

Club of Newberg, OR

Driving Change – Autonomous Vehicles’ Big Impact

National Economic Education Delegation

Jon Haveman, Ph.D.

July 6, 2021



NATIONAL ECONOMIC
EDUCATION DELEGATION

1

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.



NATIONAL ECONOMIC
EDUCATION DELEGATION

2

2

Who Are We?

- **Honorary Board: 54 members**

- 2 Fed Chairs: Janet Yellen, Ben Bernanke
- 6 Chairs Council of Economic Advisers
 - Furman (D), Rosen (R), Bernanke (R), Yellen (D), Tyson (D), Goolsbee (D)
- 3 Nobel Prize Winners
 - Akerlof, Smith, Maskin

- **Delegates: 590+ members**

- At all levels of academia and some in government service
- All have a Ph.D. in economics
- Crowdsource slide decks
- Give presentations

- **Global Partners: 45 Ph.D. Economists**

- Aid in slide deck development



NATIONAL ECONOMIC
EDUCATION DELEGATION

3

3

Available NEED Topics Include:

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



NATIONAL ECONOMIC
EDUCATION DELEGATION

4

4

Credits and Disclaimer

- **This slide deck was authored by:**
 - Jon Haveman, NEED
- **This slide deck was reviewed by:**
 - Ronald Fisher, Michigan State University
 - William F. Fox, University of Tennessee, Knoxville
- **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).

5

Outline

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

6

Autonomous Taxonomy

SAE AUTONOMY LEVELS

HUMAN

LEVEL 0
Human driver is in complete control. Maybe the car shifts its own gears, if you, you know, have fun.

LEVEL 1
Driver must be ready to take over at any time. Features like adaptive cruise control, parking assist with automatic steering, lane keeping assist, in any combination.

LEVEL 2
Automated system is doing most of the driving, including steering, braking, and accelerating, but human must be alert and ready to take over at any time.

LEVEL 3
In specific situations and environments, like highway driving, the car is in complete control. Human driver can read or text or whatever if they want.

LEVEL 4
The car can drive itself independently in most environments, with some exceptions for weather or unusual environments. Human may still need to take over at times.

LEVEL 5
All robot, all the time. Humans just along for the ride and, ideally, to tell the car where to go. No restrictions where the car can drive.

ROBOT

WAYMO

NATIONAL ECONOMIC EDUCATION DELEGATION

JALOPNIK

7

7

Growth Path

The self-driving vehicle revolution

An illustration of potential growth

2015 2020 2030 2050

Era 1:
Fully autonomous vehicles (AVs) being developed for consumers

Era 2:
Consumers begin to adopt AVs

Era 3:
AVs become the primary means of transport

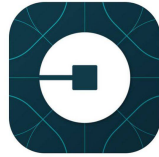
McKinsey & Company

NATIONAL ECONOMIC EDUCATION DELEGATION

8

8

40+ Corporations Working On Autonomous Vehicles



WAYMO



NATIONAL ECONOMIC
EDUCATION DELEGATION

9

9

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.



NATIONAL ECONOMIC
EDUCATION DELEGATION

10

What will the future look like?



11

This:



12

But, will it be:



NATIONAL ECONOMIC
EDUCATION DELEGATION

13

Hell

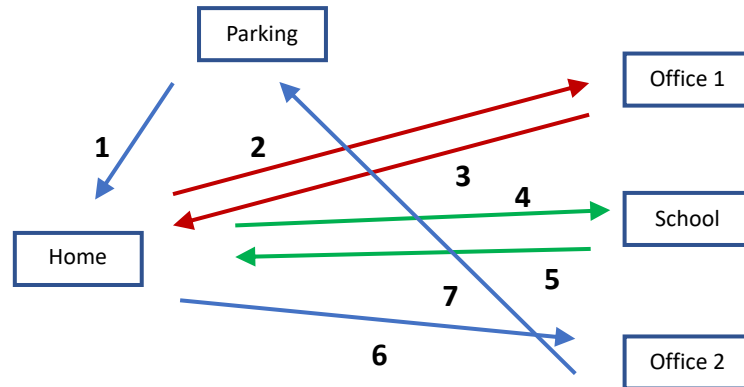
- **Primarily individual private car ownership**
 - Much as today.
- **Internal combustion engines**
- **Why Hell?**
 - Dramatically increased VMT and pollution.
 - Potentially increased congestion.
 - Parking



NATIONAL ECONOMIC
EDUCATION DELEGATION

14

Two Adults and a Child: Morning Miles



And this is just the morning.....

Heaven



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

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.**



NATIONAL ECONOMIC
EDUCATION DELEGATION

17

Economics Drives Transition: Private

- **Adoption dividend for private individuals**
 - Eliminate car ownership
 - Ave annual cost of owning a car: \$9,561 (2020)
 - Cost per mile will fall: \$0.59 to \$0.19
 - Repurpose your garage
 - \$50,000 from transition to bedroom
- **Time recovery**
 - 39% of the Yamhill County workforce has a commute in excess of 30 minutes.



NATIONAL ECONOMIC
EDUCATION DELEGATION

18

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



NATIONAL ECONOMIC
EDUCATION DELEGATION

19

Encourage Change

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

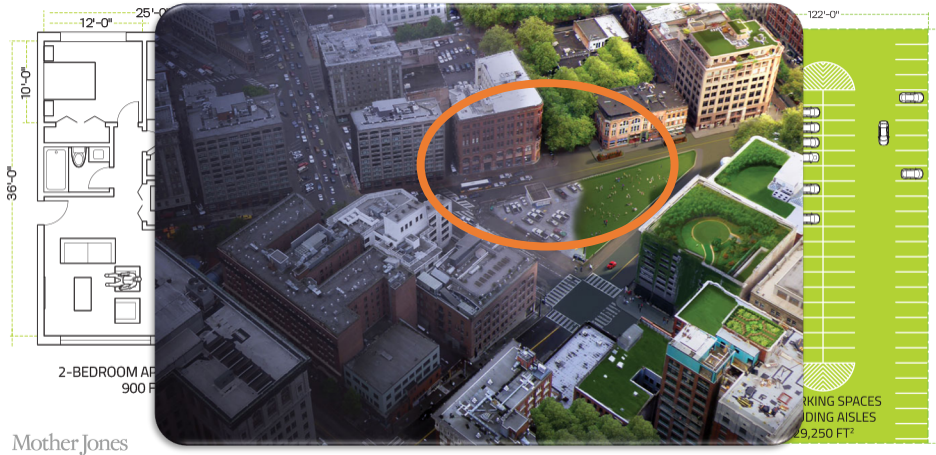
These are all societal benefits that come about too slowly
if the private market is left to itself.



NATIONAL ECONOMIC
EDUCATION DELEGATION

20

Environment



What Changes Will This Bring?

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

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

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...



NATIONAL ECONOMIC
EDUCATION DELEGATION

23

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?



NATIONAL ECONOMIC
EDUCATION DELEGATION

24

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).



25

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!**



26

Thank you!

Any Questions?

www.NEEDelegation.org

Jon D. Haveman

Jon@NEEDelegation.org

Contact NEED: info@NEEDelegation.org

Submit a testimonial: www.NEEDelegation.org/testimonials.php

Become a Friend of NEED: www.NEEDelegation.org/friend.php



NATIONAL ECONOMIC
EDUCATION DELEGATION

27