

**YONGYANG CAI**  
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**Current Position:** Associate Professor (with tenure since June 2019), Department of Agricultural, Environmental and Development Economics, The Ohio State University

**Other Affiliations:** RDCEP, University of Chicago;  
Sustainability Institute, The Ohio State University

## **Education**

PhD, Computational and Mathematical Engineering, Stanford University, 2010  
MS, Financial Mathematics, Stanford University, 2008

## **Research Interest**

Computational Economics; Climate Change Economics; Environmental and Resource Economics; Integrated Modeling; Financial Mathematics; Decision Making under Uncertainty

## **Employment**

2016.10-present	Associate Professor (with tenure since June 2019), Department of Agricultural, Environmental and Development Economics, The Ohio State University; Core Faculty, Sustainability Institute, The Ohio State University
2011-present	Researcher, RDCEP, University of Chicago
2015.01-2016.10	Senior Research Scientist, Becker Friedman Institute, University of Chicago
2015-2016	Visiting Fellow, Hoover Institution, Stanford University
2013-2014.12	Research Scientist, Becker Friedman Institute, University of Chicago
2011-2015	Researcher, Hoover Institution, Stanford University
2012	Visiting Scholar, Energy Policy Institute at Chicago, University of Chicago
2011-2013	Postdoctoral Research Fellow, National Bureau of Economic Research
2010-2011	Postdoctoral Research Fellow, Dept. of Management Science & Engineering, Stanford University
2004-2010	Research Assistant, Hoover Institution & ICME, Stanford University
2002-2004	Research Assistant, Dept. of Computer Science, University of New Mexico
1999-2002	Senior Software Engineer, Zhongxing Telecommunication Corporation, Shanghai Research Institute

## **Honors, Awards, Grants, Fellowships**

- The 2018 Nobel Committee cited my work in their scientific report for supporting the award of the Nobel Prize in Economics to William Nordhaus
- A White House report in July 2014 featured my work

- National Science Foundation grant SES-1739909, “INFEWS/T1: Impacts of Deglobalization on the Sustainability of Regional Food, Energy, Water Systems”, 2017-2021, USD 2,400,000, Co-PI. (PI: Elena Irwin)
- National Science Foundation grant SES-1463644, “DMUU: Center for Robust Decision-Making Tools for Climate and Energy Policy”, 2015-2020, USD 4,500,000. (PI: Elisabeth Moyer; former PI: Ian Foster)
- United States Department of Agriculture NIFA-AFRI grant 2018-68002-27932, “Building a sustainable and resilient agroecosystem through an understanding of climate and farmer behavioral variability”, 2018-2021, USD 1,200,000, Co-PI. (PI: Robyn Wilson)
- United States Department of Agriculture NIFA-AFRI grant 2015-67023-22905, “Will Global Change Jeopardize the US Forest Carbon Sink”, 2015.01-2017.12, USD 500,000. (PI: Thomas Hertel)
- National Science Foundation grant SES-0951576, “DMUU: Center for Robust Decision-Making Tools for Climate and Energy Policy”, 2011-2016, USD 6,000,000. (PI: Ian Foster)
- Great Lakes Consortium for Petascale Computation projects at the Blue Waters Supercomputer, “Policy Responses to Climate Change in a Dynamic Stochastic Economy”, 2013-2020, 1,465,000 node hours, PI (former PI: Lars Peter Hansen).
- Beagle supercomputer climate project at Computation Institution of the University of Chicago, 2012-2015, PI.
- Visiting scholarship, Energy Policy Institute at Chicago, University of Chicago, 2012
- Postdoctoral research fellowship, Hoover Institution and MS&E, Stanford University, 2010-2011
- Research assistantship, Hoover Institution and ICME, Stanford University, 2004-2010
- Research assistantship, Department of Computer Science, University of New Mexico, 2002-2004

## **Referred Journal Publications**

1. Cai, Yongyang, and Thomas S. Lontzek (2019). The social cost of carbon with economic and climate risks. *Journal of Political Economy*, 127(6), 2684–2734.
  - A White House report in July 2014, titled with “The Cost of Delaying Action to Stem Climate Change”, features this paper with its conclusion that high social cost of carbon can be justified without assuming the possibility of catastrophic events.
  - Its earlier versions include Hoover economic working paper 18113, arXiv:1504.06909, NBER working paper 18704 (“The social cost of stochastic and irreversible climate change”), RDCEP working paper 12-02 (“DSICE: A dynamic stochastic integrated model of climate and economy”), and RDCEP working paper 12-03 (“Tipping points in a dynamic stochastic IAM”).
2. Baldwin, Elizabeth, Yongyang Cai, and Karlygash Kuralbayeva (2019). To Build or Not to Build? Capital Stocks and Climate Policy. *Journal of Environmental Economics and Management*, in press. <https://doi.org/10.1016/j.jeem.2019.05.001> (An earlier version is titled with “Build now, regret later? Infrastructure and Climate Policy”)
3. Cai, Yongyang (2019). Computational methods in environmental and resource economics. *Annual Review of Resource Economics* 11, 59–82. <http://www.annualreviews.org/eprint/SFINGCT7MAWSVFGTMVB/full/10.1146/annurev-resource-100518-093841>
4. Cai, Yongyang, Harris Selod, and Jevgenijs Steinbuks (2018). Urbanization and land property rights. *Regional Science and Urban Economics*, 70, 246–257. (An earlier version is World Bank Policy Research Working Paper 7486)
5. Cai, Yongyang, Alla A. Golub, and Thomas W. Hertel (2017). Agricultural research spending must increase in light of future uncertainties. *Food Policy* 70, 71–83.

6. Cai, Yongyang, Kenneth L. Judd, and Jevgenijs Steinbuks (2017). A nonlinear certainty equivalent approximation method for dynamic stochastic problems. *Quantitative Economics*, 8(1), 117–147. (An earlier version is NBER working paper 21590.)
7. Cai, Yongyang, Kenneth L. Judd, Thomas S. Lontzek, Valentina Michelangeli, and Che-Lin Su (2017). A nonlinear programming method for dynamic programming. *Macroeconomic Dynamics*, 21, 336–361. (An earlier version is NBER working paper 19034.)
8. Yeltekin, Sevin, Yongyang Cai, and Kenneth L. Judd (2017). Computing equilibria of dynamic games. *Operations Research*, 65(2): 337–356. <http://dx.doi.org/10.1287/opre.2016.1572>
9. Cai, Yongyang, Timothy M. Lenton, and Thomas S. Lontzek (2016). Risk of multiple interacting tipping points should encourage rapid CO2 emission reduction. *Nature Climate Change* (2016 impact factor: 19.3), 6, 520–525.
  - The article is featured by News & Views of *Nature Climate Change* in 2016 with a report titled with “Climate change economics: Reacting to multiple tipping points” written by Frederick van der Ploeg (<https://www.nature.com/articles/nclimate2962>), and an editorial article titled with “The devil is in the deep tail” (<https://www.nature.com/articles/nclimate3021>).
10. Cai, Yongyang, and Alan H. Sanstad (2016). Model uncertainty and energy technology policy: the example of induced technical change. *Computers & Operations Research* 66, 362–373. (An earlier version is RDCEP Working Paper No. 14-01.)
11. Cai, Yongyang, Kenneth L. Judd, Timothy M. Lenton, Thomas S. Lontzek, and Daiju Narita (2015). Environmental tipping points significantly affect the cost-benefit assessment of climate policies. *Proceedings of the National Academy of Sciences* (2015 impact factor: 9.4), 112(15), 4606–4611.
12. Lontzek, Thomas S., Yongyang Cai, Kenneth L. Judd, and Timothy M. Lenton (2015). Stochastic integrated assessment of climate tipping points indicates the need for strict climate policy. *Nature Climate Change* (2015 impact factor: 17.2), 5, 441–444.
  - The 2018 Nobel Committee’s scientific report, titled with “Economic Growth, Technological Change, and Climate Change”, cited this paper for supporting the award of the Nobel Prize in Economics to William Nordhaus.
13. Cai, Yongyang, and Kenneth L. Judd (2015). Dynamic programming with Hermite approximation. *Mathematical Methods of Operations Research*, 81, 245–267. (An earlier version is “Dynamic programming with Hermite interpolation, RDCEP working paper 12-09.”)
14. Cai, Yongyang, Kenneth L. Judd, Greg Thain, and Steven Wright (2015). Solving dynamic programming problems on a computational grid. *Computational Economics*, 45(2), 261–284. (An earlier version is NBER working paper 18714.)
15. Cai, Yongyang, and Kenneth L. Judd (2013). Shape-preserving dynamic programming. *Mathematical Methods of Operations Research*, 77(3), 407–421.
16. Cai, Yongyang, Kenneth L. Judd and Thomas S. Lontzek (2012). Open science is necessary. *Nature Climate Change* (2012 impact factor: 14.5), Vol. 2, Issue 5, 299.
17. Cai, Yongyang, and Kenneth L. Judd (2012). Dynamic programming with shape-preserving rational spline Hermite interpolation. *Economics Letters*, 117(1), 161–164.
18. Cai, Yongyang, and Kenneth L. Judd (2010). Stable and efficient computational methods for dynamic programming. *Journal of the European Economic Association*, 8(2–3), 626–634.
19. Kapur, Deepak, and Yongyang Cai (2009). An algorithm for computing a Grobner basis of a polynomial ideal over a ring with zero divisors. *Mathematics in Computer Science*, 2(4), 601–634.
20. Cai, Yongyang (1999). An improvement on the QL algorithm for symmetric tridiagonal matrices. *Numer. Math. J. Chinese Univ. (English Ser.)*, 8(1): 35–38.

## **Book Chapters**

21. Cai, Yongyang, and Kenneth L. Judd (2014). Advances in numerical dynamic programming and new applications. Chapter 8 in: *Handbook of Computational Economics*, Vol. 3, ed. by Karl Schmedders and Kenneth L. Judd, Elsevier.

### **Selected Working Papers**

22. Cai, Yongyang, William Brock, Anastasios Xepapadeas, and Kenneth Judd (2019). Climate Policy under Spatial Heat Transport: Cooperative and Noncooperative Regional Outcomes. arXiv:1909.04009 [econ.GN] (NBER working paper 24473). <https://arxiv.org/abs/1909.04009>
  - Its earlier versions include “Climate Policy under Cooperation and Competition between Regions with Spatial Heat Transport” and “Climate change economics and heat transport across the globe: Spatial-DSICE” (ASSA 2017 conference paper).
23. Cai, Yongyang, Jevgenijs Steinbuks, Kenneth L. Judd, Jonas Jaegermeyr, and Thomas W. Hertel (2020). Modeling Uncertainty in Large Natural Resource Allocation Problems.
  - Its earlier versions include “The effect of climate and technological uncertainty in crop yields on the optimal path of global land use” (The World Bank Policy Research Working Paper 7009) and “Optimal path for global land use under climate change uncertainty” (AAEA 2013 conference paper). [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2483543](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2483543)
24. Cai, Yongyang, Kenneth L. Judd and Rong Xu (2013). Numerical solution of dynamic portfolio optimization with transaction costs. NBER working paper 18709.
25. Cai, Yongyang, Kenneth L. Judd, and Thomas S. Lontzek (2012). Continuous-time methods for integrated assessment models. NBER working paper 18365.
26. Cai, Yongyang, Alla A. Golub, and Thomas W. Hertel (2016). Developing long-run agricultural R&D policy in the face of uncertain economic growth. ASSA 2017 conference paper. <https://www.aeaweb.org/conference/2017/preliminary/paper/Er934Tb8>
27. Cai, Yongyang, Kenneth L. Judd and Thomas S. Lontzek (2018). Numerical dynamic programming with verification and uncertainty quantification: an application to climate policy. Working paper. [https://www.imfs-frankfurt.de/fileadmin/user\\_upload/Events\\_2018/MMCI\\_Conference/Papers/90-Kenneth\\_Judd-Numerical\\_Dynamic\\_Programming\\_with\\_Verification\\_and\\_Uncertainty\\_Quantification.pdf](https://www.imfs-frankfurt.de/fileadmin/user_upload/Events_2018/MMCI_Conference/Papers/90-Kenneth_Judd-Numerical_Dynamic_Programming_with_Verification_and_Uncertainty_Quantification.pdf)
28. Cai, Yongyang (2020). The role of uncertainty in controlling climate change. Working paper.

### **Selected Other Publications**

29. Cai, Yongyang (2017). Tipping risks call for stringent climate policy. Discovery Themes blog, The Ohio State University. <https://discovery.osu.edu/tipping-risks-call-stringent-climate-policy>
30. Cai, Yongyang (2010). Dynamic programming and its application in economics and finance, PhD thesis, Stanford University.

### **Conference Presentations and Invited Talks**

1. A dynamic regional economic model to evaluate impacts of deglobalizing forces on food, energy and water systems and the sustainability of the Great Lakes region. AAEA Annual Meeting, Kansas City, Missouri, July 2020.
2. Climate Policy under Spatial Heat Transport: Cooperative and Noncooperative Regional Outcomes. Pennsylvania State University, April 2020.
3. Climate Policy under Spatial Heat Transport: Cooperative and Noncooperative Regional Outcomes. University of New Mexico, April 2020.

4. Climate Policy under Spatial Heat Transport: Cooperative and Noncooperative Regional Outcomes. The Midwest Economics Association's 84<sup>th</sup> Annual Meeting, Evanston, Illinois, March 2020.
5. Climate Policy under Spatial Heat Transport: Cooperative and Noncooperative Regional Outcomes. 2019 INFORMS Annual Conference, Seattle, Washington, October 2019.
6. Climate Policy with Carbon Removal and Storage in a Dynamic Stochastic Economy. 2019 INFORMS Annual Conference, Seattle, Washington, October 2019.
7. Climate Policy in a Dynamic Stochastic Economy. Blue Waters Symposium, Sunriver, Oregon, June 2019.
8. To Build or Not to Build? Capital Stocks and Climate Policy. The 8<sup>th</sup> AERE annual summer conference, Lake Tahoe, Nevada, May 2019.
9. Building a Dynamic Equilibrium Regional Economic Model for the Food, Energy and Water System. PMAT meeting, Columbus, November 2018.
10. Climate Policy under Cooperation and Competition between Regions with Spatial Heat Transport. SEA 88<sup>th</sup> Annual Meeting, Washington DC, November 2018.
11. Climate Policy under Cooperation and Competition between Regions with Spatial Heat Transport. 2018 INFORMS Annual Conference, Phoenix, November 2018.
12. Dynamic Portfolio Choice, nICE workshop, Stanford University, August 2018.
13. NLCEQ: A Nonlinear Certainty Equivalent Approximation method, nICE workshop, Stanford University, August 2018.
14. Climate Policy under Cooperation and Competition between Regions with Spatial Heat Transport. The 2018 China Meeting of the Econometric Society, Shanghai, June 2018.
15. To Build or Not to Build? Capital Stocks and Climate Policy. The 2nd Research Conference on Macroeconomic Modelling and Model Comparison, Stanford University, June 2018.
16. Climate Policy under Cooperation and Competition between Regions with Spatial Heat Transport. Blue Waters Symposium, Sunriver, Oregon, June 2018. (The video is available online: [https://www.youtube.com/watch?v=wfDAJN\\_g2ao](https://www.youtube.com/watch?v=wfDAJN_g2ao))
17. To Build or Not to Build? Capital Stocks and Climate Policy. Sustainable and Resilient Economics, The Ohio State University, February 2018.
18. Build now, regret later? Infrastructure and Climate Policy. 2017 INFORMS Annual Conference, Houston, Texas, October 2017.
19. Urbanization and property rights. International Society of Dynamic Games (ISDG) – China Chapter Conference on Dynamic Games and Game Theoretic Analysis, Ningbo, China, August 2017.
20. Policy Responses to Climate Change in a Dynamic Stochastic Economy, U.S. Business Council for Sustainable Development Conference, The Ohio State University, July 2017.
21. Build now, regret later? Infrastructure and Climate Policy. The 20<sup>th</sup> Annual Conference on Global Economic Analysis, Purdue University, June 2017.
22. Climate change impacts in a stochastic dynamic model of forestry. The 6<sup>th</sup> AERE annual summer conference, Pittsburgh, Pennsylvania, June 2017.
23. Climate Change Economics and Heat Transport across the Globe: Spatial-DSICE. The Conference on the Macro and Micro Economics of Climate Change, Santa Barbara, May 2017.
24. Dynamic stochastic integration of climate and economy. Byrd Polar and Climate Research Center, The Ohio State University, February 2017.
25. Spatial DSICE and Min-max Regret. RDCEP External Advising Board meeting, University of Chicago, January 2017.
26. Climate Change Economics and Heat Transport across the Globe: Spatial-DSICE. ASSA Annual Meeting 2017, Chicago, January 2017.
27. The social cost of carbon with economic and climate risks. Economic Research in High Performance Computing Environments Workshop, Federal Reserve Bank of Kansas City, Kansas, October 2016.
28. NLCEQ: A nonlinear certainty equivalent approximation method for dynamic stochastic problems. ICE 2016. Hoover Institution, Stanford, July 2016.



29. The social cost of carbon with economic and climate risks. The 2016 North American Summer Meetings of the Econometric Society, Philadelphia, June 2016.
30. Policy responses to climate change in a dynamic stochastic economy. Blue Waters Symposium, Sunriver, Oregon, June 2016.
31. The social cost of carbon with economic and climate risks. The University of Maryland, College Park, February 2016.
32. DSICE: a framework for social cost of carbon with uncertainty. RDCEP All Hands Meeting, University of Chicago, December 2015.
33. The social cost of carbon with economic and climate risks. The Ohio State University, January 2016.
34. Bayesian learning in dynamic stochastic integration of climate and economy. The 4<sup>th</sup> AERE annual summer conference, San Diego, California, June 2015.
35. The impact of economic and climate risks on the social cost of carbon. RDCEP All Hands Meeting, University of Chicago, November 2014.
36. The impact of economic and climate risks on the social cost of carbon. Developing the Next Generation of Economic Models of Climate Change Conference, University of Minnesota, September 2014.
37. Massive parallelism in economics and climate change. Dinner talk at ATPESC 2014, Argonne National Lab, August 2014. (The video is available online: <https://www.youtube.com/watch?v=Kkfl7WKHzY8>)
38. Numerical solutions for solving dynamic portfolio problems. SITE 2014, Stanford University, July 2014.
39. Nonlinear certainty equivalent method for high-dimensional dynamic programming problems. ICE 2014, Hoover Institution, Stanford, July 2014.
40. Optimal climate policy in the face of uncertainty. Purdue University, May 2014.
41. The social cost of stochastic and irreversible climate change and Bayesian learning. The World Bank, Washington D.C., December 2013.
42. The social cost of stochastic and irreversible climate change. AGU Annual Meeting, San Francisco, December 2013.
43. Dynamic stochastic integration of climate and economy. RDCEP All Hands Meeting, University of Chicago, October 2013.
44. The social cost of stochastic and irreversible climate change. INFORMS Annual Meeting, Minneapolis, October 2013.
45. Numerical dynamic programming and parallelization. Summer 2013 Computation in CA, Stanford University, July 2013.
46. Parallelization and GSSA. Summer 2013 Computation in CA, Stanford University, July 2013.
47. Advances in numerical dynamic programming and new applications. Workshop: Advances in Numerical Methods for Economics, International Monetary Fund, Washington D.C., June 2013. (The video is available online: <https://www.youtube.com/watch?v=avmoLzmZjj8>)
48. Parallelization for computational economics. Department of Economics, Stanford University, December 2012.
49. DSICE: dynamic stochastic integration of climate and economy. Computation Institute, University of Chicago, November 2012.
50. DICE-CJL & DSICE: integrated assessment models. Initiative for Computational Economics, University of Chicago, July 2012.
51. Tipping points in a dynamic stochastic IAM. The 2<sup>nd</sup> Annual Summer Conference, Association of Environmental and Resource Economists, Asheville, North Carolina, June 2012.

## **Teaching & Advising**

### **Teaching (The Ohio State University)**

AEDE 7120 – Advanced Quantitative Methods II, Autumn 2019 (SEI: 5/5)

AEDE 7110 – Advanced Quantitative Methods I, Autumn 2019 (SEI: 4.93/5)

AEDE 7320 – Advanced Resource Economics, Spring 2018, 2019 (SEI: 4.70/5)

AEDE 4002.01 – Econometric Applications in Agribusiness and Applied Economics, Autumn 2018  
AEDE 8895 – PhD Research Seminars, Autumn 2018  
AEDE 6120 – Applied Quantitative Analysis, Spring 2018  
AEDE 8200 – Frontiers of Applied Economics (computational methods in economics), Spring 2017

### **Guest Lecturer**

AEDE 7320 – Advanced Resource Economics, OSU, Spring 2017  
Econ 288 – Computational Economics, Stanford University, Fall 2012

### **Workshop Lecturer**

new Initiative for Computational Economics (nICE) summer workshop, Stanford University, 2018  
Initiative for Computational Economics (ICE) summer workshop, University of Chicago, 2012

### **Graduate Student Advising**

#### **Doctoral Student (Advisor)**

2016-present Ziyu Guo, The Ohio State University  
2017-present Ziqian Gong, The Ohio State University

#### **Doctoral Student (Co-Advisor)**

2016-2018 Yu Zhang, The Ohio State University (placement: Assistant Professor, University of International Business and Economics)  
2018-2019 Di Wu, The Ohio State University (placement: Assistant Professor, Zhejiang Gongshang University)

#### **Doctoral Student (Dissertation Committee Member)**

2016-2018 Shaohui Tang, The Ohio State University  
2017-2018 Yun Pu, The Ohio State University  
2018-present Ziyu He, University of California, Santa Cruz

### **Postdoc Supervising**

2018-2019 Shaohui Tang, The Ohio State University

## **Service**

### **Editor**

Guest Editor, a special issue of the journal “*Mitigation and Adaptation Strategies for Global Change*” (impact factor: 2.6), 2018-2019

### **Reviewer of Economic Journals**

American Economic Journal: Economic Policy; American Economic Journal: Macroeconomics; American Journal of Agricultural Economics; Computational Economics; Economics of Innovation and New Technology; Environmental Economics and Policy Studies; Environmental and Resource Economics; Journal of Economic Dynamics and Control; Journal of Environmental Economics and Management; Journal of Forest Economics; Journal of Global Economic Analysis; Journal of the Association of Environmental and Resource Economists; Quantitative Economics; Studies in Nonlinear Dynamics & Econometrics

### **Reviewer of Other Journals**

Advances in Atmospheric Sciences; Appl. Math. J. Chinese Univ.; Climatic Change; Ecosystem Services; Journal of Agricultural Science and Technology; Mitigation and Adaptation Strategies for Global Change; Nature Communications; Proceedings of the National Academy of Sciences

### **Reviewer of Grant Proposals**

Alfred P. Sloan Foundation; Austrian Science Fund (FWF); National Science Foundation; Swiss National Science Foundation; Swiss National Supercomputing Centre

### **Other Review Service**

Agricultural & Applied Economics Association annual meeting (abstract reviewer); Czech National Bank; The Annual Conference on Global Economic Analysis (abstract reviewer)

### **Organizer/Co-organizer**

INFORMS 2019 invited session “Economic Development, Energy and Climate” (chair and organizer)

INFORMS 2019 invited session “Economic Growth, Environment and Climate” (chair and organizer)

INFORMS 2018 invited session “Advances in Integrated Assessment Modeling” (chair and organizer)

INFORMS 2017 invited session “Energy and Climate” (chair and organizer)

ASSA 2017 session "Decision Making in the Face of Economic and Climate Uncertainty"

ICE 2014 Workshop

Workshop of Summer 2013 Computation in CA

### **Departmental Service (The Ohio State University)**

2019-present Member, Ad Hoc Nomination Committee

2018-present Member, Graduate Studies Committee

2017-present Member, Ad Hoc Seminar Committee

2017-present Faculty mentor for undergraduate students

### **University Service (The Ohio State University)**

Environmental Fellowship Committee, 2020

Poster reviewer, CFAES Graduate Poster Competition 2019

Graduate Faculty Representative for PhD Oral Exams:

Jon Michel (2019, Department of Economics); Nam Gang Lee (2018, Department of Economics);

Hyungjo Hur (2017, The John Glenn College of Public Affairs)

### **Professional Affiliations**

American Economic Association (AEA); Association of Environmental and Resource Economists (AERE); Agricultural and Applied Economics Association (AAEA); Econometric Society; The Institute for Operations Research and the Management Sciences (INFORMS)