

FRE 474: Economics of Global Resource Use and Conservation

Class: Monday, Wednesday, Friday, 11:00 to 12:00, Forest Sciences Centre 1001

Office Hours Instructor: Monday, Wednesday, 13:00 to 14:00, McMillan 331

Office Hours TA: Please make an appointment via email.

Instructor

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TA

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Prerequisites

One of LFS 252, STAT 300, BIOL 300, ECON 326, COMM 291

One of ECON 371, FRE/ECON 374, Or permission of the instructor.

Students from a diversity of backgrounds are welcome, but knowledge of 1) statistics/econometrics, specifically regression analysis and 2) the theory of environmental economics is an important prerequisite for the course.

Description

What is the state of our global natural environment? What are the drivers of environmental degradation and which environmental policies have been successful in halting it? Is there a trade-off between poverty alleviation and the conservation of tigers, coral reefs or tropical rainforests?

This course explores the state of the natural environment, the economic drivers of environmental degradation and the impact of conservation policies on environmental and economic outcomes using empirical approaches. It presents the state of the natural environment including global fish stocks, forests, and biodiversity, introduces empirical methods necessary to evaluate the causal impact of economic development and environmental policies on conservation outcomes and guides students in implementing these methods in the programming language R. The focus of the course is on the estimation of causal relationships in conservation economics using econometrics and the statistical software R. The students will apply these methods to real world data in assignments and a term project which will also serve as the basis for evaluation.

Learning Objectives

In this course, you will learn to

1. Explain the relationship between economic development, environmental policies, resource use and conservation outcomes.
2. Use econometrics to estimate causal relationships in conservation economics and
3. Implement these econometrics methods in the programming language R.

At the end of this course, you will be able to replicate the results of published environmental economics studies, discuss their approaches and interpret their results.

Course Structure and Evaluation

The content of this course will be presented in lectures. The first part of the course (Section 1) will present the state of the natural environment. The second part (Section 2) introduces econometric methods to estimate causal relationships. It follows an applied approach and assumes the mathematics underlying these methods as prerequisites (e.g. OLS asymptotics are not covered in this course). Section 3 shows how to implement these methods in the programming language R. The focus of this part is on econometrics and assumes basic knowledge of R as prerequisite. Section 4 introduces topics in global resource use and conservation and discusses studies that apply econometric methods to topics in global conservation. Section 5 is reserved for student presentations.

Software: We will use the programming language 'R' and the integrated development environment 'RStudio' to analyze and visualize the data. Both programs are open source and you can download them free of charge. Please install both programs on your computer. The courses uses the R packages `dplyr`, `tidyverse`, `ggplot2`, `plm` and especially `lfe`. Please have them installed on your computer as well.

Reading: All papers that are marked with (*) under the course outline are required readings. The econometrics section follows the book by Angrist and Pischke, which I highly recommend:

Angrist, J.D. and Pischke, J.S., 2014. Mastering'metrics: The path from cause to effect. Princeton University Press.

A good online source for econometrics in R is: www.econometrics-with-r.org/
However, the course does not follow the book closely. A more general online source for R is: <https://r4ds.had.co.nz/>

Evaluation: Your Grade will be determined as follows

	Share of final grade
In-class participation	10 %
Midterm exam (September 27)	20 %
Assignments (throughout October)	20 %

Project Report (Assignment of topics September 13)	
a) Introduction (November 1)	10 %
b) Data, methods and results (November 15)	10 %
c) Final report (December 13)	20 %
15 Minutes presentations (November 18 to November 29)	10 %

In class participation: I will grade in-class participation. Asking good questions or giving thoughtful answers to the instructor or to classmates increases the grades of in-class participation. Being frequently absent reduces the grade.

Midterm exam: The midterm exam takes place after Section 2 (econometrics) of the course and covers all topics covered in Section 2. We will start each day with questions about the last session. Use them as practice questions for the midterm exam. If you feel that a midterm was unfairly graded, you can appeal by returning it to me with an attached note. However, I will regrade the entire exam, so your score may go up or down as a result.

Assignments: There are three assignments during Section 3 (R) of the course. A pdf file of less than two pages containing the commented R code, the results and a discussion of the results have to be submitted on the Canvas page of the course. Only the top two assignments will enter your grade. If you hand in assignments less than three days late, they will be graded 30 % less. If you hand them in more than 3 days late, they will be graded 50 % less.

Project report: Instead of a final exam you will write a project report of less than 10 pages. The report has to be written by each student individually. The report is about a research question related to a published paper. I will assign the questions but you can tell me your preferences after I introduced the topics. Part of the report will be to replicate the results from the paper. I will make the data available on the Canvas page of this course. The report has the following components. Each component has to be submitted separately at the specified deadlines.

1. Introduction (3 pages + 1 page references): This component discusses the importance of the topic in general and the specific research question through the lens of environmental economics. It also discusses the related literature and the contribution of this question to the general understanding of this topic.
2. Data, methods and results (4 pages + appendix): In this component, you are asked to visualize the data, describe your econometric approach, implement the approach in R and discuss the results. This section also contained your commented R-code as an appendix (not counted as part of the 10 pages). I will make the data for your questions available on the canvas page of the course.
3. Final report (10 pages including references but excluding the appendix): The final report contains both previous sections and an additional conclusion that summarizes the challenges of the approach and the implications of the findings. In the final report, you have the chance to address my comments to the two earlier components of the report.

Presentations: The presentations should cover the introduction and motivation (5 minutes), the approach and data (5 minutes) and the results and discussion (5 minutes). Please send the slides of the presentation in pdf format to the instructor one day before your presentation.

I will discuss further details and answer questions after I introduce the specific topics. The report must be written in English and submitted on Canvas as pdf file. If you hand in one of the first parts more than three days late, it will be graded 30 % less. If you hand it in more than 3 days late, it will be graded 50 % less. The final reported will only be graded if it is submitted on time due to external deadlines.

Course Outline

Section 1: Introduction

1. Current conservation issues

Section 2: Econometrics

2. Data analysis 1: Randomized trials

Angrist and Pischke, Chapter 1

3. Data analysis 2: Regression

Angrist and Pischke, Chapter 2

4. Data analysis 3: Instrumental variables

Angrist and Pischke, Chapter 3

5. Data analysis 4: Regression discontinuity design

Angrist and Pischke, Chapter 4

6. Data analysis 5: Differences-in-differences

Angrist and Pischke, Chapter 5

Section 3: Data in R

7. Short introduction to R and data wrangling

Short introduction to R and the tidyverse. Data import, data cleaning, data reformatting, summary statistics, merging of data.

8. Data visualization and summary statistics in R

Introduction to ggplot2

9. Econometrics in R

Introduction to regression in R and the packages plm and lfe.

Section 4: Applications

10. The Impact of Economic Development on the Environment

- (*) Foster, A.D. and Rosenzweig, M.R., 2003. *Economic growth and the rise of forests*. *The Quarterly Journal of Economics*, 118(2), pp.601-637.
- Baland, J.M., Libois, F. and Mookherjee, D., 2018. Forest Degradation and Economic Growth in Nepal, 2003–2010. *Journal of the Association of Environmental and Resource Economists*, 5(2), pp.401-439
- (*) Abman, R., & Carney, C. (2019). *Agricultural productivity and deforestation: Evidence from input subsidies and ethnic favoritism in Malawi*. *Working Paper*

- Assunção, J., Lipscomb, M., Mobarak, A.M. and Szerman, D., 2017. Agricultural Productivity and Deforestation in Brazil. Working Paper
- Assunção, J., & Bragança, A. (2015). Does technical change in agriculture increase deforestation? Evidence from the Brazilian soybean revolution. Working Paper.
- Abman and Lundberg 2019 Does Free Trade Increase Deforestation? The Effects of Regional Trade Agreements. Working Paper.
- (*) Eisenbarth, S. 2019 *Do exports of renewable resources lead to resource depletion? Evidence from fisheries. Working Paper.*

11. The Economic Impact of Environmental Degradation

- (*) Mendelsohn, R., Nordhaus, W. D., & Shaw, D. (1994). The impact of global warming on agriculture: a Ricardian analysis. *The American Economic Review*, 753-771.
- (*) Deschênes, O., & Greenstone, M. (2007). The economic impacts of climate change: evidence from agricultural output and random fluctuations in weather. *American Economic Review*, 97(1), 354-385.
- (*) Hsiang, S. M., Burke, M., & Miguel, E. (2013). Quantifying the influence of climate on human conflict. *Science*, 341(6151), 1235367.
- Edwards, R. B. (2019). Export agriculture and rural poverty: evidence from Indonesian palm oil. Working Paper.

12. The Impact of Environmental Policies

- (*) Jayachandran, S., De Laat, J., Lambin, E.F., Stanton, C.Y., Audy, R. and Thomas, N.E., 2017. Cash for carbon: A randomized trial of payments for ecosystem services to reduce deforestation. *Science*, 357(6348), pp.267-273.
- Hsiang, S., & Sekar, N. (2016). Does legalization reduce black market activity? Evidence from a global ivory experiment and elephant poaching data (No. w22314). National Bureau of Economic Research.
- (*) Bošković, B. and Nøstbakken, L., 2017. The cost of endangered species protection: Evidence from auctions for natural resources. *Journal of Environmental Economics and Management*, 81, pp.174-192.
- Sims, K.R. and Alix-Garcia, J.M., 2017. Parks versus PES: Evaluating direct and incentive-based land conservation in Mexico. *Journal of Environmental Economics and Management*, 86, pp.8-28.
- (*) Burgess, R., Costa, F. J., & Olken, B. A. (2018). Wilderness Conservation and the Reach of the State: Evidence from National Borders in the Amazon (No. w24861). National Bureau of Economic Research
- (*) Gabriel Englander: Property rights lead to protection of global marine resources (if published by then).

Section 5: Student presentation

1. (*) Alix-Garcia, J., McIntosh, C., Sims, K.R. and Welch, J.R., 2013. The ecological footprint of poverty alleviation: evidence from Mexico's Oportunidades program. *Review of Economics and Statistics*, 95(2), pp.417-435
2. (*) Alix-Garcia, J.M., Sims, K.R. and Yañez-Pagans, P., 2015. Only one tree from each seed? Environmental effectiveness and poverty alleviation in Mexico's

- Payments for Ecosystem Services Program. American Economic Journal: Economic Policy, 7(4), pp.1-40
3. (*) Asher, S., Garg, T. and Novosad, P., accepted. The Ecological Impact of Transportation Infrastructure. Economic Journal.
 4. (*) Isaksen, E.T. and Richter, A., 2019. Tragedy, property rights, and the commons: investigating the causal relationship from institutions to ecosystem collapse. Journal of the Association of Environmental and Resource Economists.
 5. (*) Keiser, D., 2019. The missing benefits of clean water and the role of mismeasured pollution. Journal of the Association of Environmental and Resource Economists, 6 (4).
 6. (*) Souza-Rodrigues, E.A., 2015. Deforestation in the Amazon: A unified framework for estimation and policy analysis. The Review of Economic Studies

Academic Integrity

The integrity of academic work depends on the honesty of all those who work and study at the university and the acknowledgement of the work of others through careful citation of all sources used in your work. Plagiarism and other forms of academic misconduct are treated as serious offences at UBC, whether committed by faculty, staff, or students.

You should be aware of the sections of the University Calendar that address academic integrity (<http://www.students.ubc.ca/calendar/index.cfm?tree=3,286,0,0>) and plagiarism (<http://vpacademic.ubc.ca/integrity/ubc-regulation-on-plagiarism/>). The UBC library also has a useful web-based Plagiarism Resource Centre (www.library.ubc.ca/home/plagiarism/) that explains what plagiarism is and how to avoid it. The copying of passages from any sources, without proper reference will be considered plagiarism. If you have questions or concerns about any of these policies or conventions in relation to how they apply to the work you do in this course, please discuss them with me.

UBC Policies and Regulations: Students are reminded that they are subject to the University's Policies and Regulations, and are directed especially to "Student Declaration and Responsibility", "Academic Honesty and Standards", and "Academic Freedom" sections.
Academic Concession: Students facing any medical, emotional, or personal circumstances that may negatively impact academic attendance or performance are expected to notify their instructor as well as their home Faculty's Academic Advising Office. Instructors and Advisors can help by explaining your options and working with you to access supports or explore a form of academic concession.

Change of Registration: Students are permitted to change their registration, by adding or dropping courses, but must be mindful of the deadlines.

Personal Support: Students experiencing personal challenges that are impacting their academics and well-being are strongly encouraged to learn more about the resources available on the Health and Wellness website.

Academic Support: Please visit Academic Success to learn more about campus resources to support your success.

Accommodations for Students with Disabilities: Students requiring accommodation in this course, or in need of support for an on-going medical condition please let me know as soon as possible and/or provide me with documentation and recommendations from Access &

Diversity. You can find more information about the services provided by Centre for Accessibility