

ECON9912

[Dynamic Games in Environmental Economics](#)

What

Ph.D minicourse (14h/5credit)

When

4/12: 10:15-11:45 + 12:15-14:00, room 1047

5/12: 9:15-12:00 and 14:15-16:00, room 1047 and 1220 (14-16)

6/12: 9:15-12:00 and 14:15-16:00, room 1047

Where

1047 (and 1220 Tuesday afternoon), Eilert Sundt's building, UiO

Sign up

<http://www.uio.no/studier/emner/sv/oekonomi/ECON9912/>

Professor

[Bård Harstad](#)

Syllabus date

November 25th, 2017

This Ph.D minicourse applies modern dynamic game theory and presents a coherent framework that can be used to analyze jurisdictions' strategic choices of emissions over time, their investments in technology, coalition formation, agreements, negotiations, and renegotiations. Assumptions will be based on real-world environmental policy, and we will learn how to use various tools to derive analytical results that are relevant for domestic policies as well as international treaties.

The material will draw on a large literature but is summarized in [Lecture Note 1](#), [Lecture Note 2](#), and [Lecture Note 3](#). There will be 14h lectures and a take-home exam later for those who want to get credit for the class.

Session 1

Repeated games and subgame-perfect equilibria (self-enforcing agreements)

Session 2

Stochastic games and Markov-perfect equilibria (legally binding agreements)

Session 3

Incomplete contracts and hold-up problems (short-term agreements)

Session 4

Optimal contracts and duration (long-term agreements and spillovers)

Session 5

Renegotiation and renegotiation design (uncertainty and updating)

Session 6

Free-riding and coalition formation (participation)

**Required background:**

Fudenberg and Tirole (1996): *Game Theory*, Ch. 3-5 and 13, or something similar.

Related readings:

Most of the reading will be based on [Lecture Note 1](#), [Lecture Note 2](#), and [Lecture Note 3](#).

The following journal articles are also relevant:

Barrett, Scott (1994): "Self-enforcing international environmental agreements," *Oxford Economic Papers*, 46, p. 878-94.

Barrett, Scott (2002): "Consensus Treaties," *Journal of Institutional and Theoretical Politics*, 158: 519--41."

Barrett, Scott (2005): "The Theory of International Environmental Agreements," Ch. 28 in Mäler, K.-G. and Vincent, J.R., *Handbook of Environmental Economics 3*: 1457-1516, Elsevier.

Battaglini, Marco and Harstad, Bård (2016): "Participation and Duration of Environmental Agreements," *Journal of Political Economy* 124(1): 160-204.

Beccherle, Julien and Tirole, Jean (2011): "Regional Initiatives and the Cost of Delaying Binding Climate Change Agreements," *Journal of Public Economics* 95 (10-11): 1339-48.

Buchholz, Wolfgang and Konrad, Kai (1994): "Global Environmental Problems and the Strategic Choice of Technology," *Journal of Economics* 60 (3): 299-321.

Calvo, Emilio and Rubio, Santiago (2013): "Dynamic Models of International Environmental Agreements: A Differential Game Approach," *International Review of Environmental and Resource Economics* 6(4): 289-339.

Carraro, Carlo and Siniscalco, Domenico (1993): "Strategies for the international protection of the environment," *Journal of Public Economics* 52 (3): 309-28.

Dixit, Avinash and Olson, Mancur (2000): "Does voluntary participation undermine the Coase Theorem?" *Journal of Public Economics* 76 (3): 309-35.

Dockner, Engelbert J., Long, Ngo Van and Sorger, Gerhard (1996): "Analysis of Nash equilibria in a class of capital accumulation games," *Journal of Economic Dynamics and Control* 20 (6-7): 1209-1235.

Dutta, Prajit K. and Radner, Roy (2004): "Self-enforcing climate-change treaties," *Proc. Nat. Acad. Sci. U.S.*, 101, 4746-51.

Dutta, Prajit K. and Radner, Roy (2009): "A Strategic Analysis of Global Warming: Theory and Some Numbers," *Journal of Economic Behavior & Organization* 71 (2): 187-209.

- Gerlagh, Reyer and Liski, Matti (2011): "Strategic Resource Dependence," *Journal of Economic Theory* 146(2): 699-727.
- Golombek, Rolf and Hoel, Michael (2005): "Climate Policy under Technology Spillovers," *Environmental and Resource Economics* 31 (2): 201-27.
- Harstad, Bård (2012): "Climate Contracts: A Game of Emissions, Investments, Negotiations, and Renegotiations," *Review of Economic Studies* 79(4): 1527-57.
- Harstad, Bård (2012): "Buy Coal! A Case for Supply-Side Environmental Policy," *Journal of Political Economy* 120(1): 77-115.
- Harstad, Bård (2016): "The Dynamics of Climate Agreements," *Journal of the European Economic Association* 14(3): 719-52. .
- Harstad, Bård (2016): "The Market for Conservation and Other Hostages," *Journal of Economic Theory* 166(Nov): 124-51.
- Harstad, Bård, Lancia, Francesco and Russo, Alessia (2017): "Compliance Technology and Self-Enforcing Agreements," mimeo, University of Oslo.
- Hong, Fuhai and Karp, Larry (2012): "International Environmental Agreements with Mixed Strategies and Investment," *Journal of Public Economics* 96 (9-10): 685-97.
- Jaffe, Adam B.; Newell, Richard G. and Stavins, Robert N. (2003): "Technological Change and the Environment," in Mäler, K.-G. and Vincent, J.R., *Handbook of Environmental Economics* 1: 461-516.
- Levhari, D. and L. J. Mirman (1980): "The Great Fish War: An Example Using Nash-Cournot Solution," *Bell Journal of Economics*, 11, 322--334.
- Newell, Richard G.; Jaffe, Adam B. and Stavins, Robert N. (2006): "The Effects of Economic and Policy Incentives on Carbon Mitigation Technologies," *Energy Economics* 28: 563-78.
- Ploeg, Frederick van der, and de Zeeuw, Aart (1992): "International aspects of pollution control," *Environmental and Resource Economics* 2 (2): 117-39.
- Rey, Debraj and Vohra, Rajiv (2001): "Coalitional Power and Public Goods," *Journal of Political Economy* 109 (6): 1355-84.
- Segal, Ilya and Whinston, Michael D. (2013): "Property Rights," Ch. 3, *Handbook of Organizational Economics*, (Gibbons and Roberts, Eds), Princeton University Press.
- de Zeeuw, Aart (2008): "Dynamic effects on the stability of international environmental agreements," *Journal of Environmental Economics and Management* 55(2): 163--74.