Northwestern | Department of Economics

Fall 2024 Economics 355 Professor Savage

TRANSPORTATION ECONOMICS AND PUBLIC POLICY

Instructor:
Professor Ian Savage, 2211 Campus Drive (KGH), room 3371, 847-491-8241, ipsavage@northwestern.edu

Teaching Assistant:
Yuejun Chen, yuejunchen2029@u.northwestern.edu

WHAT IS THE COURSE ABOUT?

Course Description: The objective of this course is to provide the student with an understanding of the transportation industries in the United States and the major policy issues confronting government and the public. All modes of transportation are considered: highways, trucking, mass transit, airlines, maritime, railroads, and pipelines. The course acquaints the student with the underlying economics of transportation provision including demand, costs, the economics of regulation and regulatory reform, the pricing and quality of service, managing congestion, subsidies, competition between the various modes, and the social appraisal of projects.

Learning Objectives: After completing this course, you should:

- know the underlying economics of the demand for and supply of transportation services;
- understand market equilibria, and how failures in market processes lead to public policy interventions; and
- know how the tools learned in intermediate microeconomics and econometrics courses can be used to analyze real world markets and public policy decisions in transportation.

Prerequisites: Economics 281, 310-1, and 310-2.

HOW IS THE COURSE ORGANIZED?

Lectures: Two lectures a week on Monday and Wednesday from 11:00AM to 12:20PM in Harris Hall L07.

Discussion Section: A required weekly discussion section is held on Fridays at the same time and in the same room as the lectures. The discussion section on September 27 will consist of an overview of the history of U.S. transportation conducted by Professor

Savage. Each week the Teaching Assistant will also present a small amount of new material that complements the lectures.

Office Hours:
We will offer a choice of in-person and virtual office hours:

Sundays	8:00-9:30pm	Virtual	Yuejun Chen
Mondays	1:30-2:30	KGH 3371	Professor Savage
Mondays	4:00-5:00	Virtual	Professor Savage
Tuesdays	10:30-11:30	Virtual	Professor Savage
Tuesdays	3:00-4:30	KGH 3198	Yuejun Chen
Wednesdays	9:30-10:30	KGH 3371	Professor Savage

Access virtual office hours on Zoom through the class Canvas page.
You can arrange for an appointment at other times by e-mailing or seeing us before or after the lectures and discussion sections. Additional office hours prior to the final exam will be announced in class.

Workbook: Instead of distributing class PowerPoint slides, the course uses “skeleton notes" (which we will call “the workbook”) that should be brought to every class. These notes contain more information and explanation than can normally be on a PowerPoint slide deck. They are an outline of the lectures for you to follow along and have space for you to take notes. Crucially, there are 'blank sections" for you to complete during the lecture. There are two options for using the workbook, which is divided into 14 sections:

1. Make notes on the hardcopies that will be distributed in class
2. Download a pdf file from Canvas and annotate it on a tablet during class.

Short Videos: There is a series of short (3 to 10 minute) videos posted in the Panopto tab of Canvas. These videos are a voiceover of the slides for small segments of the course and focus mainly on self-contained analytical models. The videos are released immediately after the relevant lecture.

HOW IS THE COURSE EVALUATED?

Evaluation:

- Seven graded problem sets (10% of the total grade)
- Midterm examination 1 in class on Wednesday October 16 (25%)
- Midterm examination 2 in class on Wednesday November 13 (25%)
- Final examination from 9AM to 11AM on Monday December 9 (40%).

No make-ups will be given for the midterm exams. In the event of a pre-approved absence, or a verified illness, additional weight will be given to the other midterm exam and the final exam. WCAS rules “forbid administering a final examination to individual students in advance of the assigned time. Students are required to take the final examination at the designated time.” An earlier exam will not be given. Practice examinations are posted in Canvas.

Problem Sets: Problem sets are posted in Canvas. Generally, they are due at 5:00PM Central Time on Wednesdays in Crowdmark. They are graded and reviewed in the discussion section two days later. The schedule is:

Set #	Submission Deadline	Returned & Discussed
1	5pm October 2	October 4
2	5pm October 9	October 11
3	5pm October 23	October 25
4	5pm October 30	November 1
5	5 pm November 6	November 8
6	5 pm November 20	November 22
7	5 pm November 25*	November 27

* The seventh problem set is due two days earlier than normal at 5PM on Monday and will be returned and discussed in place of the regular lecture on Wednesday (the day before Thanksgiving).

SYLLABUS AND READINGS

Readings are posted in Canvas, linked from the "modules" page. Some chapters from the book José A. Gómez-Ibáñez, William B. Tye and Clifford Winston (eds.) *Essays in Transportation Economics and Policy: A Handbook in Honor of John R. Meyer*, Washington D.C.: Brookings Institution. These are marked as GTW in the listings.

Topic 1: Why Have a Course in Transportation Economics?

What is it about transportation that interests economists? What tools do economists have to tackle transportation problems?

Topic 2: History of American Transportation

The history of transportation is marked by changing technology, competition between various forms of transportation, government regulation for most of the twentieth century, and then deregulation in the period since 1980. This topic also considers current and future issues and challenges.

- Ian Savage (2024), *History of American Transportation: A Brief History Lesson for Economists*, paper prepared for Economics 355.

Topic 3: Descriptive Statistics

The relative importance of individual modes, the traffic they carry, and the market share of the major firms. This topic is presented as part of Problem Set 1.

- Ian Savage (2024), *Descriptive Statistics: Data for the United States*, paper prepared for Economics 355.

Topic 4. Freight Demand

Transportation is a *derived demand* because manufacturers in place A have profitable opportunities for selling their goods in place B. Models of interregional and international trade are used to derive a demand function for freight service.

Topic 5: Passenger Demand

In some cases, travel may be pleasurable in and of itself. However, in general travel occurs because passengers who live at place C derive income or pleasure from activities at place D. Passenger travel is therefore interconnected with the geographic location of residences, jobs, schools, shops, and leisure opportunities. For many trips, passengers have a choice for the mode of travel (driving versus public transit, taking the train versus flying). In making their choice they are responsive to both the price and service quality of rival modes. A major component of transportation service quality is the speed of travel, and hence the journey time. Considerable efforts have been made to estimate the sensitivity of demand to changes in travel time by calculating the value that people place on time saving.

- GTW Chapter 12 “Transportation and Land Use”
- GTW Chapter 2 “The Demand for Transportation: Models and Applications” (some of this chapter is too advanced for this course. You need not - unless you want to - read the section entitled “Advanced Disaggregate Demand Models” on pages 24-31).
- US Department of Transportation (2016)*, The Value of Travel Time Savings: Department of Transportation Guidance for Conducting Economic Evaluations*, US Department of Transportation.

Topic 6: Theory of Costs

The theory of production functions and their associated cost functions. Particular attention is given to specifying “proper cost functions” that are consistent with economic theory.

- GTW Chapter 3 “Learning About Transport Costs”

Topic 7: Empirical Cost Estimation

Empirical investigation of the cost structure of the railroad, trucking, and airline industries. Particular attention is given to whether specific modes display “economies of scale,” and how these economies may arise.

Topic 8: Regulation

Transportation has a long history of governmental intervention and regulation. There was regulatory liberalization and reform in some modes from the late 1970s. While some

transportation markets such as trucking, maritime and major air routes can operate effectively as competitive markets, there are other markets where there are fears that only one ("natural monopoly") or a few firms can survive in the marketplace. Discussion of the form that regulation can take for natural monopolies such as bulk rail movements and pipelines, and the alternatives to regulation that may be applicable to non-bulk rail traffic (intermodal competition), urban bus services ("Demsetz competition"), and airlines (contestability).

- Ian Savage (2006), "Economic Regulation of Transport: Principles and Experience," in Michael Crew and David Parker (eds.) *International Handbook on Economic Regulation*. Cheltenham, UK: Edward Elgar.
- Various Authors (2018), "40 Years of Transportation Deregulation: Airlines, Railroads, Trucking, Intercity Buses" *Transportation Research News* 315: 3-53.

Topic 9: Pricing

Pricing of transportation services is problematic. Transportation production is characterized by high fixed costs and relatively low marginal costs. Commercial companies cannot break even or make a profit by setting prices equal to marginal costs. The recovery of fixed costs becomes even more complex because firms offer multiple products (business versus leisure travel, peak versus off-peak travel, grain versus coal) that share the same infrastructure. Even in competitive markets, there are usually a small number of competitors. Models of oligopolistic competition are discussed with an emphasis on empirical methods to determine the competitive strategy that has been adopted by carriers.

- GTW Chapter 4 "Pricing"

Topic 10: Fares and Frequencies

The typical firm modelled in ECON 310-1 either chooses output (and the market determines price) or it chooses price (and the market determines the quantity demanded). Transportation firms get to choose both! They set their fares and the quantity supplied in terms of service frequency. Profit-maximizing models of price and frequency are presented, and rules developed on how optimal frequencies should change if demand grows.

Topic 11: Project Evaluation

Investments in transportation infrastructure usually cannot be evaluated using standard financial evaluation methods. Many investments have the characteristics of public goods (such as untolled highways) or involve costs or benefits that are not usually traded in an open market (such as time saving and the risks of injury). There are frequently spill-over effects on third parties such as noise from airports, visual intrusion from new highways, and pollution of the environment. Evaluations of many large investments in transportation

infrastructure attempt to take these effects into account. The underlying theory is illustrated by case studies.

- GTW Chapter 5 “Project Evaluation”
- US Department of Transportation (2023), *Benefit Cost Analysis Guidance for Discretionary Grant Programs*, US Department of Transportation.
- US Department of Transportation (2021), *Guidance on Treatment of the Economic Value of a Statistical Life in U.S. Department of Transportation Analyses*, US Department of Transportation.

Topic 12: Safety

Safety is of considerable concern to drivers, passengers, and freight shippers but actions to prevent crashes are costly. Models of “optimal” safety provision are discussed for private driving and for crashes involving commercial passenger and freight companies. These desired levels of safety are unlikely to be achieved because there are multiple market failures that require policy interventions that imperfectly correct them.

- Ian Savage (2013), “Comparing the Fatality Risks in United States Transportation across Modes and Over Time” *Research in Transportation Economics* 43: 9-22.
- Ian Savage (2021), “Economics of Transportation Safety” in Roger W. Vickerman (ed), *International Encyclopedia of Transportation*, Elsevier.

Topic 13: Congestion Pricing Theory

Excessive road congestion occurs because individual motorists do not take account of the delay they impose on other motorists by traveling at peak times on congested roads. Economist have derived both simple static and more complex dynamic models to explore why congestion occurs and how imposition of a congestion toll can mitigate the problem. While presented in a highway context, these pricing principles are also applicable to other congested facilities such as airport runways and maritime locks.

- GTW Chapter 10 “Determinants of Motorization and Road Provision”

Topic 14: Road Pricing Practice

Development of transponder technology since 1990 has transformed theoretical models into practical solutions. Imposition of congestion-varying pricing has become quite common. The discussion is illustrated by applications in Southern California, London, Stockholm, Singapore, and Northern Virginia.

In addition, the decline of traditional funding streams such as the gas tax have led to an interest in alternative funding models such as introducing tolls on previously untolled facilities or moves to mileage-based user fees, both of which could vary with the level of congestion encountered.

- Paul Sorenson (2013), "From Fuel Taxes to Mileage Fees" *Access* 43: 13-19.

Road traffic can also be managed by the pricing of on-street (meter) and off-street (garage) parking. Moreover, mispricing of parking can contribute to congestion as vehicles cruise to find vacant spots.

- Donald Shoup (2021), "Pricing Curb Parking" *Transportation Research Part A: Policy and Practice* 154: 399-412.
- Gregory Pierce and Donald Shoup (2013) "SFpark: Pricing Parking by Demand" *Access* 43: 20-28.

THE LEGAL STUFF

Specific To This Class

In-Class Computer Policy: Students may use a tablet or similar device to annotate the electronic version of the course "skeleton notes" (course workbook). With this exception, students may not use a laptop computer or computer tablet during in-person lectures. Such devices must remain in your bag and may not be placed on your desk. Students annotating course notes agree to refrain from using their device for other purposes such as surfing the web or reading or responding to messages during class.

Mobile Communications Policy: Mobile telephone devices should have the ringer turned off and placed in pockets or backpacks. It may not be placed on your desk. Students may not make or receive phone calls, surf the web, or send or read text messages during an in-person class.

General

This course follows the Northwestern University Syllabus Standards. Students are responsible for familiarizing themselves with this information.