

# THE FUTURE OF MOBILITY: TESLA DERANGEMENT SYNDROME



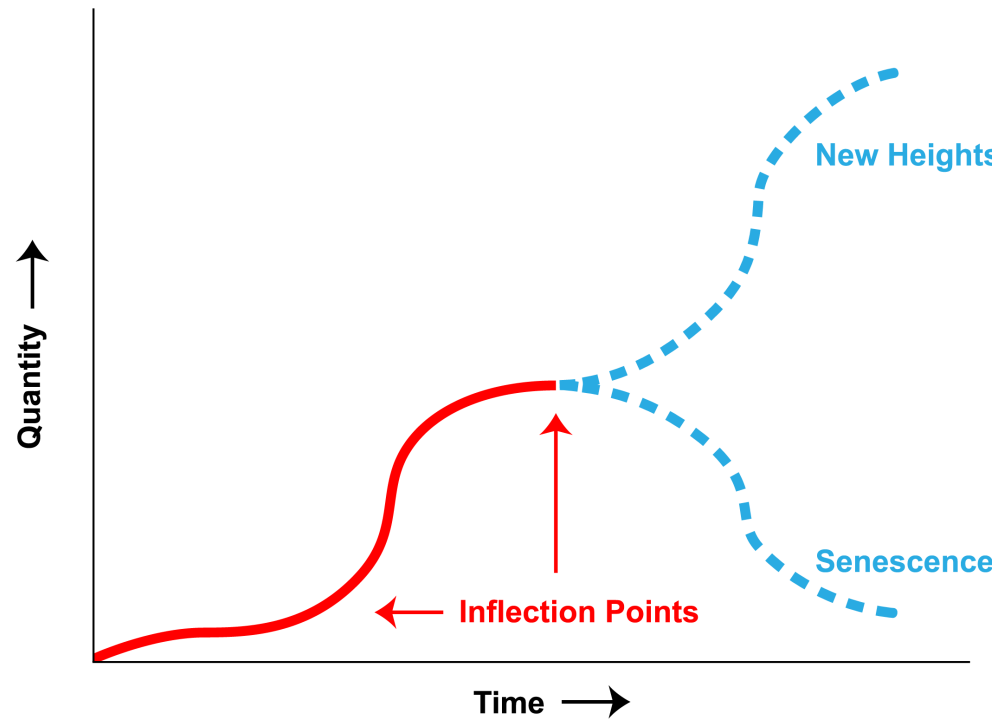
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# *The Oil Inflection Point?*



- 50% of people think Amazon, Apple, Google will like manufacture cars by 2050

# Cars: Big Kahuna For Oil Demand

Cars without oil, owners, or operators ?

Tesla effect → Batteries replace hydrocarbons

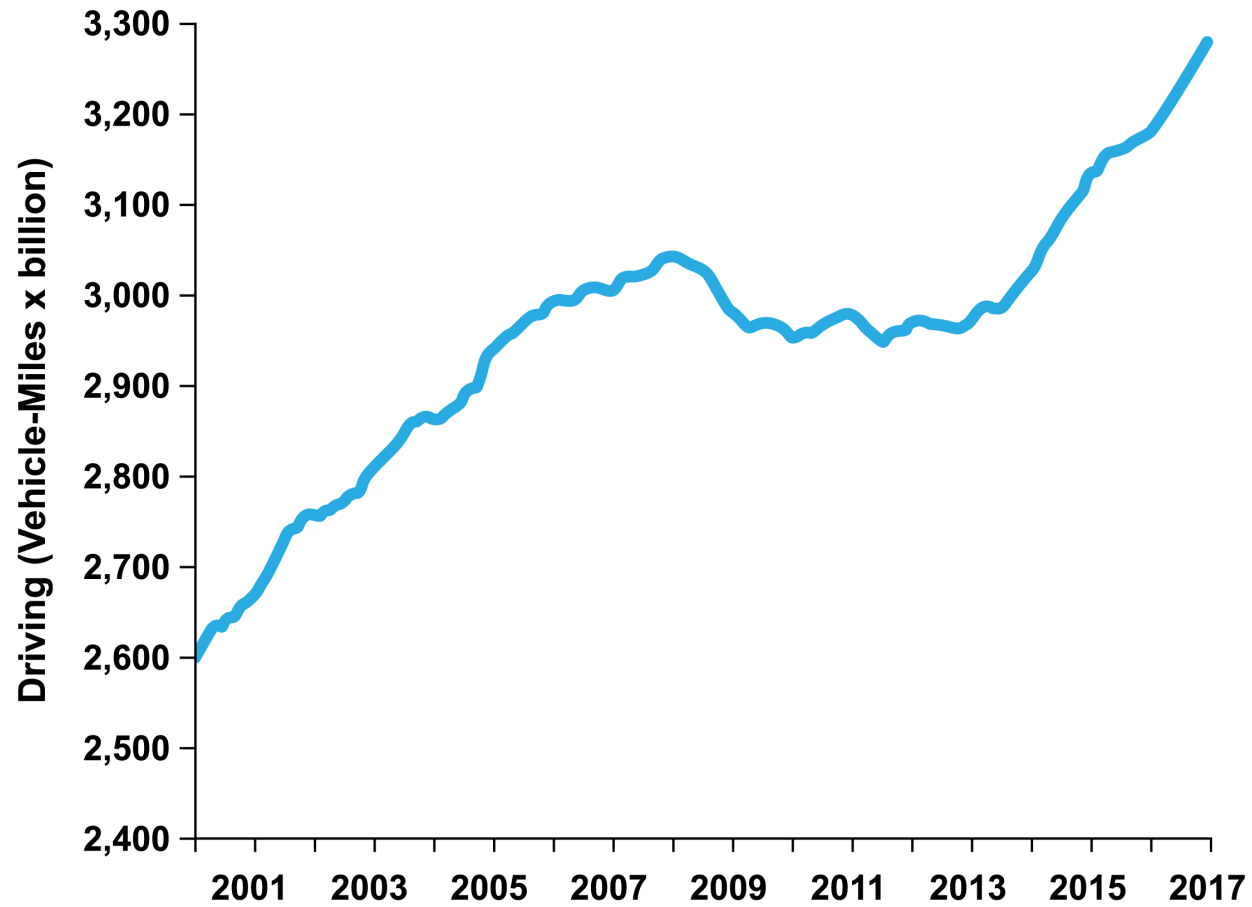
Uber effect → Sharing replaces property

Google effect → Robots replace drivers



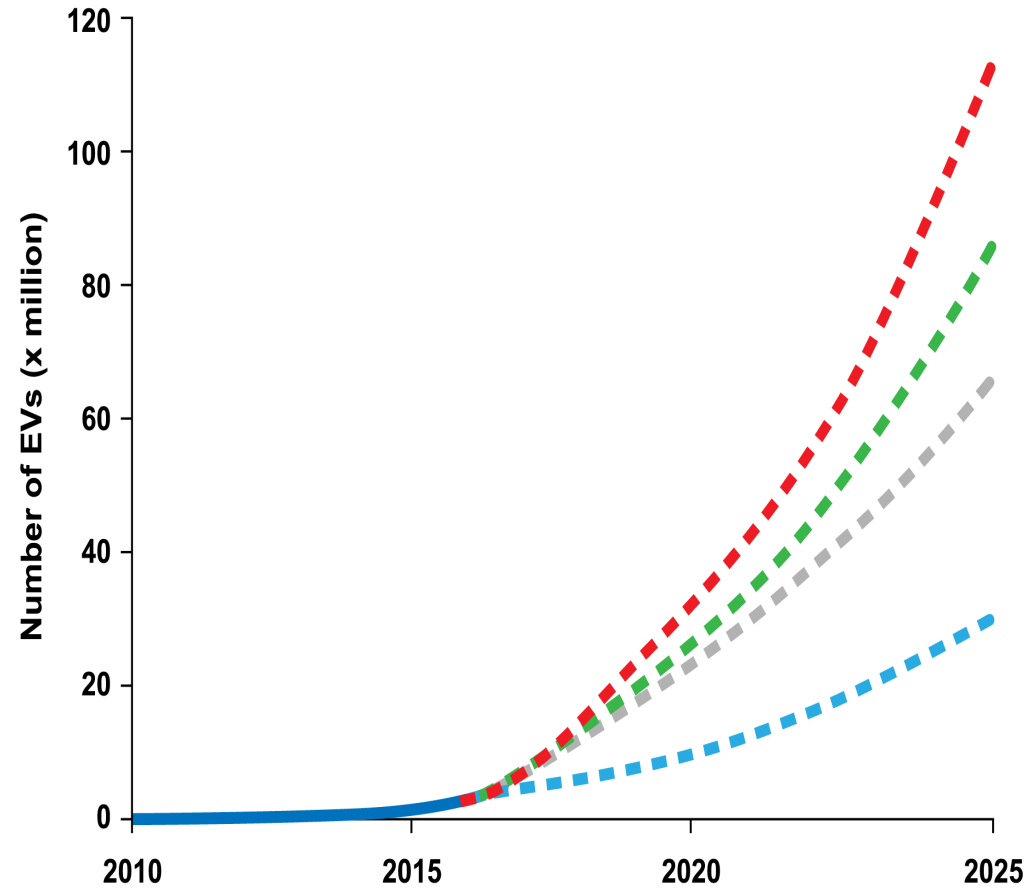
# *But First... Has U.S. Reached Peak Driving?*

Annual U.S. Vehicle-Miles Driven



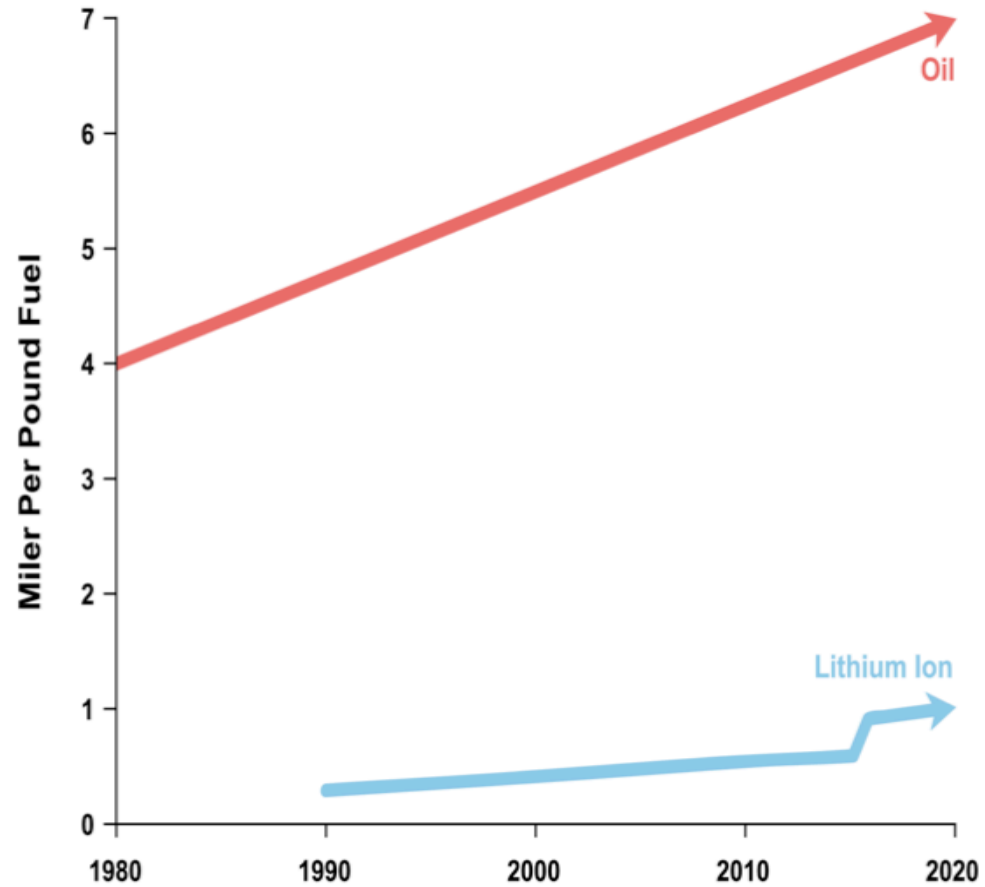
# *Tesla Effect: What If EV Optimists Are Right?*

## IEA Global EV Outlook



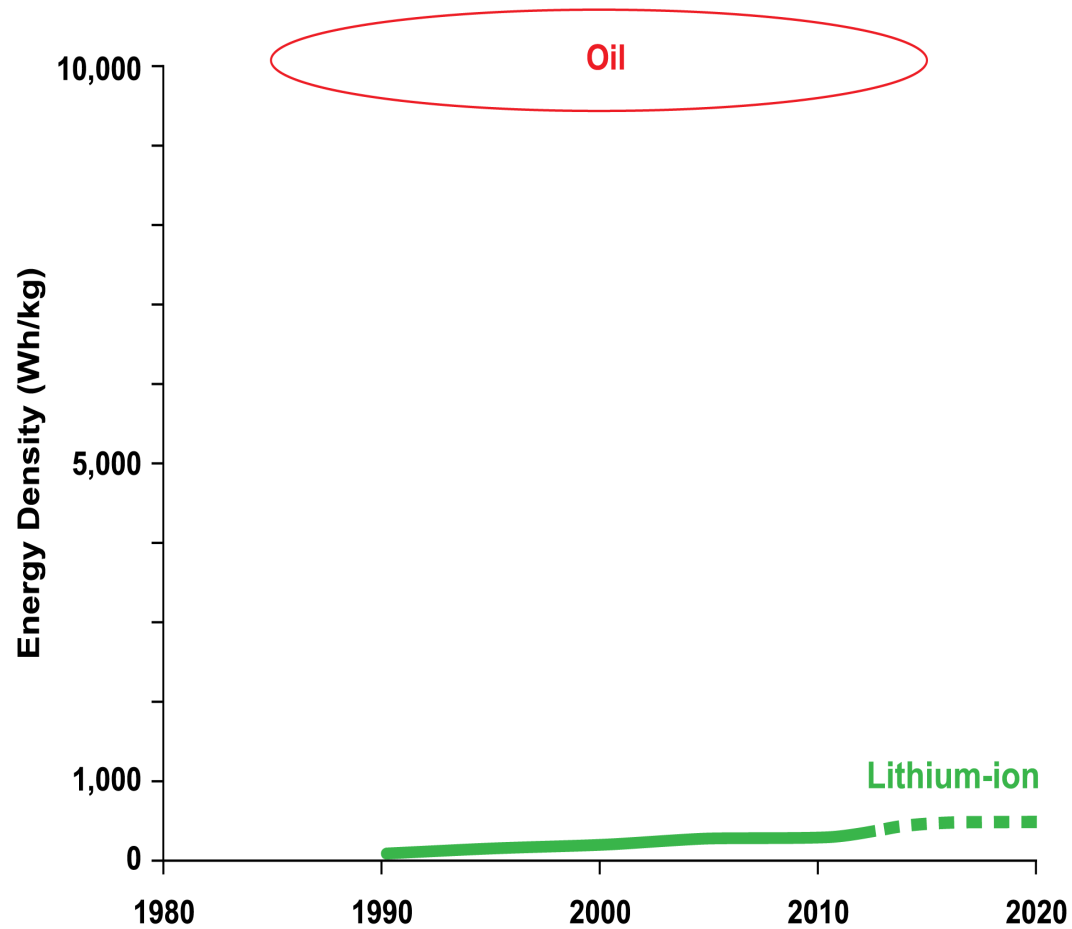
# All Tech Gets Better ... Batteries vs Barrels

## Range Per Pound Of Fuel



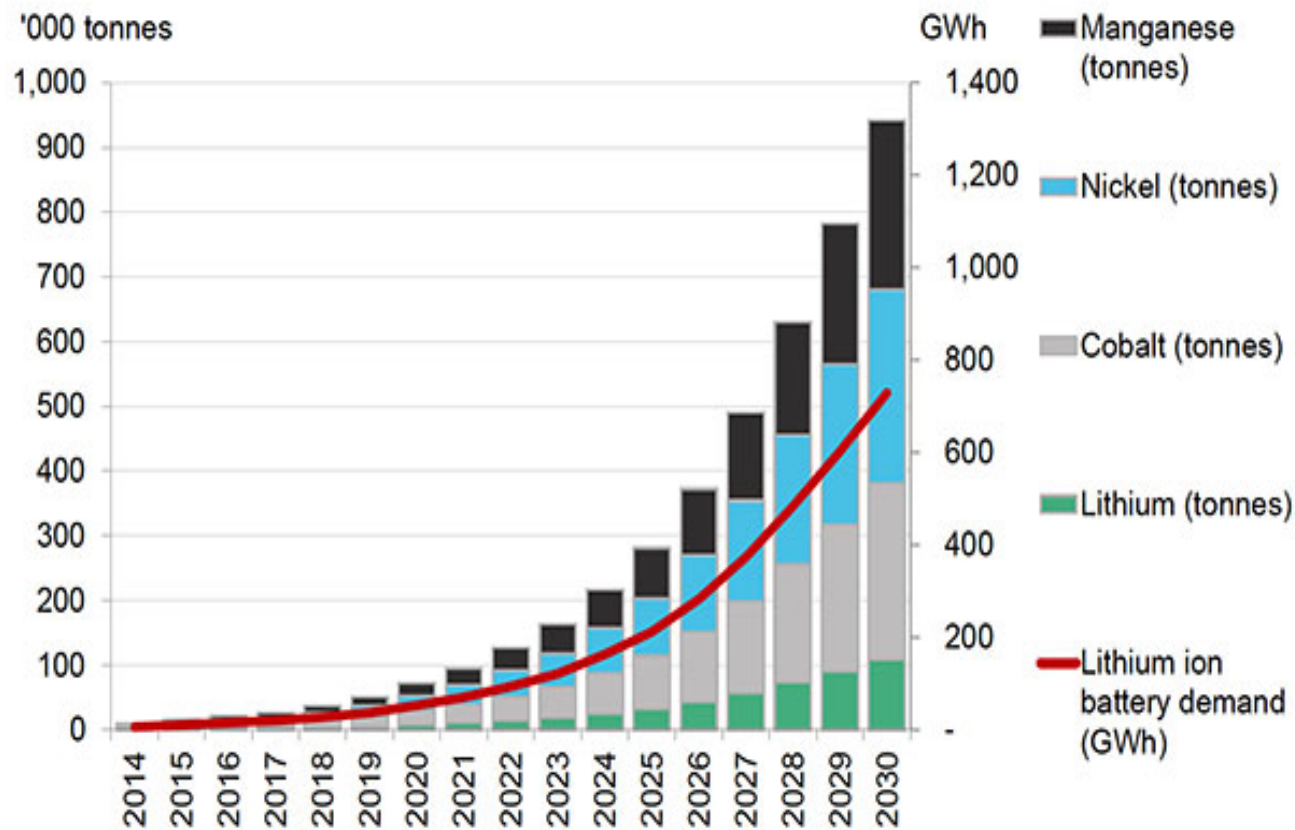
# *But... Batteries Will Never Get Good Enough*

Energy Density Of Fuel



# Batteries → Commodities Boom

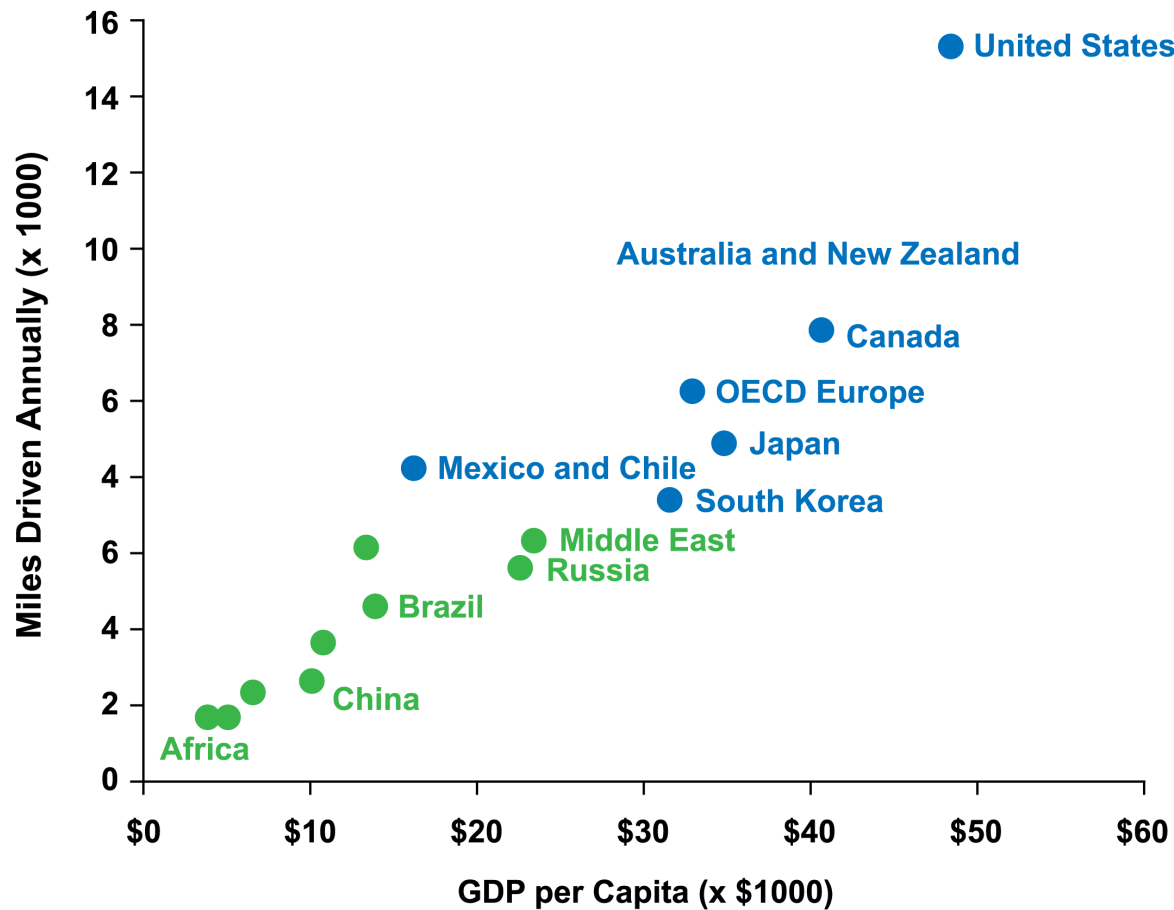
Tons Mined To Build Batteries  
(30 million EVs)





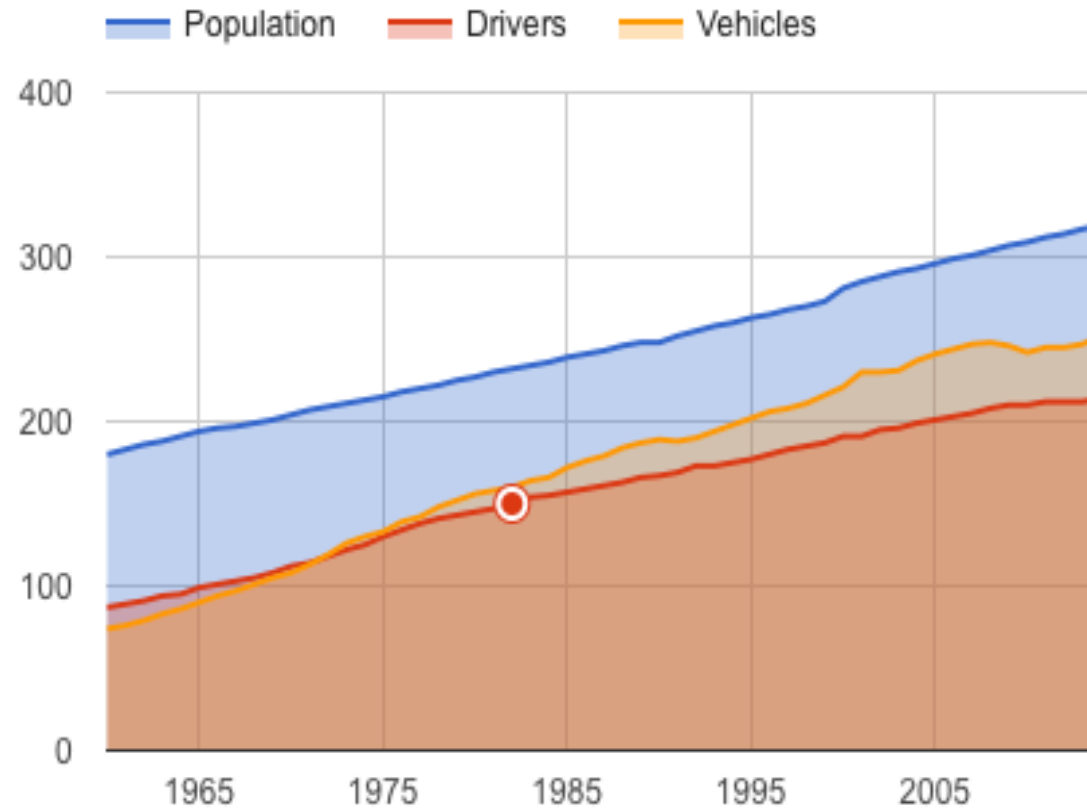
# Uber Effect → More Affordable & Accessible

## Wealth Increases Driving



# *Another Uber Effect → More Fun Cars*

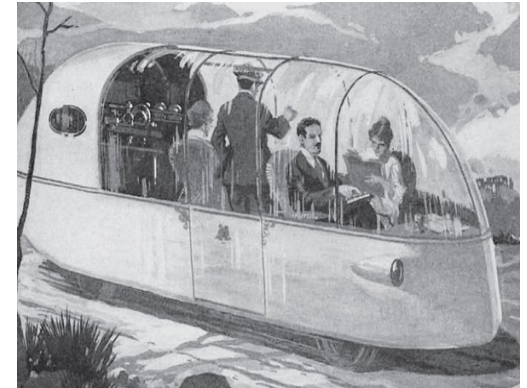
**U.S. Population, Vehicles & Drivers**  
( x 1 million)



# Google Effect: Eternal Dream Of Self-Driving

*The car of the future will have no such thing as a “driver’s seat.” Driving will be done from a small control board.”*

*January 5, 1918, Scientific American*

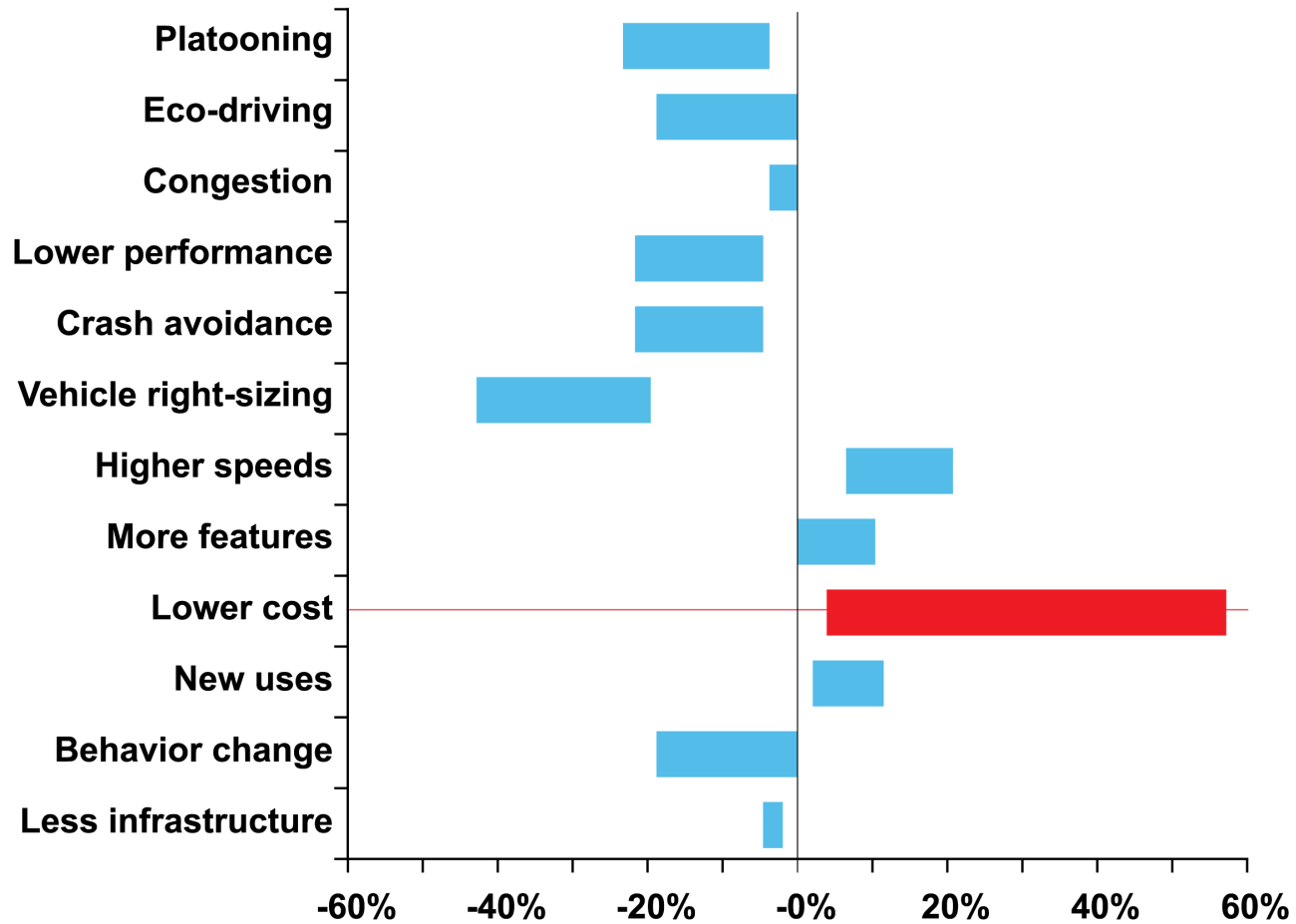


*“You ... push the button marked ‘Electronic Drive.’... Fantastic? Not at all. The first long step ... was successfully illustrated by RCA.”*

*January, 1958, Electronic Age*

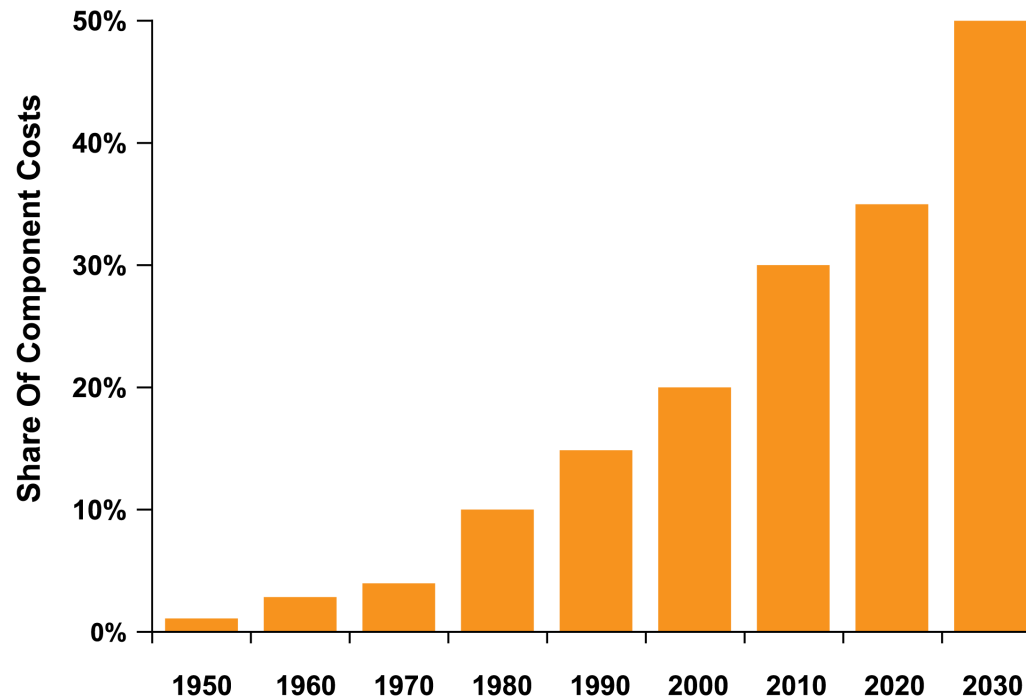


# *Energy Impacts of Sharing + Robocars*



# *The Real Google Effect ... The Silicon Car*

Electronics Share Of Cost To Build A Car



- Car of future – “Computer server” on wheels ....Audi

# *Wild Card: Uber Air*

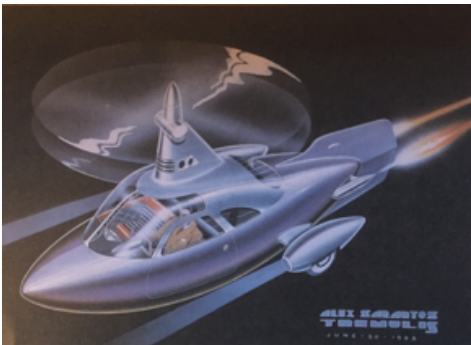
**2020 Lilium**



**2017 Airbus Self-Flying Taxi**



**1944 Artist's Conception**



# Grand Transitions In Transportation

