# Econ 330: Urban Economics

## Lecture 14

John Morehouse
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# Lecture XVI: Automobiles, continued

# Schedule

## Today

1) **Collisions**

2) **Energy-Efficient Vehicles (EEVs)**

# Externalities:

## Last time:

1. People in the US own a lot of cars
2. Many externalities from driving
3. Congestion and solutions

## Today

- Collisions
- Energy Efficient Vehicle Subsidies (and why we care about them in Urban Econ)

# Cost of Collisions

## Direct Costs

- 3.1 million injuries
- 40,000 deaths
- $300 billion

## Indirect Costs

- **External costs** (via congestion)
- 4.4 cents per mile
- 5 billion USD lost from accident delays (estimated)

# Vehicle Safety Act of 1966

VSA of 66 mandated all vehicles include:

1. Seat belts
2. Head Restraints
3. Shatter-proof windshields
4. Collapsible steering column

**Question:** What changes in behavior should we expect? **Discuss**

# Vehicle Safety Act of 1966

## Consequences

1. Only a small reduction in death rates from automobile collisions
2. Rate at which collisions occurred increased
3. Death rate for pedestrians and bicyclists increased

**Question**: Should we be surprised? Why might this have happened?

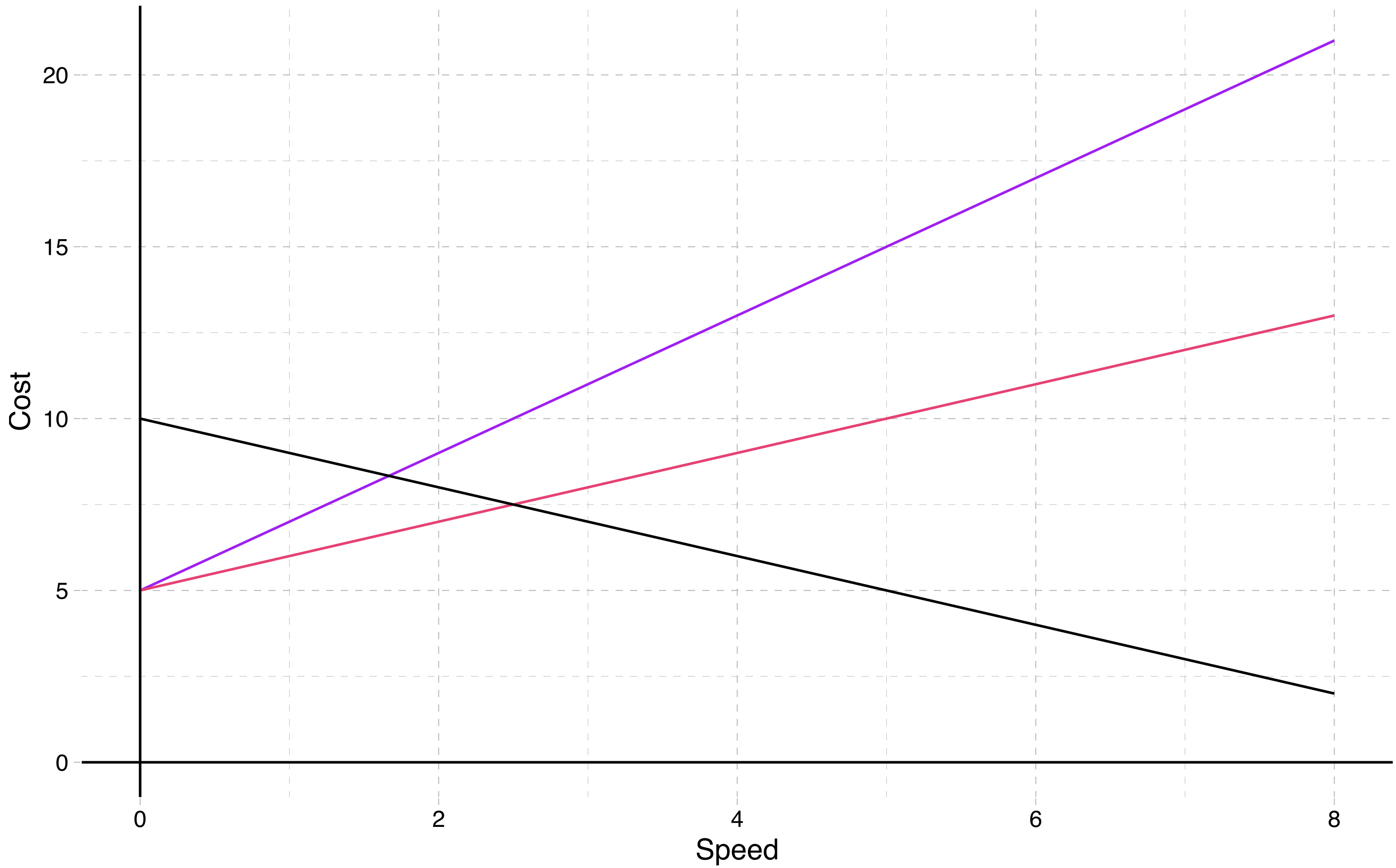
**Discuss**

# Vehicle Safety Act of 1966

These consequences are indeed foreseeable. What happened?

- Marginal cost of driving recklessly decreased
  - Conditional on being in an accident, you were now more likely to survive
  - So more people drove recklessly, then everything else follows (more accidents, more peds/bicyclists killed)

# VSA: Graph




**MC no VSA** **MC VSA**

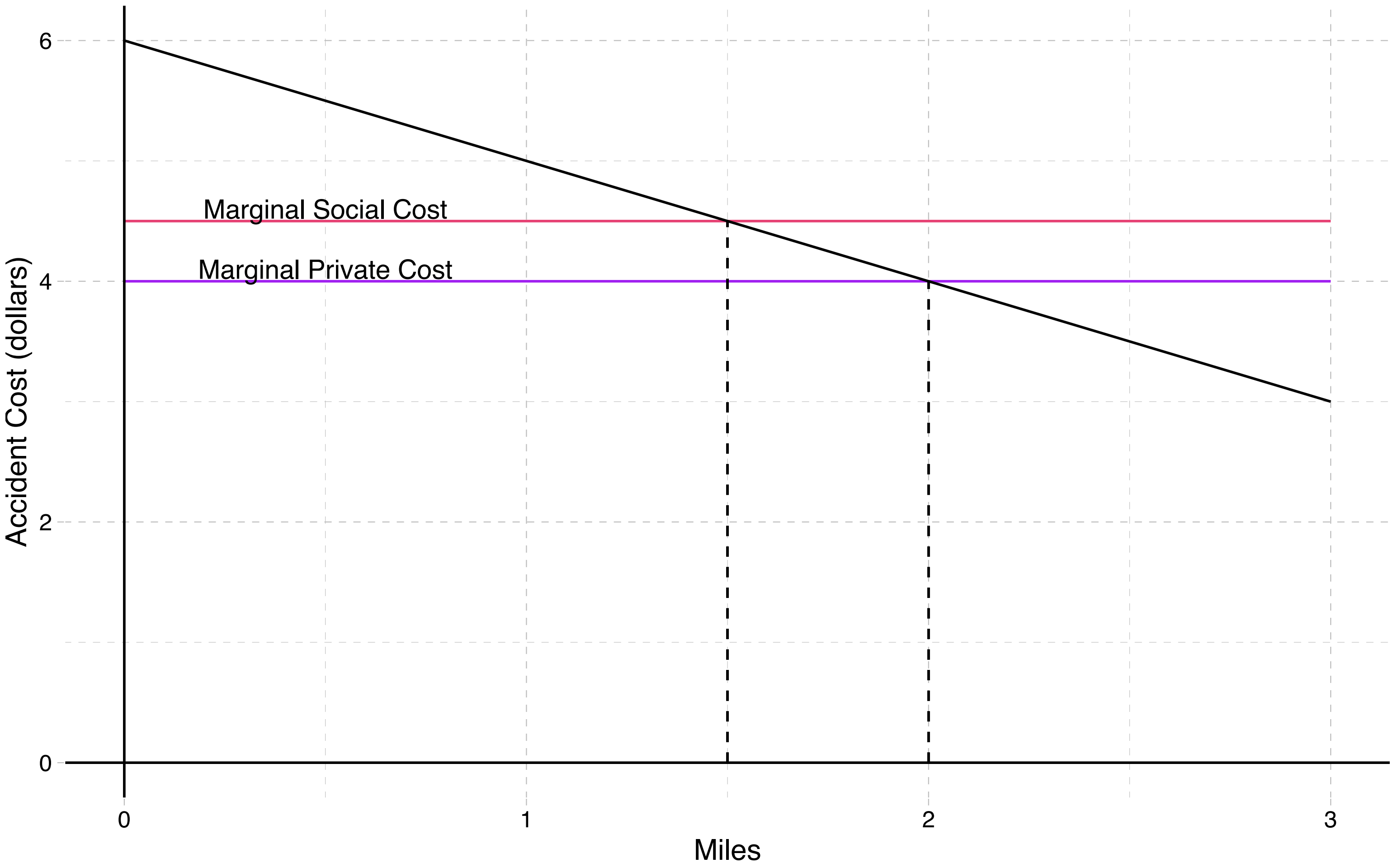
# So what?

So what can we do?

## Pigou strikes again

- Vehicle miles traveled (VMT) tax: tax per mile driven
- Include external collision cost per mile
- Shuts down gap between social cost and private cost of driving

# Pigou strikes again: Graph




- Marginal external cost is gap between MSC and MPC.

# Checklist

1) **Collisions** ✅

2) **EEVs**

# Carbon Emissions

Last externality we will discuss:

## Carbon Emissions from Driving

- Solutions:

    1. Energy Efficient Vehicle (EEVs) Subsidies
    2. Gasoline (or carbon) tax
    3. VMT tax

# EEVs

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So what's all the hype?

- Energy-efficient vehicles consume less gasoline per mile traveled
    - Private fixed cost is usually higher, but the variable cost is lower
    - e.g. Sticker price for EEV is more, but cheaper to drive
    - Social cost is lower (fewer carbon emissions per mile driven)

# EEVs

**Question**: If an individual switches from an SUV to a prius, will their carbon emissions from driving fall? **Discuss**

*Key Assumption*: We can be certain carbon emissions fall if the individual drives the same amount with both cars

- Is this a reasonable thing to assume?
- Probably not, as the cost per mile driven is less than the SUV

# EEVs

**Key Insight**:

People drive more when it becomes cheaper to do so

**Questions**:

1. What happens to congestion if we subsidize electric/hybrid vehicles?
2. What happens to carbon emissions?

# EEVs: Congestion Graph

# EEVs: Subsidy Graph

# EEVs: Carbon Emissions

Predicting carbon emissions is tougher

1. If we subsidize **hybrid vehicles**
   - Lower $CO_2$/mile but more miles…so unclear
2. If we subsidize **electric vehicles**
   - Depends where electricity comes from
   - Some electricity is very $CO_2$ intensive, others not

In either case: what key **elasticity** might you be interested in knowing to answer this question?

# EEVs: Carbon Emissions

Want 1. miles driven to the price of hybrid vehicles and 2. Average carbon emissions of all vehicles driven to a change in the price of EEVs

**Example**:

- Suppose $\varepsilon_{\text{miles,price EEV}} = -\mathbf{3}$
  - As the price of a hybrid falls by 1%, the miles driven increases by 3%
  - We are saying people will drive more in EEVs relative to regular cars. Price falls, more people buy/drive EEVs so total mileage goes up
- Assume $\varepsilon_{\text{CEPM ,price EEV}} = .1$: CEPM is **C**arbon **E**missions **P**er **M**ile
  - Why is the sign different (+)? Price of eev falls $\implies$ more people drive EEVs $\implies$ average carbon intensity of cars on road fall (so they move in the same direction)

# Example, continued

Ok, so we had $\varepsilon_{\textbf{miles,price EEV}} = \mathbf{-3}$, and $\varepsilon_{\textbf{CEPM ,price EEV}} = \mathbf{1}$

Question: Before an EEV subsidy, the total miles driven in a city was 1000 and the carbon emissions per mile are 2 lbs.

- What happens to overall emissions when the government subsidizes EEV's leading to a 1% decrease in the equilibrium price?

**Total Emissions Prior**: $1000 * 2 = 2000\text{lbs}$

- Miles after: $\mathbf{1000 * 1.03 = 1,030}$ (price goes down so miles go up)

- Emissions per mile after: $\mathbf{2 * .99 = 1.98}$

**Total Emissions Post**: $1,030 * 1.98 = 2,039.4\text{lbs}$

So total emissions went *up* 🤯 (in this example)

# Evidence

Newer evidence of distributional concerns over EEV subsidies†

**Basic idea**: energy demand increases, but gasoline demand falls

- Poorer individuals live near power plants (negative amenity)
- Higher electricity demand deteriorates air quality around power plants
  - will vary by type of plant. If you have clean energy, this isn't a concern

† This comes from a study done by Holland et. al

# Checklist

1) **Collisions** ✅

2) **EEVs** ✅