

# Econ 330: Urban Economics

## Lecture 16

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# Lecture XVI: Automobiles, continued

# Schedule

## Today

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

## Upcoming

- **Book Report Due March 8th**

# 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**

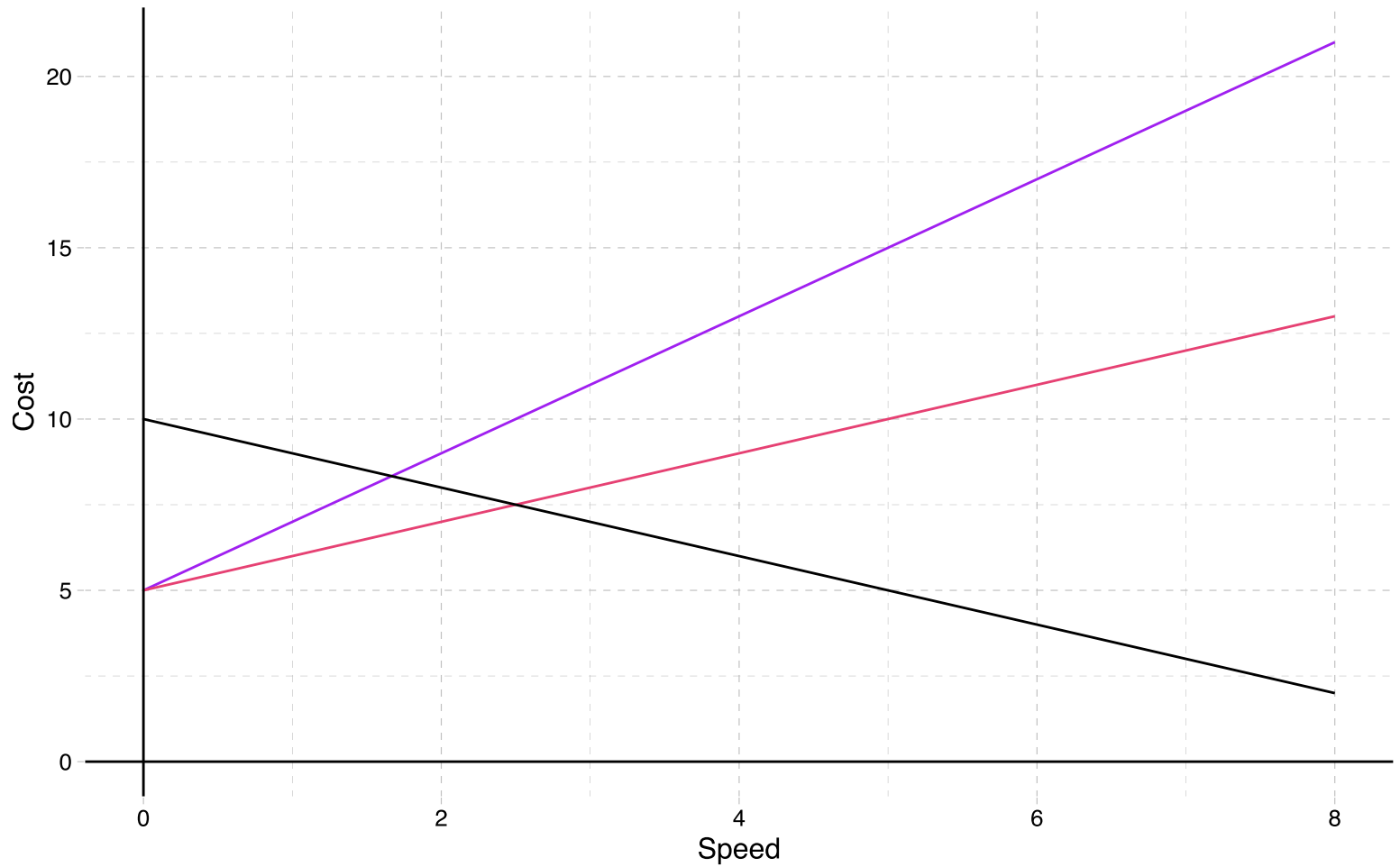
# Vehicle Safety Act of 1966

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

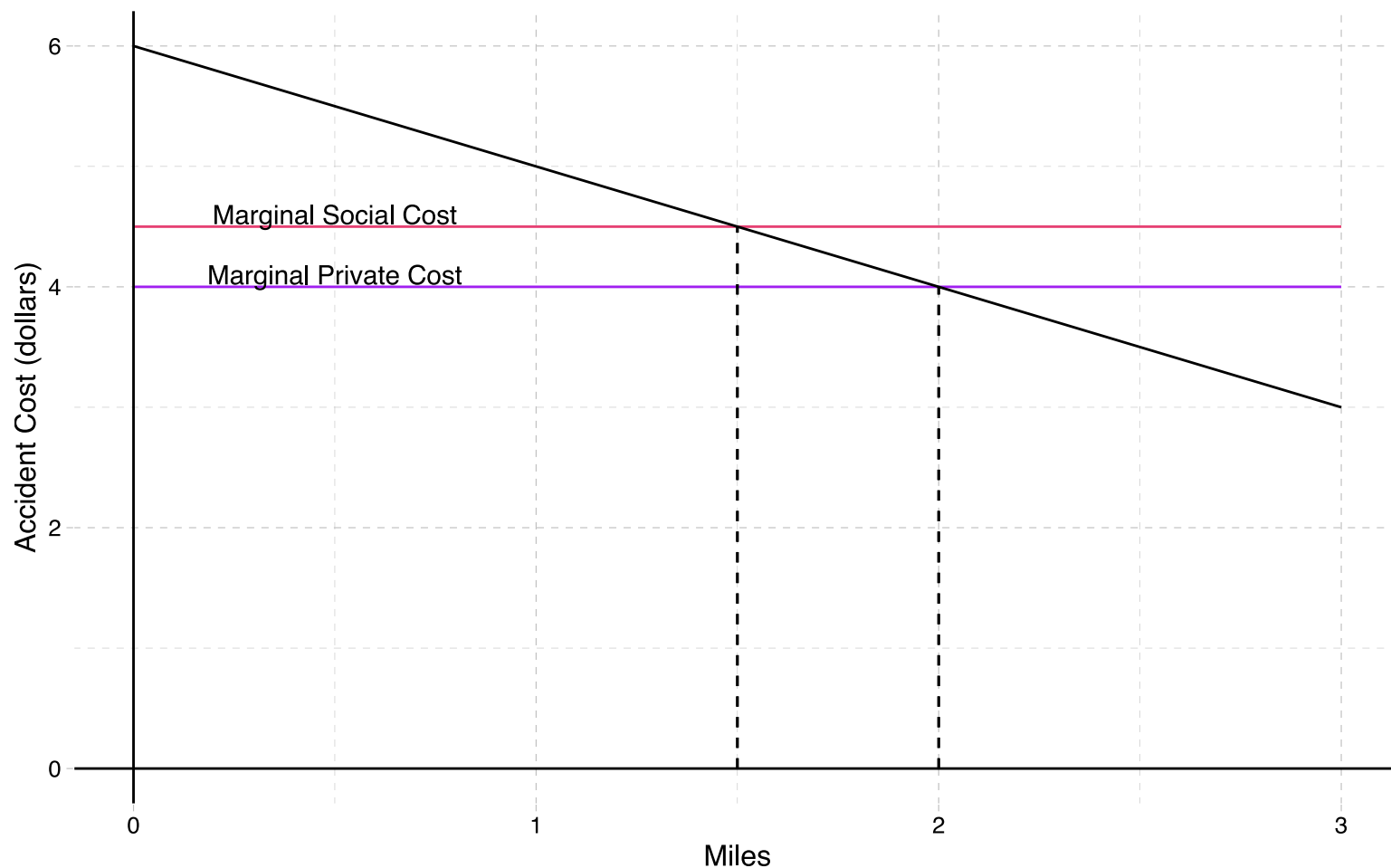
# So what?

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





# EEVs



# EEVs

So whats all the hype?

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

## 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

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

## Example:

- Suppose  $\epsilon_{\text{miles,price EEV}} = -3$ 
  - As the price of a hybrid falls by 1%, the miles driven increases by 3%
- Also assume  $\epsilon_{\text{CEPM,price EEV}} = .05$  where CEPM is **C**arbon **E**missions **P**er **M**ile
  - This says that as hybrids get cheaper, the average carbon emissions per mile falls as well

# Example, continued

Ok, so we had  $\epsilon_{\text{miles,price EEV}} = -3$ , and  $\epsilon_{\text{CEPM,price EEV}} = .05$

**Question:** Prior to an EEV subsidy, the total miles driven in a city was 1000 and the carbon emissions per mile is 2 lbs.

- What happens to overall emissions when the government subsidizes EEV's leading to a 10\% decrease in the equilibrium price?

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

- Miles after:  $1000 * 1.3 = 1,300$
- Emissions per mile after:  $2 * .97 = 1.94$

**Total Emissions Post:**  $1,300 * 1.94 = 2,522\text{lbs}$

So total emissions went up 🤔

# Evidence

Newer evidence of distributional concerns over EEV subsidies<sup>†</sup>

**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

<sup>†</sup> This comes from a study done by [Holland et. al](#)



# Checklist

1) **Collisions** ✓

2) **EEVs** ✓