THE UNINTENDED RISKS OF CURRENT ELECTRIC VEHICLE POLICY (AND BETTER ALTERNATIVES)

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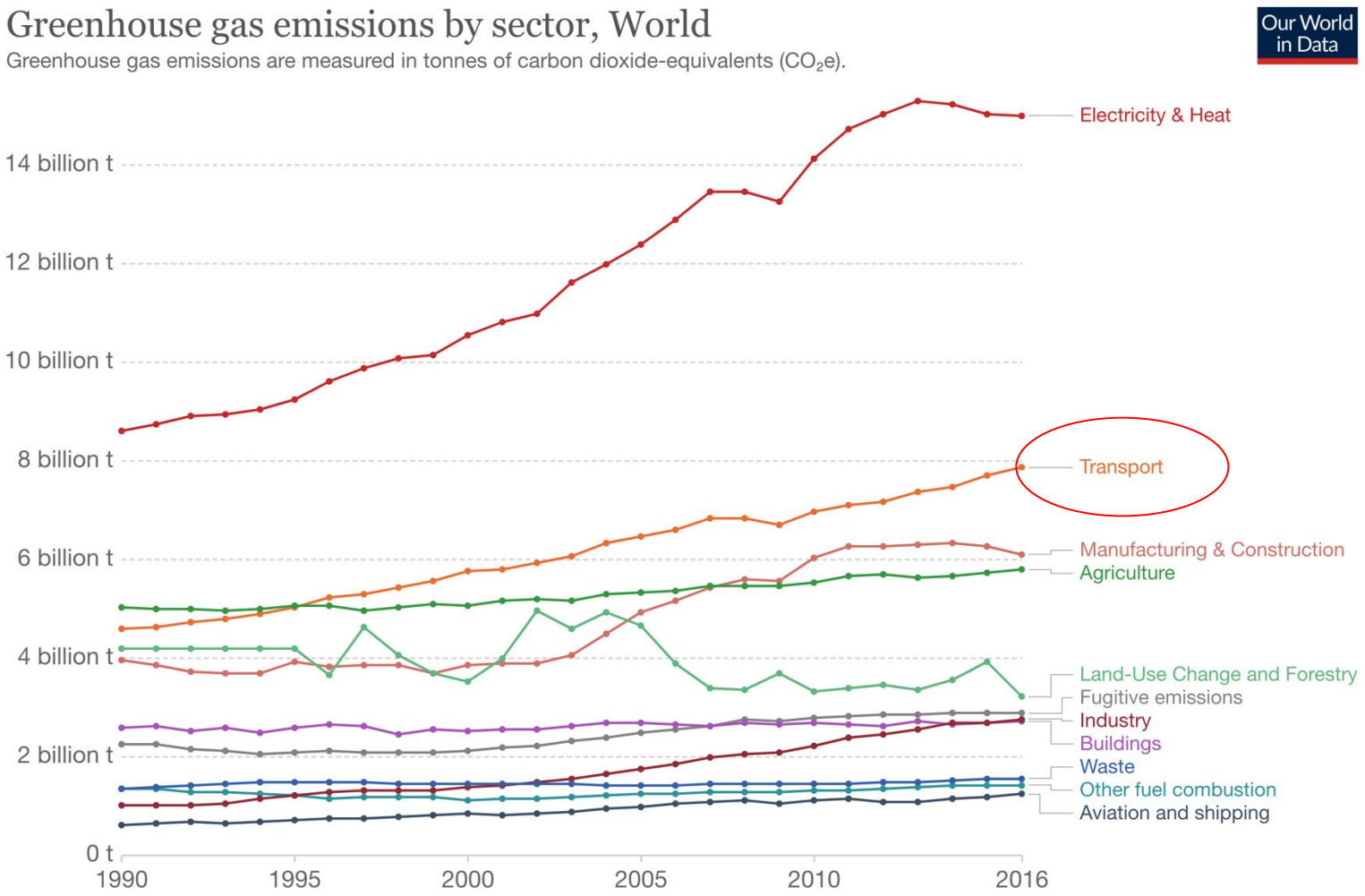
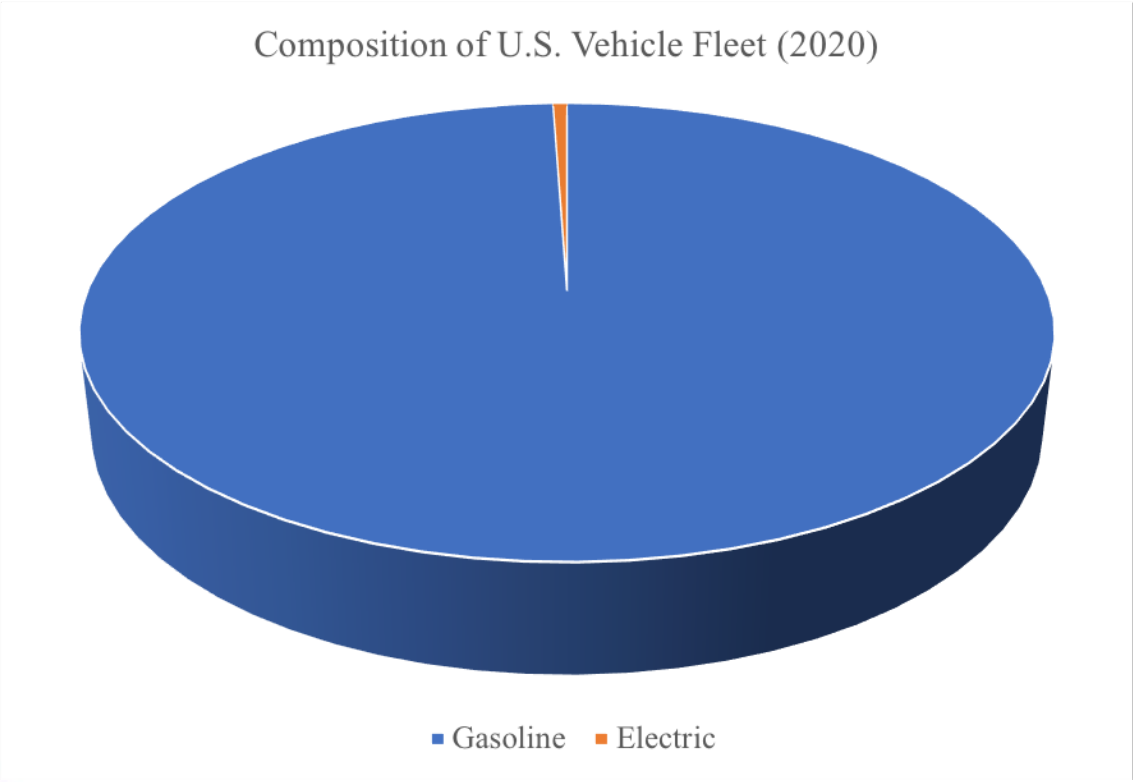
Today

- **Goals of transportation electrification**
- EV policies and the incentives that they create
- Are EVs substitutes for gasoline cars?
- Closing remarks: zooming out

Transportation is a major/growing source of GHGs (~20%)

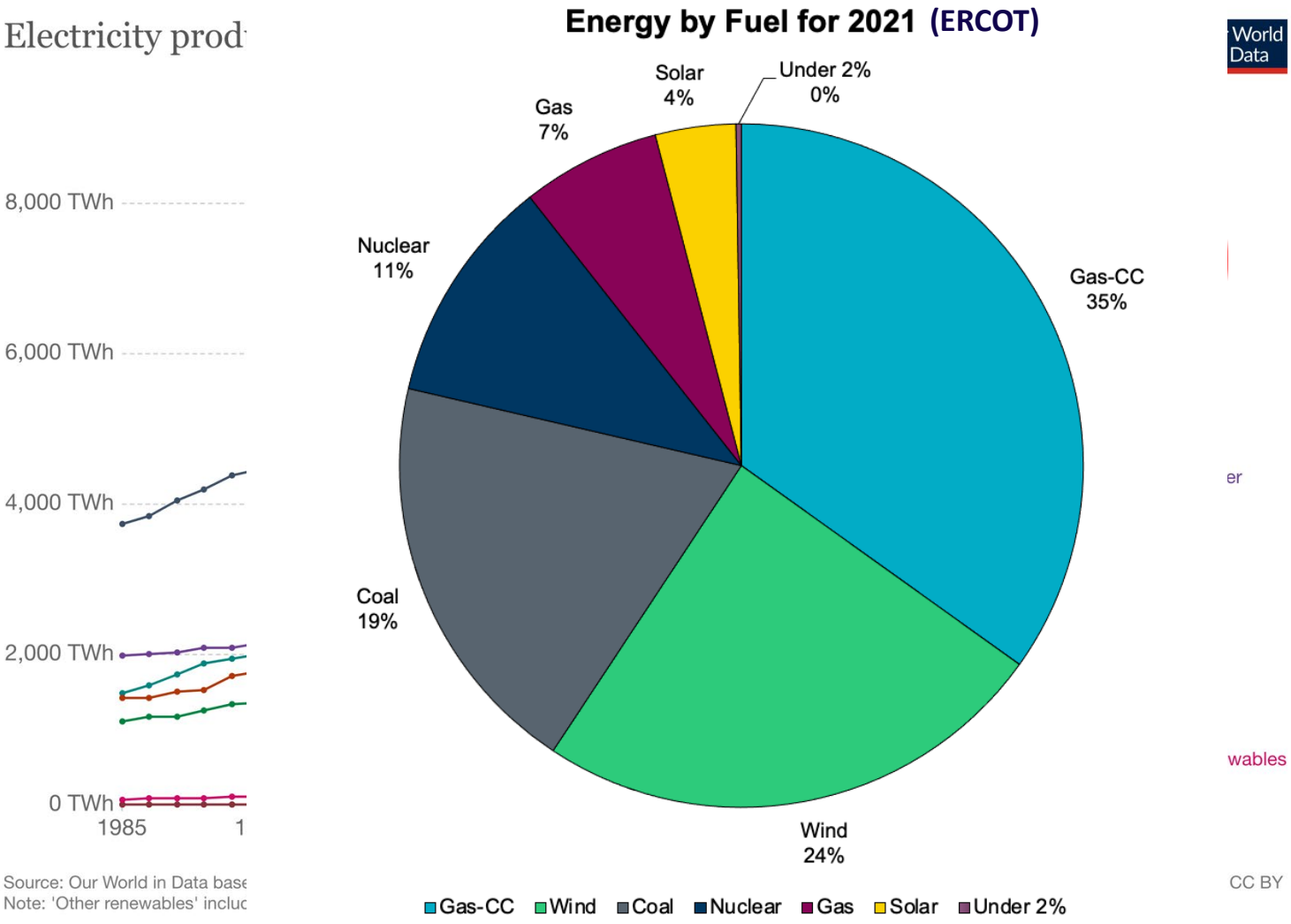


We drive mostly gasoline-powered cars (US & worldwide)



Electrification vision

~60% of electricity comes from fossil fuels (high GHG)



An effective emissions reduction strategy will:

- Reduce pollution
  - Reduce the number of cars on the road
  - Reduce driving on fossil fuel energy (gasoline and coal/gas electricity)
  - Time and place are important
- Mitigate risk
  - We have no idea what technology will look like in 2035 or 2050
  - Technology-neutrality policies are preferred
    - Allow new information/tech to be incorporated over time
- Produce a model for developing countries to follow
  - Must allow for economic growth
  - Cost matters

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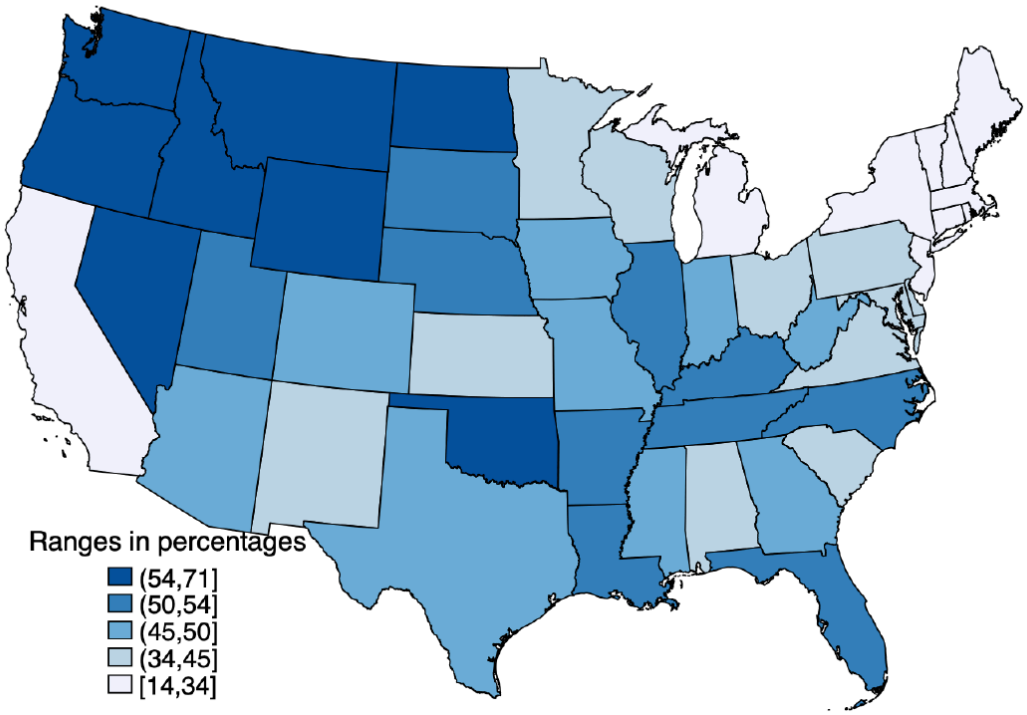
EVs typically cost less to operate

- Nissan Leaf (EV) vs Nissan Versa (gasoline) in 2019

Figure 1: Implicit variable cost savings per mile for EV relative to ICE



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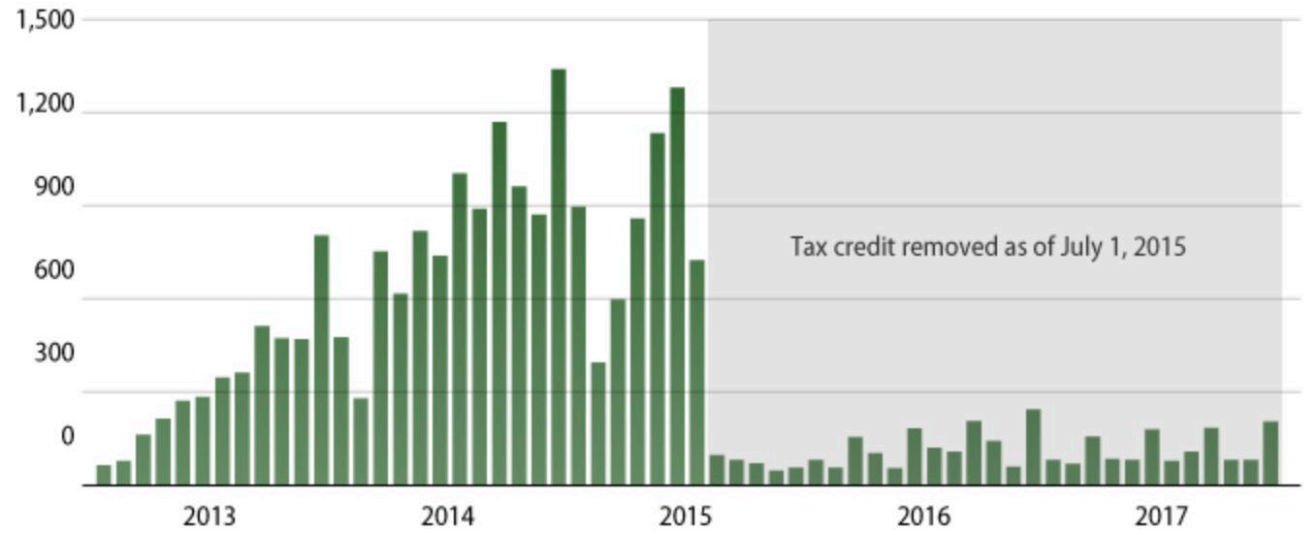
Source: Rapson & Muehlegger 2021

EVs cost substantially more to manufacture

- Subsidies bring down up-front cost to buyers

Battery electric vehicle (BEV) sales in Georgia fell dramatically when tax credits were removed

BEV sales in Georgia, 2013–2017

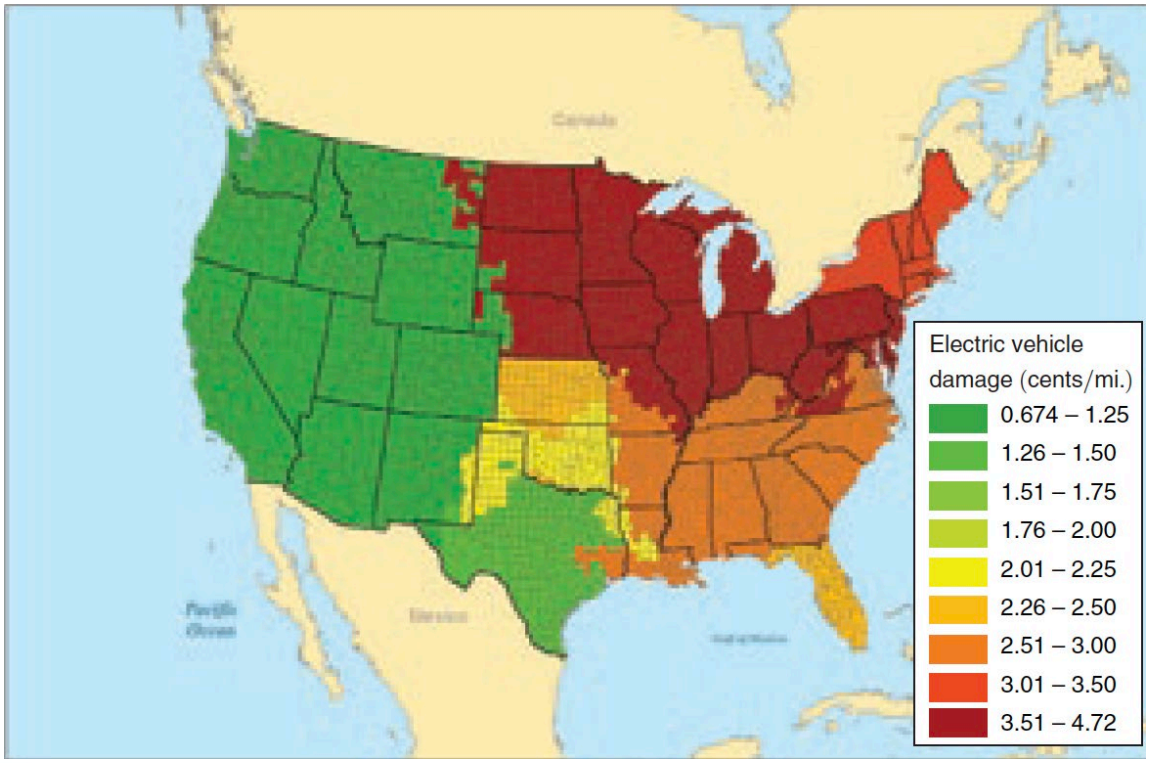


Source: Alliance of Automobile Manufacturers, "Advanced Technology Vehicle Sales Dashboard," available at https://autoalliance.org/energy-environment/advanced-technology-vehicle-sales-dashboard/ (last accessed April 2018).

CAP

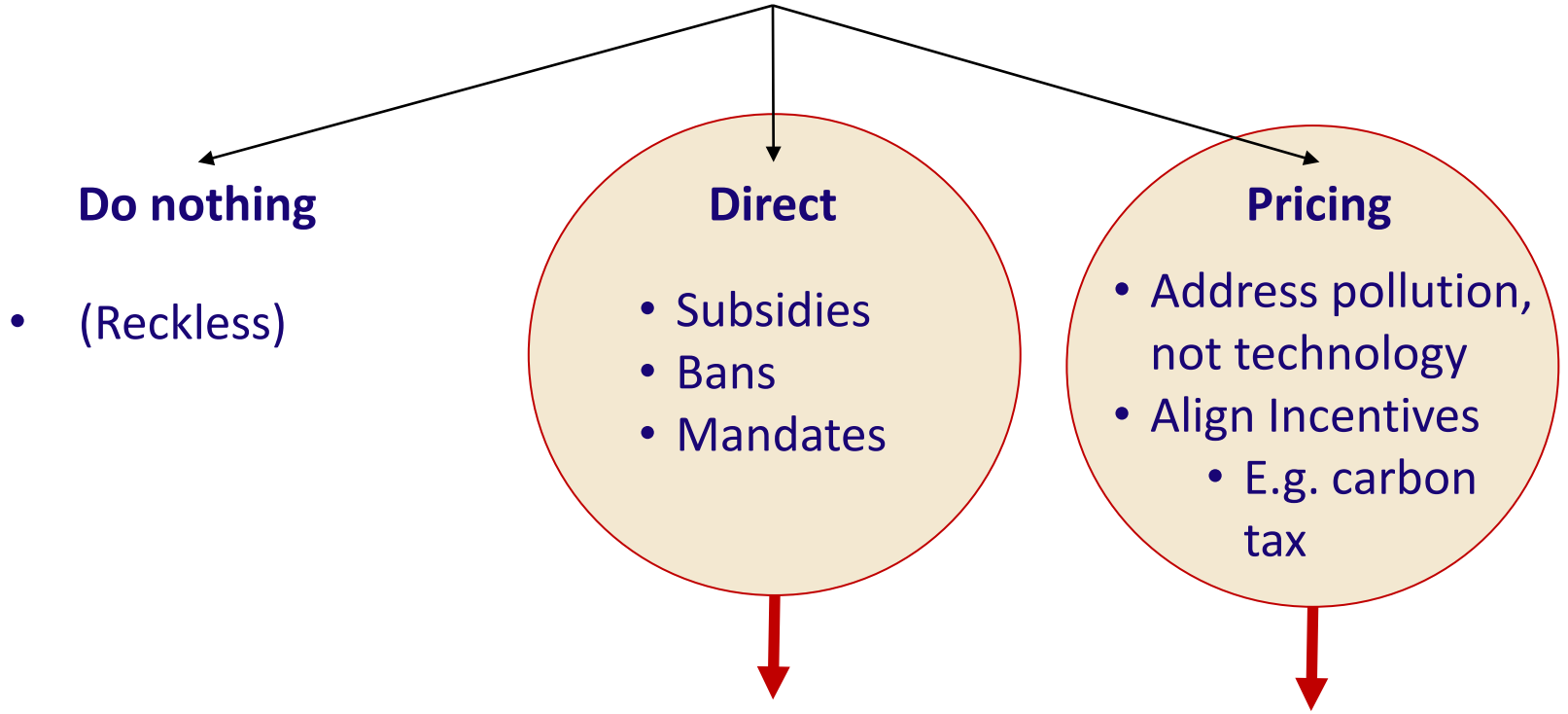
EVs are not "zero-emissions vehicles"

- 2021: Midwest grid 70% fossil fuel generation (30% coal)



Source: Holland, Mansur, Muller & Yates 2016

Government EV policy options



Subsidizing EVs produces unintended consequences

- Puts more cars on the road
- Fails to reduce driving in gasoline cars
- Promotes driving EVs in areas with coal electricity
  - Remember, driving EVs is cheaper per mile
- Makes older gasoline cars scarce (valuable), so they live longer
- Drives down the price of oil

Why not just ban gasoline cars?

The Electric Vehicle Transition and the Economics of Banning Gasoline Vehicles

Stephen P. Holland
Erin T. Mansur
Andrew J. Yates

AMERICAN ECONOMIC JOURNAL: ECONOMIC POLICY (FORTHCOMING)

- Massive net benefits to gasoline cars (revealed preference)
  - Likely to persist for decades
- Ban/mandate is good when:
  - EVs are as good or better than gasoline cars
  - Buyers are making “mistakes”

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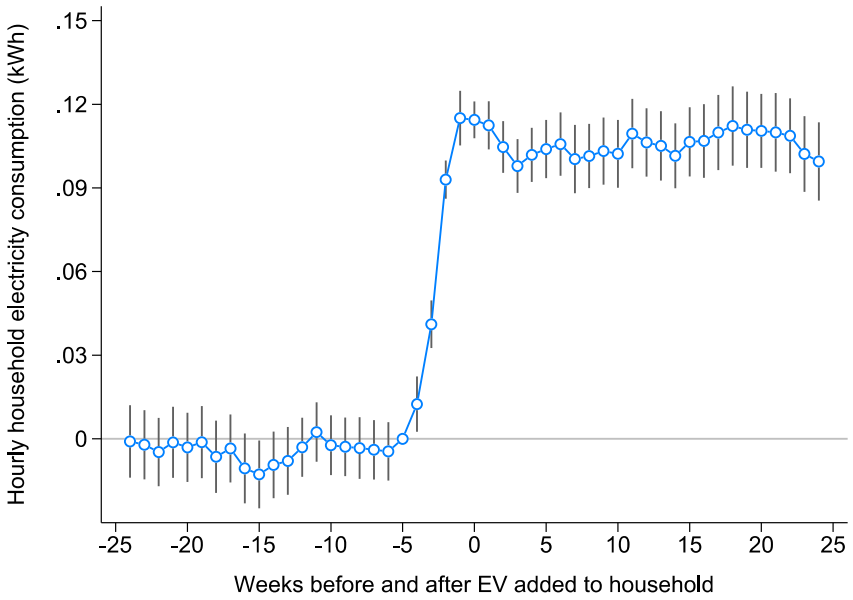
EVs are being used less than we thought



(+) Adjust for away-from-home charging

(+) Adjust for fuel efficiency

eVMT = 6,700 miles/BEV/yr
vs
10,000 miles/gas car/yr

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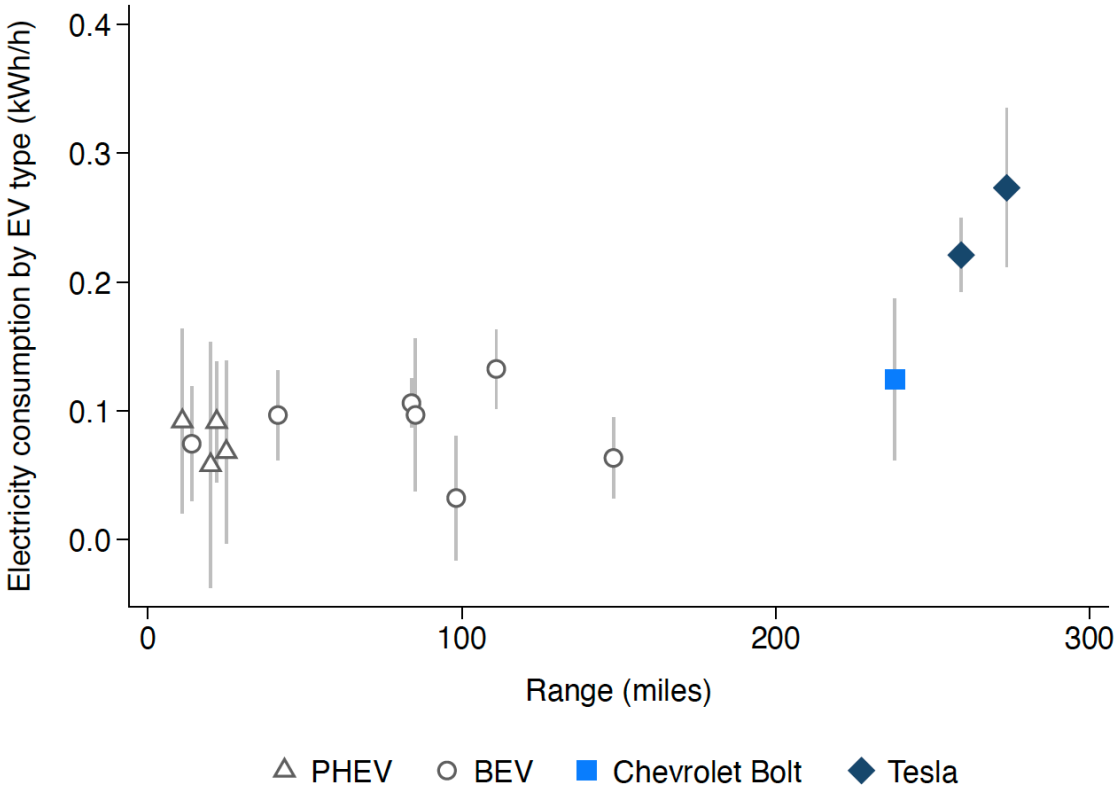
Source: Burlig, Bushnell, Rapson & Wolfram (2021)

Potential explanations for low eVMT

- Low battery range (changing rapidly)
- Early adopters are simply different from future adopters
- EVs are, in some cases, complements to gasoline cars
- High electricity prices?
- Are other undesirable attributes of EVs?
  - (Poor charging infrastructure, price, comfort, size, other?)

Each of these has different implications for the transportation electrification vision

Battery range isn't the entire reason for low eVMT



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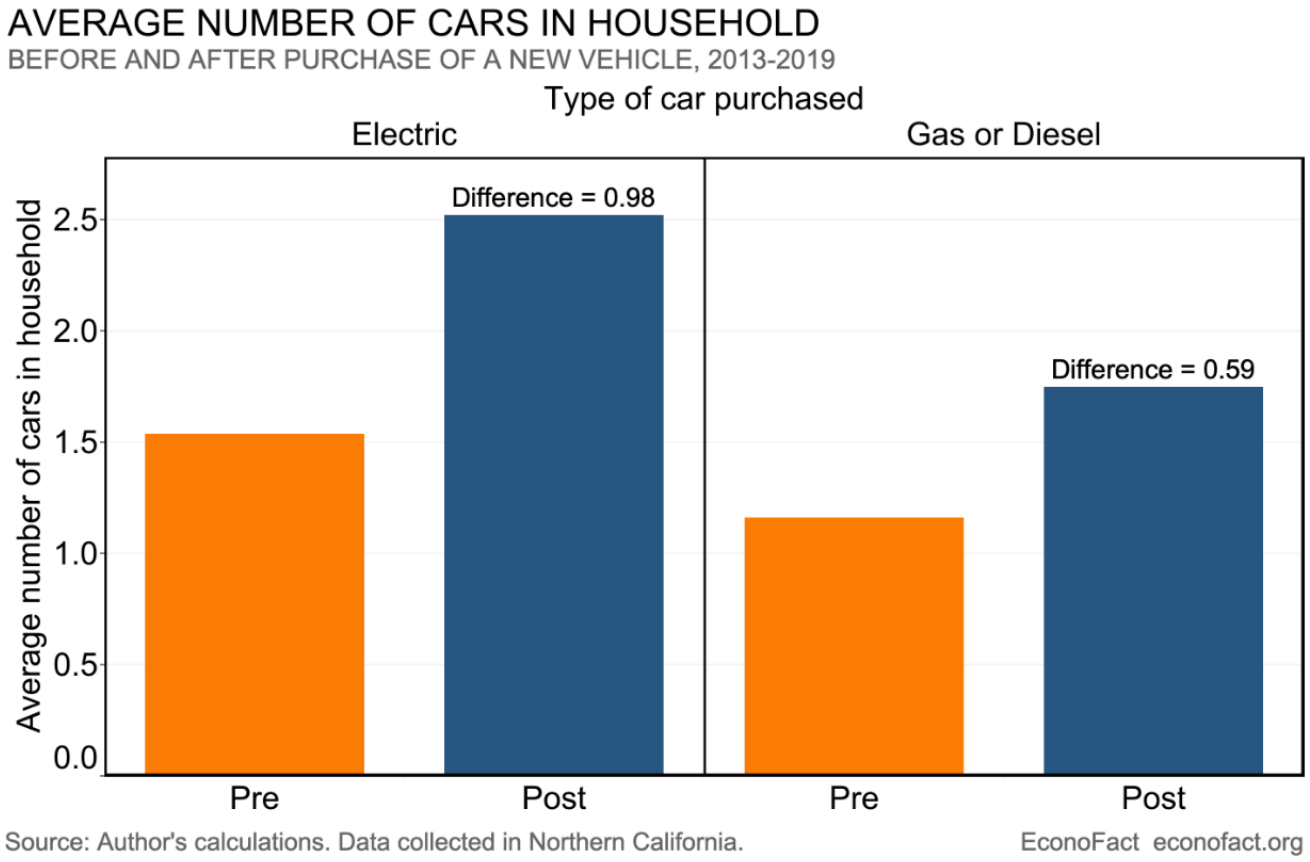
Source: Burlig, Bushnell, Rapson & Wolfram (2021)

In the US, EVs may be "extra" cars (not replacements)



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Source: Burlig, Bushnell, Rapson (in progress)

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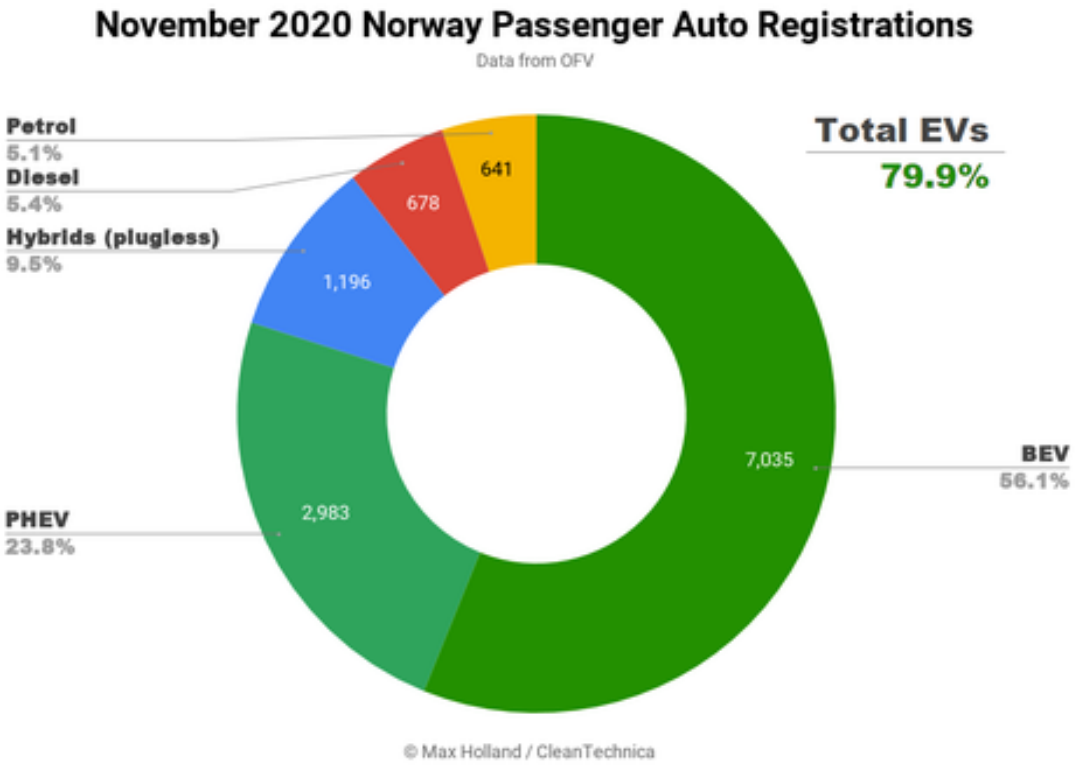
An EV model to consider: Norway



- No EV subsidies
- Massive taxes on gasoline cars
- 98% renewable electricity (hydro → replicable?)

Looking forward (1): Uncertainties

- Will mainstream drivers adopt EVs?
  - Should they be forced to?
- Globally, how do we get to 100% renewable electricity (or close)?
  - What will that do to prices? Reliability?
  - Today, >60% of global electricity generation is from oil and gas
- Macroeconomic ("general equilibrium") effects must be considered
  - Will scarcity in raw materials drive the price of EVs (or electricity) up?
  - Will electrification lead to low gasoline prices?

Looking forward (2): Objectives

- Are there are other, lower-cost GHG abatement options?
  - E.g. Direct air capture (~$400/ton CO2?), hydrogen, fuel efficiency, cellulosic ethanol
  - How do we identify and pursue these with appropriate vigor?

- Carbon pricing
  - Necessary, if not sufficient
  - Technology-neutral

- Ethical considerations and developing countries
  - ~1 billion people have no electricity (IEA)
    - Billions more have unreliable electricity supply
  - If oil prices fall dramatically, should developing countries be denied gasoline cars?

Takeaways for EV policy

- EV technology is promising and will likely be a big part of the future
  - We should encourage EVs *indirectly* via pollution taxes
  - But not to the exclusion of other (even yet-to-be-invented) technologies

- Massive uncertainties exist
  - Cost of transition to reliable, renewable grid
  - Desirability of EVs, particularly to some important market segments

- 1: Minimize the use of subsidies, bans and mandates

- 2: Get incentives right via technology-neutral emissions policies (e.g. pollution pricing)

Thank you

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