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 collissions
2. Rate at which collisions occured increased
3. Death rate for pedestrians and bicyclsts increased

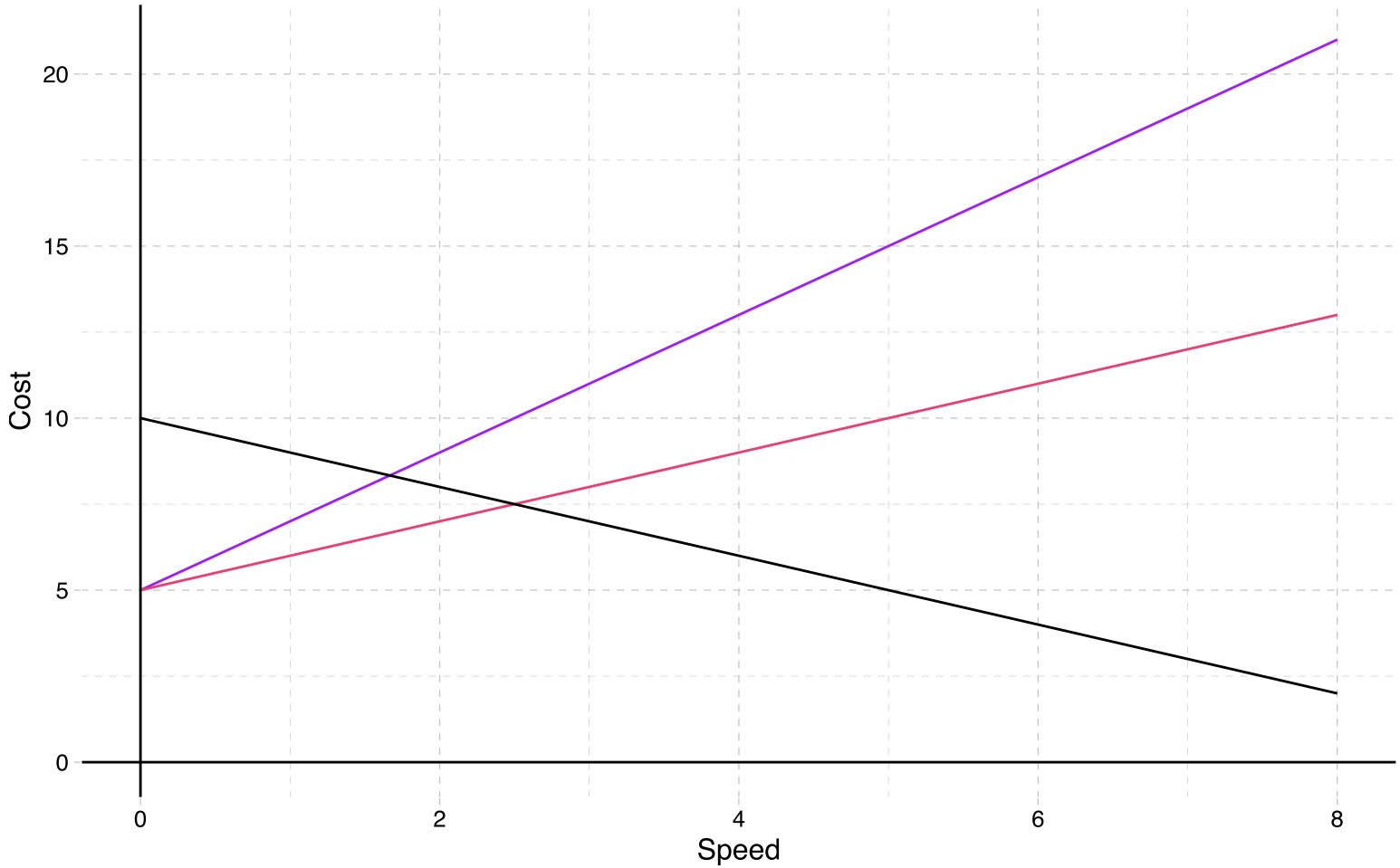
Question: Should we be surprised? Why might this have happened?
Discuss

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**

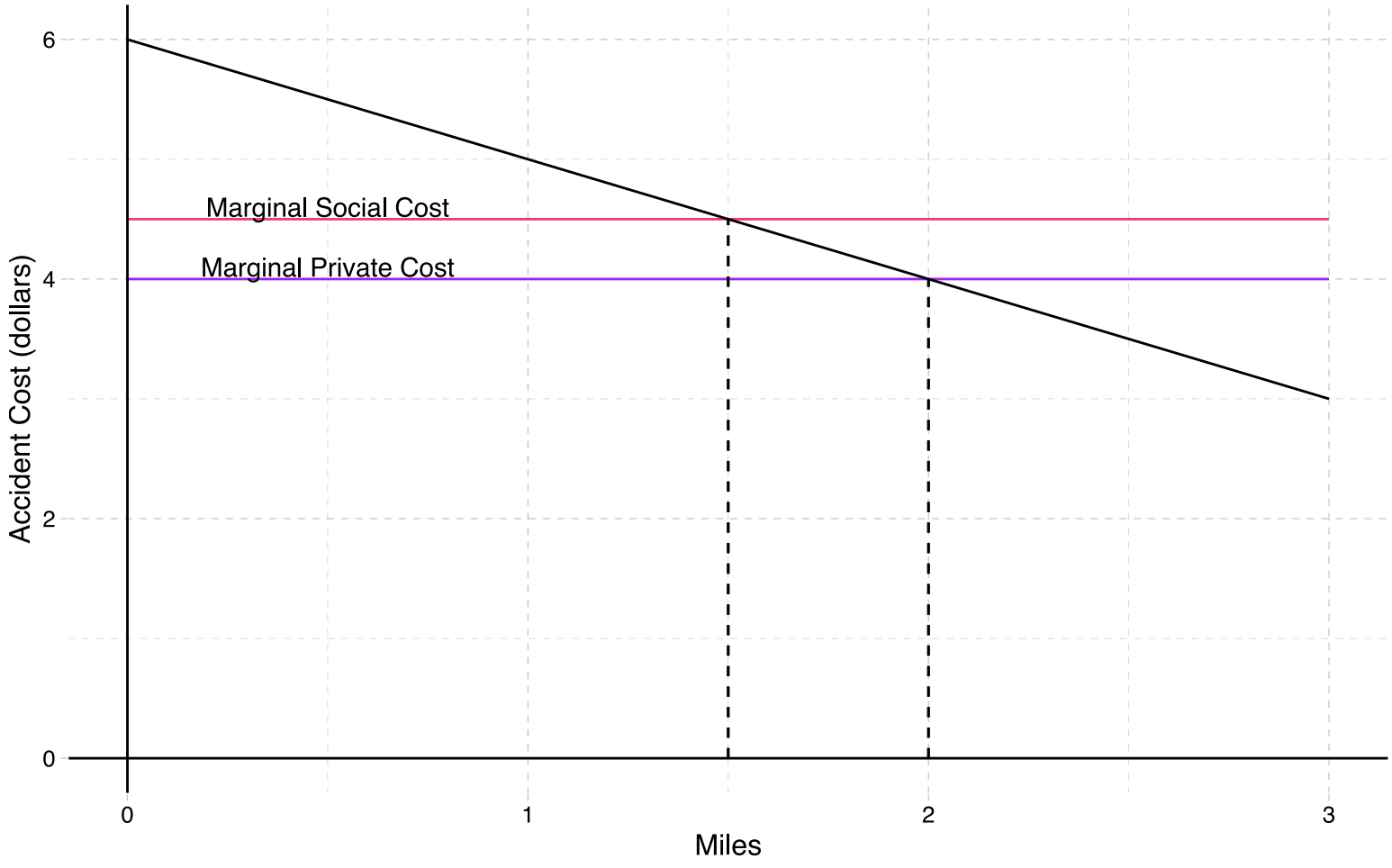
So what?

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

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

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 $\varepsilon_{\text{miles,price EEV}} = -3$
  - As the price of a hybrid falls by 1%, the miles driven increases by 3%
- Also assume $\varepsilon_{\text{CEPM ,price EEV}} = .1$ 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 $\varepsilon_{\text{miles,price EEV}} = -3$, and $\varepsilon_{\text{CEPM ,price EEV}} = 1$

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 1% decrease in the equilibrium price?

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

- Miles after: $1000 * 1.03 = 1,030$ (price goes down so miles go up)
- Emissions per mile after: $2 * .99 = 1.98$

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 indviduals 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** ✅