

**Department of Resource Economics
University of Massachusetts-Amherst**

**RES EC 720: Environmental and Resource Economics
Spring 2022**

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Objectives and Requirements

Res Ec 720 is a three-credit graduate course in environmental and natural resource economics. The course is focused largely, but not exclusively on environmental economics and policy. We intend to provide the foundational knowledge for advanced study of this field. All students are expected to have taken graduate courses in microeconomic theory and statistics.

The course is split into two parts. Professor Stranlund will cover dynamic optimization with environmental and natural resource applications and the theory of environmental regulation in the first part. Evaluations in the first part will be based on a series of homework assignments and a midterm exam. Professor Mullins will cover empirical applications in the second part. Evaluations in this part will be based on submitted summaries of assigned articles, a literature review, and in-class presentations of one of the covered papers. In addition to your performance on the exam and assignments, your grade will be determined by your participation in class. At a minimum, we expect each of you to attend *every* class prepared to discuss the assigned readings.

Texts

There are no required texts for this course, but two that we strongly encourage you to have for your library are:

Daniel J. Phaneuf and Till Requate. 2017. *A Course in Environmental Economics: Theory, Policy, and Practice*. Cambridge University Press.

Angrist, Joshua and Jorn-Steffen Pischke. 2009. *Mostly Harmless Econometrics*. Princeton University Press.

We will refer to these texts in the reading list as Phaneuf and Requate (2017) and Angrist and Pischke (2009), respectively.

In addition, we recommend that you familiarize yourselves with an undergraduate text like Tom Tietenberg's and Lynne Lewis's *Environmental and Natural Resource Economics* (11th edition, 2018). This text provides intuitive and graphical expositions of topics that we will explore more rigorously. A more advanced undergraduate/beginning graduate text is Charles Kolstad's *Environmental Economics* (2nd edition, 2010). At the other end of the difficulty spectrum are Barry Field's texts, *Environmental Economics* and *Natural Resource Economics*. These texts are used in our introductory undergraduate classes in this field.

You should also familiarize yourself with the *Review of Environmental Economics and Policy*. This journal publishes accessible reviews of various topics in environmental economics, so it is a good source for gaining a broad understanding of research in this field.

Course Outline and Reading List (Subject to Change)

Readings marked with a (*) in the list below will be stressed and should be read prior to class. The reading list is also meant to serve as a partial bibliography should you wish to delve deeper into a particular topic. If you wish to go even further, please feel free to ask us about additional readings.

First Module: Professor Stranlund (Through Monday, March 21)

1. Dynamic Optimization

*A. Chiang, *Elements of Dynamic Optimization*, McGraw-Hill, New York, 1992. Chapter 7 (especially sections 7.1-7.4, 7.7) and chapter 8.

*John Stranlund. "Optimal Control with Natural Resource Applications."

2. The Economic Theory of Environmental Regulation

Fundamentals of Designing Environmental Policies

Goulder, Lawrence H., and Ian W.H. Parry. 2008. "Instrument choice in environmental policy." *Review of Environmental Economics and Policy* 2(2), 152-174.

*Muller, Nicholas Z., and Robert Mendelsohn. 2009. "Efficient pollution regulation: getting the prices right." *American Economic Review* 99(5), 1714-1739.

Phaneuf and Requate (2017), Chapter 3.

*John Stranlund. "Introduction."

*John Stranlund. "Fundamentals of Environmental Regulation."

Market Imperfections

Juan Pablo Montero. 2009. "Market power in pollution markets." *The Energy Journal* 30, 115-142.

Phaneuf and Requate (2017), Chapters 6, 8.3 and 8.4.

*Requate, Till. 2007. "Environmental Policy under Imperfect Competition." In *The International Yearbook of Environmental and Resource Economics 2006/2007: A Survey of Current Issues*. Tom Tietenberg and Henk Folmer (eds.), Edward Elgar Publishing.
[Focus on Sections 1, 2, 4.1 – 4.3, and 9]

*John Stranlund. "Environmental Regulation and Imperfect Competition."

Regulation under Abatement-Cost Uncertainty

*M.J. Roberts and M. Spence. 1976. "Effluent Charges and Licenses under Uncertainty," *Journal of Public Economics* 5, 193-208.

Fell, Harrison, Erica Moore and Richard Morgenstern. 2011. "Cost containment under cap and trade: a review of the literature." *International Review of Environmental and Resource Economics* 5, 285-307.

*Phaneuf and Requate (2017), Chapter 4. (Especially, 4.1 and 4.2)

*John Stranlund. "Taxes vs. Tradable Permits vs. Hybrid Policies."

Enforcing Environmental Policies (if we have time)

- *Gray, Wayne B., and Jay P. Shimshack. 2011. "The effectiveness of environmental monitoring and enforcement: a review of the empirical evidence." *Review of Environmental Economics and Policy* 5(1), 3-24.
- *Stranlund, John K. 2017. "The economics of enforcing emissions markets." *Review of Environmental Economics and Policy* 11(2), 227-246.
- *John Stranlund. "Enforcing Environmental Policies."

Regulating non-point source pollution (if we have time)

- *Shortle, James and Richard Horan. 2001. The economics of nonpoint pollution control, *Journal of Economic Surveys* 15(3): 255-289.
- *John Stranlund. 2013. Regulating nonpoint source pollution.

Second Module: Professor Mullins (Starting Wednesday, March 23)

Sandmo, Agnar. "The early history of environmental economics." *Review of Environmental Economics and Policy* 9, no. 1 (2015): 43-63.

3. Valuation and Impact Measurement - Approaches

Stated Values – Contingent Valuation

- *Hanemann, W. Michael. "Valuing the Environment through Contingent Valuation." *The Journal of Economic Perspectives* (1994): 19-43.
- Phaneuf and Requate (2017), Chapter 19

Revealed Values-Basics

- *Angrist, Joshua D., and Jörn-Steffen Pischke. "The Credibility Revolution in Empirical Economics: How Better Research Design is Taking the Con out of Econometrics." *The Journal of Economic Perspectives* (2010): 3-30.
 - *Nevo, Aviv, and Michael D. Whinston. "Taking the dogma out of econometrics: Structural modeling and credible inference." *The Journal of Economic Perspectives* (2010): 69-81.
- Phaneuf and Requate (2017), Chapter 15

The "Gold Standard": Randomized Controlled Trials

- *Duflo, Esther, Rachel Glennerster, and Michael Kremer. "Using Randomization in Development Economics Research: A Toolkit." *Handbook of Development Economics* 4 (2007): 3895-3962.
- [Focus on Section 2]

Causal Inference using Quasi-Experimental Data

- *Greenstone, Michael, and Ted Gayer. "Quasi-Experimental and Experimental Approaches to Environmental Economics." *Journal of Environmental Economics and Management*, 57.1 (2009): 21-44.
- [Focus on first half of the paper]

4. Empirical Applications in Environmental Economics

Valuation: Economic Goods (and Bads)

- Davis, Lucas, "The Effect of Health Risk on Housing Values: Evidence from a Cancer Cluster." *American Economic Review*, 94.5 (2004): 1693-1704.
- Phaneuf and Requate (2017), Chapter 17, 18, 20
- Levinson, Arik, "Valuing Public Goods using Happiness Data: The Case of Air Quality." *Journal of Public Economics*, 96.9–10 (2012): 869–880.

Exposure & Health

- Chay, Kenneth Y., and Michael Greenstone. "The Impact of Air Pollution on Infant Mortality: Evidence from Geographic Variation in Pollution Shocks Induced by a Recession." *The Quarterly Journal of Economics*, 118.3 (2003): 1121-1167.
- Chen, Yuyu, Avraham Ebenstein, Michael Greenstone, and Hongbin Li. "Evidence on the impact of sustained exposure to air pollution on life expectancy from China's Huai River policy." *Proceedings of the National Academy of Sciences* 110, no. 32 (2013): 12936-12941.
- Almond, Douglas, Lena Edlund, and Mårten Palme. "Chernobyl's Subclinical Legacy: Prenatal Exposure to Radioactive Fallout and School Outcomes in Sweden." *Quarterly Journal of Economics* 124.4 (2009): 1729-1772.
- Graff Zivin, Joshua, and Matthew Neidell. "The Impact of Pollution on Worker Productivity." *American Economic Review* 102.7 (2012): 3652-73.

Power and Renewables

- Borenstein, Severin. "The Private and Public Economics of Renewable Electricity Generation." *The Journal of Economic Perspectives* 26.1 (2012): 67-92.
- Baker, Erin, Meredith Fowlie, Derek Lemoine, and Stanley S. Reynolds. "The Economics of Solar Electricity." *The Annual Review of Resource Economics* 5 (2013): 387-426.
- Novan, Kevin. "Valuing the wind: renewable energy policies and air pollution avoided." *American Economic Journal: Economic Policy* 7.3 (2015): 291-326.

Environmental Justice, Distributional Concerns

- Hsiang, Solomon, Paulina Oliva, and Reed Walker. "The distribution of environmental damages." *Review of Environmental Economics and Policy* 13, no. 1 (2019): 83-103.

Transportation

- Zivin, Joshua S. Graff, Matthew J. Kotchen, and Erin T. Mansur. "Spatial and temporal heterogeneity of marginal emissions: Implications for electric cars and other electricity-shifting policies." *Journal of Economic Behavior & Organization* 107 (2014): 248-268.
- Currie, Janet, and Reed Walker. "Traffic Congestion and Infant Health: Evidence from E-ZPass." *American Economic Journal-Applied Economics*, 3.1 (2011): 65.

Water

- Keiser, David A., and Joseph S. Shapiro. "Consequences of the Clean Water Act and the demand for water quality." *The Quarterly Journal of Economics* 134.1 (2019): 349-396.
- Carson, Richard T., Phoebe Koundouri, and Céline Nauges. "Arsenic mitigation in Bangladesh: A household labor market approach." *American Journal of Agricultural Economics* 93.2 (2011): 407-414.
- Currie, Janet, et al. "Something in the water: Contaminated drinking water and infant health." *Canadian Journal of Economics/Revue canadienne d'économie* 46.3 (2013): 791-810.
- Greenstone, Michael, and Rema Hanna. "Environmental Regulations, Air and Water Pollution, and Infant Mortality in India." *American Economic Review* 104.10 (2014): 3038-3072.
- Hornbeck, Richard, and Pinar Keskin. "Does agriculture generate local economic spillovers? Short-run and long-run evidence from the Ogallala Aquifer." *American Economic Journal: Economic Policy* 7, no. 2 (2015): 192-213.

Policy Evaluation

- Levinson, Arik. "How much energy do building energy codes save? Evidence from California houses." *The American Economic Review* 106, no. 10 (2016): 2867-2894.
- Schmalensee, Richard, and Robert N. Stavins. "Lessons Learned from Three Decades of Experience with Cap and Trade." *Review of Environmental Economics and Policy* 11, no. 1 (2017): 59-79.
- Davis, Lucas W. "The Effect of Driving Restrictions on Air Quality in Mexico City." *Journal of Political Economy*, 116.1 (2008): 38-81.
- Davis, Lucas W., Alan Fuchs, and Paul Gertler. 2014. "Cash for Coolers: Evaluating a Large-Scale Appliance Replacement Program in Mexico." *American Economic Journal: Economic Policy*, 6(4): 207- 38.
- Calel, Raphael, and Antoine Dechezlepretre. "Environmental policy and directed technological change: evidence from the European carbon market." *Review of Economics and Statistics* 98, no. 1 (2016): 173-191.

Climate Change

- Tol, Richard SJ. "The economic impacts of climate change." *Review of Environmental Economics and Policy* 12, no. 1 (2018): 4-25.
- Carleton, Tamma A., and Solomon M. Hsiang. "Social and economic impacts of climate." *Science* 353.6304 (2016): aad9837.
- Deryugina, Tatyana, and Solomon M. Hsiang. *Does the environment still matter? Daily temperature and income in the United States*. No. w20750. National Bureau of Economic Research, 2014.
- Barreca, Alan, Karen Clay, Olivier Deschenes, Michael Greenstone, and Joseph S. Shapiro. "Adapting to climate change: The remarkable decline in the US temperature-mortality relationship over the twentieth century." *Journal of Political Economy* 124, no. 1 (2016): 105-159.
- Hsiang, Solomon M., Marshall Burke, and Edward Miguel. "Quantifying the influence of climate on human conflict." *Science* 341.6151 (2013): 1235367.
- Schlenker, Wolfram, and Michael J. Roberts. "Nonlinear temperature effects indicate severe damages to US crop yields under climate change." *Proceedings of the National Academy of Sciences* 106.37 (2009): 15594-15598.

Behavioral Environmental Economics

- Shogren, Jason F., and Laura O. Taylor. "On behavioral-environmental economics." *Review of Environmental Economics and Policy* 2, no. 1 (2008): 26-44.
- Gillingham, Kenneth, David Rapson, and Gernot Wagner. "The rebound effect and energy efficiency policy." *Review of Environmental Economics and Policy* 10, no. 1 (2016): 68-88.

Accommodation Statement

The University of Massachusetts Amherst is committed to providing an equal educational opportunity for all students. If you have a documented physical, psychological, or learning disability on file with Disability Services (DS), you may be eligible for reasonable academic accommodations to help you succeed in this course. If you have a documented disability that requires an accommodation, please notify me within the first two weeks of the semester so that we may make appropriate arrangements.

Academic Honesty Statement

Since the integrity of the academic enterprise of any institution of higher education requires honesty in scholarship and research, academic honesty is required of all students at the University of Massachusetts Amherst. Academic dishonesty is prohibited in all programs of the University. Academic dishonesty includes but is not limited to: cheating, fabrication, plagiarism, and facilitating dishonesty. Appropriate

sanctions may be imposed on any student who has committed an act of academic dishonesty. Instructors should take reasonable steps to address academic misconduct. Any person who has reason to believe that a student has committed academic dishonesty should bring such information to the attention of the appropriate course instructor as soon as possible. Instances of academic dishonesty not related to a specific course should be brought to the attention of the appropriate department Head or Chair. Since students are expected to be familiar with this policy and the commonly accepted standards of academic integrity, ignorance of such standards is not normally sufficient evidence of lack of intent (http://www.umass.edu/dean_students/codeofconduct/acadhonesty/).