

Fall 2018

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](mailto:ipsavage@northwestern.edu)

Teaching Assistant:

Ryan Lee, [ryanlee2014@u.northwestern.edu](mailto:ryanlee2014@u.northwestern.edu)

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 will be considered: trucking, highways, mass transit, airlines, maritime, railroads, and pipelines. The course will acquaint 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, subsidies, competition between the various modes, and the social appraisal of projects. The course concludes by applying economic tools to two serious transportation problems in American cities - highway congestion, and the level of subsidies to mass transit.

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

Lectures: There are two lectures a week on Monday and Wednesday from 11:00AM to 12:20PM in Harris Hall L07. **First class will be held on Friday September 28 from 11:00AM to 12:20PM.**

Discussion Section: Students are also required to attend weekly discussion sections held on Fridays at the same time and in the same room as the lectures. The discussion section on October 5 will consist of an overview of the history of U.S. transportation conducted by Professor Savage. The sections on October 19 and November 16 will be devoted to returning and discussing the midterm examinations. Each week the Teaching Assistant will also present a small amount of new material that complements the lectures.

Office Hours:

Mondays	9:00-10:30	KGH 3411	Ryan Lee
Mondays	2:00-4:00	KGH 3371	Professor Savage
Tuesdays	5:00-7:00pm	KGH 3411	Ryan Lee (not on Nov 20)
Wednesdays	1:30-3:30	KGH 3371	Professor Savage (not on Nov 21)

Prior to the midterm exams, Professor Savage will hold additional office hours on Tuesdays October 16 and November 13 from 9:30-11:30 in KGH 3371.

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.

Evaluation: Evaluation will be made on a final examination (40% of the total grade), two midterm examinations (25% each), and seven graded problem sets (10%). The midterm examinations will be held on Wednesday October 17 and Wednesday November 14. No make-up exams will be given. The final examination is from 9AM to 11AM on Monday December 10. 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.

Readings: Readings are either:

- (a) 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. There is no need to purchase a hard copy. It is available as a free e-book through Northwestern University Library:  
[site.ebrary.com.turing.library.northwestern.edu/lib/northwestern/detail.action?docID=10063824](http://site.ebrary.com.turing.library.northwestern.edu/lib/northwestern/detail.action?docID=10063824)
- (b) Posted in Canvas.

Course Packet: There is a course packet containing class materials, problem sets and past examinations. It is available from the main office of the Economics Department, room 3317 in the 2211 Campus Drive building. The office is open Monday to Friday 8:30AM to 5PM. The price is \$20. Payment should be by cash or check. You should bring the packet to each class.

Problem Sets: There are seven problem sets, which will be graded, and then discussed at the Friday discussion sessions. Generally, the deadline for submitting completed problem sets is 5:00PM on the Wednesday prior to the relevant discussion section. Problem sets received late get zero credit. Copies of the problem sets are included in the course packet (the price of the course packet was calculated such that you are not charged for copies of the problem sets). The schedule for the problem sets is as follows:

<u>Set #</u>	<u>Submission Deadline</u>	<u>Returned &amp; Discussed</u>
1	5pm October 3	October 5
2	5pm October 10	October 12
3	5pm October 24	October 26
4	5pm October 31	November 2
5	5 pm November 7	November 9
6*	5 pm November 19*	November 21*
7	5 pm November 28	November 30

\* The sixth problem set is due two days earlier than normal at 5PM on Monday November 19, and will be returned and discussed in place of the regular lecture on Wednesday November 21 (the day before Thanksgiving).

Laptop Computer Policy: Except in the case of proven medical necessity, students may not use a laptop computer or computer tablet during the lectures. Such devices must remain in your bag, and may not be placed on your desk.

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

AccessibleNU: Any student requesting accommodations related to a disability or other condition is required to register with AccessibleNU (accessiblenu@northwestern.edu; 847-467-5530) and provide professors with an accommodation notification from AccessibleNU, preferably within the first two weeks of class. All information will remain confidential.

## **SYLLABUS**

Listed below are the topics covered in the course. At the end there is a timetable showing when each subject will be covered, along with the assigned readings.

### Part 1 - Issues, History and Descriptive Statistics

The course will commence with an overview of the history of American transportation, descriptive statistics on the current transportation system, and current issues of interest to economists. 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. We will also learn about the relative importance of individual modes, the traffic they carry, and the market share of the major firms.

### Part 2 - Principles of Transportation Economics

This section of the course is designed to equip the student with an understanding of the basic principles of the economics of the provision and regulation of transportation service.

#### 2.1 Demand

Transportation is rarely demanded for its own sake. It is a *derived demand* because people in place A want to go to enjoy benefits at place B, and manufacturers in place C have profitable opportunities for selling their goods in place D. For any particular trip, many passengers and freight shippers have a choice for the mode of travel. In making their choice they will be 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 in the last fifty years to estimate the sensitivity of demand to changes in travel time by calculating the value that people place on time saving.

#### 2.2 Costs

We will review the theory of production functions and their associated cost functions. Using this as a base, we will empirically investigate the cost structure of the railroad, trucking and airline industries.

#### 2.3 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. We will discuss 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).

## 2.4 Pricing

We will explore the reasons why 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. We also consider pricing by firms competing for the same traffic.

## 2.5 Project Evaluation

Investments in transportation infrastructure usually cannot be evaluated using standard financial evaluation methods. This is because the provision of transportation service does not just affect the firm and the immediate consumer. There are frequently spill-over effects on third parties such as noise from airports, visual intrusion from new highways, and the risk of injury and death to pedestrians. Other investments have the characteristics of public goods, or involve characteristics that are not usually traded in an open market (such as safety). In the past fifty years evaluations of many large investments in transportation infrastructure have attempted to take these effects into account. We will review the underlying reasoning for doing so, and look at some case studies which quantify these spill-over effects and value non-market goods.

## 2.6 Safety

Safety is of considerable concern to passengers and freight shippers, but is expensive to provide. We will consider the demand for and supply of safety, and the nature of “optimal” safety provision. We will then consider why the market might not work to provide desired levels of safety, and the possible interventions to correct some of the market failures.

### Part 3 - Contemporary Urban Transportation Problems

The urban transportation “problem” is characterized by road congestion, parking difficulties, environmental concerns, difficulties for pedestrians, road accidents, over-crowding on public transit in the peak hours, and infrequency of provision in the off-peak. It is an objective of the final part of this course to understand how some of these “problems” arise, and evaluate possible solutions.

#### 3.1 Highway Congestion

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. We will explore the theories of congestion, and how imposition of a congestion toll could help alleviate the problem. Various methods have been proposed over the years for implementing congestion charges. We will review the range of policy options, and study some places where congestion tolls have been applied – Southern California, London, Stockholm and Singapore. Moreover, changes in tolling technology and the decline of traditional funding streams such as the gas tax have led to a recent expansion in the number of toll roads. Some of them have tolls that respond to changing levels of congestion. These pricing principles are also applicable to other congested facilities such as airport runways and maritime locks.

### 3.2 Transit Subsidies

Since the 1960s, operators of transit services have not traded commercially. Substantial funding has been provided both for capital and operating expenses from municipal, state and federal funds. The rationales for transit subsidies will be critically examined. The rationales commonly used to justify subsidy are: achieving “first best” in the presence of economies of scale; acting as a proxy for road congestion tolls; “social service” provision; and the provision of unremunerative routes. We will also discuss the trade-off that transit agencies face in setting fares and service frequency.

## **SCHEDULE OF LECTURES AND READINGS**

Course Packet: Pages approximately corresponding with the lecture

Readings:

1. GTW = chapters from Gómez-Ibáñez, Tye and Winston (eds.) *Essays in Transportation Economics and Policy: A Handbook in Honor of John R. Meyer* available as a free e-book through Northwestern University Library: [site.ebrary.com.turing.library.northwestern.edu/lib/northwestern/detail.action?docID=10063824](http://site.ebrary.com.turing.library.northwestern.edu/lib/northwestern/detail.action?docID=10063824)
2. Bound into the Course Packet
3. Unless otherwise indicated in the “modules” section of Canvas.

<b>Friday September 28</b>	<b>Lecture 1</b>	<b>Issues in U.S. Transportation / Freight Demand</b>
	Course Packet	Pages 25-29
	Readings	None
<b>Monday October 1</b>	<b>Lecture 2</b>	<b>Passenger Demand</b>
	Course Packet	Pages 29-39
	Readings	<ul style="list-style-type: none"> <li>• GTW Chapter 12 “Transportation and Land Use”</li> <li>• GTW Chapter 2 “The Demand for Transportation: Models and Applications” (some of this chapter is too advanced for this course. In particular you need not - unless you want to - read the section entitled “Advanced Disaggregate Demand Models” on pages 24-31)</li> </ul>
<b>Wednesday October 3</b>	<b>Lecture 3</b>	<b>Valuation of Time, Theory of Costs</b>
	Course Packet	Pages 40-53
	Readings	<ul style="list-style-type: none"> <li>• <i>The Value of Travel Time Savings: Department of Transportation Guidance for Conducting Economic Evaluations</i> US Department of Transportation</li> <li>• GTW Chapter 3 “Learning About Transport Costs”</li> </ul>
<b>Friday October 5</b>	<b>Lecture 1A</b>	<b>History of U.S. Transportation</b>
	Course Packet	Pages 1-15 (also statistics on pages 17-24 that are used in Problem Set 1)
	Readings	<ul style="list-style-type: none"> <li>• “Why Millennials are Shunning Cars” <i>Washington Post</i></li> <li>• “Second Chances: Regulation and Deregulation of Taxi and For-Fire Ride Services” <i>Transportation Research News</i></li> </ul>
<b>Monday October 8</b>	<b>Lecture 4</b>	<b>Empirical Cost Estimation</b>
	Course Packet	Pages 46-64
	Readings	None

<b>Wednesday October 10</b>	<b>Lecture 5</b>	<b>Regulation (I)</b>
	Course Packet	Pages 65-85
	Readings	<ul style="list-style-type: none"> <li>• “Economic Regulation of Transport: Principles and Experience” Course Packet pages 65-80</li> <li>• “40 Years of Transportation Deregulation: Airlines, Railroads, Trucking, Intercity Buses” <i>Transportation Research News</i></li> <li>• <i>Between Public and Private Mobility: Examining the Rise of Technology-Enabled Transportation Services</i> Transportation Research Board Special Report 319 (Chapter 9 “Conclusions and Recommendations”)</li> </ul>
<b>Monday October 15</b>	<b>Lecture 6</b>	<b>Regulation (II)</b>
	Course Packet	Pages 85-94
	Readings	None
<b>Wednesday October 17</b>	<b>Midterm Examination I</b>	
<b>Monday October 22</b>	<b>Lecture 7</b>	<b>Pricing (I) – unconstrained monopoly pricing</b>
	Course Packet	Pages 97-106
	Readings	<ul style="list-style-type: none"> <li>• GTW Chapter 4 “Pricing” (pages 99-111, 119-136)</li> </ul>
<b>Wednesday October 24</b>	<b>Lecture 8</b>	<b>Pricing (II) – constrained “Ramsey” pricing</b>
	Course Packet	Pages 109-116
	Readings	None
<b>Monday October 29</b>	<b>Lecture 9</b>	<b>Pricing (III) - competitive pricing</b>
	Course Packet	Pages 116-133
	Readings	None
<b>Wednesday October 31</b>	<b>Lecture 10</b>	<b>Project Evaluation (I) – theory</b>
	Course Packet	Pages 135-140
	Readings	<ul style="list-style-type: none"> <li>• GTW Chapter 5 “Project Evaluation”</li> <li>• <i>Guidance on Treatment of the Economic Value of a Statistical Life in U.S. Department of Transportation Analyses</i> US Department of Transportation</li> </ul>
<b>Monday November 5</b>	<b>Lecture 11</b>	<b>Project Evaluation (II) – practice</b>
	Course Packet	Pages 141-148
	Readings	None
<b>Wednesday November 7</b>	<b>Lecture 12</b>	<b>Safety</b>
	Course Packet	Pages 151-174
	Readings	<ul style="list-style-type: none"> <li>• “Transport Safety” Course Packet page 154-163</li> <li>• “Comparing the Fatality Risks in United States Transportation across Modes and Over Time” <i>Research in Transportation Economics</i></li> </ul>
<b>Monday November 12</b>	<b>Lecture 13</b>	<b>Structure of Cities / Congestion Pricing Theory</b>
	Course Packet	Pages 175-186
	Readings	<ul style="list-style-type: none"> <li>• GTW Chapter 10 “Determinants of Motorization and Road Provision”</li> <li>• “A Bathtub Model of Downtown Traffic Congestion” Access</li> </ul>
<b>Wednesday November 14</b>	<b>Midterm Examination II</b>	

<b>Monday November 19</b>	<b>Lecture 14</b>	<b>Congestion Pricing Practice</b>
	Course Packet	Pages 186-206
	Readings	<ul style="list-style-type: none"> <li>• Press Clippings on Solutions to Urban Road Congestion</li> </ul>
<b>Wednesday November 21</b>	<b>Review of Problem Set 6</b>	
<b>Monday November 26</b>	<b>Lecture 15</b>	<b>Congestion Pricing Practice / Urban Transit Subsidies (I)</b>
	Course Packet	Pages 207-213
	Readings	<ul style="list-style-type: none"> <li>• “SFpark: Pricing Parking by Demand” <i>Access</i></li> <li>• “Optimizing the Use of Public Garages: Pricing Parking by Demand” <i>Transport Policy</i></li> <li>• “From Fuel Taxes to Mileage Fees” <i>Access</i></li> <li>• “Public Perception of Mileage-Based User Fees” <i>Transportation Research News</i></li> <li>• <i>Approaches to Making Federal Highway Spending More Productive</i> Congressional Budget Office</li> <li>• GTW Chapter 4 “Pricing” (pages 111-119)</li> <li>• GTW Chapter 11 “The Urban Transportation Problem: A Reexamination and Update”</li> </ul>
<b>Wednesday November 28</b>	<b>Lecture 16</b>	<b>Urban Transit Subsidies (II)</b>
	Course Packet	Pages 214-218
	Readings	None
<b>Monday December 10</b>	<b>Final Examination (9AM-11AM)</b>	