2030 for widespread adoption in many regions.



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## Why is this Heaven?

- **Not only autonomous, but:**
  - Shared
  - Connected
  - Green
- **Far fewer cars in existence.**
  - Better resource utilization.
- **VMT could go up or down, but more productive than in Hell.**
- **Congestion effects – unclear, but likely reduced.**
  - Right-sized vehicles, platooning, sharing, V2V communication
- **Minimal need for parking.**

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## Transition

- **Short term: Tesla model of highway autonomy**
  - Level 2, adaptive cruise control
- **Medium term:**
  - short period of personal vehicle ownership with level 3 capability
  - introduction of independent private fleets – Uber, Lyft, Google, nuTonomy, etc., with level 4/5 capability
- **Long term:**
  - Personal vehicle ownership is largely a thing of the past

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# Economics Drives Transition: Private

- **Adoption dividend for private individuals**
  - Eliminate car ownership
    - Ave annual cost of owning a car: $9,282
    - Cost per mile will fall: $0.59 to $0.19
  - Repurpose your garage
    - $50,000 from transition to bedroom
- **Time recovery**
  - 50% of Bay Area workforce has a commute in excess of 30 minutes

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# Economics Drives Transition: Public

- **Economic and social costs associated with human drivers are enormous:**
  - ACCIDENTS:
    - Drive 25% of congestion
    - Result in 40,000 deaths
    - And 3+ million injuries
    - 90+% caused by human error
  - Costs of human drivers estimated at $0.8 to $1.3 **TR**illion each year

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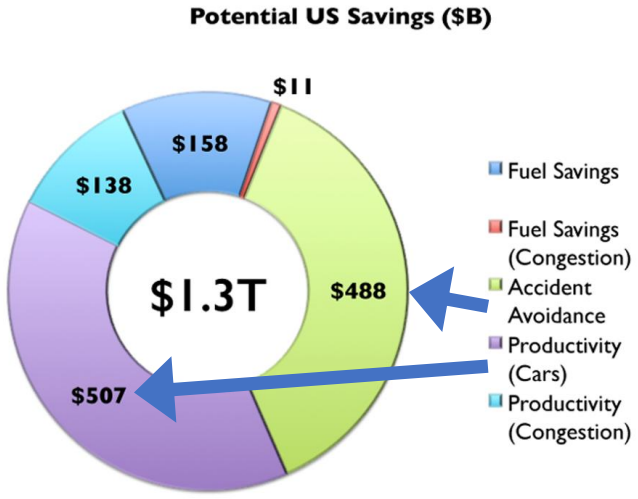
# Potential Savings

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Morgan Stanley

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# Public Policy/Planning Issues

- **Government buy-in:**
  - Essential – gov't must encourage progress
  - Difficult – because of displacement issue
- **Important transitional issues:**
  - What infrastructure should be developed?
  - What to do about public transportation?
  - What to do with all of the parking spaces?


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# Planning

- **Respond to the coming changes**
  - The planning horizon for any investment in transportation infrastructure based on today's predominant technology has changed.
    - It may have gotten **MUCH shorter.**
- **Encourage the changes to happen more quickly**
  - Mobility, safety, productivity, and environmental benefits abound.

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# Responding to the coming changes:

- **Transportation organizations must develop a forecast for adoption in their specific geography**
  - San Francisco – faster than Chicago
  - Chicago – faster than Fresno
  - Fresno - faster than Kansas
- **How does this affect the ROR calculation on projects?**
  - Highway expansion? Public Transportation?

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## Encourage Change

- **Mobility and equity considerations**
  - Elderly/disabled/impoverished
- **Safety:** only way to reduce traffic fatalities is by coordinated effort
- **Productivity:** reduced congestion
- **Environment:** speed transition to electric vehicles

These are all societal benefits that come about too slowly if the private market is left to itself.

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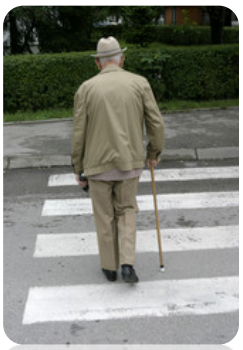
## Mobility and Equity

- **Mobility**
  - Handicapped
  - Elderly
  - Lower income
- **Equity**
  - Public Transportation often does not work well for low income workers/residential workers
    - Does not go from residential to residential, but from residential to commercial



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## Safety and Productivity

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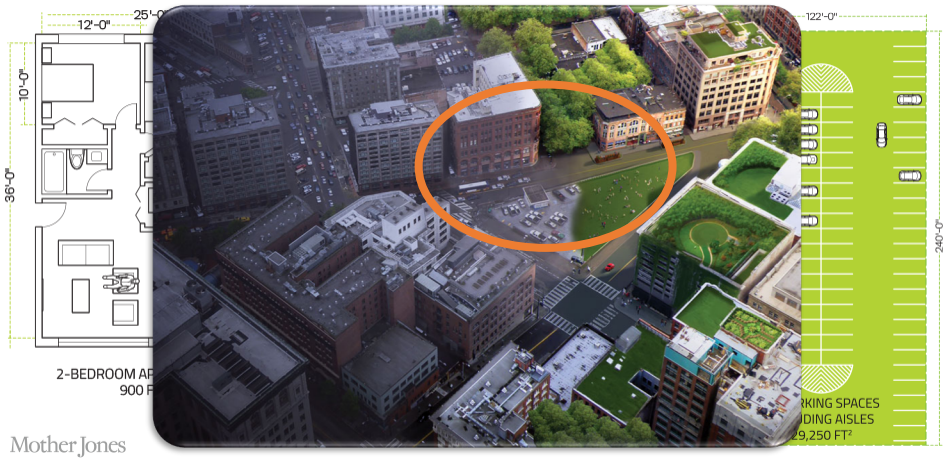
## Environment

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## Incentives Through Policy and Planning

- **Allow vehicles equipped with ACC into HOV lanes**
  - Eventual conversion of HOV lanes to ACC/AV lanes
- **Allow ACC equipped vehicles to travel faster in HOV lanes**
- **Subsidize ACC upgrades**
  - Arguably more concrete benefits than electric vehicles
- **Sticks: higher costs of vehicle ownership**
  - Registration fees, VMT taxes, etc.

Note: ACC = Adaptive Cruise Control

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## Interim Summary

- **Transition is coming very quickly!**
  - Most reports are extremely conservative
  - Apply generally, but faster in many regions.
- **Very important to start incorporating AVs into planning now.**
  - To realize the benefits of AVS.
  - Sacrifice expansion for maintenance.

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## What Changes Will This Bring?

- Disposable Income
- Government Finances
- Transportation
- Infrastructure
- Employment
- Housing
- Public Transportation
- Parking

Potentially dramatic improvements in infrastructure planning and maintenance - Data sharing and integration

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## Disposable Income


- Costs $9,282 to own a car
- Will cost $3,000 to use TaaS
- Net increase in disposable income of > $6,000
- Spread across all households: more than $1 trillion in new spending in the economy
- Major boost to economic activity
  - CREATING JOBS!

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# Government Finances


- **Government finances thrown for a loop:**
  - Revenues up and down:
    - Parking revenue, tickets, traffic violation revenues
    - More commercial, retail and residential space
  - Less spending on road development
  - More (maybe less) spent on road maintenance
    - Fewer road miles
    - but perhaps more VMT

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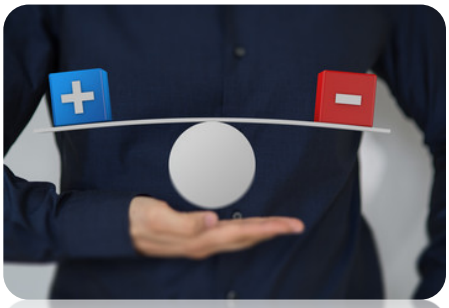
# Transportation

- **Demand for transportation will likely increase significantly: price falls, demand rises**
  - Commutes may increase in distance, but not necessarily in duration
  - Zero passenger trips will arise
    - Deliveries
- **At the same time, demand for roadway lane-miles will likely decrease**
  - AVs make significantly more efficient use of space
  - Front to back and side to side



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# Infrastructure

- **Focus of transportation infrastructure:**
  - Currently on expansion
  - Will turn toward:
    - Maintenance
      - Signage and striping has to be robust
      - TaaS providers push for fewer potholes?
    - Adding technology
      - Stop lights will be digital as well as visual
  - Some will disappear: Signs!

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# Employment

- **Massive job displacement/relocation (Millions!):**
  - Drivers of all varieties: truck, taxi, delivery…
  - Car production jobs, car parts production jobs
  - Gas station, vehicle repair, and body shop
  - Police and fire
  - Health care workers
  - And so on…


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# Employment (con't)


- **What jobs will be created?**
  - IT jobs
  - Retail/Production jobs
  - ??
- **Always easier to identify things that will go away than to identify what will pop up in its place**
- **Regardless of where they are created, training programs will be crucial to the transition.**

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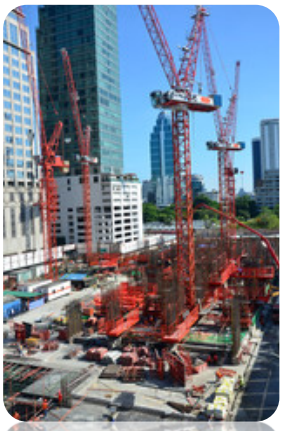
# Housing



- **Housing is suddenly easier to build**
  - Issue of traffic congestion is significantly reduced
  - Space for new housing is available where parking lots used to be
- **Existing houses can now accommodate more people: garage to bedroom conversions**

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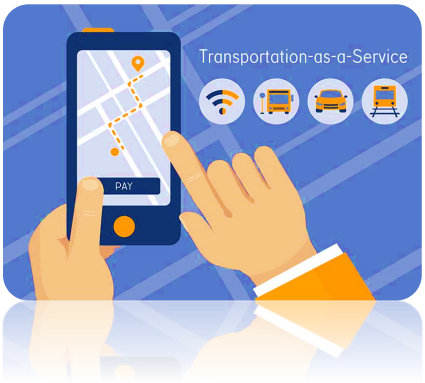
# Public Transportation




- **Ambiguous implications for public transportation**
- **Demand may:**
  - Shrink because of low cost of TaaS
  - Grow because last mile problem is solved
- **Extensions may be added through contract with TaaS company**



# Cautionary Tale From Long Ago

- **Automobiles impact on rail:**

"The increasing dominance of cars was also felt by railway companies, which by June 1894 had to start making **pricing concessions** for transporting goods, even including free transport."

- Samuel I. Schwartz, No One at the Wheel, 2018

# Parking

- **Greatly reduced demand for parking lots.**
- **Service providers will own parking lots in strategic places.**
  - Where the cost of land is low.
- **Street parking will largely be a thing of the past.**
  - More green space in cities.
- **Shopping mall parking will be converted to:**
  - More shopping mall? Housing?
- **Apartment complexes will convert parking.**

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# Freeing Up Urban Space from Parking

- **Los Angeles: 14% of incorporated land area**
  - 200 Square miles
- **San Francisco: 275,450 on-street parking spaces**
  - Enough to parallel-park a line of cars 900 miles.
    - California's entire coastline is 840-miles.
  - Enough parking to fill parking lots that would cover the **Presidio, Golden Gate Park, and Lake Merced**.
- **Nationwide: (estimate) 500 million spaces**
  - That's larger than Delaware and Rhode Island combined.
  - Could be as many as 2 billion (add in Connecticut and Vermont).

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## Summary of Change

- **Massive employment upheaval.**
- **Local government finances will look very different.**
- **Housing will be easier to build and more plentiful.**
- **Parking conversions will be commonplace.**
- **Demand for transportation infrastructure will likely decline.**
  - Transportation infrastructure technology will be a booming business.
- **Demand for public transportation may well decline.**

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## Environmental Implications Depends: Heaven or Hell

- **Improved resource utilization**
- **More efficient travel**
  - Right sized vehicles
  - Optimized routes
  - Reduced congestion
  - No searching for parking
- **Increased VMT**
- **Cleaner technologies**
  - Electric
  - Lighter vehicles
- **Energy use of onboard electronics**
  - Weight and functional
- **Increased urban sprawl**

Bottom line: push governments at all levels to embrace and to implement policies deterring private vehicle ownership and zero passenger miles

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# Thank you!

## Any Questions?

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