

Jacob Adenbaum

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University of Edinburgh

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Education

2016 - 2022 Ph.D. Economics, University of Minnesota, Minneapolis, MN
2010 - 2014 B.A. Math and Economics. *Graduated with Honors*. Swarthmore College, Swarthmore, PA

Research Interests

Macroeconomics, Labor, Computational Macro, Firm Structure, Inequality, Scientific Machine Learning

Current and Past Positions

2022 – Present University of Edinburgh, Early Career Researcher
2021 – 2022 Duke University, Visiting Student (Virtual)
2018 – 2020 University of Minnesota, Research Assistant to Kyle Herkenhoff
2014 – 2016 Federal Reserve Bank of New York, Research Analyst

Honors and Awards

2024 Google Cloud Research Grant (\$5,000) with Fil Babalievsky and William Jungerman
2024 University of Edinburgh Teaching Award (Nominated)
2023 University of Edinburgh Teaching Award (Nominated)
2019 – 2022 Census Bureau Special Sworn Status
2017 – 2018 University of Minnesota, Department of Economics Fellowship
2016 – 2017 Mary and Robert Litterman Fellowship in Economics, 2016-2017
2014 Swarthmore College, Honors in Mathematics

Working Papers and Works in Progress

1. “Learning on the Job” with Fil Babalievsky and William Jungerman (Job Market Paper)
Abstract: What are the sources of worker learning within the firm? How much of a worker’s human

capital growth comes from firm specific factors, such as the learning environment, as opposed to their own ability, and the composition of their coworkers? In this paper, we introduce a novel labor search model with multi-worker firms, learning from coworkers, and heterogeneity in learning-by-doing rates that can vary at the worker and firm level. Despite its complexity, we show that it is possible to solve such a model by leveraging recent advances from the machine learning literature. We use French administrative data to discipline the parameters of the model, specifically by targeting how wage growth varies across workers, firms, and the distribution of coworker wages. With the calibrated model in hand we perform a series of structural and statistical decompositions to test how much of the variance of human capital is driven by learning from coworkers and by heterogeneous learning-by-doing, and find that learning from coworkers is the dominant source of learning in the economy. Switching off learning from coworkers lowers human capital and wages by more than 25%, and differences in the composition of coworkers accounts for more than 50% of the variance of human capital growth rates. Finally, we use the model to calculate dynamic markdowns that price in the benefits of learning on the job and find that markdowns are less than 5% on average for workers with more than 1 year of experience at their current firm.

2. “Deep Reinforcement Learning for Economics” with Fil Babalievsky and William Jungerman

Abstract: This paper provides a self-contained guide to deep reinforcement learning methods for economists. These tools allow agents to find the policy function that maximizes their expected discounted stream of rewards under very few assumptions about the structure of the model, and are potentially applicable to a wide class of economic models. We begin by translating the language of reinforcement learning to the language of economics. Next, we introduce neural networks, a class of function approximators that have proven useful for reinforcement learning. We use a standard consumption-savings problem as our test case and show that a leading reinforcement learning algorithm can handle a scaled-up version of the problem with 100 workers in the household. We conclude by offering a practical guide with implementation details and a discussion of what kinds of problems are more amenable to reinforcement learning than conventional techniques.

3. “Endogenous Firm Structure and Worker Specialization”

Abstract: What tasks must be performed to produce a good? Which occupations are well suited to do those tasks? And what are the gains to worker specialization within the firm? I use Brazilian administrative data to document new facts about how firms vary the types of workers that they choose to hire as they grow larger. Bigger firms hire more distinct occupations. They also hire a set of workers whose cognitive, manual, and interpersonal skills are more dispersed than at small firms. I then develop a structural model of how firms choose which types of workers to hire, and how they assign tasks to these workers. I propose a novel identification strategy for how to indirectly infer the (multi-dimensional) distribution of skill requirements for tasks that firms face and show how to estimate the distribution of tasks that firms face using only cross-sectional data on which occupations firms choose to hire, and in what proportion, across the firm size distribution. I estimate my model using Brazilian manufacturing firms, and show that more than 1/3 of the variance in firm level TFP is due to firms’ endogenous choices of which types of workers to hire (and how specialized those workers should be). I find that gains from increasing firm specialization are about 1.3% of output, and that the costs to shutting down worker specialization within firms are large, leading to a 9.6% decrease in total output.

4. “Credit Access and the Earnings Mobility of Workers and Entrepreneurs” with Carter Braxton, Kyle Herkenhoff, Gordon Phillips

Abstract: Does greater access to credit increase the earnings mobility of workers and entrepreneurs? Has the expansion of consumer credit contributed to the increase in earnings inequality? We answer the first question by linking individual credits reports to administrative earnings data for workers as well as entrepreneurs. We answer the second question by developing a tractable labor sorting model with human capital accumulation. We link TransUnion credit reports to the LEHD on scrambled social security numbers. We stratify individuals based on credit scores (the marginal cost of credit), and credit limits (the stock of credit), and we document their lifecycle earnings mobility patterns from

1998 to 2008. We instrument access to credit using house price variation and credit account ages in 1998. We find that credit access has an insignificant effect on earnings mobility among initially low earning households. We find that credit access has significant positive significant effect on the earnings mobility of high earning households. We find similar results for entrepreneurial income, with those who have initially high entrepreneurial earnings benefiting the most from credit access. We estimate our model to match these facts, and then we counterfactually shut down credit markets. We find that credit access, while welfare improving, significantly increases measured wage and entrepreneurial income inequality.

Publications

1. “Do long-haul truckers undervalue future fuel savings?” with Adam Copeland and John Stevens, *Energy Economics*, Volume 81, 2019, pp 1148-1161.

Abstract: The U.S. federal government enacted fuel efficiency standards for medium and heavy trucks for the first time in September 2011. Rationales for using this policy tool typically depend upon frictions existing in the marketplace or consumers being myopic, such that vehicle purchasers undervalue the future fuel savings from increased fuel efficiency. We measure by how much long-haul truck owners undervalue future fuel savings by employing recent advances to the classic hedonic approach to estimate the distribution of willingness-to-pay for fuel efficiency. We find significant heterogeneity in truck owners’ willingness to pay for fuel efficiency, with the elasticity of fuel efficiency to price ranging from 0.51 at the 10th percentile to 1.33 at the 90th percentile, and an average of 0.91. Combining these results with estimates of future fuel savings from increases in fuel efficiency, we find that long-haul truck owners’ willingness-to-pay for a 1 percent increase in fuel efficiency is, on average, just 29.8% of the expected future fuel savings. These results suggest that introducing fuel efficiency standards for heavy trucks might be an effective policy tool to raise medium and heavy trucks’ fuel economy.

Presentations

1. “Learning on the Job”: Federal Reserve Bank of Atlanta 2024 (Scheduled); UNC Chapel Hill 2024 (Scheduled); Cornell 2024 (Scheduled)
2. “Endogenous Firm Structure and Worker Specialization”: Baruch College 2022; US Census Bureau, 2022; Royal Economic Society/Scottish Economic Society, 2023; BSE Summer Forum 2023

Teaching Experience

2023 – Present	<i>Lecturer and Course Organizer:</i> Programming and Numerical Methods for Economics, University of Edinburgh (new course design)
2023 – Present	<i>Lecturer and Course Organizer:</i> Economics 2 (Intermediate Macro), University of Edinburgh
2020 - 2021	<i>Writing Assistant:</i> , International Trade, University of Minnesota
2020	<i>Writing Assistant:</i> , International Development, University of Minnesota
2018	<i>Writing Assistant:</i> , Economics Capstone, University of Minnesota
2017 - 2018	<i>Teaching Assistant:</i> , Graduate Econometrics, University of Minnesota
2011 - 2014	<i>Math Department Clinician</i> , Linear Algebra, Modern Algebra, Swarthmore College

Other Writing

1. “Quarter-End Strategies in GCF Varies by Dealers’ Jurisdiction and Balance Sheet Composition,” with Yan Chow, New York Federal Reserve Markets Source. December 2015.
2. “The Triparty Repo Market Like You’ve Never Seen it Before,” with Antoine Martin, Susan McLaughlin, Liberty Street Economics Blog. October 2015.

Programming

Julia, Python, R, Stata, SAS, MATLAB, \LaTeX

Languages and Citizenship

Languages: English (native), French (intermediate)

Citizenship: United States

References

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