

THE UNIVERSITY OF BRITISH COLUMBIA

Vancouver School of Economics

Brian Copeland

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ECONOMICS 471

Economics of Nonrenewable Resources

Office: Buchanan Tower 925

Email: brian.copeland@ubc.ca

Phone: 604 827 0005 [It is usually much better to contact me by email].

Office hours: Wed. 1.30 - 3

T.A.: Alistair Fraser - contact information and office hours are on Connect page

Scope of the Course:

This course focuses on economic issues related to exhaustible resources (such as fossil fuels and minerals). Topics include questions such as whether or not resources are depleted too quickly in free markets; explanations for the observed evolution of resource prices; the sustainability of economic growth in a world with finite resources; effects of resource booms on the rest of the economy; taxation of exhaustible resources; environmental issues related to resource extraction; energy and alternatives to fossil fuels; energy and climate change; international trade issues; and others as time permits.

Related courses offered by the School of Economics include Economics 370 (Cost Benefit Analysis), 371 (Environmental Economics), 374 (Land Economics) and 472 (Renewable Resources) and 573 (Graduate Environmental Economics)

Prerequisite:

Economics 301 or 304 or equivalent (Intermediate Microeconomics); Math 104 and 105 (Calculus). [Note that Math 104 and 105 are prerequisites for Econ 301/304]. I will assume that students are familiar with the basic concepts of microeconomics at the level of Econ 301. Calculus will be used in this course.

Requirements:

Midterm Exam (30%) October 21.

Final Exam (50%) Scheduled by Registrar's Office

Assignments (20%) Will be posted on the Connect page for this course when available

Textbook:

There is no required textbook; the course will be based on material from the readings below.

Slides:

I will sometimes use prepared slides but often I will write on the board instead. This means that if you miss a class you will need to get notes from someone else in the class.

Preliminary Course Outline and Reading List

Some of the readings below are optional - required readings will be announced in class. Some additional readings may be suggested throughout the course. Especially important readings are marked with an asterisk (*) - this will be updated as the course proceeds.

1. Introduction

Malthus, [*An Essay on the Principle of Population*](#), 1798 [Available online in various places]
Meadows, D. et al., [*The Limits to Growth*](#), Universe Books, 1972
National Energy Board, "[Canada's Energy Future 2013](#)"
Krauss, C. "[New Technologies Redraw the World's Energy Picture](#)," New York Times, Oct. 25, 2011.

2. Resource Depletion and Resource Prices

*Hartwick and Olewiler, Ch. 8 and 9
*Jeffrey Krautkraemer and Michael Toman, "[Fundamental Economics of Depletable Energy Supply](#)," Discussion Paper 03-01, Resources for the Future, November 2003
*Fisher, A.C. Resource and Environmental Economics, Ch. 2
*Conrad, J., *Resource Economics*, Cambridge University Press, 1999; Ch. 5. Available as an online book via UBC Library. [There is also a second edition but I have not seen it yet.]
*Solow, R. M. "The Economics of Resources or the Resources of Economics," *American Economic Review*, (1974): 1-14.
*Stiglitz, J. E., "Monopoly and the rate of extraction of exhaustible resources," *American Economic Review*, (Sept. 1976). Read p. 655 - 656 (up to end of Section I).
*Goulder, L.H. and R.G. Williams, "The choice of discount rate for climate change evaluation," Resources for the Future Discussion Paper 12-43, Dec. 2012.
Margaret E. Slade and Henry Thille. "Whither Hotelling: Tests of the Theory of Exhaustible Resources," *Annual Review of Resource Economics*, 1(1), 2009. pp. 239--260.

3. Scarcity, Growth and Sustainability

Nordhaus, W., "Lethal Model II: The Limits to Growth Revisited," *Brookings Papers on Economic Activity*, 1992:2."
Jeffrey A. Krautkraemer, "[Economics of Natural Resource Scarcity: The State of the Debate](#)" Resources for the Future Discussion Paper 05-14, 2005.
*Geoffrey Heal, "Reflections—Defining and Measuring Sustainability," *Review of Environmental Economics and Policy*, Volume 6, Issue 1, Winter 2012, pp. 147–163
*Arrow, K.J. et al., "[Are We Consuming Too Much?](#)" *The Journal of Economic Perspectives*, Vol. 18, No. 3 (Summer, 2004), pp. 147-172
Fisher, A.C. Resource and Environmental Economics, Ch. 4
*Copeland, B.R. "Notes for Economics 471: Renewable Resources: How do market outcomes differ from those for nonrenewable resources?" Oct. 2014

4. Energy conservation; alternative energy sources

*Copeland, B.R. "Notes for Economics 471: Energy conservation and transitions to alternative energy: Policies to encourage conservation, reduce fossil fuel emissions and stimulate the emergence of renewable energy sources," Oct. 2014.

Conservation and the rebound effect

Kenneth Gillingham, Richard G. Newell, and Karen Palmer "[Energy Efficiency Economics and Policy](#)," Resources for the Future Discussion Paper 09-13, April 2009

*Allcott, Hunt, and Michael Greenstone. 2012. "Is There an Energy Efficiency Gap?" *Journal of Economic Perspectives*, 26(1): 3-28.

*Gillingham, Kenneth, Matthew Kotchen, David Rapson, and Gernot Wagner. 2013. "The Rebound Effect is Over-played," *Nature* 493:475-476

Gillingham, K., D. Rapson, G. Wagner (2013) "[The Rebound Effect and Energy Efficiency Policy](#)," UC Davis, 2014

Koichiro Ito, "Do Consumers Respond to Marginal or Average Price? Evidence from Nonlinear Electricity Pricing" *American Economic Review* 2014 p. 537 - 563

Hunt Allcott and Dmitry Taubinsky, "The lightbulb paradox: evidence from two randomized experiments", NBER working paper, 2014.

Fuel efficiency standards

*Paul R. Portney, Ian W. H. Parry, Howard K. Gruenspecht and Winston Harrington, "The Economics of Fuel Economy Standards" *Journal of Economic Perspectives* Vol. 17, No. 4 (Autumn, 2003), pp. 203-217

Mark R. Jacobsen, "Evaluating US Fuel Economy Standards in a Model with Producer and Household Heterogeneity" *American Economic Journal: Economic Policy* 2013, 5(2): 148-187

Subsidies for green energy; feed-in tariffs; green paradox and leakage

*Severin Borenstein, "The Private and Public Economics of Renewable Electricity Generation," *Journal of Economic Perspectives* 26 (Winter 2012): 67-92

*Carolyn Fischer and Louis Preonas, "Combining Policies for Renewable Energy: Is the Whole less than the sum of the parts?" Resources for the Future Discussion Paper. March 2010. Read p. 1-10 and the conclusion (p. 28-31)

Anna Pegels and Wilfried Lütkenhorst, "Is Germany's Energy Transition a case of successful Green Industrial Policy? Contrasting wind and solar PV," *Energy Policy*, 2014

Mathew Morey and Laurence Kirsch, "Germany's Renewable Energy Experiment: A Made-to-Order Catastrophe," *Electricity Journal*, June 2014

*Aghion, P., D. Hemous and R. Veugelers (2009), "No green growth without innovation", Bruegel Policy Brief, 2009/07, Bruegel Brussels.

H.W. Sinn, *The Green Paradox*, MIT Press 2012 [Available online via UBC Library].

Frederick van der Ploeg & Cees Withagen, "[Global Warming and the Green Paradox](#)," OxCarre Research Paper 116, July 2013.

5. Effects of Resource Booms on the Rest of the Economy

W. Max Corden and J. Peter Neary, "Booming Sector and De-industrialisation in a Small Open Economy," *The Economic Journal*, 1982, pp. 825–848. (The model developed in class is based on the material up to p. 831)

*Fernando M. Aragon, Punam Chuhan-Pole and Bryan Christopher Land, "The Local Economic Impacts of Resource Abundance: Theory and Evidence" Simon Fraser University, June 2014.

Grant D. Jacobsen and Dominic P. Parker, "[The Economic Aftermath of Resource Booms: Evidence from Boomtowns in the American West](#)," *Economic Journal*, forthcoming 2014.

Fortin, N.M. and T. Lemieux, "[Changes in Wage Inequality in Canada: An Interprovincial Perspective](#)," UBC School of Economics, Jan. 2014.

Fernando M. Aragon and Juan Pablo Rud, "Polluting Industries and Agricultural Productivity: Evidence from Mining in Ghana," forthcoming, *Economic Journal*. Currently available on Aragon's web page

van der Ploeg, Frederick, "Natural Resources: Curse or Blessing?" *Journal of Economic Literature* 2011, 49:2, 366–420.

6. Resource Taxation

*Boadway, R. and M. Keen, "[Theoretical perspectives on resource tax design](#)," CESifo Working Paper, No. 1206, 2009.

Boadway, R. and M. Keen, "[Rent Taxes and Royalties in Designing Fiscal Regimes for Non-Renewable Resources](#)," forthcoming in David Layton and Robert Halvorsen (eds), *Handbook on the Economics of Natural Resources* (Edward Elgar). Also available as CESifo Working Paper, No. 4568, 2014.

Mintz, J. and D. Chen, "[Capturing Economic Rents From Resources Through Royalties and Taxes](#)," School of Public Policy Research Paper, University of Calgary, Oct. 2012.

7. Trade and Natural Resources

*Ruta, M and AJ Venables (2012), "International trade in natural resources: practice and policy", CEPR Discussion Paper 8903; also in *Annual Review of Resource Economics*, 2012.

*Kim, J. (2010), "Recent Trends in Export Restrictions", OECD Trade Policy Papers, No. 101, OECD Publishing

WTO, [World Trade Report 2010 : Trade in natural resources](#)