**气候变化经济学**

本课程分析气候变化的经济学和气候政策。内容包括但不限于碳的社会成本、气候变化政策工具、气候政策的评估方法、政策的不确定性和时点、适应气候变化、及中国、欧洲和美国的气候政策。本课旨在让学生了解气候变化经济学的关键问题，涵盖理论和实证知识，提供在本领域做研究所需的视角和工具。

**联系方式**

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**上课时间**：每周二下午7-9节

**阅读材料**：本课没有必须的教材。阅读材料在“课程大纲和阅读材料”部分。

**课程形式和要求**：

*Lectures: I will give lectures that cover the topics listed below.*

*Presentation of Pre-assigned Paper*: Some of the class meetings will focus on pre-assigned papers. Each student is expected to present one of the assigned papers once or twice during the semester.

*Research Proposal*: In the end of the course, students need submit a research proposal and present it.

**成绩结构:**

 Presentation of pre-assigned paper: 20%

 Research proposal write-up: 35%

 Research proposal presentation: 30%

 Class attendance and discussion: 15%

**课程大纲和阅读材料**

This course will cover the following topics. Students are encouraged (not required) to read the papers in the reading list before class meetings.

1. **Introduction and Overview**
* IPCC, 2018, “Global Warming of 1.5 °C”
1. **Social Cost of Carbon**
* Coase, Ronald, 1960, “The Problem of Social Cost”, *Journal of Law and Economics* 15(2), pp.427-437.
* Pearce, David, 2003, “The Social Cost of Carbon and Its Policy Implications”, *Oxford Review of Economic Policy* 19(3), pp.362-384.
1. **Market Failure and the Rationales for Policy**
* Goulder, Lawrence, 2016. “Notes on Externalities and Market Failure.”
1. **Climate Policy Instruments**
	1. Taxes and Subsidies
* Goulder, Lawrence and Ian Parry, 2008, “Instrument Choice in Environmental Policy”, *Review of Environmental Economics and Policy.*
* Marron, Donald B., and Eric J. Toder. 2014. “Tax Policy Issues in Designing a Carbon Tax.” *American Economic Review*, 104 (5): 563-68.
* Goulder, Lawrence, 2019. “Notes on the Choice between Emissions Taxes, Emissions Allowances, and Mandated Technologies.” Mimeo, Stanford University.
	1. Tradable Emissions Permits
* Goulder, Lawrence, 2013, “Markets for Pollution Allowances: What Are the (New) Lessons?” *Journal of Economic Perspectives*. 27(1), pp.87-102.
* Goulder, Lawrence and Andrew Schein, 2013, “Carbon Taxes versus Cap and Trade: A Critical Review”, *Climate Change Economics*. 4(03), p.1350010.
* Goulder, Lawrence, Marc Hafstead, and Michael Dworsky, 2010, “Impacts of Alternative Emissions Allowance Allocation Methods under a Federal Cap-and-Trade Program”. *Journal of Environmental Economics and Management*. 60(3), pp.161-181.
* Newell, Richard, William Pizer, and Daniel Raimi, 2013, “Carbon Markets 15 Years after Kyoto: Lessons Learned, New Challenges”, *Journal of Economic Perspectives.* 27(1), pp.123-46.
	1. Standards
* Holland, Stephen, Jonathan Hughes, and Christopher Knittel, 2009, “Greenhouse Gas Reductions under Low Carbon Fuel Standards?” *The American Economic Journal: Economic Policy.* 1(1), pp.106-46.
* Goulder, Lawrence, Mark R. Jacobsen, and Arthur van Benthem, 2009. “Unintended Consequences from Nested Federal & State Environmental Regulations: The Case of the Pavley Greenhouse-Gas-per-Mile Limits.” *Journal of Environmental Economics and Management.* 63(2), pp.187-207.
	1. Border Adjustment
* Fowlie, Meredith, Claire Peterson, and Mar Reguant. 2021. “Border Carbon Adjustments When Carbon Intensity Varies Across Producers: Evidence from California”. *American Economic Review Papers and Proceedings*. vol. 111, pp. 401-05.

1. **Evaluating Climate Policy**
	1. Overview of Benefit-cost Analysis
* Arrow, K.J., Cropper, M.L., Eads, G.C., Hahn, R.W., Lave, L.B., Noll, R.G., Portney, P.R., Russell, M., Schmalensee, R., Smith, V.K. and Stavins, R.N., 1996. Is there a role for benefit-cost analysis in environmental, health, and safety regulation?. *Science*, 272(5259), pp.221-222.
* Hahn, R.W. and Dudley, P.M., 2020. How well does the US Government do benefit-cost analysis?. *Review of Environmental Economics and Policy*.
	1. Discounting and Decision Making
* Nordhaus, William, 2007. “A Review of the Stern Review on the Economics of Climate Change,” *Journal of Economic Literature*. 45(3), pp.686-702.
* Weitzman, Martin, 2007. “A Review of the Stern Review on the Economics of Climate Change,” *Journal of Economic Literature*. 45(3), pp.703-724.
* Stern, Nicholas, 2008. “The Economics of Climate Change.” *American Economic Review* 98(2), pp.1-37.
* Goulder, Lawrence H., and Roberton C. Williams III, 2012. “The Choice of Discount Rate for Climate Change Policy Evaluation.” *Climate Change Economics*, 3(04), p.1250024.
	1. Efficiency vs Equity
* Goulder, Lawrence H., Marc AC Hafstead, GyuRim Kim, and Xianling Long. 2019. “Impacts of A Carbon Tax across US Household Income Groups: What Are the Equity-efficiency Trade-offs?” *Journal of Public Economics* 175: 44-64.
* Fowlie, Meredith, Reed Walker, and David Wooley. 2020. “Climate Policy, Environmental Justice, and Local Air Pollution”. *Brookings Economic Studies Program*.
* Dinan, Terry and Diane Rogers. 2002. “Distributional Effects of Carbon Allowance Trading: How Government Decisions Determine Winners and Losers,” *National Tax Journal*. 55(2), pp.199-221.
	1. Numerical Modeling of Climate Change Policy
* Nordhaus, William D., 2010. “Economic Aspects of Global Warming in a Post- Copenhagen Environment,” *Proceedings of the National Academy of Sciences.* 107(26), pp.11721-11726.
* Pindyck, Robert, 2013. “Climate Change Policy: What Do the Models Tell Us?” *Journal of Economic Literature*, 51(3), pp.860-72.
* Hsiang, Solomon, and Amir S. Jina, 2014. The Causal Effect of Environmental Catastrophe on Long-Run Economic Growth: Evidence from 6,700 Cyclones, *NBER Working Paper* No0. 20352, July.
* Cai, Yongyang, Kenneth Judd, and Thomas Lontzek, 2013. “The Social Cost of Stochastic and Irreversible Climate Change.” *NBER Working Paper 18704*, January.
* Nordhaus, William D., 2011. “Tail Events and Economic Analysis,” *Review of Environmental Economics and Policy,* 5(2):240-257, Summer.
	1. Co-benefits of Climate Policy
* Ürge-Vorsatz, D., Herrero, S.T., Dubash, N.K. and Lecocq, F., 2014. Measuring the co-benefits of climate change mitigation. Annual Review of Environment and Resources, 39, pp.549-582.
	1. Emission Leakage, Rebound Effect, and Green Paradox
* Fowlie, Meredith and Mar Reguant, 2021, “Mitigating Emissions Leakage in Incomplete Carbon Markets*”. Journal of the Association of Environmental and Resource Economists*. 9(2), pp.307-343.
* Fowlie, Meredith and Mar Reguant. 2018. “Challenges in the Measurement of Leakage Risk,” *American Economic Review Papers and Proceedings*. vol. 108, pp. 124-29.
* Gillingham, K., Rapson, D. and Wagner, G., 2020. “The Rebound Effect and Energy Efficiency Policy.” *Review of Environmental Economics and Policy*.
* Van der Ploeg, F. and Withagen, C., 2012. “Is There Really A Green Paradox?”. *Journal of Environmental Economics and Management*, 64(3), pp.342-363.
	1. [Optional] Estimating the Impacts of Climate Change on Agriculture
* Mendelsohn, Robert, William D. Nordhaus and Daigee Shaw. 1994. "The Impact of Global Warming on Agriculture: A Ricardian Analysis." *American Economic Review* 84(4):753-771
* Deschenes, Olivier, and Michael Greenstone, 2007. “The Economic Impacts of Climate Change: Evidence from Agricultural Output and Random Fluctuations in Weather.” *American Economic Review* 97(1).
* Massetti, Emanuele, and Robert Mendelsohn, 2011. “Estimating Ricardian Functions with Panel Data.” *Climate Change Economics* 2:301-319.
* Schlenker, Wolfram and Michael J. Roberts. 2009. "Nonlinear Temperature Effects Indicate Severe Damages to U.S. Crop Yields under Climate Change." *Proceedings of the National Academy of Sciences*, 106(37):15594-15598.
* Schlenker, Wolfram, W. Michael Hanemann, and Anthony Fisher, 2005. “Will U.S. Agriculture Really Benefit from Global Warming? Accounting for Irrigation in the Hedonic Approach.” *American Economic Review* 95(1), March
* Fisher, Anthony C., W. Michael Hanemann, Michael J. Roberts and Wolfram Schlenker, 2012. “The Economic Impacts of Climate Change: Evidence from Agricultural Output and Random Fluctuations in Weather: Comment.” *American Economic Review* 102(7).
* Deschenes, Olivier, and Michael Greenstone, 2012. “The Economic Impacts of Climate Change: Evidence from Agricultural Output and Random Fluctuations in Weather: Reply.” *American Economic Review* 102(7).
* Burke, Marshall, and Kyle Emerick, 2016. “Adaptation to Climate Change: Evidence from US Agriculture.” *American Economic Journal: Economic Policy*, 8(3), pp.106-40.
* Rosenzweig, Cynthia and Martin L. Parry. 1994. "Potential Impact of Climate Change on World Food Supply." *Nature*, 367:133-138. Agronomic approach (crop models).
1. **Interactions between Climate Policy and the Fiscal System**
* Bovenberg, A. Lans and Ruud A. de Mooij. 1994. “Environmental Levies and Distortionary Taxation.” *American Economic Review*. 84(4), pp.1085-1089.
* Goulder, Lawrence H., and Marc A. C. Hafstead, 2017. “Climate Policy, Fiscal Interactions, and Economic Outcomes.” Chapter 2 of *Meeting the Climate Challenge: Computable General Equilibrium Analysis of U.S. Policy Options.*
* Bento, Antonio M., and Mark Jacobsen, 2007. “Ricardian Rents, Environmental Policy and the ‘Double-Dividend’ Hypothesis.” *Journal of Environmental Economics and Management* 53:17-31.
* Goulder, Lawrence H. 1995. “Environmental Taxation and the 'Double Dividend': A Reader's Guide.” *International Tax and Public Finance*, Vol. 2, Issue 2, May.
* Bovenberg, A. Lans, and Lawrence H. Goulder, 2002. “Neutralizing the Adverse Industry Impacts of CO2 Abatement Policies: What Does It Cost?” in C. Carraro and G. Metcalf, eds., *Behavioral and Distributional Effects of Environmental Policies,* University of Chicago Press.
1. **Uncertainty**
	1. Uncertainty and Instrument Choice
* Weitzman, Martin. 1974. “Prices vs. Quantities,” *Review of Economic Studies* 41:447- 491.
* Pizer, William, 2002. “Combining Price and Quantity Controls to Mitigate Global
* Climate Change.” *Journal of Public Economics* 85(3).
* Pindyck, Robert, 2007, “Uncertainty in Environmental Economics”, *Review of Environmental Economics and Policy* 1(1).
* Borenstein, Severin, James Bushnell, Frank Wolak, and Matthew Zaragoza-Watkins, 2019, “Expecting the Unexpected: Emissions Uncertainty and Environmental Market Design”, *American Economic Review*. 109(11), pp.3953-77.
	1. The Timing of Policy Action
* Weitzman, Martin, 2011. “Fat-Tailed Uncertainty in the Economics of Catastrophic Climate Change. *Review of Environmental Economics and Policy*, Volume 5, Issue 2, Summer.
* Nordhaus, William D., 2011. “The Economics of Tail Events with an Application to Climate Change,” *Review of Environmental Economics and Policy*, 5(2):240-257, Summer.
* Goulder, Lawrence. H., 2019. “Timing Is Everything: How Economists Can Better Address the Urgency of Stronger Climate Policy.” *Review of Environmental Economics and Policy* 14(1).
* Cai, Yongyang, and Thomas Lontzek, 2019. “The Social Cost of Carbon with Economic and Climate Risks.” *Journal of Political Economy* 126(6).
1. **China’s Climate Policy**
* Goulder, Lawrence H., Xianling Long, Jieyi Lu, and Richard D. Morgenstern. “China’s Unconventional Nationwide CO2 Emissions Trading System: Cost-effectiveness and Distributional Impacts." *Journal of Environmental Economics and Management* 111 (2022): 102561.
* Jotzo, Frank, Valerie Karplus, Michael Grubb, Andreas Löschel, Karsten Neuhoff, Libo Wu, and Fei Teng. “China’s Emissions Trading Takes Steps Towards Big Ambitions.” *Nature Climate Change* 8, no. 4 (2018): 265-267.
* Karplus, Valerie Jean. “Institutions and emissions trading in China.” *AEA Papers and Proceedings*, vol. 108, pp. 468-72. 2018.
* Zhang, Da, Qin Zhang, Shaozhou Qi, Jinpeng Huang, Valerie J. Karplus, and Xiliang Zhang. “Integrity of firms’ emissions reporting in China’s early carbon markets.” *Nature Climate Change* 9, no. 2 (2019): 164-169.
* Liu, Zhu, Dabo Guan, Scott Moore, Henry Lee, Jun Su, and Qiang Zhang. “Climate Policy: Steps to China's Carbon Peak.” *Nature* 522, no. 7556 (2015): 279-281.
1. **[Optional] United States Climate Policies**
* Goulder, Lawrence, and Robert Stavins, 2010, “Interactions between State and Federal Climate Change Policies”. In D. Fullerton and C Wolfram, eds., The Design and Implementation of U.S. Climate Change Policy, Cambridge, Mass.: National Bureau of Economic Research.
* Bushnell, James B. 2008. “The Design of California’s Cap-and-Trade and Its Impact on Electricity Markets” *Climate Policy,* 8, 277-292.
* Stavins, Robert, Judson Jaffe and Todd Schatzki, 2007. “Too Good To Be True? An Examination of Three Economic Assessments of California Climate Change Policy.” *NBER Working Paper 13587*, November
1. **[Optional] European Union Climate Policies**
* EU Emissions Trading System: <https://ec.europa.eu/clima/eu-action/eu-emissions-trading-system-eu-ets_en>
* Bushnell, James B., Howard Chong, and Erin T. Mansur. 2013. “Profiting from Regulation: Evidence from the European Carbon Market.” *American Economic Journal: Economic Policy*, 5 (4): 78-106.
* Raphael Calel, Antoine Dechezleprêtre; 2016, “Environmental Policy and Directed Technological Change: Evidence from the European Carbon Market”. *The Review of Economics and Statistics*. 98 (1): 173–191.
1. **[Optional] Adaption to Climate Change**
* Adger, W. Neil, Saleemul Huq, Katrina Brown, Declan Conway, and Mike Hulme. “Adaptation to Climate Change in the Developing World.” *Progress in Development Studies* 3, no. 3 (2003): 179-195.
* Mendelsohn, Robert. “The Economics of Adaptation to Climate Change in Developing Countries.” *Climate Change Economics* 3, no. 02 (2012): 1250006.
* Adger, W. Neil, Suraje Dessai, Marisa Goulden, Mike Hulme, Irene Lorenzoni, Donald R. Nelson, Lars Otto Naess, Johanna Wolf, and Anita Wreford. “Are There Social Limits to Adaptation to Climate Change?.” *Climatic Change* 93, no. 3 (2009): 335-354.