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## VITA

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Current Position: Principal Economist  
Federal Reserve Board of Governors  
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Education: Ph.D., 2005, Department of Economics, University of Virginia.  
M.A., 1996, Department of Economics, American University.  
B.A., 1992, Pennsylvania State University, in Economics.

Positions: 2000-2002 Instructor, University of Virginia (microeconomics, statistics)  
2002-2009 Economist, Board of Governors of the Federal Reserve System  
2010-2015 Senior Economist, Board of Governors of the Federal Reserve System  
2015-present Principal Economist, Board of Governors of the Federal Reserve System

## Published Papers

“Defining unemployment in developing countries: evidence from Trinidad and Tobago,” with Eric Strobl. *Journal of Development Economics* 73, no. 1 (2004): 465-476.

“Formal home health care, informal care, and family decision making,” with Michelle S. Goeree, Bridget Hiedemann, and Steven Stern. *International Economic Review* 50, no. 4 (2009): 1205-1242.

“Is the Information Technology Revolution Over?” with Stephen D. Oliner, and Daniel E. Sichel. *International Productivity Monitor*, no. 25 (2013): pp. 20-36.

“The Scope of U.S. ‘Factoryless Manufacturing’” with Kimberly Bayard and Dominic Smith, in Houseman, Susan N., and Michael J. Mandel eds., *Measuring Globalization: Better Trade Statistics for Better Policy*, vol. 2, pp. 81-120. Kalamazoo, Michigan: W.E. Upjohn Institute for Employment Research (2015).

“Does the United States have a productivity slowdown or a measurement problem?” with John G. Fernald, and Marshall B. Reinsdorf. *Brookings Papers on Economic Activity* 2016, no. 1 (2016): 109-182.

“Prices of High-Tech Products, Mismeasurement, and the Pace of Innovation,” with Stephen D. Oliner, and Daniel E. Sichel. *Business Economics*, vol. 52, no. 2 (2017): pp. 103-113.

“ICT Services and Their Prices: What Do They Tell Us about Productivity and Technology?” with Carol Corrado. *International Productivity Monitor*, vol. 33 (2017), pp. 150-181.

“Quality-Adjusted Price Measurement: A New Approach with Evidence from Semiconductors,” with Brian K. Kovak, and Ryan Michaels. *Review of Economics and Statistics* 99, no. 2 (2017): pp. 330-342.

“The Rise of Cloud Computing: Minding Your P’s, Q’s and K’s,” with Carol Corrado and Daniel E. Sichel. Forthcoming in Carol Corrado, Jonathan Haskel, Javier Miranda, and Daniel Sichel, eds., *Measuring and Accounting for Innovation in the 21st Century*. (Available as No. w25188. National Bureau of Economic Research (2018): <https://www.nber.org/papers/w25188>.)

“How fast are semiconductor prices falling?” with Stephen D. Oliner, and Daniel E. Sichel. *Review of Income and Wealth* 64, no. 3 (2018): pp. 679-702.

“Getting Smart About Phones: New Price Indexes and the Allocation of Spending Between Devices and Services Plans in Personal Consumption Expenditures”, with Ana Aizcorbe and Daniel E. Sichel. Forthcoming in *Measuring Economic Growth and Productivity*. (Available as Finance and Economics Discussion Series 2019-012. Board of Governors of the Federal Reserve System (U.S.) (2019): <https://doi.org/10.17016/FEDS.2019.012>.)

“Accounting for Innovations in Consumer Digital Services: IT still matters”, with Carol A. Corrado. Forthcoming in Carol Corrado, Jonathan Haskel, Javier Miranda, and Daniel Sichel, eds., *Measuring and Accounting for Innovation in the 21st Century*. (Available as Finance and Economics Discussion Series 2019-049. Board of Governors of the Federal Reserve System (U.S.) (2019): <https://doi.org/10.17016/FEDS.2019.049>.)

"The Increasing Deflationary Influence of Consumer Digital Access Services," with Carol Corrado. *Economics Letters* 196 (2020).

“The Digital Economy and Productivity,” in *The Measure of Economies: Measuring Productivity in an Age of Technological Change* (2024). Brookings Institution, Washington, D.C.

## Working Papers

“Prices for Communications Equipment: Rewriting the Record,” with Carol A. Corrado. Finance and Economics Discussion Series 2015-069. Board of Governors of the Federal Reserve System (U.S.) (2015). (Available at: <http://dx.doi.org/10.17016/FEDS.2015.069>.)

“ICT Asset Prices: Marshaling Evidence into New Measures,” with Carol Corrado. Finance and Economics Discussion Series 2017-016. Board of Governors of the Federal Reserve System (U.S.) (2017). (Available at: <https://doi.org/10.17016/FEDS.2017.016r1>.)

## Notes

“The Recent Slowdown in High-Tech Equipment Price Declines and Some Implications for Business Investment and Labor Productivity,” with Eugénio P. Pinto. FEDS Notes 2015-03-26. Board of Governors of the Federal Reserve System (U.S.) (2015). (Available at: <https://doi.org/10.17016/2380-7172.1512>.)

“Domestic Electronics Manufacturing: Medical, Military, and Aerospace Equipment and What We Don't Know about High-Tech Productivity,” FEDS Notes 2015-06-02. Board of Governors of the Federal Reserve System (U.S.) (2015). (Available at: <https://doi.org/10.17016/2380-7172.1548>.)

“Recent Trends in Communications Equipment Prices,” with Carol A. Corrado. FEDS Notes 2015-09-29. Board of Governors of the Federal Reserve System (U.S.) (2015). (Available at: <https://doi.org/10.17016/2380-7172.0067>.)

“Prices for Data Storage Equipment and the State of IT Innovation,” FEDS Notes 2015-07-01. Board of Governors of the Federal Reserve System (U.S.) (2017). (Available at: <https://doi.org/10.17016/2380-7172.0056>.)

“Own-Account IT Equipment Investment,” with Carol A. Corrado, and Daniel E. Sichel. FEDS Notes 2017-10-04. Board of Governors of the Federal Reserve System (U.S.) (2017). (Available at: <https://doi.org/10.17016/2380-7172.2071>.)

“The Mysterious Cross-Country Dispersion in Mobile Phone Price Trends,” *FEDS Notes* 2019-08-05. Board of Governors of the Federal Reserve System (U.S.). (Available at: <https://doi.org/10.17016/2380-7172.2413>)

"The Increasing Deflationary Influence of Consumer Digital Access Services," with Carol Corrado. *Economics Letters*. 2020. <https://doi.org/10.1016/j.econlet.2020.109447>

“Accounting for Innovations in Consumer Digital Services: IT Still Matters,” with Carol Corrado. *National Bureau of Economic Research Studies in Income and Wealth* (2021)

“The Digital Economy and Productivity,” FEDS Working Paper 2022-038.

#### Work in Progress

“The Global Electronics Supply Chain from Soup to Nuts,”

“Phantom Data Centers? Where are All the Chips Going?”

“Generative AI at the Crossroads: Light Bulb, Dynamo, or Microscope?” with Martin Baily, Aidan Kane, and Paul Soto

“Historical Geography of the Semiconductor Industry,” with Molly Harnish and Adrian Hamins-Puertolas.

“Computer Depreciation, Used Prices, and the Business Cycle,” with Wendy Dunn and Eugénio P. Pinto

“Nobody Beats the Wiz? Establishment Effects in a Perfectly Competitive Market,” with Isabel Leigh.

“Where’s Qualcomm? Identifying Global Manufacturers in the National Accounts”

“Why are Personal Computers Still Manufactured in the United States?”

“Storage Matters: Constant-quality Prices for the Lowly Disk Drive”

“The Scope of U.S. Factoryless Manufacturing,” with Kimberly Bayard and Dominic Smith

“In search of the White Whale: Location Decisions of Unbranded U.S. PC Manufacturers”

“A nonparametric Estimator of Unemployment Insurance Effects”

#### Presentations

Conference on Research on Income and Wealth (NBER Summer Institute), July 2007, “Prices for Communications Equipment: Updating and Revisiting the Record.”

Conference on Research on Income and Wealth (NBER Summer Institute), July 2009, “Why are PCs Still Manufactured in the United States?”

College of Nanoscale Science and Engineering, April 2011, “Where’s Qualcomm? How Statistics Obscure the Leading Edge of the U.S. Semiconductor Industry.”

Conference on “Measuring the Effects of Globalization,” February 2013, “The Scope of U.S. Factoryless Manufacturing.”

Center for Economic Studies, U.S. Bureau of the Census, May 2013, “The Scope of U.S. Factoryless Manufacturing.”

Congressional Budget Office, August 2013, “Is the Information Technology Revolution Over?”

Washington International Trade Association, June 2014, “The Scope of U.S. Factoryless Manufacturing”

Conference on Research on Income and Wealth (NBER Summer Institute), July 2014, “How Fast are Semiconductor Prices Falling?”

Society for Economic Measurement Conference, August 2014, “How Fast are Semiconductor Prices Falling?”

Bureau of Economic Analysis, April 2016, “The State of IT Price Measurement”

American Economic Association Annual Meeting, January 2017, “A New Look at Prices of Personal Computers: Desktops, Laptops, and Tablets”

Bureau of Economic Analysis Advisory Committee, May 2017, “The Rise of Cloud Computing: Minding Your P’s and Q’s (and K’s)”

American Enterprise Institute, November 2017, “Possible Sources for the (Measured) Productivity Slowdown”

5th IMF Statistical Forum: Measuring the Digital Economy, November 2017, “The Rise of Cloud Computing: Minding Your P’s and Q’s (and K’s)”

Fifth World KLEMS Conference, June 2018, “Accounting for Innovation in Consumer Digital Services: Implications for economic growth and consumer welfare”

Society of Government Economists, April 2019, "Getting Smart About Phones: New Price Indexes and the Allocation of Spending Between Devices and Services Plans in Personal Consumption Expenditures."

Economic Statistics Centre of Excellence, May 2019, "Getting Smart About Phones: New Price Indexes and the Allocation of Spending Between Devices and Services Plans in Personal Consumption Expenditures."

Society for Economic Measurement, August 2019, "The State of Play in Price Measurement for Consumer Electronics: A Cross-Country Comparison."

Brookings Institution, Productivity Measurement Initiative meeting, April 2020, "Measuring the Digital Economy."

CRIW Conference on Technology, Productivity, and Economic Growth, Spring 2022, "Historical Geography of the Semiconductor Industry."

Conference on Research on Income and Wealth (NBER Summer Institute), July 2023, "Transistors all the Way Down: Viability of Direct Volume Measurement in the Semiconductor Industry."

5th Statistics Conference of the Central Bank of Chile, September 2023, "The Digital Economy and Productivity."

ASSA 2024 Annual Meeting, January 2024, "Transistors all the way Down: Viability of Direct Volume Measurement in the Semiconductor Industry."

NBER Conference on Resilience in Supply Chains, December 2024, "The Geography of the Electronics Supply Chain from Soup to Nuts."

Society of Government Economists Conference, April 2025, "Generative AI at the Crossroads: Light Bulb, Dynamo, or Microscope?"

R&S Lunchtime Workshop, Federal Reserve Board of Governors, April 2025, "Generative AI at the Crossroads: Light Bulb, Dynamo, or Microscope?"

AI and the Future of Work, May 2025, "Generative AI at the Crossroads: Light Bulb, Dynamo, or Microscope?"

Referee for: American Economic Review: Insights, Applied Economics Letters, Australian Economic Review, Eastern Economic Journal, Economic Inquiry, Economic Journal, Economics and Statistics, Economics Letters, European Economic Review, International Journal of Central Banking, International Productivity Monitor, Journal of Comparative Economics, Journal of Economic Behavior and Organization, Journal of Economic Literature, Journal of Human Resources, Journal of Labor Economics, Journal of Political Economy, Proceedings of the National Academy of Sciences, Quarterly Journal of Economics, Review of Income and Wealth, Science Advances, Southern Economic Journal, World Development.