Econ 330: Urban Economics

Lecture 15

John Morehouse
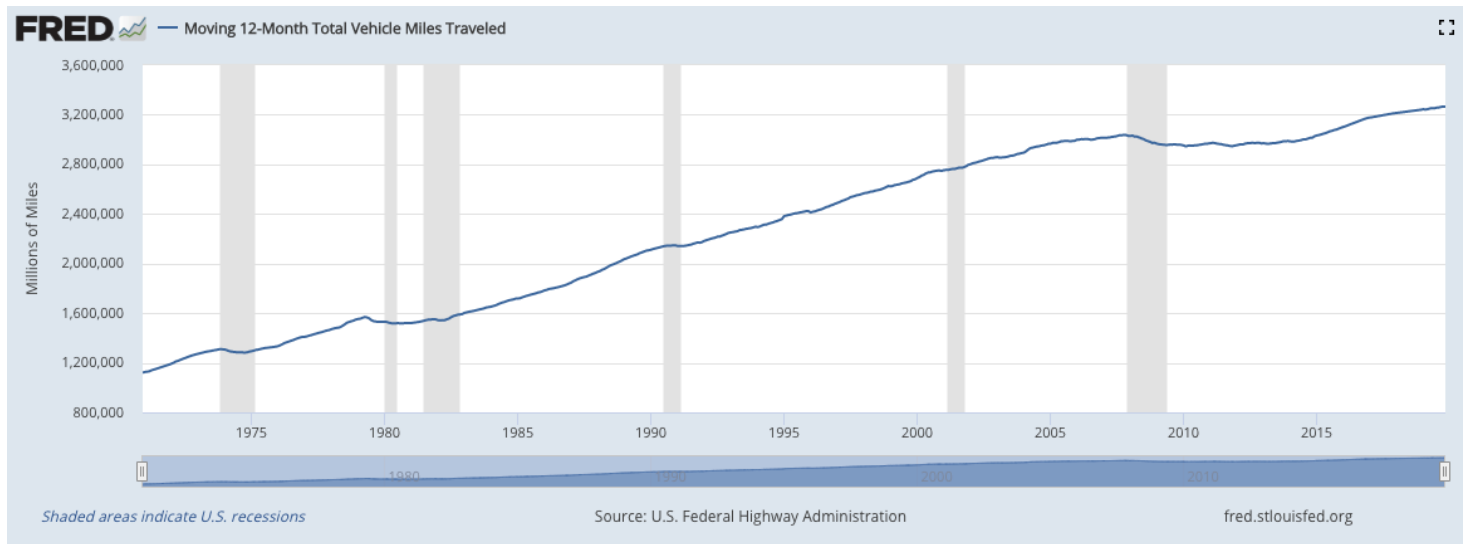Feb 22nd, 2021

Lecture XV: Highways Pt 1

Schedule

Today

1) **US Auto Use**

2) **Externalities**

3) **Congestion Pricing**

Upcoming

- **HWIII due Feb 28th**

- **Book Report Due March 7th**

Vehicle Miles Traveled

Motor vehicles per 1000 inhabitants vs GDP per capita, 2014

'Motor vehicles' includes automobiles, SUVs, trucks, vans, buses, commercial vehicles and freight motor road vehicles. This data excludes motorcycles and other two-wheelers. GDP per capita is adjusted for price differences between countries (PPP adjustment).
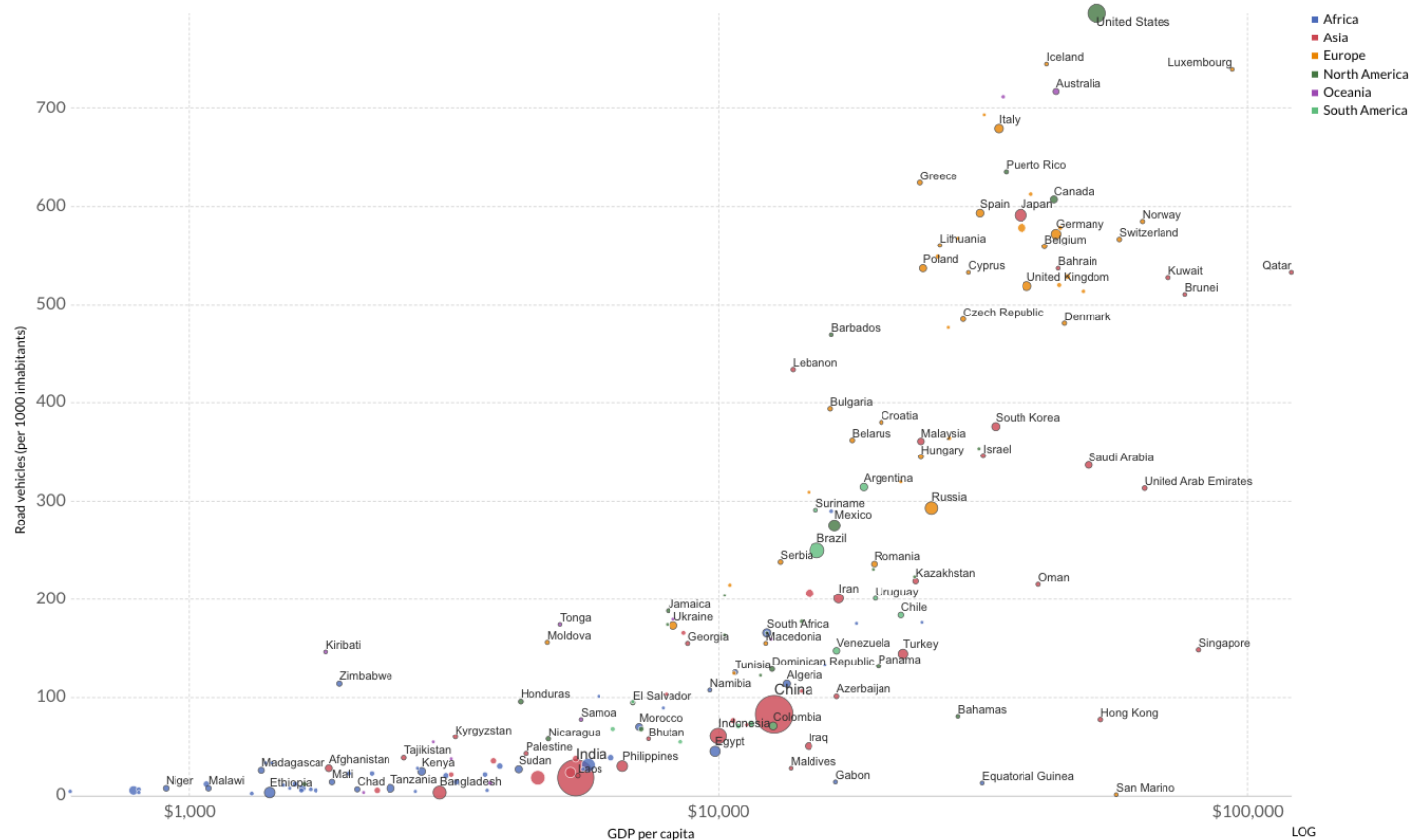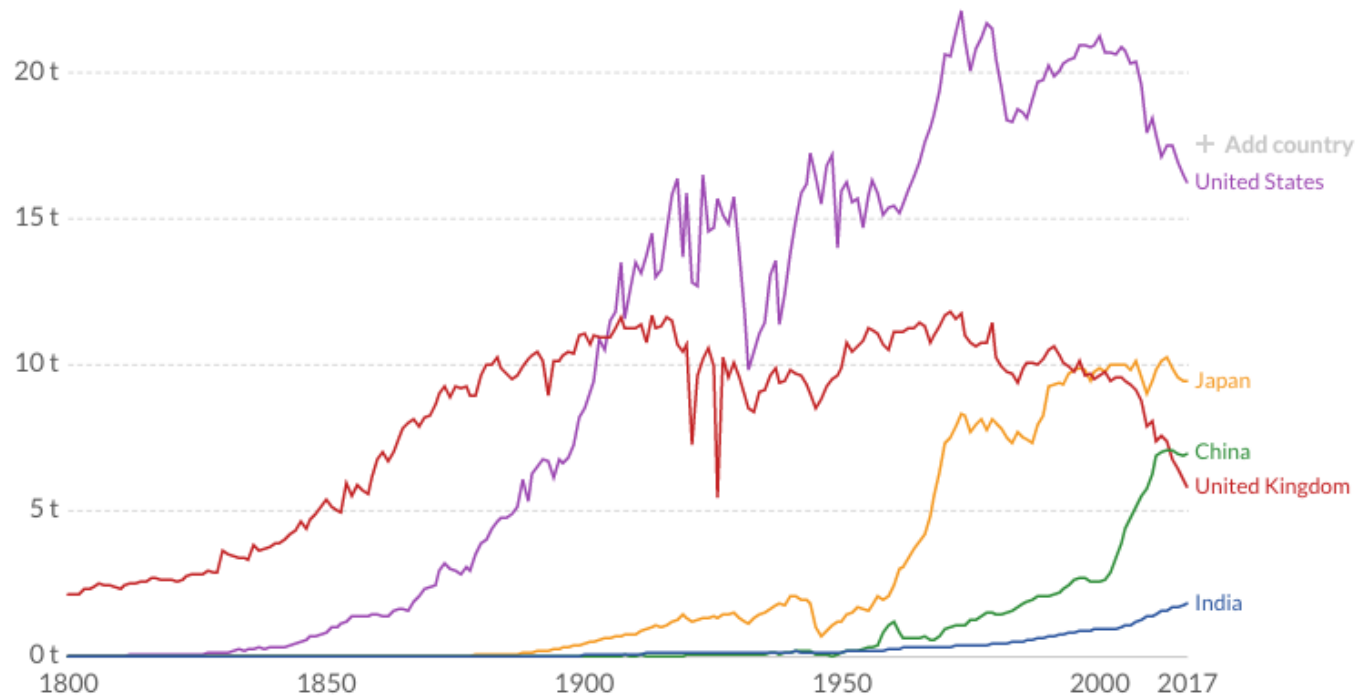
Carbon Emissions

CO₂ emissions per capita
Average carbon dioxide (CO₂) emissions per capita measured in tonnes per year.

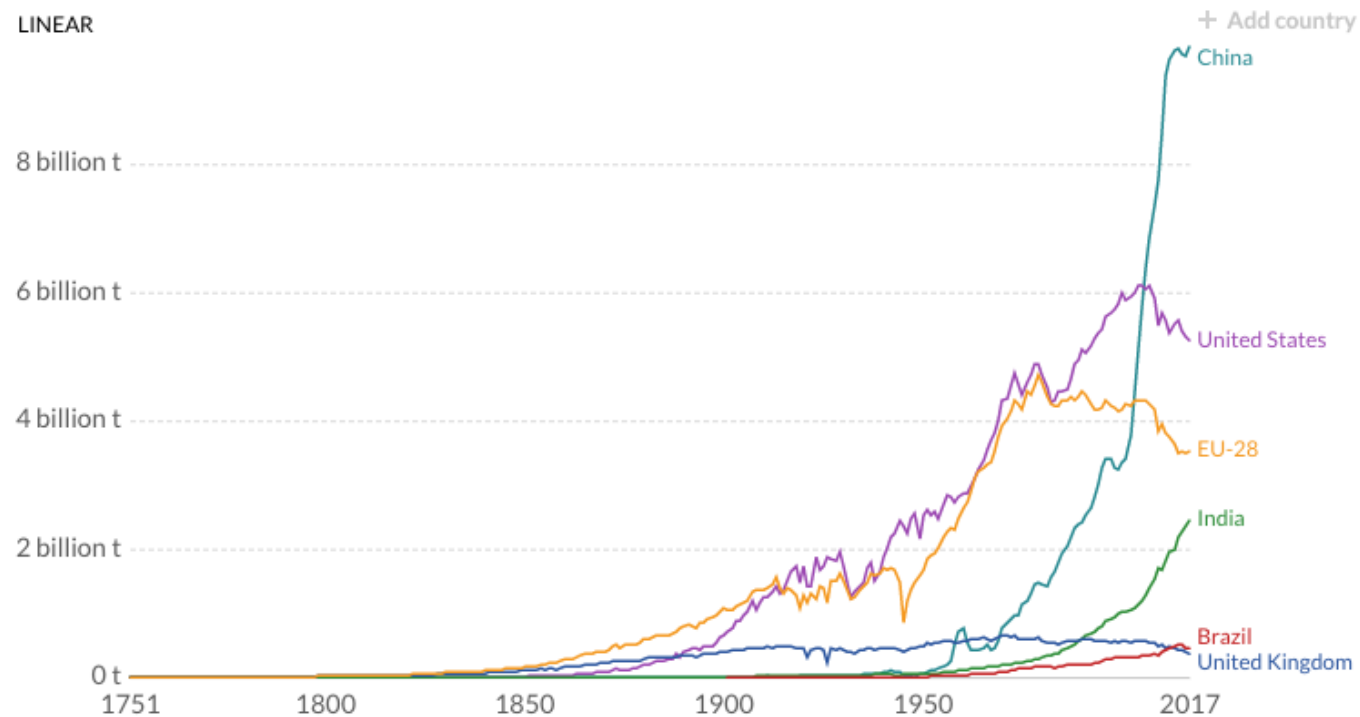Source: OWID based on CDIAC; Global Carbon Project; Gapminder & UN

CC BY

Carbon Emissions

Annual CO₂ emissions
Annual carbon dioxide (CO₂) emissions, measured in tonnes per year.

Source: Global Carbon Project; Carbon Dioxide Information Analysis Centre (CDIAC)

A Question

Important Policy Questions:

- How do we reduce CO_2 per capita emissions in the US?

- What happens if per capita CO_2 emissions in China skyrocket?

Future of global carbon emissions depends heavily on how car ownership rates evolve in China and other emerging economies

Checklist

1) **US Auto Use** ✅

2) **Externalities**

3) **Congestion Pricing**

Externalities

Question:

- Are the costs of driving entirely internalized by the driver?

- **Axiom 3**: Externalities cause inefficiency

Externalities

What are some externalities from driving?

1. Congestion

2. Environmental Damage

3. Collisions

4. Blight (parking lots instead of parks)

5. Noise Pollution

Today: we will focus on congestion externalities

Externalities

How costly is congestion?

- Typical commuter spends **47 hours per year** in traffic

    - **Very high** in some metro areas (LA: 93, SF: 72, Atlanta: 67)

    - Estimated gasoline cost due to congestion delays: **5 billion per year**

    - Time + Gas cost estimate: **63 billion per year**

Modeling Externalities

Let's start by assuming the only externality from driving is congestion

- **Marginal Social Cost** (MSC): Added cost to *society* from one extra unit of production

    - **Note**: $MSC \neq MC$

- MSC is the marginal cost (private) plus the marginal external cost (social)

Congestion Externalities

- MEC from congestion = $m \cdot v \cdot c$ where

  - m is the additional time in traffic from an extra vehicle on the road

  - v is the number of other road users

  - c is the oppurtunity cost of time

Note: When there are few cares on the road, m and v are relatively small

- As the number of cars increases, MEC increases (it is nonlinear)

- Also: the above formula makes a strong assumption, what is it?

Another Graph

Checklist

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So what?

Okay, congestion is an issue, how do we fix it?

Popular Answer: Build more roads

- Thought: if we build more roads, then congestion will decrease since there will be more space on the road

- Q: What is the *crucial* assumption we make when stating: "building roads will reduce congestion"

  - A: The number of drivers will remain the same before and after the road is built

LA Traffic

A Predictable Response

More people driving when a new road is built is easy to understand

1. People avoid driving because it is costly

2. Building a new road makes it less costly

3. Some people were *on the margin* of driving, and the new road pushes them over

So what?

Roads: Not a great solution. Better idea?

Pigouvian Taxes:

- **Main insight**: social cost of driving exceeds private

- Inidividuals do not bear full cost of action, so they engage in it too often

- Raise individual price until social cost = private cost $\implies$ people drive less

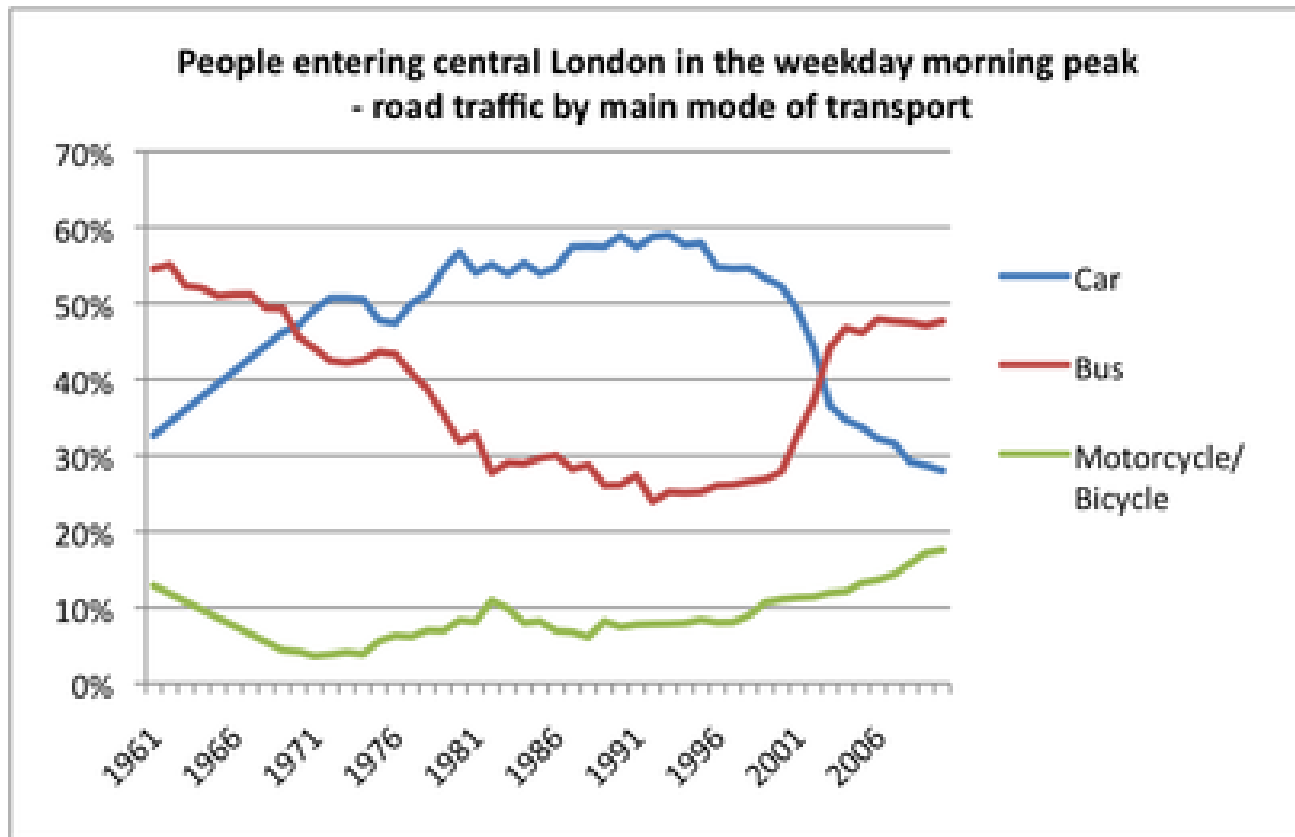- Done via a tax (in this case: congestion)

Where is it?

Where is it?

What Happened ?

People entering central London in the weekday morning peak - road traffic by main mode of transport

Model with Pigouvian Taxes

Peak vs. Off Period Taxes

Mechanisms

Model demonstrated congestion taxes reduce traffic volume. How?

1. Modal substition: switch to carpool, public transit

2. Switch to off-peak travel

3. Switch route

4. Location decisions: change residence or workplace, cutting travel distance

Discussion

Congestion taxes sound like a good idea, right? What are the problems?
Discuss

- Roads aren't always congested. So tax needs to be time-varying. Gets very complicated

- Are all autos charged the same amount (semis and prius?)

Checklist

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