1.1 — The Tools of Microeconomics

ECON 306 • Microeconomic Analysis • Spring 2023

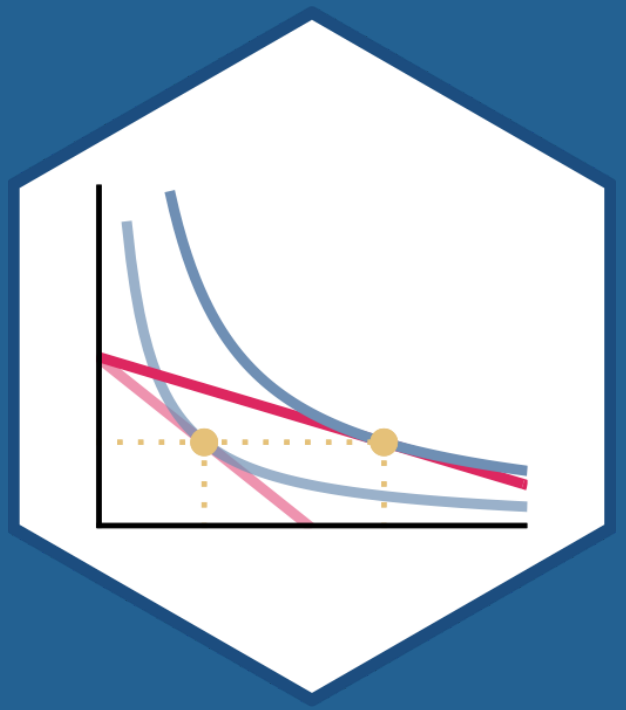
Ryan Safner

Associate Professor of Economics

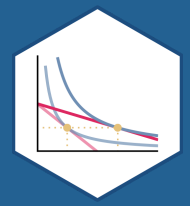
safner@hood.edu

ryansafner/microS23

microS23.classes.ryansafner.com



Outline



About Me

Edinburgh, 2019

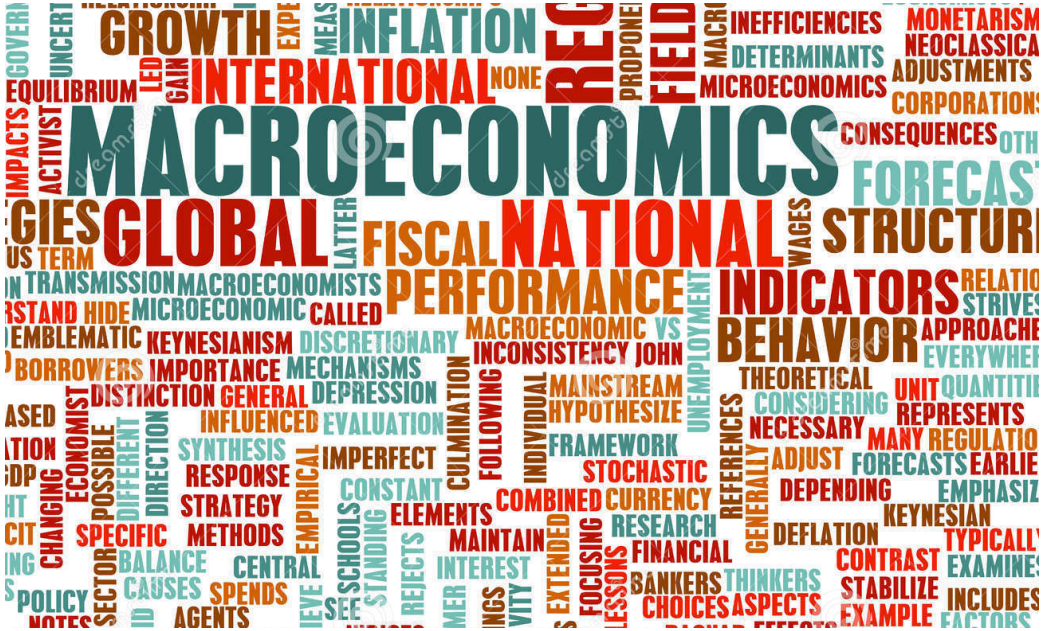
- Ph.D (Economics) — George Mason University, 2015
- B.A. (Economics) — University of Connecticut, 2011
- 7th year teaching at Hood
- Specializations:
  - Law and Economics
  - Austrian Economics
- Research interests
  - modeling innovation & economic growth
  - political economy & economic history of intellectual property
  - my Substack: Increasing Returns

What's Keeping Me Busy

Micro-economics

Micro- vs. Macro-economics

- What is “an economy?”
- Where do aggregates (“GDP”, “unemployment”, & “inflation”) come from?
- **Micro**: [modeling] **Choices** and **consequences**
- **Macro**: [modeling] **Systemic interaction** of choosers & **emergent behavior**



Where You Are Now

- **Basic concepts** of markets, individuals (consumers & firms), economies:
  - ECON 205: Principles of Macroeconomics
  - ECON 206: Principles of Microeconomics
- **Modeling** markets, individuals (consumers & firms), economies
  - ECON 306: Microeconomic Analysis
  - ECON 305: Macroeconomic Analysis.magenta[†]

† Required for ECON majors only. Calculus I required.

Economists Speak a Foreign Language...

- Terms you “know” from ordinary life mean **very different things** to economists:

> Cost, efficiency, welfare, competition, marginal, equilibrium, profit, public good, discrimination, elasticity

- Using these words’ “ordinary” meanings can lead to *wrong* economic conclusions!

- You will need to **“relearn”** the economic meanings of these words

...But You Can Learn It

- You'll need to master a new vocabulary:

  > marginal rate of substitution, marginal cost, consumer surplus, allocative efficiency, externality

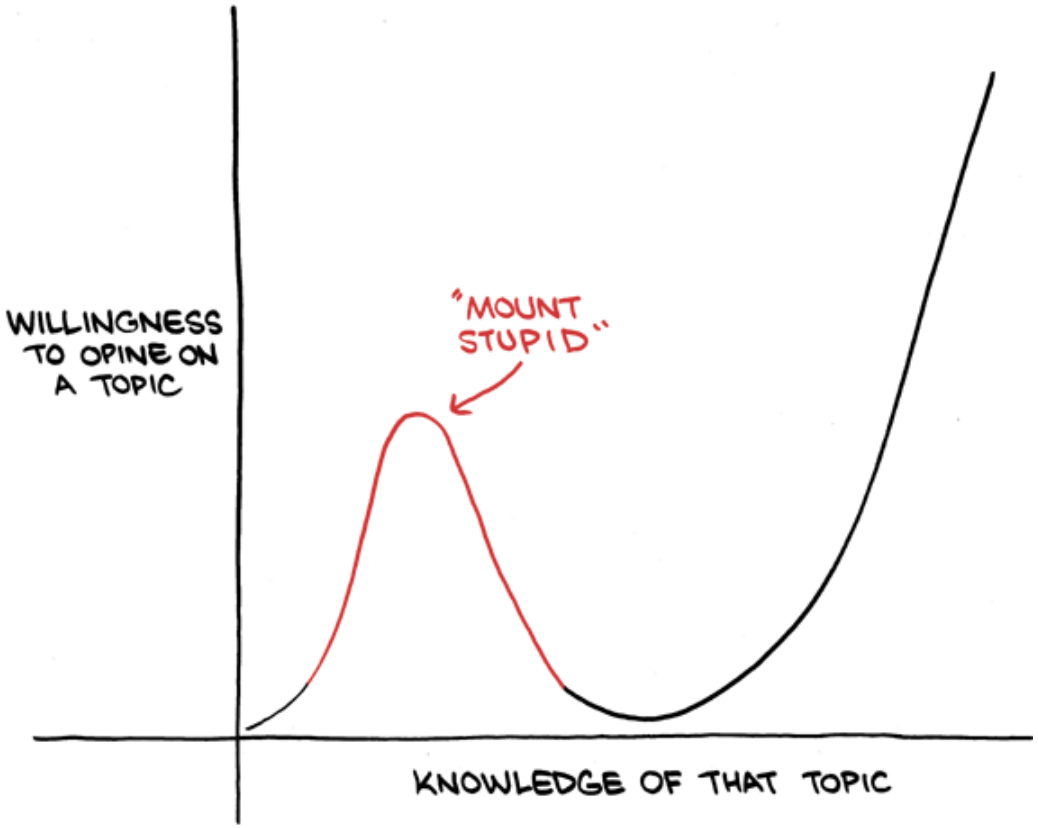
- Avoid excessive jargon, but these concepts are useful to explain reality!

Don't Think You Know It Already!

- Everyone thinks they are *already* an economist and can speak this foreign language
- Be humble!
- Economics is *often* common sense, but reached via deep analytical thinking

And Tread Cautiously

- But be careful, *a little bit of knowledge* is a dangerous thing!
- An application of the famous "Dunning-Kreuger effect" in social psychology



Source: SMBC

Economics ≠ Business or $$$

Mike Simpson, M.D.
@DrMikeSimpson

Follow

The fact that every person with a PhD in economics is NOT a billionaire should tell you all you need to know about the worth of that particular field of study.

2:25 PM - 2 Jun 2018

213 Retweets **1,035** Likes

236 213 1.0K

Economics ≠ Business or $$$

Kevin Banda
@KevinKBanda

Following

The fact that every person with a PhD in geology is NOT a rock should tell you all you need to know about the worth of that particular field of study.

> **Mike Simpson, M.D.** @DrMikeSimpson
> The fact that every person with a PhD in economics is NOT a billionaire should tell you all you need to know about the worth of that particular field of study.
> Show this thread

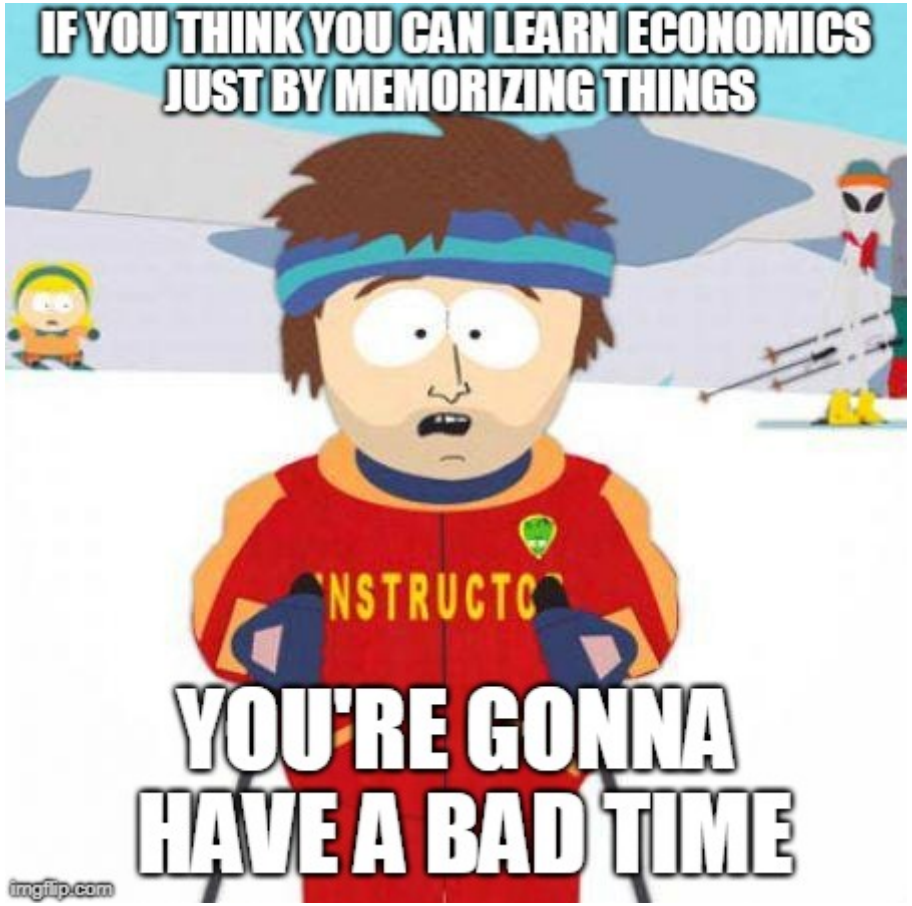
6:22 AM - 4 Jun 2018

399 Retweets **2,271** Likes

59 399 2.3K

Economics Can Be Difficult

- Economics is hard!
- We are literally retraining and rewiring your brain to see the world in a new way
- If you “don't get it” you can't just try to memorize a bunch of facts



Economics Can Be Difficult

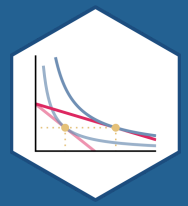
- Not trying to scare you! (I'd rather say this now than after the Exam)
    - **Grades don't reflect your worth as a person!**
- **Comparative advantage**: nobody can be good at everything!
    - I'm awful at accounting, chemistry, etc.

The Uses of Economics

- Most of you will not become professional economists — that's OK
    - Economics is a **liberal art**, useful to you even if it's not your career
- Understand **“how the world works”**

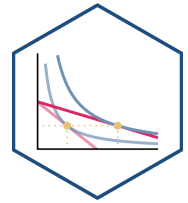
The Uses of Economics

- A great **bullshit-detector**, especially about self-interested, squishy, or political statements
- People love to forget that we have to make tradeoffs
    - “Economics puts parameters on people's utopias”



The Tools of Microeconomics

Economics as a *Way of Thinking*



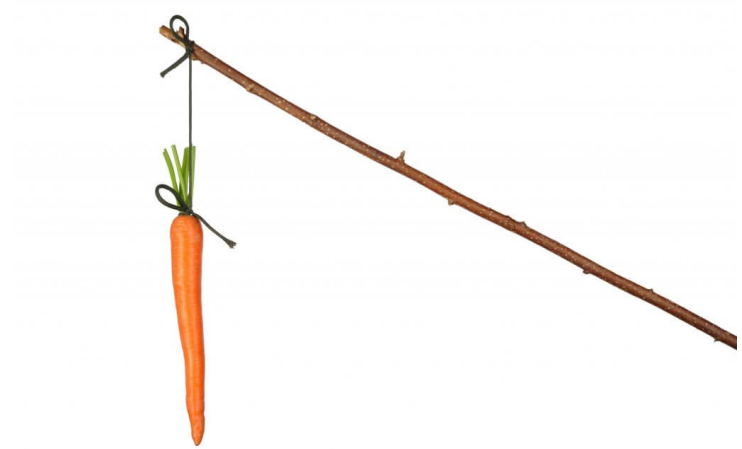
- Economics is a **way of thinking** based on a few core ideas:

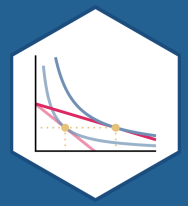
Economics as a *Way of Thinking*

- Economics is a **way of thinking** based on a few core ideas:
- **People respond to incentives**
  - Money, punishment, taxes and subsidies, risk of injury, reputation, profits, sex, effort, morals

Economics as a *Way of Thinking*

- Economics is a **way of thinking** based on a few core ideas:
- **People respond to incentives**
  - Money, punishment, taxes and subsidies, risk of injury, reputation, profits, sex, effort, morals
- **Environments adjust until they are in equilibrium**
  - People adjust their choices until optimal, given others' actions



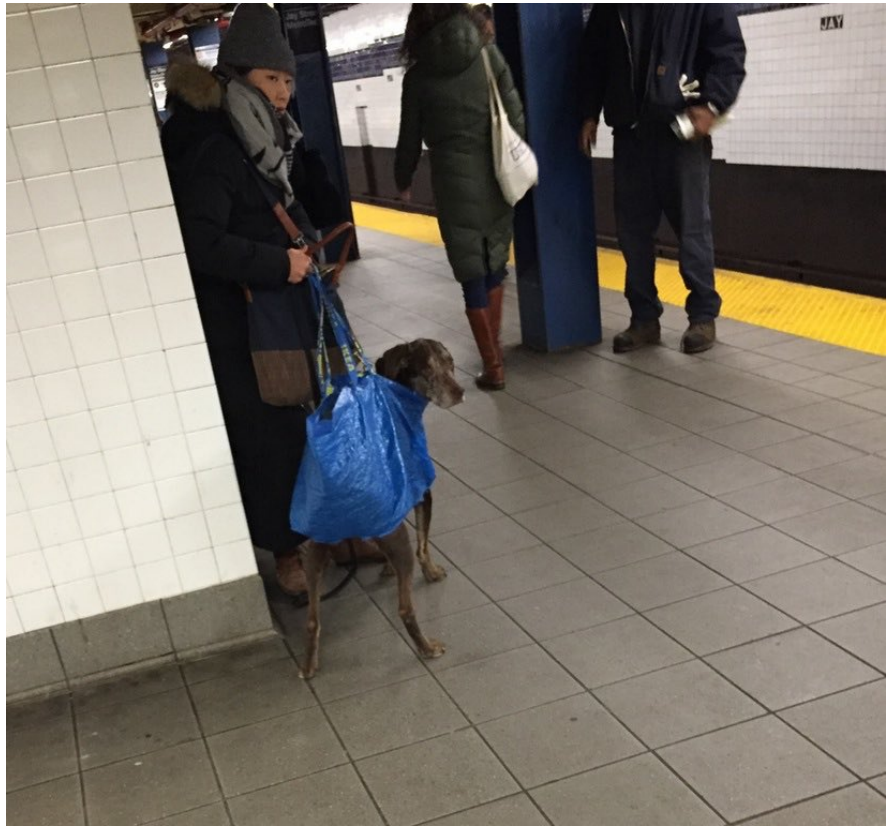


Incentives

Incentives Example: Subway I

The NYC Subway bans dogs unless they can be [“enclosed in a container”]

Incentives Example: Subway II



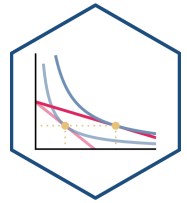
Pictures Source

Incentives Example: Rat Bounty

Some governments pay bounties to reduce pest populations such as rats.

Example: Suppose the government were to pay $250 for every rat tail turned in.

Incentives: Even Dolphins Understand I



Animal behaviour

Why dolphins are deep thinkers

The more we study dolphins, the brighter they turn out to be, writes **Anuschka de Rohan**

Anuschka de Rohan

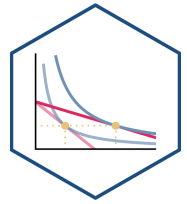
Wed 2 Jul '03 21.25 EDT

20,181

The brain of an adult bottlenose dolphin is about 25% heavier than the average human adult's brain. Photograph: Stephen Frink/Getty Images

July 2 2003, "Why Dolphins are Deep Thinkers", *The Guardian*

Incentives: Even Dolphins Understand II



At the Institute for Marine Mammal Studies in Mississippi, Kelly the dolphin has built up quite a reputation. All the dolphins at the institute are trained to hold onto any litter that falls into their pools until they see a trainer, when they can trade the litter for fish. In this way, the dolphins help to keep their pools clean.

Kelly has taken this task one step further. When people drop paper into the water she hides it under a rock at the bottom of the pool. The next time a trainer passes, she goes down to the rock and tears off a piece of paper to give to the trainer. After a fish reward, she goes back down, tears off another piece of paper, gets another fish, and so on. This behaviour is interesting because it shows that Kelly has a sense of the future and delays gratification. She has realised that a big piece of paper gets the same reward as a small piece and so delivers only small pieces to keep the extra food coming. She has, in effect, trained the humans.

July 2 2003, "Why Dolphins are Deep Thinkers", *The Guardian*

Incentives: Monkeys Too

These Monkeys Understand Economics and Intentionally Steal High-Ticket Items to Barter for Better Food, Study Finds

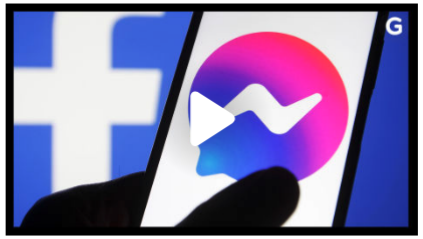
Jody Serrano
1/17/21 8:43PM

54 1

A Balinese long-tailed monkeys, Macaca fascicularis, eats an apple in the Sacred Monkey Forest in Ubud, Bali, Indonesia, on November 16, 2018.
Photo: Gabriel Bouys / AFP (Getty Images)

Some of you all may be familiar with the crime ring of long-tailed macaque monkeys that reside around the Uluwatu Temple in Bali, Indonesia, who were

Recent Video



The 5 Facebook Messenger Features You Need to Know

Caitlin McGarry | 12

January 17, 2021, These Monkeys Understand Economics and Intentionally Steal High-Ticket Items to Barter for Better Food, Study Finds, *Gizmodo*

In Fact a Lot of the Natural World Behaves Economically

PNAS

Proceedings of the National Academy of Sciences of the United States of America

Keyword, Author, or DOI

Home | Articles | Front Matter | News | Podcasts | Authors | Submit

RESEARCH ARTICLE

Walrasian equilibrium behavior in nature

Ted Loch-Temzelides

+ See all authors and affiliations

PNAS July 6, 2021 118 (27) e2020961118; https://doi.org/10.1073/pnas.2020961118

Edited by Stephen Polasky, University of Minnesota, St. Paul, MN, and approved April 16, 2021 (received for review October 12, 2020)

Article | Figures & SI | Info & Metrics | PDF

Significance

Mutualisms are commonly observed ecological interactions, often involving the exchange of resources across species. Such exchanges can be thought of as biological markets. Biologists modeling these markets often employ an informal mix of economics and game-theoretic concepts. A fundamental question is whether exchange in biological markets is consistent with general economic equilibrium theory (GET), the main paradigm used to study exchange in economics. This paper uses data from biological experiments to demonstrate that the trading behavior of mycorrhizal fungi is consistent with the predictions of GET. The large volume of knowledge in GET might result in new insights about biological exchange. In turn, experimental findings in biology can lead to a new field of application for GET.

Loch-Temzelides, Ted, 2021, "Walrasian equilibrium behavior in nature", *PNAS* 118(27)

Cold Spring Harbor Laboratory

bioRxiv

THE PREPRINT SERVER FOR BIOLOGY

bioRxiv posts many COVID19-related papers. A reminder: they have not been formally peer-reviewed and should not guide health-related behavior or be reported in the press as conclusive.

New Results

The nematode worm *C. elegans* chooses between bacterial foods exactly as if maximizing economic utility

Abraham Katzen, Hui-Kuan Chung, William T. Harbaugh, Christina Della Iacono, Nicholas Jackson, Stephanie K. Yu, Steven W. Flavell, Paul W. Glimcher, Shawn R. Lockery

doi: https://doi.org/10.1101/2021.04.25.441352

This article is a preprint and has not been certified by peer review [what does this mean?].

0 | 0 | 0 | 0 | 1 | 29

Abstract | Full Text | Info/History | Metrics | Preview PDF

Abstract

In value-based decision making, options are selected according to subjective values assigned by the individual to available goods and actions. Despite the importance of this faculty of the mind, the neural mechanisms of value assignments, and how choices are directed by them, remain obscure. To investigate this problem, we used a classic measure of utility maximization, the Generalized Axiom of Revealed Preference, to quantify internal consistency of food preferences in *Caenorhabditis elegans*, a nematode worm with a nervous system of only 302 neurons. Using a novel combination of microfluidics and electro-physiology, we found that *C. elegans* food choices fulfill the necessary and sufficient conditions for utility maximization, indicating that nematodes behave exactly as if they maintain, and attempt to maximize, an underlying representation of subjective value. Food choices are well-fit by a utility function widely used to model human consumers. Moreover, as in many

Katzen et al., 2021, "The nematode worm *C. elegans* chooses between bacterial foods

Takeaways About Incentives I

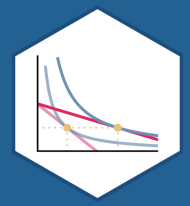
- People respond to (changes in) incentives
- People have goals they seek to attain
- Making one alternative more costly $\neq$ people *stop* pursuing their goals
- People will seek (less preferred) *alternative* methods to attain goals
- **Unintended consequences**!

Takeaways About Incentives II

Peter Fortune AM
@PeterTFortune · **Follow**

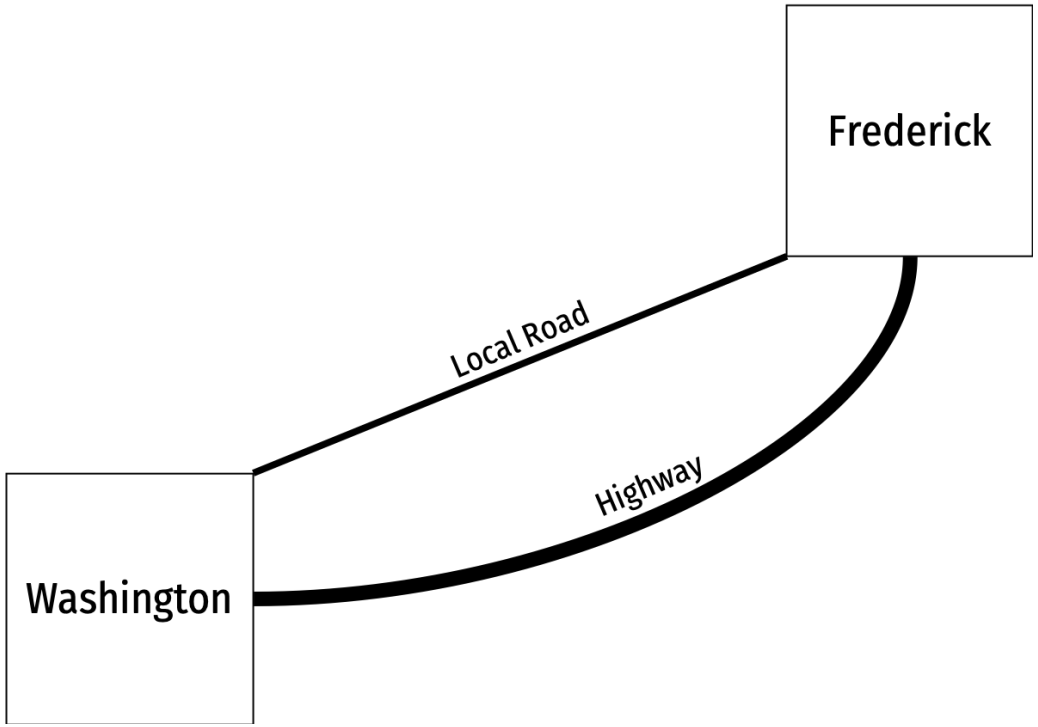
Whenever I am working on policy decisions I think of this image... 🚴

2:54 PM · Aug 7, 2019



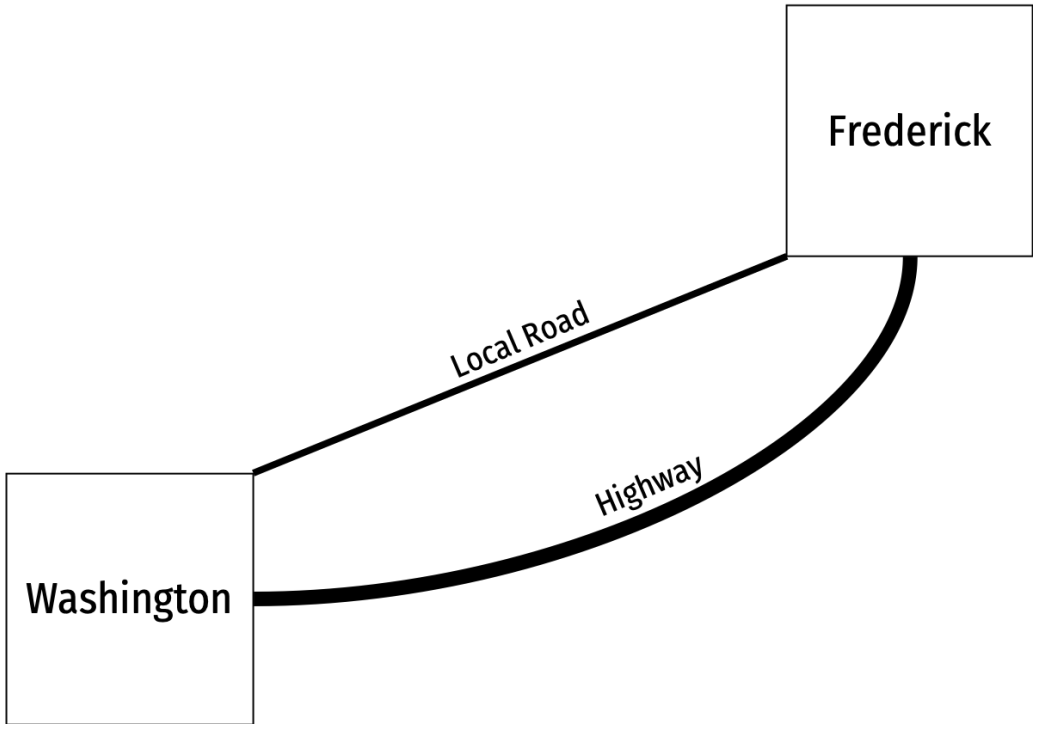
Equilibrium

Equilibrium Example I



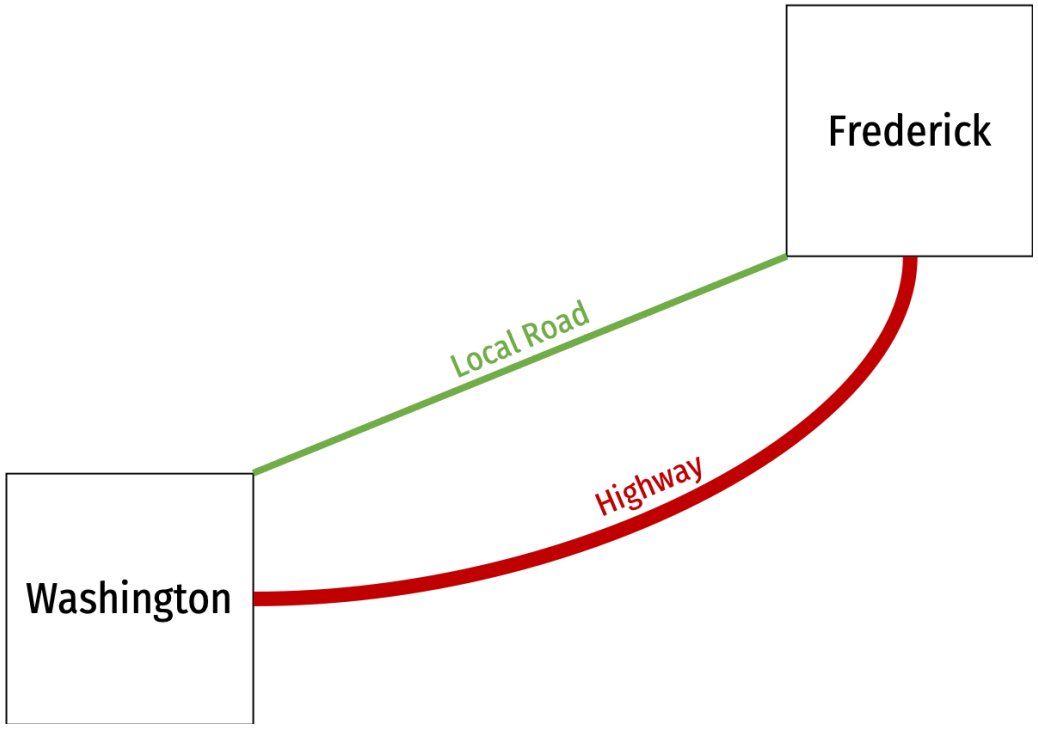
- Suppose 2 roads connect Frederick and Washington
- 100 cars commute
- Local road travel time: 30 min + 1 min/car
- Highway travel time: 1 hour (always)

Equilibrium Example I



- Suppose 2 roads connect Frederick and Washington
- 100 cars commute
- Local road travel time: 30 min + 1 min/car
- Highway travel time: 1 hour (always)
- Assume people **optimize**: choose road to **minimize travel time** between cities

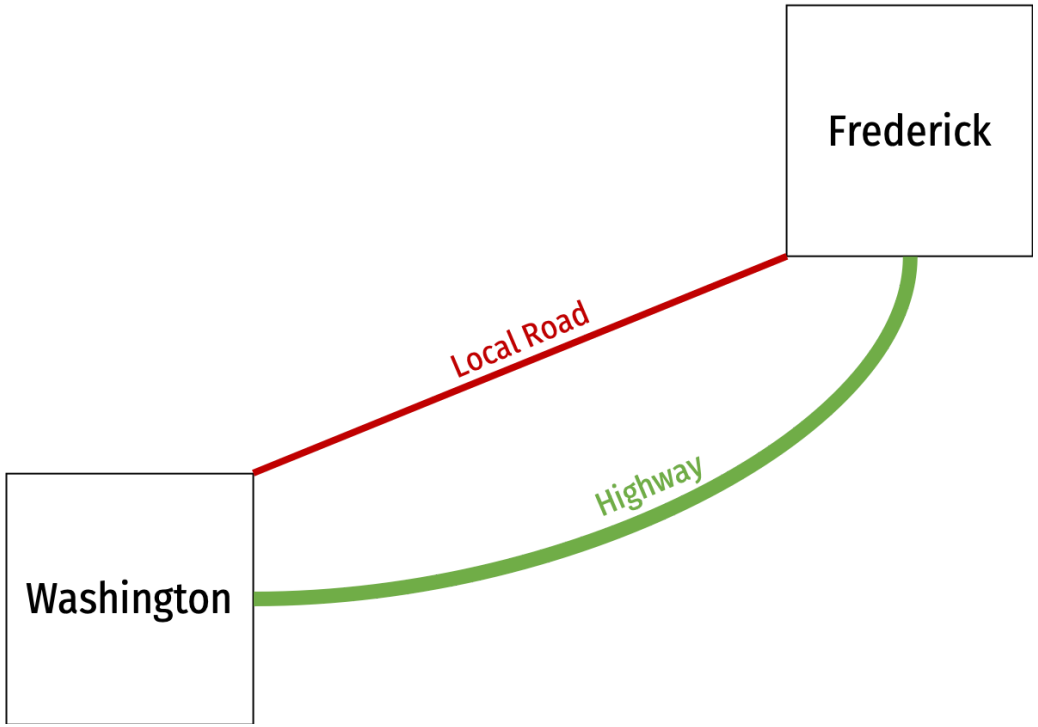
Equilibrium Example II



- Suppose 2 roads connect Frederick and Washington
- 100 cars commute
- Local road travel time: 30 min + 1 min/car
- Highway travel time: 1 hour (always)

Scenario I: There are **less than 30 cars** on the local road

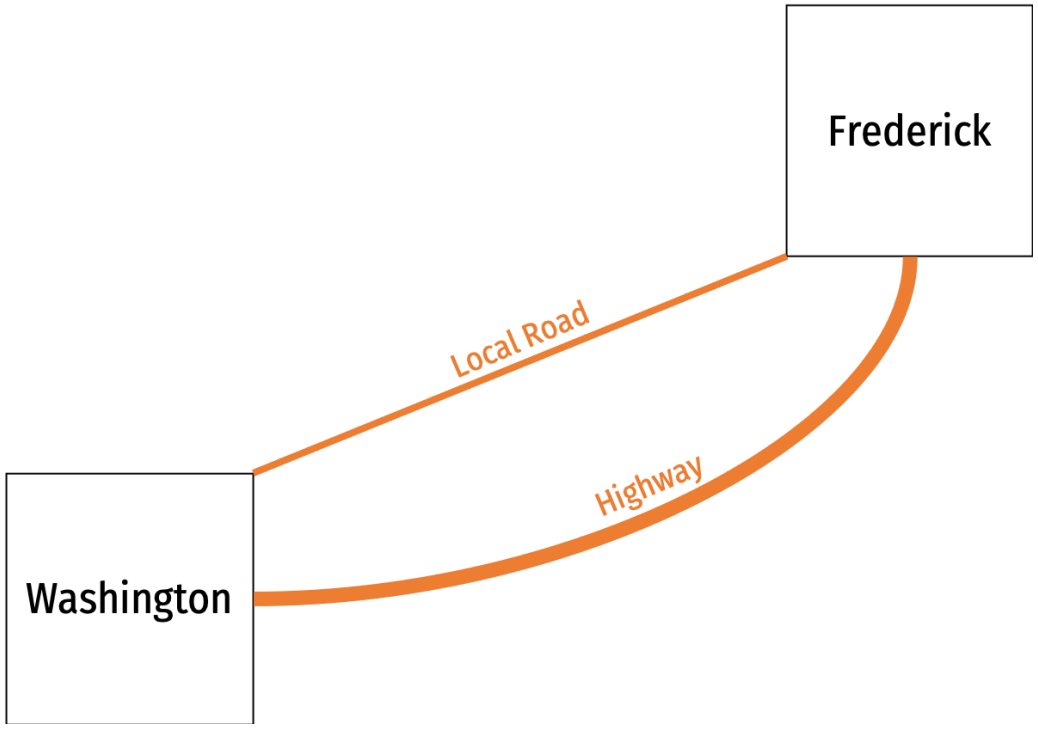
Equilibrium Example III



- Suppose 2 roads connect Frederick and Washington
- 100 cars commute
- Local road travel time: 30 min + 1 min/car
- Highway travel time: 1 hour (always)

Scenario II: There are **more than 30 cars** on the local road

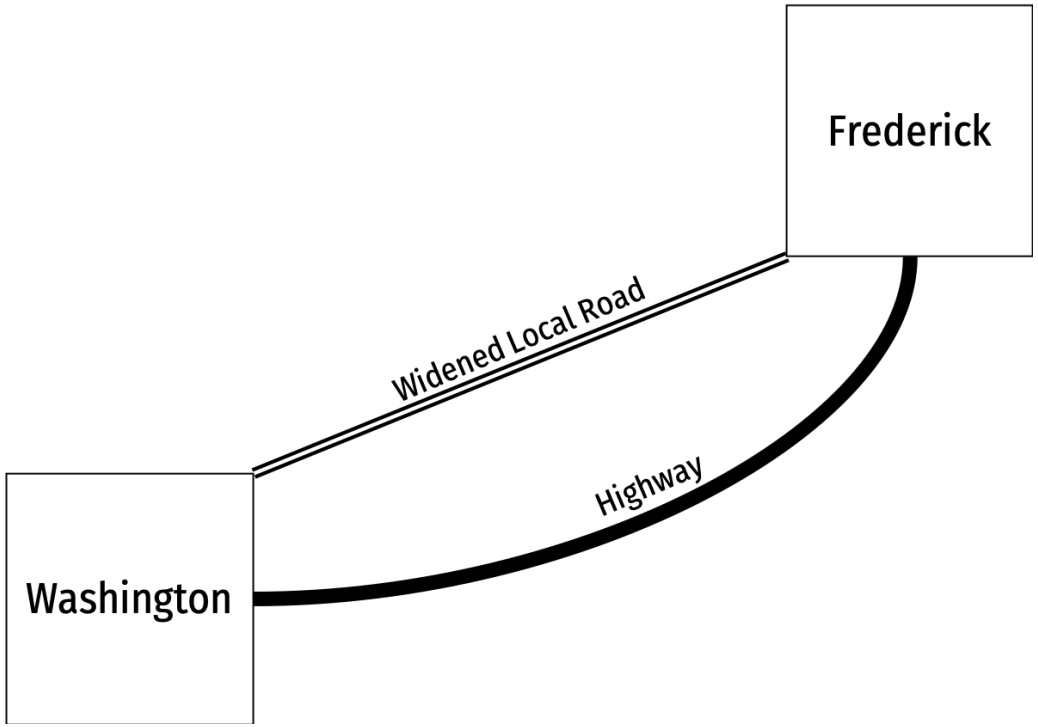
Equilibrium Example IV



- Suppose 2 roads connect Frederick and Washington
- 100 cars commute
- Local road travel time: 30 min + 1 min/car
- Highway travel time: 1 hour (always)

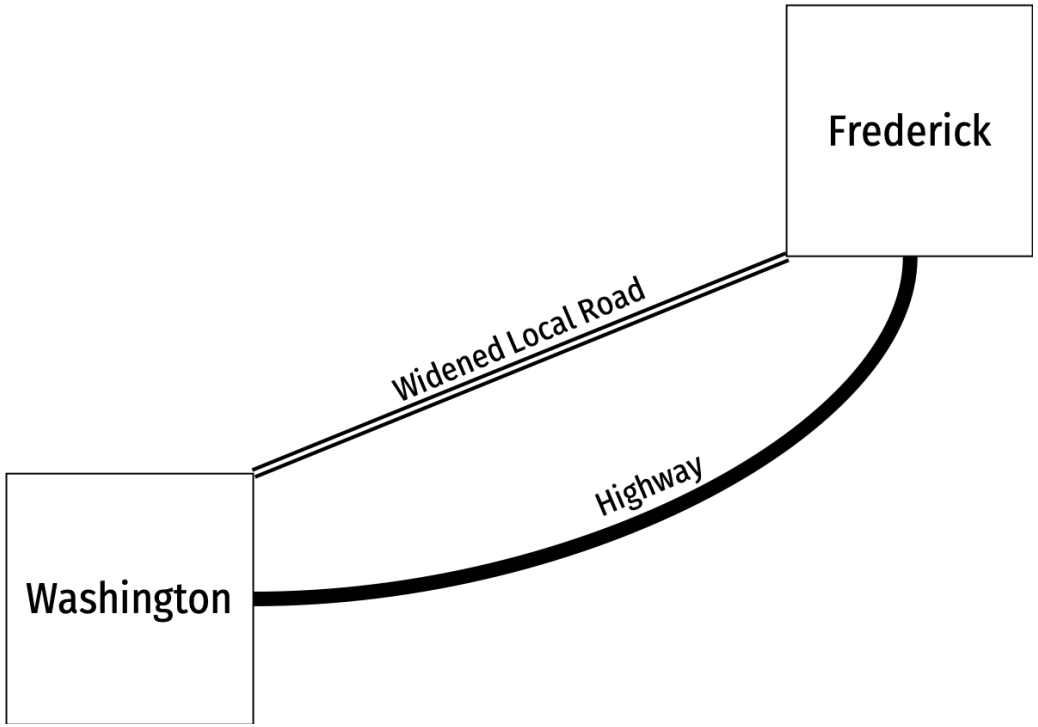
Equilibrium: How many cars are on each road? (Why?)

Equilibrium Example V



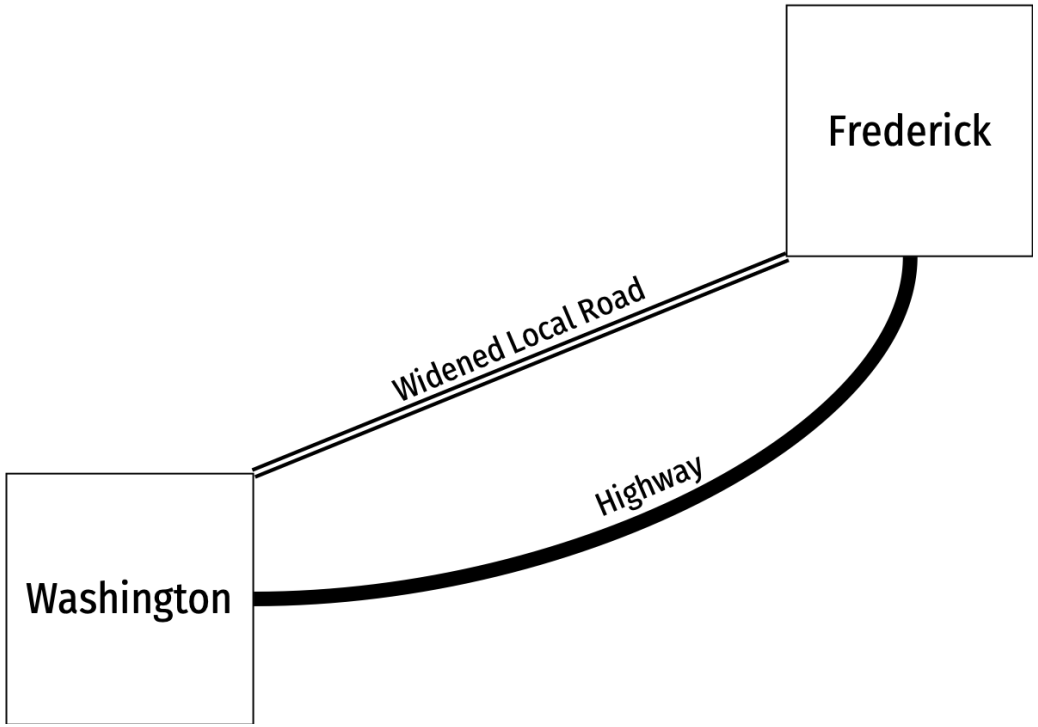
- **Suppose the State *doubles the capacity* of the local road**
- Local road travel time: **30 min + 0.5 min/car**
- Highway travel time: 1 hour (always)

Equilibrium Example V



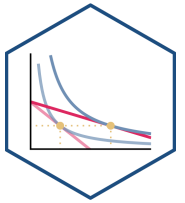
- **Suppose the State *doubles the capacity* of the local road**
- Local road travel time: **30 min + 0.5 min/car**
- Highway travel time: 1 hour (always)
- **Will this reduce travel time?**
- Yes! says the State:
  - 30 cars use the local road, takes 1 hour
  - With wider road it takes 45 min!

Equilibrium Example V



- **Suppose the State *doubles the capacity* of the local road**
- Local road travel time: **30 min + 0.5 min/car**
- Highway travel time: 1 hour (always)
- **Will this reduce travel time?**
- Yes! says the State:
  - 30 cars use the local road, takes 1 hour
  - With wider road it takes 45 min!
- **Is this an equilibrium?**

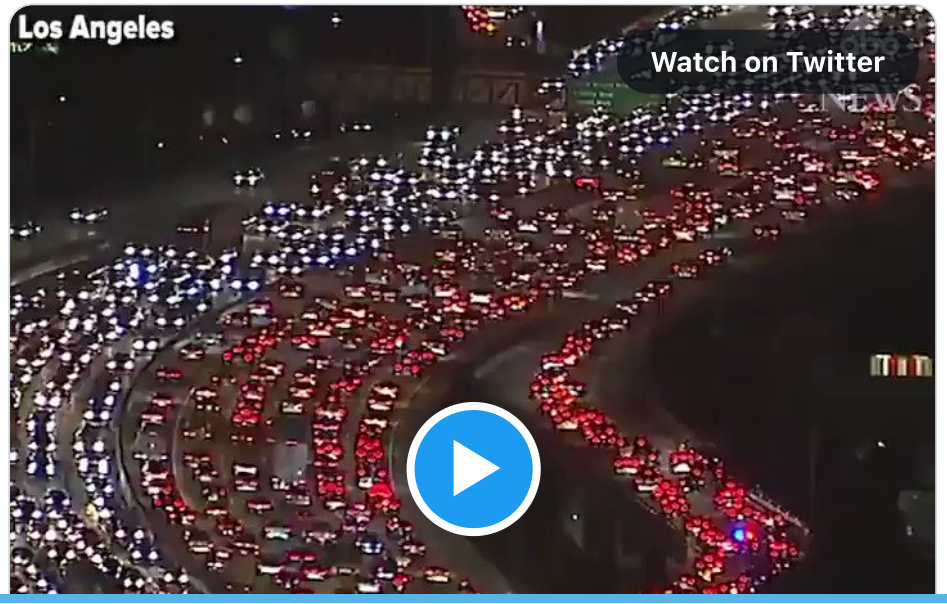
In the Long Run...(& Repeating the Same Mistake)



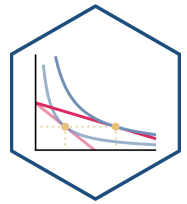
21st Century City 🏗️🚲🚇🌆
@urbanthoughts11 · **Follow**

1970: One more lane will fix it.
1980: One more lane will fix it.
1990: One more lane will fix it.
2000: One more lane will fix it.
2010: One more lane will fix it.
2020: ?

via @avelezig



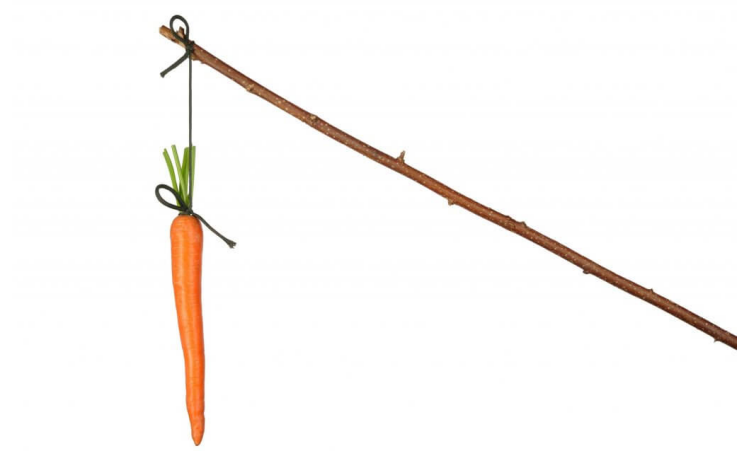
Comparative Statics



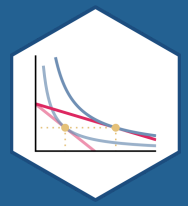
- **Comparative statics**: examining changes in equilibria cased by an external change (in incentives, constraints, etc.)

Optimization and Equilibrium

- If people can **learn** and **change** their behavior, they will tend to **switch** to a higher-valued option
- If there are no alternatives that are better, a person is at an **optimum**
- Everyone is at an optimum $\iff$ the system is in **equilibrium**

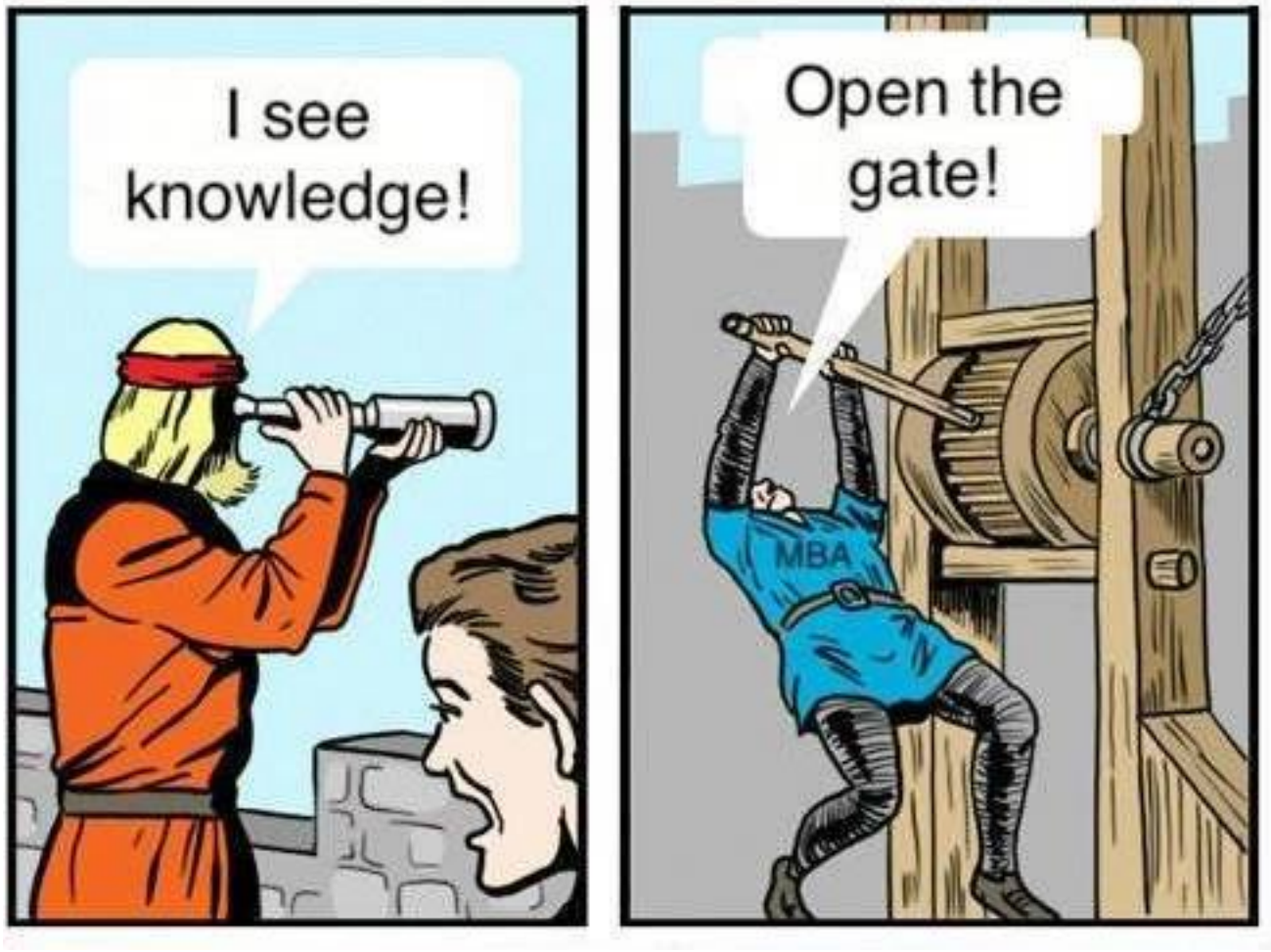


Economics Is Broader Than You Think

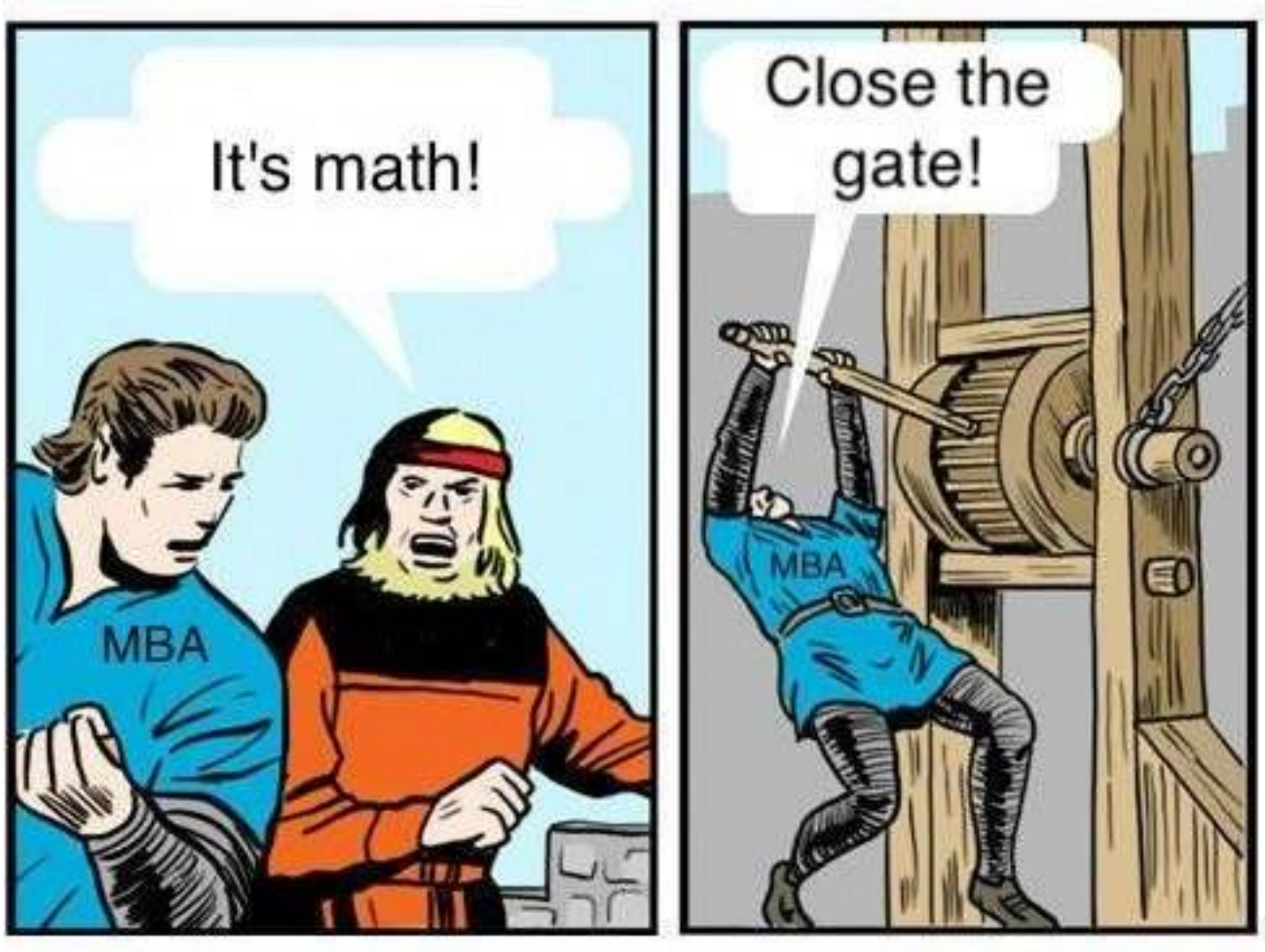


Real Talk: The Math

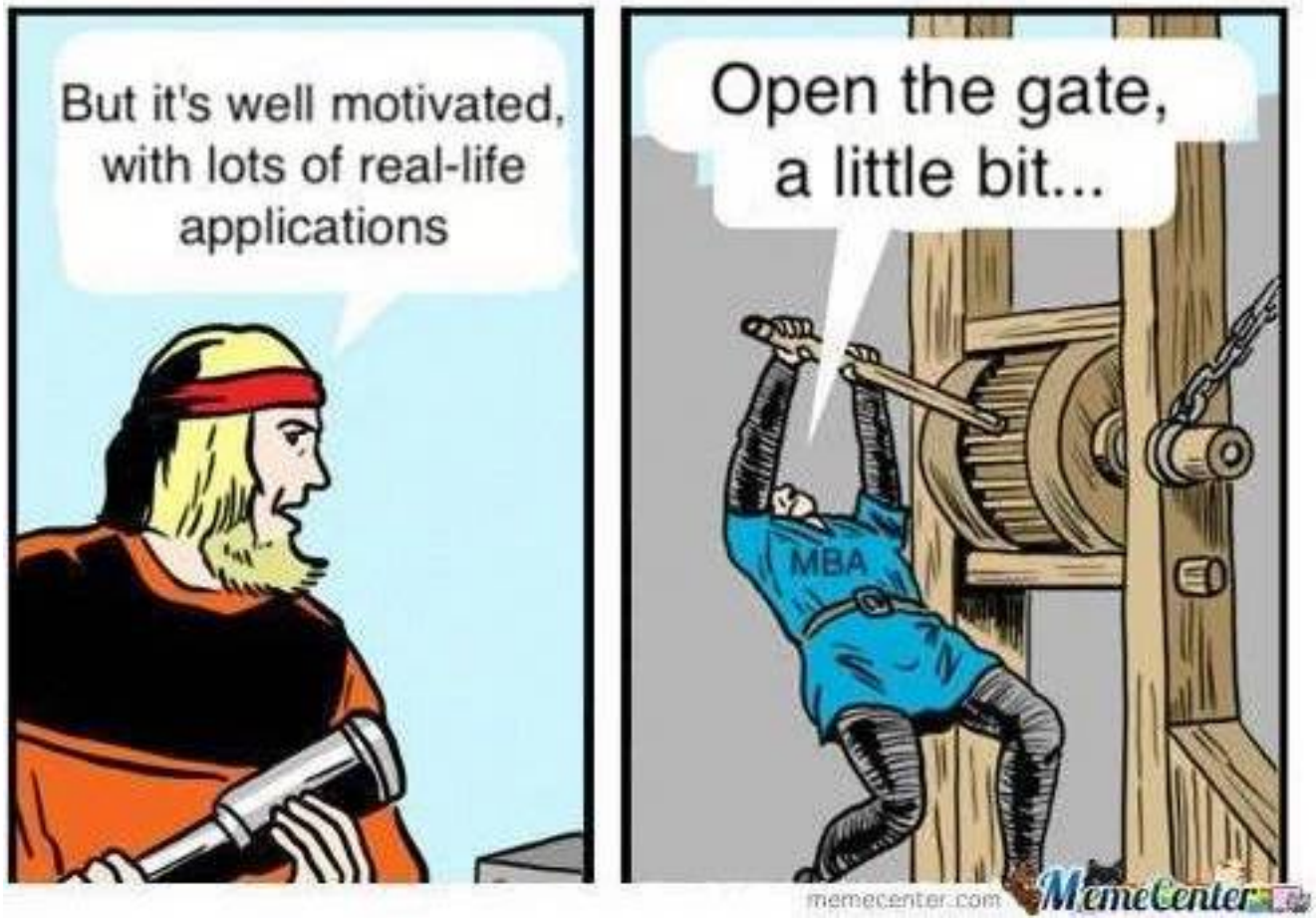
Real Talk



Real Talk

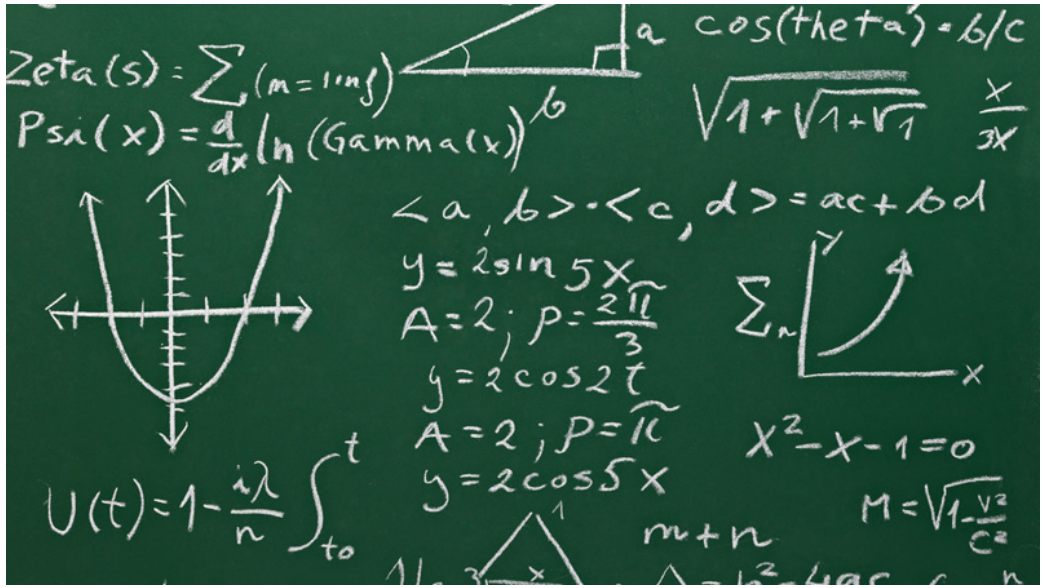


Real Talk


But it's well motivated, with lots of real-life applications
Open the gate, a little bit...
MBA
memecenter.com
MemeCenter

Why We Model I

- Economists often “speak” in models that explain and predict human behavior
- The pure language of models is mathematics
  - things that are universally true, deducible from axioms, can easily spot errors
  - often equations and graphs
  - this is what scares students most about economics



Why We Model II

- Economists use conceptual models: fictional constructions to logically examine consequences
- Very different from other sciences
  - No social experiments
  - Purposive, strategic human beings
  - Introspective understanding

The Two Major Models of Economics as a "Science"

Optimization

- Agents have **objectives** they value
- Agents face **constraints**
- Make **tradeoffs** to maximize objectives within constraints

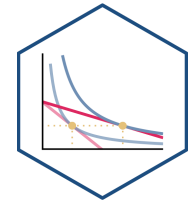
Equilibrium

- Agents **compete** with others over **scarce** resources
- Agents **adjust** behaviors based on prices
- **Stable outcomes** when adjustments stop

A Hint That Will *Almost* Never Fail You

- **The answer to 95% of questions in this course: where marginal benefit equals marginal cost**
  - What's the benefit? What's the cost?
  - Interpretation from math $\longrightarrow$ English
- In practice: **where slopes (rates of change) of two things are equal**

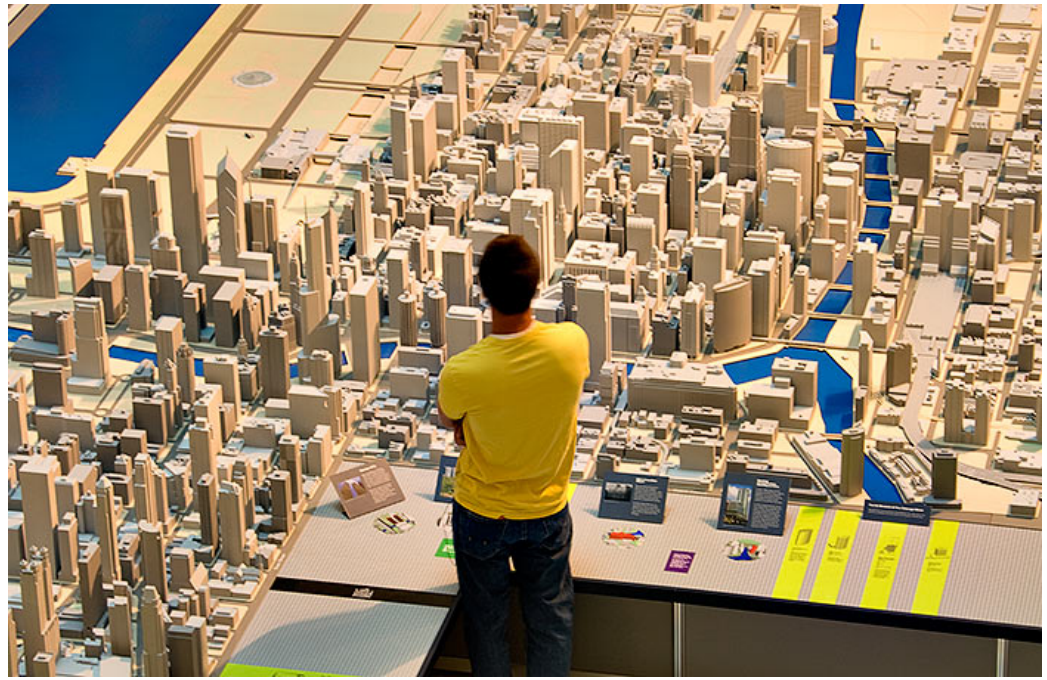
Remember: All Models are Wrong!



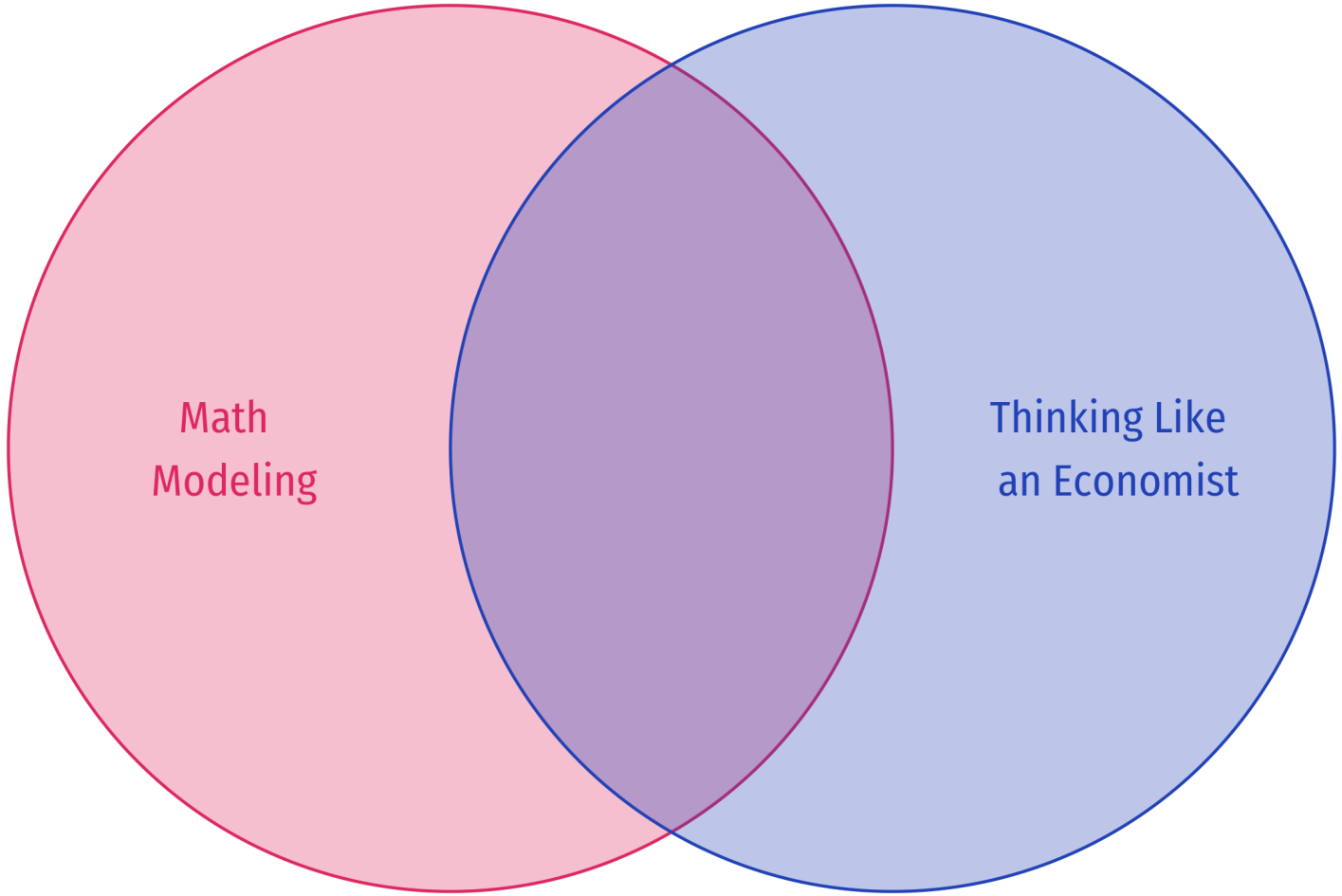
Caution: Don't conflate models with reality!

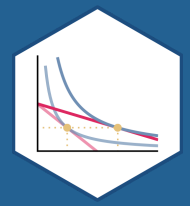
- Models **are not** reality. They help us **understand** reality.

> "All models lie. The art is telling useful lies." - George Box



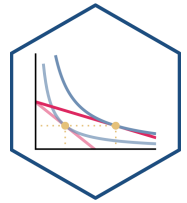
Economics Uses, but Is Not Limited to, Math





About This Course

Learning Goals



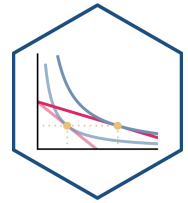
By the end of this course, you will:

1. apply the models of microeconomics (constrained optimization and equilibrium) towards explaining real world behavior of individuals, firms, and governments

2. explore the effects of economic and political processes on market performance (competition, market prices, profits and losses, property rights, entrepreneurship, market power, market failures, public policy, government failures)

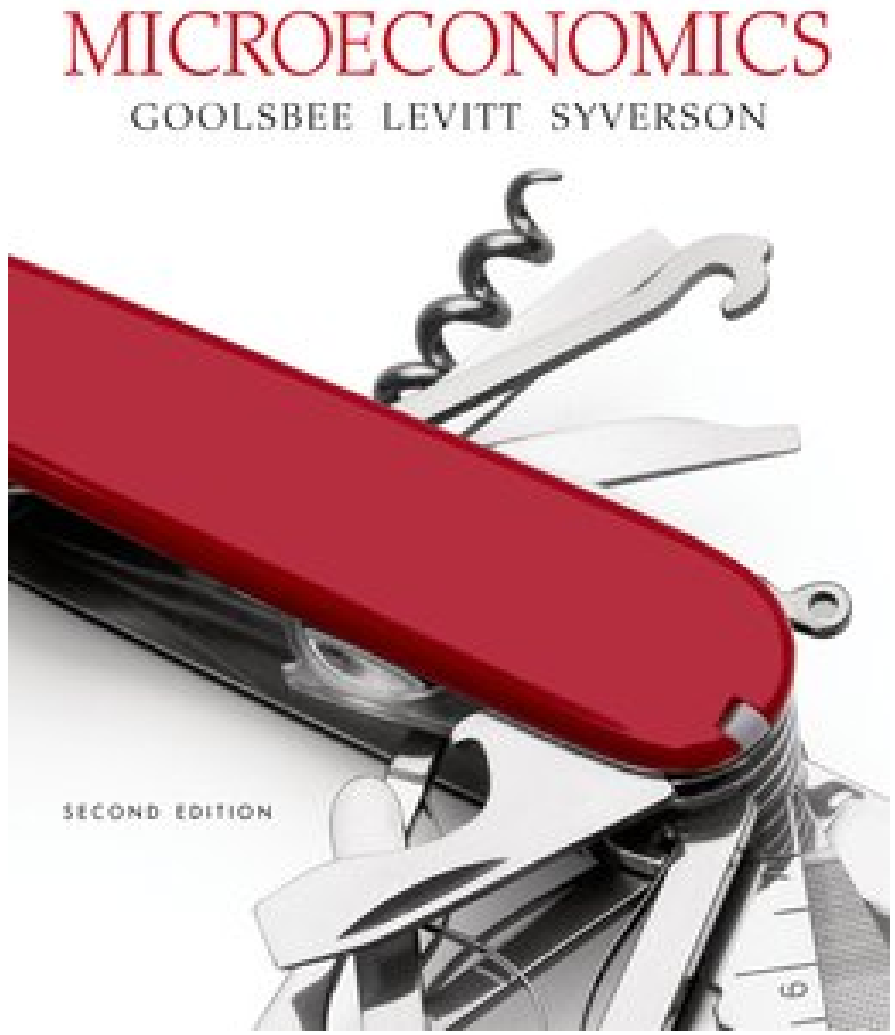
3. apply the economic way of thinking to real world issues in writing

Assignments

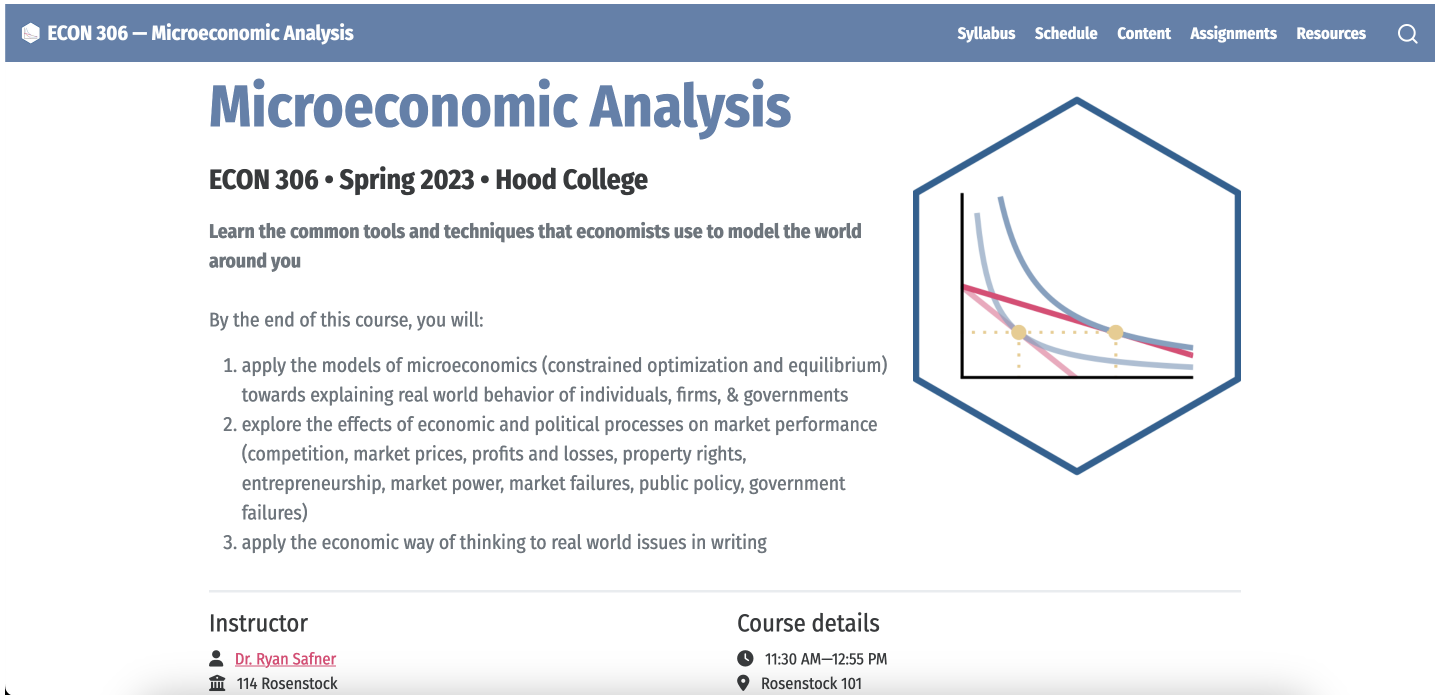


	Assignment	Percent
1	Opinion-Editorial	20%
n	Homeworks (Average)	20%
3	Exams	20% each

Your “Textbook”



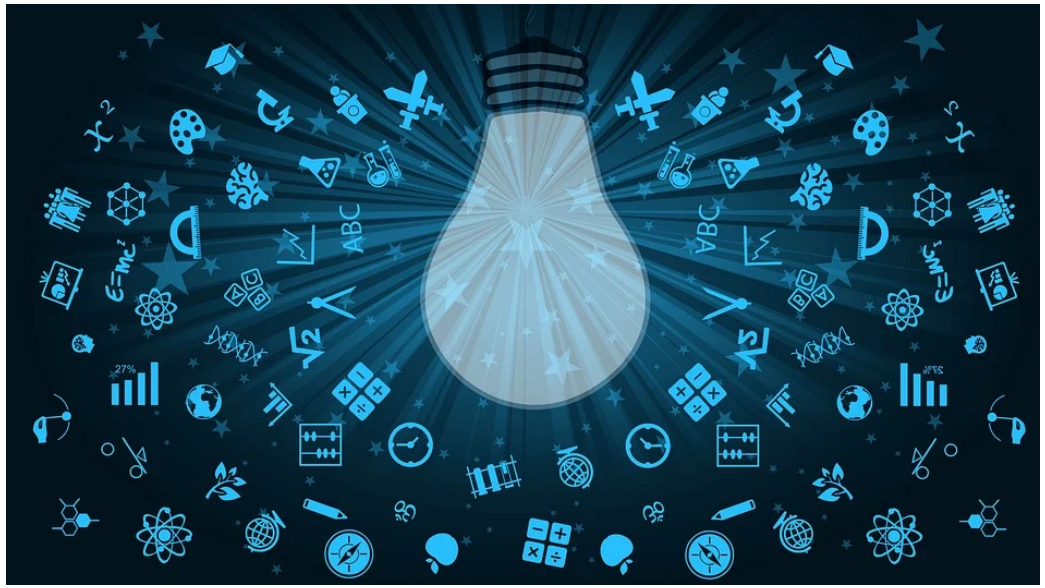
Course Website

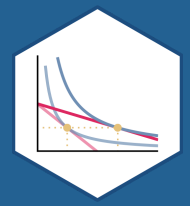


microS23.classes.ryansafner.com

Logistics

- Office hours: MW 1:30—2:30 PM & by appt
    - Office: 114 Rosenstock
- Teaching Assistant(s): TBD
    - grade HWs & hold office hours
- See the resources page for tips for success and more helpful resources

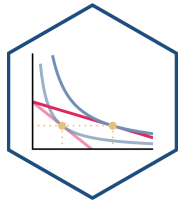




You Can Do This

And I Am Here To Help You

Roadmap for the Semester



Individual Choice Theory
- Budget Constraint
- Preferences
- Utility Maximization
- Demand Curves

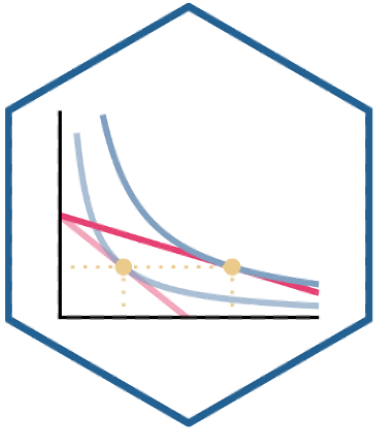
→

Production
- Firms & Technology
- Cost Minimization
- Profit Maximization
- Supply Curves

→

Market Equilibrium
- Supply & Demand
- Economic Policy
- Externalities
- Entrepreneurship

↓



Microeconomic Analysis

Imperfect Competition
- Monopoly
- Oligopoly
- Game Theory
- Factor Markets