

CHRISTOPHE COMBEMALE

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EDUCATION

Carnegie Mellon University, Pittsburgh PA

Ph.D. in Engineering and Public Policy (EPP)

August 2016 – May 2022

M.S. in Public Policy and Management (PPM)

August 2015 – May 2016

First in Class – Heinz College M.S. PPM
M.S. PPM Accelerated Master's Program

B.S. Ethics, History and Public Policy (EHPP)

August 2012 – May 2015

First in Class; University and College Honors; Science and Humanities Scholars Program

CURRENT ROLES

American Institute for Manufacturing Photonics | Albany, NY

December 2023 – Present

Member, Leadership Council

I serve on the leadership council for AIM Photonics, one of the seventeen Manufacturing USA member institutes. I advise the AIM Photonics executive team on workforce strategy for design and onshore production of advanced optoelectronics and other semiconductor devices. Most recently, I have supported cross-institute collaboration with the Advanced Robotics Manufacturing (ARM) Institute around repeatable methods for workforce supply chains analysis.

Carnegie Mellon University | Pittsburgh, PA

March 2023 - Present

Assistant Research Professor, Department of Engineering and Public Policy, College of Engineering

I develop models to explain anticipated implications of technology change for organizational and process structure and workforce skill needs. My research helps identify points of leverage for worker-oriented technology implementation and provides insights for the future of work. I currently advise a postdoctoral fellow, three doctoral students and three master's students.

Co-Lead: Workforce Supply Chains Initiative, Block Center for Technology and Society

I co-lead the Workforce Supply Chains Initiative with Dean Ramayya Krishnan of CMU's Heinz College, developing repeatable capabilities to identify regional workforce skill gaps and levers for closing them.

Research Lead: Workforce, National Network for Critical Technology Assessment

I serve as an expert contributor on labor and technology issues for an NSF-funded pilot program seeking to develop a National Network for Critical Technology Assessment. My work touches labor and equity outcomes for developments in Semiconductors, with extensions to EVs and Biopharmaceuticals. Objectives of the program include building repeatable assessment capacity for U.S. competitiveness in critical technology areas.

Valdos Consulting | Pittsburgh, PA

September 2022 - Present

CEO and Principal Partner

I am the owner and principal of Valdos Consulting, a consulting firm specializing in techno-economic modeling to support market, technology, and workforce strategy for government and private sector clients. Our team includes experts on workforce needs, systems and industrial engineering, risk and supply chain management, survey design, process optimization and strategy for emerging and critical technologies.

FORMER POSITIONS

Block Center for Technology and Society, CMU | Pittsburgh, PA November 2022-March 2023
Principal Research Consultant

I led an applied research program to better understand labor supply chains across industries and occupations, with an interest in private and public policy interventions to facilitate individuals in laddering across occupations toward mid and long-term career goals. This research connects to applied work I am conducting with Allegheny County DHS and the ARM Manufacturing Innovation Institute to develop an integrated pipeline from human services clients to training programs to employers in advanced robotics.

Allegheny County Department of Human Services | Pittsburgh, PA September 2022 – June 2023
Data Science Fellow

I used economics, operations management and systems engineering methods to seek improvements in delivery and organization of human services resources in Allegheny County. My two principal projects include building and evaluating causal effects of a workforce development pipeline in advanced robotics for human services recipients, as well as developing strategic pricing for reimbursement of behavioral service providers. I have also led applied operations research to redistrict Allegheny County's six child welfare offices for improved efficiency and client outcomes.

Carnegie Mellon University | Pittsburgh, PA May - September 2022
Post-Doctoral Research Fellow, Engineering and Public Policy

I conducted independent empirical and theoretical research funded by NSF Sci-SIP at intersection of economics and engineering, focused on implications of technology change for skill demand and organizational and industry structure.

SKILLS AND EXPERTISE

Economics and Statistics

Innovation, organization, labor economics; structural economic modeling and theory development; econometrics; statistical programming and data analytics (R, Stata, Python); survey design and implementation; risk analysis

Engineering and Technology

Systems and industrial engineering; process modeling; operations and supply chain management; automation; semiconductor and automotive design and manufacturing; workflow integration and distributed systems management for manufacturing, design and software development

General Skills

Convex and linear optimization; formal mathematics (real analysis, topology); team and project management; organizational design; historical and qualitative research methods; policy analysis; interdisciplinary communication; public speaking; French (native); Spanish (fluent)

JOURNAL PUBLICATIONS

Combemale, Whitefoot, Ales, and Fuchs. August 2021. "Not all Technological Change is Equal: How the Separability of Tasks Mediates the Effect of Technological Change on Skill Demand." *Industrial and Corporate Change*.

Jung, Laureijs, Combemale and Whitefoot. April 2021. "Design for Nonassembly: Current Status and Future Directions." *Journal of Mechanical Design* 143(4): 040801.

Miles, Combemale and Karplus. December 2023. "When the Energy Transition Comes to Town" *Issues in Science and Technology*. "The Energy Transition."

OTHER PUBLICATIONS

Combemale, Ferrone, Funk, Quay and Waldman-Brown. December 2023. "Workforce Analytic Approaches to Find Degrees of Freedom in the EV Transition." Prepared by Valdos Consulting for U.S. Department of Energy Office of Manufacturing Supply Chains.

Combemale. April 2023. "Tools for Regional Competitiveness to Meet an Era of Labor Scarcity" LMI Institute.

Assessment. Available from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4671063

Fuchs, Combemale, Whitefoot, and Glennon. March 2022. “The ‘Weighty’ Manufacturing Sector: Transforming Raw Materials Into Physical Goods.” in National Bureau of Economic Research (NBER) *The Role of Innovation and Entrepreneurship in Economic Growth*, edited by Andrews, Chatterji, Lerner, and Stern. Chicago: University of Chicago Press.

Ahn, Combemale, Khan, Morgan and Thompson. October 2023. “Semiconductor Critical Technology Assessment” *Securing America’s Future: A Framework for Critical Technology Assessment*. Edited by Fuchs et al. National Network for Critical Technology.

Combemale, C., George, N., Gonchar, E., Krishnan, R., Telang, R. 2023. “Workforce Insights Tool Report.” Block Center for Technology and Society; The National Network for Critical Technology Assessment

WORKING PAPERS

Combemale, Ales, Fuchs, Whitefoot. “How It’s Made: A General Theory of the Labor Implications of Technological Change.” *Under Review at Quarterly Journal of Economics*.

Combemale and Whitefoot. “New Technology, New Hierarchy? Implications of Product and Process Innovations for the Division of Problem Solving.” *Working Paper*.

Combemale and Fuchs. “Sorcery on the Production Line: How Embedded Knowledge at the Technical Frontier Can Give Workers a Role in Innovation.” *Working Paper*.

Cotterman, Combemale, Whitefoot and Fuchs. “The Transition to Electrified Vehicles: Evaluating the Labor Demand of Manufacturing Conventional Versus Battery Electric Vehicle Powertrains.” *Under Review at Energy Policy*.

Gonchar, Combemale and Krishnan. “Build It and They Will Come? US Regional Labor Composition and Readiness to Meet Skill Demand Shocks from CHIPS and Science.” *Working Paper*.

AWARDS AND DISTINCTIONS

Inaugural Freeman & Nelson Prize Industrial and Corporate Change, for “Not All Technological Change is Equal”	2023
Best Papers TIM Division Academy of Management, for “Not All Technological Change is Equal”	2022
Editor’s Choice Industrial and Corporate Change, for “Not All Technological Change is Equal”	2021
Best Paper Award Industry Studies Association, for “Not All Technological Change is Equal”	2019
Dean’s Fellowship Carnegie Mellon University College of Engineering	2016
Academic Merit Scholarship Carnegie Mellon Heinz College	2015
National Prize NASPAA Student Simulation Competition	2015
Edwin Fenton-Preston Covey Award for Outstanding Achievement EHPP	2015
Senior Honors Fellow Carnegie Mellon University Dietrich College	2014

SELECTED PRESENTATIONS & PROCEEDINGS

Combemale. “Measuring Skill Availability and Anticipating Skill Demand”

- ◇ Boston University Questrom School of Business (October 2023)
- ◇ Yale School of Management (September 2023)
- ◇ US Department of Commerce CHIPS Office
- ◇ US Department of Labor Future of Work Policy Group (August 2023)
- ◇ US Interagency Group on Automotive Communities: Data and Analytics Subgroup (August 2023)
- ◇ 2023 Industry Studies Association Conference. Columbus, OH.

Combemale. “Toward a Taxonomy of the Labor Implications of Technology Choices.”

- ◇ The Harvard Project on Workforce, Harvard Kennedy School (June 2023).
- ◇ National Academies Government, University, Industry Round Table. Washington, DC (October 2022)

Combemale. “New Technology, New Hierarchy? Implications of Product and Process Innovations for the Division of Problem Solving.”

- ◇ 2023 Annual ASSA/American Economic Association Meeting. New Orleans, LA
- ◇ 2022 Industry Studies Association Conference. Philadelphia, PA
- ◇ 2022 Labor and Employment Relations Association Annual Meeting. Virtual.

Session Organizer: “What Makes the Jobs of Tomorrow? The “What” and “Why” of Labor Outcomes from Technological Change.” Allied Social Science Association Annual Meeting (ASSA) (January 2022).

Combemale. “U.S. Technology Leadership Can Bring Back Production Jobs.”

- ◇ Presentation to U.S. Trade Envoy Katherine Tai During Official Visit to Carnegie Mellon University. Pittsburgh, Pennsylvania. (September 2021).

Session Organizer: “What Makes the Jobs of Tomorrow? The “What” and “Why” of Labor Outcomes from Technological Change.” Academy of Management (AOM) Annual Meeting (August 2021).

Combemale, Ales, Fuchs and Whitefoot. “How It’s Made: A General Theory of the Labor Implications of Technological Change.”

- ◇ 2022 Academy of Management Annual Meeting. Seattle, WA.
- ◇ 2022 Industry Studies Association Conference. Philadelphia, PA.
- ◇ 2022 Allied Social Science Association Annual Meeting. Virtual.
- ◇ 2021 Invited Presentation to Boston University Technology Policy Research Institute. Virtual.
- ◇ 2021 Academy of Management Annual Meeting. Virtual.
- ◇ 2021 Consortium on Competitiveness and Cooperation (CCC) Doctoral Conference. Virtual.
- ◇ 2021 Industry Studies Association Conference. Virtual.
- ◇ 2021 Labor and Employment Relations Association Annual Meeting. Virtual.

Combemale. “Transformation, Participation and Dislocation: Labor Outcomes of Technology Change in Optoelectronic Manufacturing.”

- ◇ Presentation to Session Organized by Keystone Research. Industry Studies Association Annual Conference. Virtual. (June 2021).

Combemale, Whitefoot, Ales, Fuchs. “Not all Technological Change is Equal: How the Separability of Tasks Mediates the Effect of Technological Change on Skill Demand.”

- ◇ Invited Presentation with Erica Fuchs to Freeman Friday Seminar Series, Science Policy Research Unit, University of Sussex. Virtual. (October 2021).
- ◇ Wharton Innovation Conference. Virtual. (April 2021).

Combemale, Whitefoot, Ales, Fuchs. “Accelerating U.S. Competitiveness in Integrated Photonics: Quantifying Workforce Training Needs.”

- ◇ Invited Presentation to American Institute of Manufacturing Photonics (January 2021).

Combemale, Whitefoot, Ales, Fuchs. “Not all Technological Change is Equal: Disentangling labor demand effects of automation and parts consolidation.”

- ◇ 2019 Atlanta Conference on Science & Innovation Policy. Atlanta, GA
- ◇ 2019 Academy of Management Annual Conference. Boston, MA
- ◇ 2019 Labor and Employment Relations Association Annual Meeting. Cleveland, OH
- ◇ 2019 Best Paper Presentation | Industry Studies Association Conference. Nashville, TN