

James B. Bushnell

Dept. of Economics
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Education

- 1989-1993 **University of California at Berkeley**
Ph. D. Industrial Engineering and Operations Research, December 1993
M.S. Operations Research, May 1990
- 1984-1989 **University of Wisconsin - Madison**
B.S. Economics and Industrial Engineering (Double Major), May 1989

Research Interests

- Industrial Organization and Regulation
- Energy Economics and Policy
- Environmental Economics

Academic Appointments

- 2011-present **University of California, Davis (Davis, CA)**
Associate Professor, Dept. of Economics, 2011-2015
Professor, Dept. of Economics, 2015-
- 2009-2011 **Iowa State University (Ames, IA)**
Associate Professor, Dept. of Economics, 2009 -
Cargill Chair in Energy Economics

Director, Biobased Industry Center, 2009 -
- 1993-2009 **University of California Energy Institute (Berkeley, CA)**
Assistant Research Scientist, 1993-1998
Associate Research Scientist, 1999-2002
Research Scientist, 2003-
Director of Research, 1998 -

Other Professional and Public Appointments

- 2007 - **National Bureau of Economic Research**
Faculty Research Fellow (2007-2009), Research Associate (2009-Present)
- 2013 **Victoria University (Wellington, New Zealand)**
S.T. Lee Fellow in Competition and Regulation.
- 2002 - **California Independent System Operator (Folsom, CA)**
Member, Market Surveillance Committee
- 1999- 2001 **California Power Exchange (Pasadena, CA)**
Member, Market Monitoring Committee
- 2009-2014 **California Air Resources Board (Sacramento, CA)**
Member, Economic Assessment and Allocation Committee (2009-2010),
Member Emissions Market Assessment Committee (2012-2014)

James Bushnell

Teaching Experience

- 2011- **Dept. of Economics, University of California, Davis (Davis, CA)**

Econ 100 – Intermediate Microeconomics, Winter 2012, 2013, 2014, 2015, 2016
Econ 125 – Energy Economics, Fall 2014, Winter 2015, Fall 2016
Econ 221 - Graduate Industrial Organization, Fall 2013.
- 2010 **Dept. of Economics. Iowa State University.**

Econ 301 – Intermediate Microeconomics, Fall 2010
- 1999-2009 **Haas School of Business, University of California (Berkeley, CA)**

BA212 –Energy and Environmental Markets, Spring 99, 01, 02, 04, 07, 08, 09
MBA201a – Economic Analysis for Business Decisions, Fall 02

Research Funding

- Sloan Foundation. Research on Energy Infrastructure, with a focus on hydrocarbon transport and local energy distribution.* (with Erin Mansur and Ryan Kellog) \$588,800.
- California Air Resources Board. 2015-2017. Proposal to establish the ARB Economic Fellowship Program.* \$350,000.
- UC Energy and Environmental Economics Program. The costs of supply volatility in the integration of renewable electricity generation.* (with Kevin Novan). \$17,000.
- UC-Davis Research Investments in the Sciences and Engineering. Cyber Security for Critical Infrastructures.* (with Karl Levitt, Ho-Chen, George Barnett, Anna Scaglione, and Nicole Woolsey-Biggert). \$840,000.
- NSF 2012-2014. Towards Securing Coupled Financial and Power Systems in the Next Generation Smart Grid.* (with Karl Levitt, Anna Scaglione, and Jeff Rowe and George Kasztenitas). \$240,000 (Bushnell Share)
- California Air Resources Board. 2012-2013. Emissions Market Assessment Committee for the California GHG Cap and Trade Market.* (with Severin Borenstein and Frank Wolak). \$300,000.
- California Air Resources Board. 2012-2013. Market Simulation of the California Greenhouse Gas Emissions Allowance Market.* (with Severin Borenstein and Frank Wolak). \$300,000.
- DOE/NSF, 2011-2013. Development of a Graduate Course in Energy Economics and Policy.* \$144,000. (Bushnell Share)
- USDA-NIFA, 2011-2014. Implications of U.S. Climate Policy Choices for Agricultural Input Competitiveness, Costs, and Usage.* (with Dermot Hayes). \$295,000.
- USDA-NNF, 2011-2014. A Proposal to Train Doctoral Students in the Economics and Management of Bio-renewable Energy* (with John Beghin and Giancarlo Moschini).
- California Air Resources Board. 2010-2011. Implementation of Carbon Emissions Trading in Regional Electricity Markets.* (with Yihsu Chen). \$83,000.
- Power Systems Engineering Research Center. 2010-2011. “Interactions of Multiple Market-based Energy and Environmental Policies in a Transmission-Constrained Competitive National Electricity Market.”* (with William Schulze, Danial Tyvlasky, Ward Jewell, Shmuel Oren, Yishu Chen, and Siny Joseph). \$60,000 (Bushnell Share)
- California Energy Commission, 2002-2009. Grant to establish the Center for the Study of Energy Markets* (with Severin Borenstein), \$1,450,000. (over 2 grants)
- Sloan Foundation - NBER program on International Productivity Comparisons; 2003*
2007 Analysis of Human - Technology Variation on the Productivity of Electricity Generation

James Bushnell

(with Catherine Wolfram),
California Energy Commission, 2003-2005 “Analysis of the impact of environmental regulations on gasoline production in California (with Severin Borenstein)

Other Professional and Academic Activities:

Editorial Board *Economics of Energy and Environmental Policy*. 2013- present.

Associate Editor (for Energy and Resources), *Operations Research*, 2006-2011.

Associate Editor, *Utilities Policy*, 1998-2001.

Referee for: *American Economic Review*, *Annals of Operations Research*, *Canadian Journal of Economics*, *Climate Policy*, *The Energy Journal*, *Energy Policy*, *European Economic Review*, *International Journal of Industrial Organization*, *Journal of Economics and Management Strategy*, *Journal of Environmental Economics and Management*, *Journal of Industrial Economics*, *Journal of Regulatory Economics*, *Journal of Political Economy*, *Management Science*, *Networks*, *Operations Research*, *Rand Journal of Economics*, *Resource & Energy Economics*, *Review of Economics and Statistics*, *Review of Industrial Organization*

Journal Publications

“Reforming the US Coal Leasing Program.” with Kenneth Gillingham (lead author); Meredith Fowlie, Michael Greenstone, Alan Krupnick, Charles Kolstad, Adele Morris, Richard Schmalensee, James Stock. *Science*, 2016, Vol. 354 (December): 1096-1098.

“State-level Strategic Policy Choice: The EPA’s Clean Power Plan.” (with Stephen Holland, Jon Hughes, and Chris Knittel.) *American Economic Journal: Economic Policy*. Forthcoming.

“The US Electricity Industry after 20 Years of Restructuring.” (with Severin Borenstein). *Annual Review of Economics*. Vol 7, No. 1: 437-463. 2015.

“An Economic Perspective on the EPA’s Clean Power Plan,” with Meredith Fowlie, Lawrence Goulder and Matthew Kotchen, (lead authors); Severin Borenstein, Lucas Davis, Michael Greenstone, Charles Kolstad, Christopher Knittel, Robert Stavins, Michael Wara, and Frank Wolak. *Science*, 2014, Vol. 346 (November): 815-816.

“Downstream Regulation of CO2 Emissions in California’s Electricity Sector.” (with Matthew Zaragoza and Yishu Chen). *Energy Policy*. Vol. 64: 313-323. January 2014.

“Profiting from Regulation: An Event Study of the EU Carbon Market.” *American Economic Journal: Economic Policy*. (with Howard Chong and Erin Mansur) Vol 5, No. 4. November, 2013.

“Nation-wide Transmission Overlay Design and Benefits Assessment for the U.S.” *Energy Policy*. (with Venkat Krishnan, James D McCalley, and Santiago Lemos) Vol 56: 221-232. May 2013.

“The Economic Effects of Vintage Differentiated Regulations: The Case of New Source Review.” (with Catherine Wolfram). *Journal of Environmental Economics and Management*. Vol. 64, No. 1. September 2012.

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- “Regulation, Allocation and Leakage in Cap-and-Trade Markets for CO₂.” (with Yishu Chen) *Resources and Energy Economics*. Vol. 34, No. 4. September 2012.
- “Vertical Targeting and Leakage in Carbon Policy,” (with Erin Mansur), *American Economic Review Papers and Proceedings*, Volume 101, Issue 2, May 2011.
- “Upstream vs. Downstream CO₂ Trading: A Comparison for the Electricity Context,” *Energy Policy*. 38(7), pages 3632-3643, July. 2010. (With Ben Hobbs and Frank Wolak).
- “Local Solutions to Global Problems: Climate Change Policy Choice and Regulatory Jurisdiction.” *Review of Environmental Economics and Policy*. Vol 2, pp. 175-193. 2008. (with Carla Peterman and Catherine Wolfram)
- “Implementation of California AB 32 and its Impact on Electricity Markets.” *Climate Policy*. Vol. 8, pp. 277-292. December, 2008.
- “Vertical Arrangements, Market Structure and Competition: An analysis of Restructured U.S. Electricity Markets.” *American Economic Review*. Vol 98, No. 1. March 2008. (with Erin Mansur and Celeste Saravia)
- “Inefficiencies and Market Power in Financial Arbitrage: A Study of California's Electricity Markets,” *Journal of Industrial Economics*. Vol 56, No. 2, June 2008. (with Severin Borenstein, Chris Knittel, and Catherine Wolfram).
- “Oligopoly Equilibria in Electricity Contract Markets,” *Journal of Regulatory Economics*. Vol. 32: 225-245. 2007.
- “Consumption under noisy price signals: a study of electricity retail rate deregulation in San Diego.” *Journal of Industrial Economics*. Vol. 53, No. 4, December, 2005. (with Erin Mansur).
- “California's Electricity Crisis: A Market Apart?” *Energy Policy*. Vol. 32, No. 9, June 2004.
- “A Mixed Complementarity Model of Hydro-Thermal Competition in the Western U.S.” *Operations Research*. Vol. 51, No. 1, January-February 2003.
- “Measuring Market Inefficiencies in California’s Deregulated Electricity Industry.” *American Economic Review*. Vol. 92, No. 5, December 2002. (with Severin Borenstein and Frank Wolak).
- “The Competitive Effects of Transmission Capacity in a Deregulated Electricity Industry.” *Rand Journal of Economics*. Vol. 31, No. 2, Summer 2000. (with Severin Borenstein and Steven Stoff).
- “Market Power in Electricity Markets: Beyond Concentration Measures.” *The Energy Journal*. Vol. 20, No. 4, October, 1999. (with Severin Borenstein and Chris Knittel).
- “An Empirical Analysis of the Potential for Market Power in a deregulated California Electricity Industry.” *Journal of Industrial Economics*. Vol. 47, No. 3, September, 1999. (with Severin Borenstein).
- “Transmission Pricing in California’s Proposed Electricity Market.” *Utilities Policy*, Vol 6, No. 3,

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September, 1997. (with Shmuel Oren).

“Improving Private Incentives for Electric Grid Investment.” *Resource & Energy Economics*. Vol. 19, No. 1-2, March, 1997. (with Steve Stoft).

“Market Power in California Electricity Markets.” *Utilities Policy*, Vol 5, No. 3-4, October, 1996. (with Severin Borenstein, Edward Kahn, and Steven Stoft).

“Electric Grid Investment Under a Contract Network Regime.” *Journal of Regulatory Economics*, Vol. 10, No.1, July, 1996. (with Steven Stoft).

“Internal Auctions for the Efficient Sourcing of Intermediate Products.” *Journal of Operations Management*, Vol. 12, April 1995. (with Shmuel Oren).

“Incentive Effects of Environmental Adders in Electric Power Auctions.” *The Energy Journal*, Vol. 15, No. 3, September, 1994. (with Shmuel Oren).

“Bidder Cost Revelation in Electric Power Auctions.” *Journal of Regulatory Economics*, Vol. 6, No. 1, February, 1994. (with Shmuel Oren).

Other Publications

James Bushnell. “The Economics of Carbon Offsets.” In *The Design and Implementation of U.S. Climate Policy*. Chapter 12 in Don Fullerton and Catherine Wolfram. Eds. University of Chicago Press. September, 2012.

James Bushnell. “Comment on ‘Schlenker and Roberts, Is Agricultural Production Becoming More or Less Sensitive to Extreme Heat? Evidence from US Corn and Soybean Yields’.” In *The Design and Implementation of U.S. Climate Policy*. Chapter 17 in Don Fullerton and Catherine Wolfram. Eds. University of Chicago Press. September, 2012.

In James Bushnell. “Building Blocks: Investment in Renewable and Non-Renewable Resources.” In *Harnessing Renewable Energy in Electric Power Systems*. Boaz Moselle, Jorge Padilla, and Richard Schmalensee, Eds. Resources for the Future Press. Washington, DC. 2010.

James Bushnell, Benjamin Hobbs, and Frank Wolak. “When it comes to demand response, is FERC its own worst enemy?” *The Electricity Journal*. November, 2009.

James Bushnell and Catherine Wolfram, “The Guy at the Controls: Labor Quality and Power Plant Efficiency.” In *International Differences in the Business Practices and Productivity of Firms*. Richard Freeman and Kathryn Shaw, Eds. University of Chicago Press. 2009.

James Bushnell and Catherine Wolfram. “Electricity Markets,” *New Palgrave Dictionary of Economics and the Law*. Steven N. Durlauf and Lawrence E. Blume, eds. Palgrave Macmillan. 2008.

James Bushnell “Electricity Resource Adequacy: Matching Policies and Goals,” *The Electricity Journal*. September, 2005.

James Bushnell “Looking for Trouble: Competition Policy in the U.S. Electricity Industry,” Chapter 6 in *Electricity Restructuring: Choices and Challenges*. Puller and Griffen, Eds. University of Chicago Press. 2005.

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James Bushnell “West Coast Power Blues.” *New York Newsday* Op-ed Section. January 7, 2001.

Severin Borenstein and James Bushnell. “California consumers haven’t seen the benefits of deregulating the electricity industry yet – what went wrong?” *San Jose Mercury News* Op-ed Section. August 27, 2000.

Severin Borenstein and James Bushnell, “Electricity Restructuring: Deregulation or Reregulation?” *Regulation*. Vol. 23, No. 2.

James Bushnell, “Transmission Rights and Market Power,” *The Electricity Journal*, Vol. 12, No. 9, October, 1999.

James Bushnell and Steven Stoft. “Grid Investment: Can a Market do the Job?” *The Electricity Journal*, Vol. 9, No. 1, January, 1996.

Carl Blumstein and James Bushnell. “A Guide to the Blue Book: Issues in California’s Electric Industry restructuring and Regulatory Reform.” *The Electricity Journal*, Vol. 7, No. 7, September, 1994.

Working Papers

James Bushnell and Jacob Humber “Rethinking Trade Exposure: The Incidence of Environmental Charges in the Nitrogenous Fertilizer Industry.” (with Jacob Humber). *Journal of the Association of Environmental and Resource Economists*. In 2nd Revision.

Severin Borenstein, James Bushnell, Frank Wolak, and Matthew Zaragoza-Watkins. “Expecting the Unexpected: Environmental Policy Choice and Emissions Market Design.” NBER Working Paper No. 20999, March 2015. *Under submission*.

James Bushnell. “Adverse Selection and Emissions Offsets.” Energy Institute at Haas Working Paper 222. September 2011.

James Bushnell, Carla Peterman, Catherine Wolfram, “California’s Greenhouse Gas Policies: How do they add up?” CSEM-166. University of California Energy Institute. April 2007.

James Bushnell and Jun Ishii. “A Dynamic Model of Investment in a Restructured Electricity Industry.” CSEM-164. University of California Energy Institute. January, 2007.

James Bushnell and Catherine Wolfram, “Ownership Change, Incentives and Plant Efficiency: The Divestiture of U.S. Electric Generation Plants.” Report CSEM-140 University of California Energy Institute, March 2005.

Severin Borenstein and James Bushnell, “Retail Policies and Competition in the Gasoline Industry,” CSEM-144, University of California Energy Institute, May 2005.

Severin Borenstein, James Bushnell and Matthew Lewis, “Market Power in California’s Gasoline Market.” Report CSEM-132, University of California Energy Institute, May 2004.

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James Bushnell and Celeste Saravia. "An Empirical Assessment of the Competitiveness of the ISO New England's Electricity Market," Report CSEM-101, University of California Energy Institute, December 2001.

Regulatory Filings or Reports

Opinions of the Market Surveillance Committee of the California ISO. (with Benjamin Hobbs, Scott Harvey, and Shmuel Oren (2011-2015), Frank Wolak and Benjamin Hobbs (2005-2008) and Brad Barber (2002-2005). Numerous opinions available at <http://www.caiso.com/docs/2000/09/14/200009141610025714.html>.

Severin Borenstein, James Bushnell, Frank Wolak, and Matthew Zaragoza-Watkins. "Report of the Market Simulation Group on Competitive Supply/Demand Balance in the California Allowance Market and the Potential for Market Manipulation." California Air Resources Board. June 2014.

Ross Baldick, James Bushnell, Ben Hobbs, and Frank Wolak. "Optimal Charging Arrangements for Energy Transmission." Report prepared for Ofgem Project TransmiT, Great Britain Office of Gas & Electricity Markets. May, 2011.

Bushnell, J, L. Goulder, C.R. Knittel, S. Levy, N.E. Ryan, N. Sidhu, J. Sweeney. "EAAC Economic Impacts Subcommittee Report on Air Resources Board's Updated AB 32 Scoping Plan Analysis.", March 2010.

Goulder, L., J. Adams, V. Arroyo, M. Barger, J.K. Boyce, D. Burtraw, J. Bushnell, R. Fisher, R. Frank, R. Frank, D. Kamman, C.R. Knittel, S. Levy, J. Nation, N.E. Ryan, N Sidhu, J.L. Sweeney. "Allocating Emissions Allowances Under a California Cap-and-Trade Program: Recommendations to the California Air Resources Board and California Environmental Protection Agency from the Economic and Allocation Advisory Committee", March 2010.

Ross Baldick, Ashley Brown, James Bushnell, Sue Tierney, and Terry Winter. "A National Perspective on Allocating the Costs of New Transmission Investment: Practice and Principles." White Paper prepared by the Blue Ribbon Panel on Transmission Cost Allocation for WIRES. October, 2007.

James Bushnell. "Comments on Horizontal Market Power Screens and Market-Based Rates for Public Utilities. Federal Energy Regulatory Commission. Docket No. RM04-7-000. June 30, 2004.

James Bushnell and Robert Wilmouth. "Comments of the Market Monitoring Committee of the California Power Exchange on the Federal Energy Regulatory Commission order of Nov. 1 proposing remedies for the California wholesale electricity market. Nov. 22, 2000.

James Bushnell, Alvin Klevorick, and Robert Wilmouth. "The impact of reliability must-run contract reform and ancillary-services market redesign on the performance of California's energy market." 3rd report to FERC of the Market Monitoring Committee of the California Power Exchange. June 6, 2000.

Severin Borenstein, James Bushnell, and Chris Knittel, "Comments on the use of computer models for merger analysis in the electricity industry," Federal Energy Regulatory Commission. Docket No. PL98-6-000. June, 1998.

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Severin Borenstein, James Bushnell, and Chris Knittel, "A Cournot-Nash Equilibrium Analysis of the New Jersey Electricity Market." Appendix A of Review of General Public Utilities' Restructuring Petition, Final Report. New Jersey Board of Public Utilities. Docket No. EA97060396. January, 1998.

Work in Progress

Commodity price impacts of oil-by-rail (with Aaron Smith and Jon Hughes)

Economics of the future grid: the future of electricity distribution (with Severin Borenstein, Dave Rapson, and Kevin Novan)

Vertical Position in Merger Analysis (with Erin Mansur and Frank Wolak)

Selected Presentations

"State Level Strategic Policy Choice: The US EPA's Clean Power Plan."
Colorado School of Mines (February 2016), Carnegie Mellon University (April 2015), UC Berkeley POWER conference (March 2015).

"Expecting the Unexpected: Emissions Market Uncertainty and Environmental Market Design." National University of Singapore (August 2015), Toulouse Conference on Energy, Toulouse, France. (June 2014). University of Illinois, Heartland Environmental and Resource Economics Workshop (October, 2013).

"The US Electricity Industry after 20 years of restructuring"
World Bank, Washington DC (November 2015), University of Melbourne (August 2015), University of Auckland (August 2015), Carnegie Mellon University (May 2015), University of Guelph, Dept. of Economics (September 2014), American Bar Association Anti-trust Symposium (May, 2009), Energy Information Administration Energy Conference (May, 2008), Harvard Electricity Policy Group (December 2007).

"Vertical Forward Commitments." Toulouse Conference on Energy, Toulouse, France (2014), IESE Business School. Barcelona. (June 2014). UC Davis Game Theory Workshop (April 2014). University of Auckland CMSS Summer Workshop (December 2013).

"Profiting from Regulation: An event study of the EU carbon market." Rice University (March 2011), University of Michigan (October, 2010), UC Santa Barbara Occasional Workshop on Environmental and Resource Economics (October 2009), UC Energy Institute (October 2009), UC Davis, Dept. of Economics (October, 2009), University of Illinois, Heartland Environmental and Resource Economics Workshop (November, 2009), University of Minnesota, Dept. of Applied Economics (November, 2009).

"Regulation, Allocation, & Leakage in Cap-and-Trade Markets for CO2." Rice University (December, 2008), UC Energy Institute POWER research conference (March, 2009). NBER winter institute (March, 2009), Johns Hopkins SAIS (April 2009), Iowa State University, May 2009.

James Bushnell

“Local Solutions to Global Problems: Climate Change Policy Choice and Regulatory Jurisdiction.” Gulf Coast Power Association (May, 2010), University of East Anglia, Center for Competition Policy (June, 2008), London Energy Forum (October 2007), UC Energy Institute POWER research conference (March, 2007), Western Power Trading Forum (New York, February 2007).

“The Economic Effects of Vintage Differentiated Regulations: The Case of New Source Review.” Yale University Environmental Economics Seminar (October, 2006), Tufts University, Dept. of Economics (October 2006), Johns Hopkins University (October 2006), UC Berkeley, Dept. of Ag. and Resource Econ (December 2005), University of Toulouse, IDEA, Economics of the Electricity Industry Conference (June 2005).

“Vertical Arrangements, Market Structure and Competition: An analysis of Restructured U.S. Electricity Markets.” Association of Competition Economists, Best paper of 2008 Award Ceremony, Berlin. (November, 2009), Nordic Energy Research Program, Iceland (September, 2006), Australian Competition and Consumer Commission Regulatory Conference (July, 2006), UC Irvine, Dept. of Economics (May, 2005), Universite Catolica de Louvain, Belgium (January 2004), Econometric Society Meetings, Northwestern University (June 2003), University of Wyoming, Dept. of Economics (April, 2003),.

“Diagnosing Market Power in California’s Restructured Wholesale Electricity Market,” UC Davis (Spring 2001), Dept. of Ag. & Applied Economics. University of Wisconsin, Madison. (February, 2001).

“California’s Electricity Restructuring: A Market Apart?” Australian Economic Society, Sydney MIT, Center for Environmental and Energy Policy Research (December 2001), University of Arizona. (April 2001), Public Utilities Research Center, University of Florida, Gainesville (February, 2001), Presentation to the Wisconsin Congressional Delegation. Washington, D.C. (January, 2001), National Association of Business Economists. Federal Reserve Bank of San Francisco (October 2000).

Other Consulting Projects

TrustPower (New Zealand), 2014.
Ofgem (UK), 2010-2011.
Korean Power Exchange, 2008.
Korean Electric Power Company, 2007.
WIRES, 2007.
Energy Information Administration, 2006
Wisconsin Public Power Inc., 2001
ISO – New England, Massachusetts Attorney General, 2001
U.S. Dept. of Justice, 2001
Customers First! Coalition of Wisconsin, 2000
The World Bank, 1999-2000
New Jersey Board of Public Utilities, 1997