



# *Osher Lifelong Learning Institute, Winter 2023* **Contemporary Economic Policy Issues**

University of Richmond  
Jan-Feb, 2023

Host: Jon Haveman, Ph.D.  
National Economic Education Delegation

1



## **Available** NEED Topics Include:

- **Coronavirus Economics**
- **US Economy**
- **Climate Change**
- **Economic Inequality**
- **Economic Mobility**
- **Trade and Globalization**
- **Minimum Wages**
- **Immigration Economics**
- **Housing Policy**
- **Federal Budgets**
- **Federal Debt**
- **Black-White Wealth Gap**
- **Autonomous Vehicles**
- **US Social Policy**

2

## Submitting Questions

- **Please submit questions in the chat.**
  - I will try to handle them as they come up, but may take them in a bunch as time permits.
- **We will do a verbal Q&A once the material has been presented.**
  - And the questions in the chat have been addressed.
- **Slides will be available from the NEED website tomorrow ([https://needelegation.org/delivered\\_presentations.php](https://needelegation.org/delivered_presentations.php))**



3

## Course Outline: University of Richmond

- **Contemporary Economic Policy**
  - Week 1 (1/23): U.S. Economic Update (Jon Haveman, NEED)
  - Week 2 (1/30): Federal Debt (Brian Peterson, Lagrange College)
  - Week 3 (2/6): Climate Change Economics (Sarah Jacobson, Williams College)
  - **Week 4 (2/13): Autonomous Vehicles (Jon Haveman)**
  - Week 5 (2/20): Healthcare Economics (Kelley Cullen, E. Washington Univ.)
  - Week 6 (2/27): The Black-White Wealth Gap (Jon Haveman)



4

## Credits and Disclaimer

- **This slide deck was authored by:**
  - Jon Haveman, NEED
- **This slide deck was reviewed by:**
  - Ronald Fisher, Michigan State University
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- **Disclaimer**
  - NEED presentations are designed to be nonpartisan.
  - It is, however, inevitable that the presenter will be asked for and will provide their own views.
  - Such views are those of the presenter and not necessarily those of the National Economic Education Delegation (NEED).



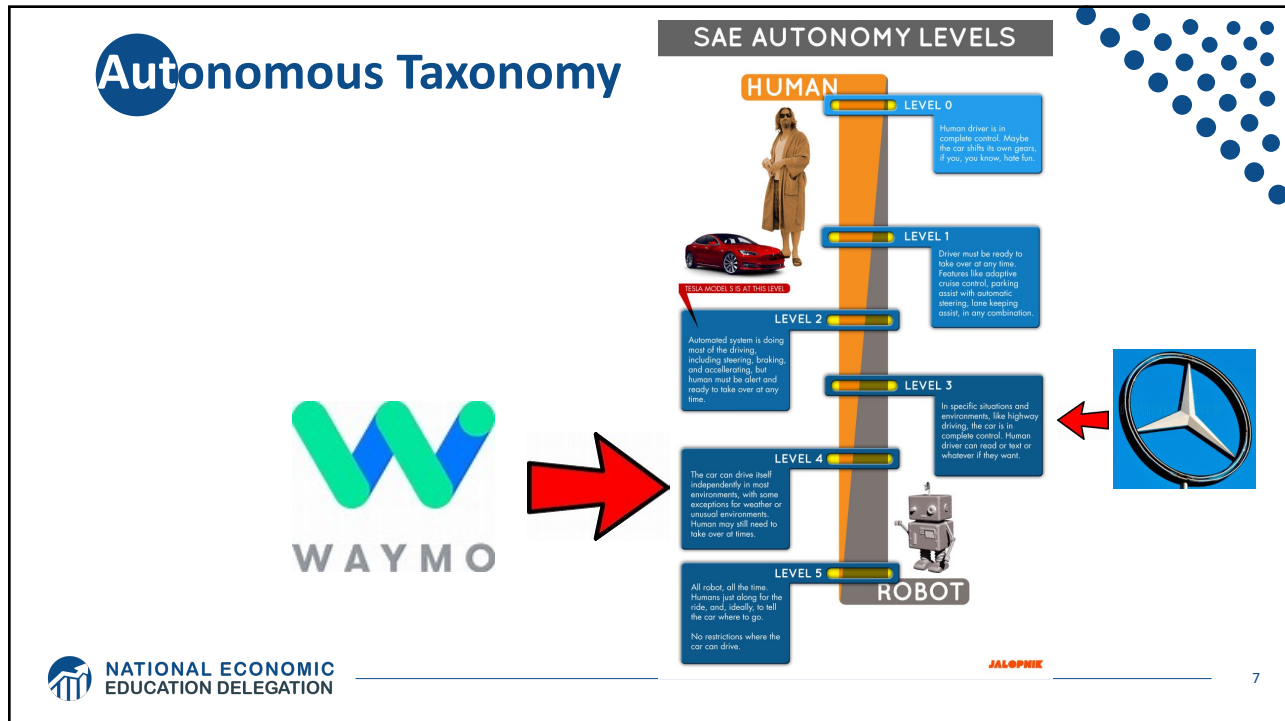
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## Outline

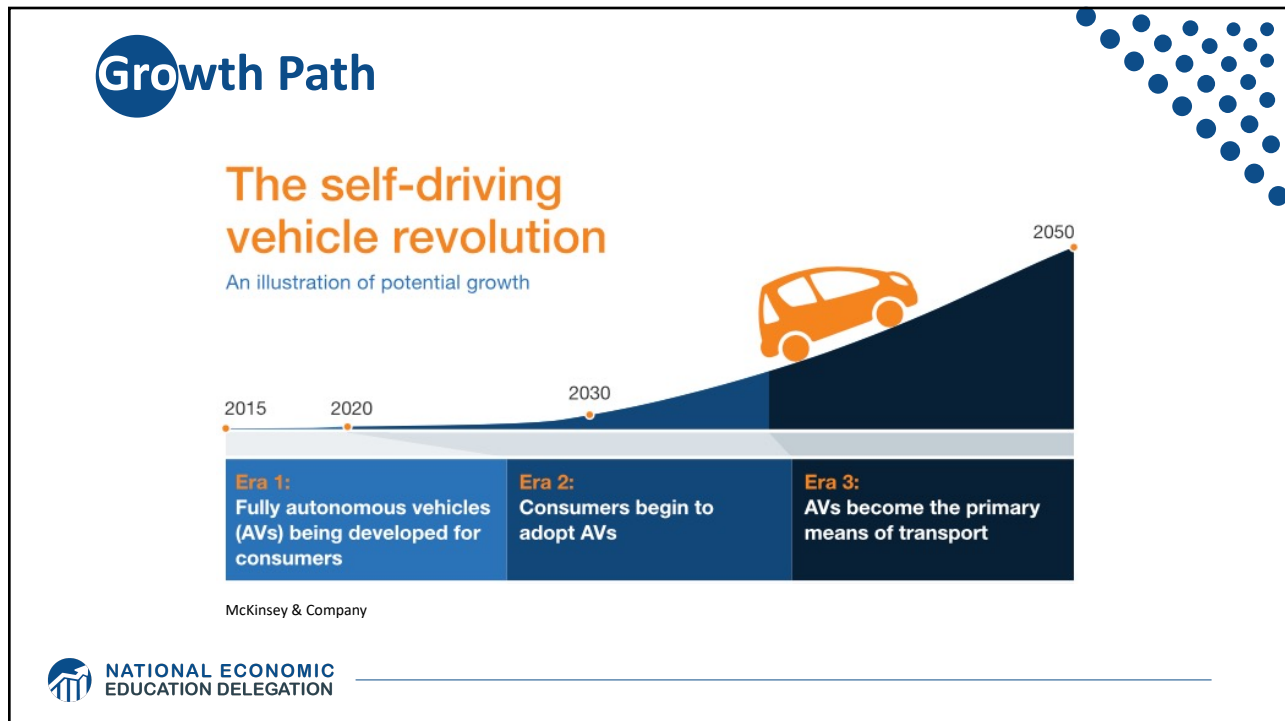
- **Where does the AV path lead?**
- **Policy/Planning Issues**
- **Major Economic/Development Changes**



6



7



8

# Three Important Questions:

1. When will Transportation as a Service (TaaS) be available?
2. How quick will the transition be?
3. What will the future look like?

# WHEN? What do the headlines say?



NVIDIA to introduce level-4 enabling system by 2018



First autonomous Toyota to be available in 2020



**Volkswagen**

Volkswagen expects first self driving cars on the market by 2019



**Audi**

Audi to introduce a self-driving car by 2020



**TESLA MOTORS**

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

## 40+ Corporations Working On Autonomous Vehicles



**TOYOTA**



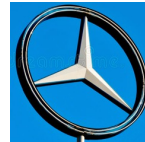
WAYMO



**HONDA**



**Audi**



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11

11

## WHEN?

### What is possible?

- **By 2025 (?)**
- **Potentially 95% of VMT by 2035.**
  - Last 5% may 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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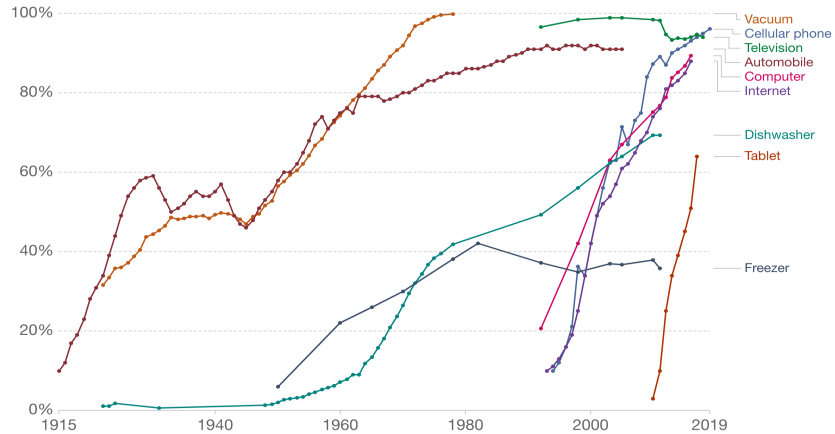
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# Rate of Technology Adoption – Faster!

## Technology adoption in US households, 1915 to 2019

Technology adoption rates, measured as the percentage of households in the United States using a particular technology.

Our World in Data



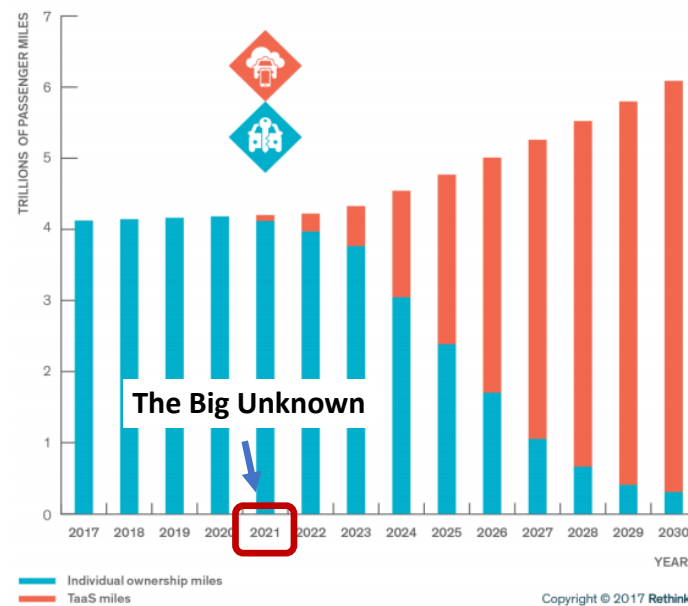
Source: Comin and Hobbijn (2004) and others. OurWorldInData.org/technology-adoption/ · CC BY. Note: See the sources tab for definitions of household adoption, or adoption rates, by technology type.

13

# Forecast

## » Speed of TaaS adoption

Timing may be off.  
But the point is:  
RAPID ADOPTION!



14

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

Lyft and Motional's all-electric robotaxi service is now live in Las Vegas

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

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

Cruise is now charging for rides in its driverless vehicles in San Francisco



# Waymo is Headed to New York!



New York City



Image courtesy of Waymo



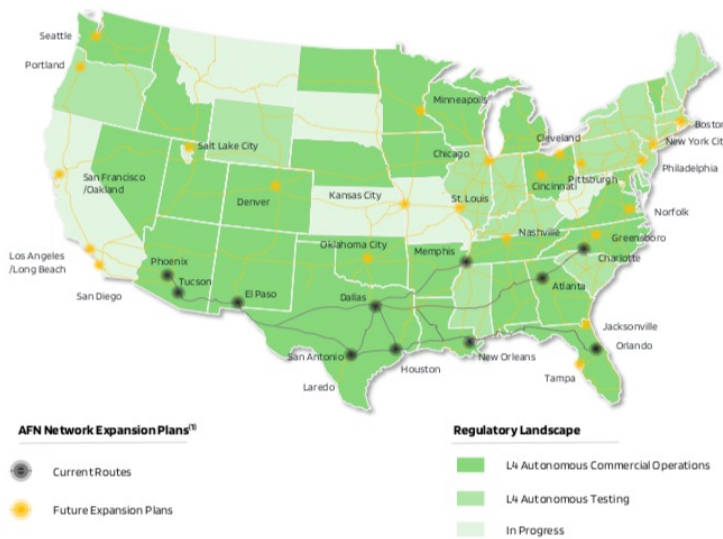


# Trucking – Highly Fertile Ground

- **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.



# TuSimple Current and Future Routes (Level 4)



**44** states  
allow autonomous semi-truck testing

**26** states  
allow autonomous semi-truck commercial deployment

**50** states  
cohesive AV operations framework laid out in US DOT 4.0 AV Regulations



## Actively Pursuing Autonomous Local Delivery

- Dominos
- Walmart
- Amazon
- CVS Pharmacy
- Stop and Shop
- Postmates
- Kroger



## What will the future look like?

**This:**



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**But, will it be:**





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# Hell

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

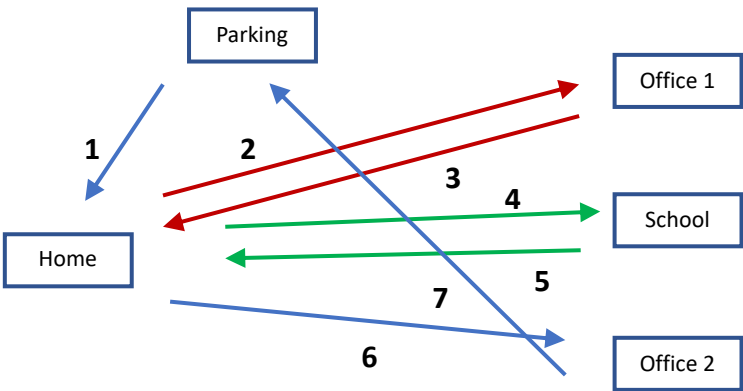





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# Two Adults and a Child: Morning Miles



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: steel, rubber, aluminum, and land!
- **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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## Economics Drives Transition: Private

- **Adoption dividend for private individuals**

- Eliminate car ownership
  - Ave annual cost of owning a car: \$10,728 (2022)
  - Cost per mile will fall: \$0.72 to \$0.19
- Repurpose your garage
  - \$50,000 from transition to bedroom

*Average Ownership Costs Per Mile*

Miles per Year	10k	15k	20k
Average Cost	76¢	72¢	70¢

- **Time recovery**

- 50% of the SF Bay Area workforce has a commute in excess of 30 minutes.



27

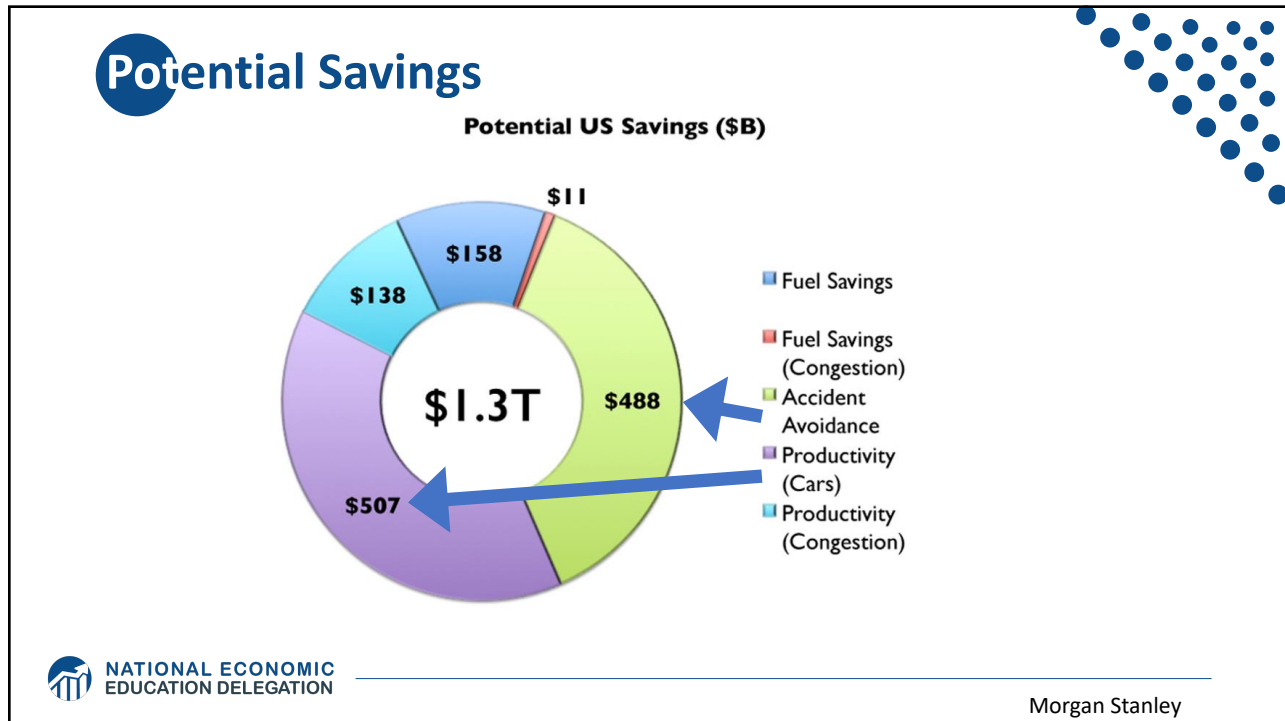
## Economics Drives Transition: Public

- **Economic and social costs associated with human drivers are enormous:**

- ACCIDENTS:
  - Drive 25% of congestion.
  - Result in 40,000 deaths.
  - And 2 million injuries.
  - 90+% caused by human error.
- Increased productivity from not driving.
- Costs of human drivers estimated at up to \$1.3 TRillion each year



28



29

## 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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## 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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34

## 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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## What Changes Will This Bring?

- **Disposable income**
- **Government finances**
- **Transportation demand**
- **Infrastructure**
- **Housing**
- **Public transportation**
- **Employment**
- **Parking**

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



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## Disposable Income



- Costs \$10,728 to own a car
- Will cost \$3,000 to use TaaS
- Net increase in disposable income of > \$7,000
- Spread across all households: more than \$1 trillion in new spending in the economy
- Major boost to economic activity
  - CREATING JOBS!

37

## Government Finances

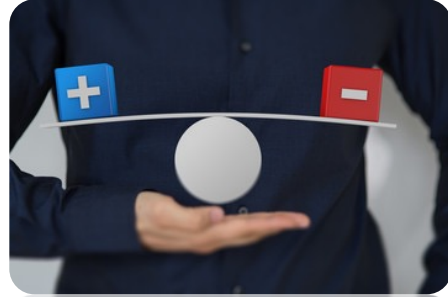


- **Government finances thrown for a loop:**
  - Revenues up and down:
    - Parking revenue, tickets, traffic violation revenues
    - More commercial, retail and residential space
  - Less spending on road development
  - More (maybe less) spent on road maintenance
    - Fewer road miles
    - but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

38

## Transportation Demand

- **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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## Housing



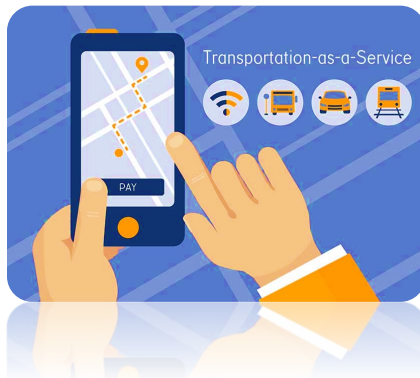
- **Housing is suddenly easier to build**
  - Issue of traffic congestion is significantly reduced.
  - Space for new housing is available where parking lots used to be.
- **Existing houses can now accommodate more people: garage to bedroom conversions.**



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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**



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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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## Parking

- **Greatly reduced demand for parking lots.**
- **Service providers will own parking lots in strategic places.**
- **Street parking will largely be a thing of the past.**
  - More green space in cities
- **Shopping mall and apartment parking?**
  - Converted to housing?



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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 60 miles longer than California's entire 840-mile coastline
- **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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46

46

## Potential Problems and Concerns

- **Expansion of the electric grid to provide sufficient capacity.**
- **Mining for rare earth minerals for batteries.**
- **Hacking of autonomous vehicles for nefarious purposes.**
- **Competition in service provision in some markets.**
- **And many more...**

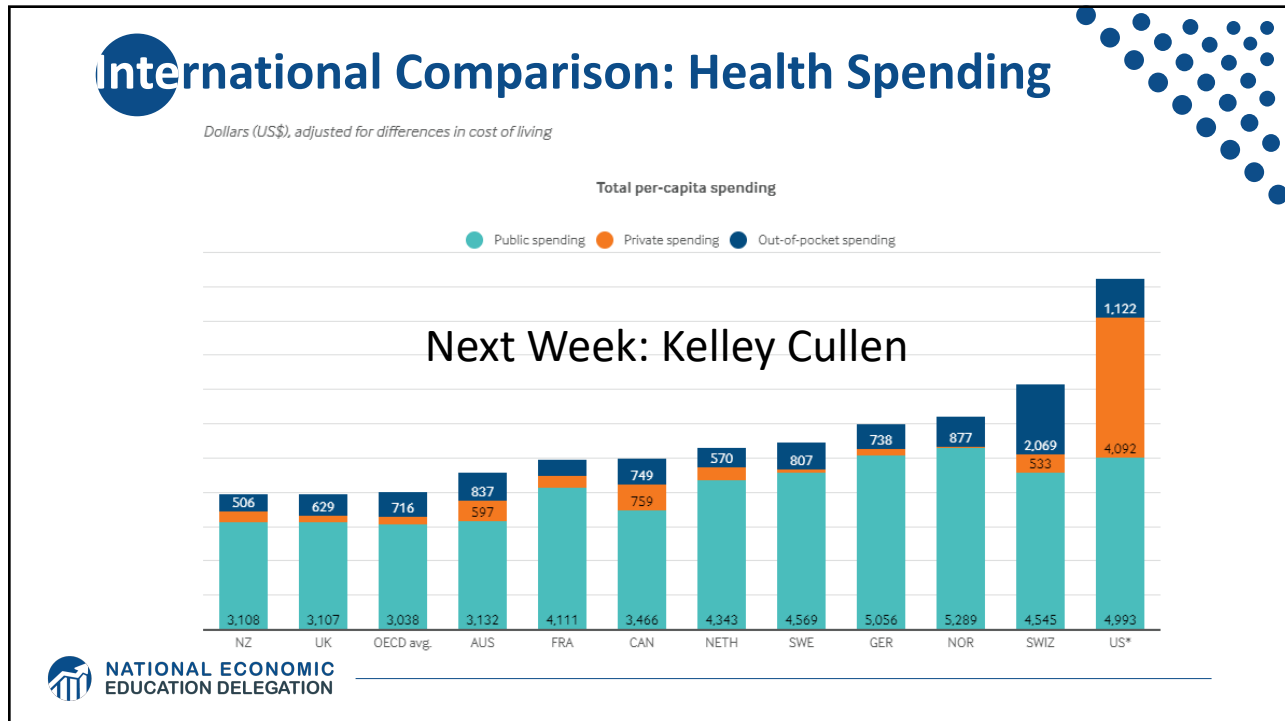


## Summary of Change

- **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.**
- **Coming likely sooner rather than later!**







49

# Thank you!

## Any Questions?

[www.NEEDelegation.org](http://www.NEEDelegation.org)  
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 Jon@NEEDelegation.org

Contact NEED: [info@NEEDelegation.org](mailto:info@NEEDelegation.org)

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50