Collin Wardius

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NBER Digital Economics AI Tutorial Application

Thank you for considering my application. Below, I describe my dissertation research, followed by my CV with contact information and my dissertation advisors.

AI is now used by a majority of teachers and students alike; school districts have invested over two billion dollars in AI tools (Doss et al., 2025; Sequeira, 2026). The effectiveness of both this direct spending and the social returns of broader investments in AI technology depend on how and whether teachers use these tools. This project studies the effect of teacher AI adoption on both students and teachers themselves, at a moment of technological transition in school districts.

The effect of AI adoption on student achievement is moderated by two forms of self-selection: not all teachers use AI, and teachers use AI in different ways. The extensive margin adoption screen determines the students that are affected; the intensive margin AI usage choice can impact the effectiveness of AI and explain differences in educational returns of adoption among teachers.

The first goal of this project is to develop novel measures of teacher AI adoption and teacher AI use. To do this, I create and administer a survey to teachers that collects data on when they adopted AI, how they use it, how they value it, and complementary training and resources their school district provides. I use the survey data to assess selection into adopting AI. In particular, I consider the relative importance of teacher characteristics, like age or experience, in mediating AI adoption, relative to district AI investments like teacher training (Campos and Singleton, 2026; Bresnahan, Brynjolfsson, and Hitt, 2002).

The second goal of this project is to assess how AI adoption affects student achievement. Through an approved data use agreement with the Pennsylvania Department of Education, I will link the survey data I collect on the timing of AI adoption to teacher-student matched education microdata, allowing me to observe dynamics in teacher effectiveness.

To estimate the effect of AI adoption on teacher effectiveness, I will implement two complementary empirical approaches. The first is a difference-in-differences analysis, comparing the evolution of effectiveness of AI adopters to later adopters and non-adopters. This identifies the effect of AI adoption for the adopters which may overstate the effects of adopting AI for the average teacher if teachers select into AI adoption on anticipated effectiveness gains.

To better understand the distribution of treatment effects, I implement a difference-in-differences-Instrumental Variables (DDIV) approach where the identifying variation comes from district-level policy shocks, like instituting AI teacher training. In support of this analysis, I build a database of school district policies collected from district websites, documents, and school board meeting minutes. The DDIV approach identifies the effect of adoption for teachers that are marginal to the policy shock, a subpopulation that is less likely to adopt at baseline.

Importantly, the survey helps to contextualize these estimates. The fielded questions concern how teachers differentially use AI, and I will test for associations between certain use behaviors and effectiveness gains.

The final goal of the project is to assess how AI adoption affects teachers themselves. Within the survey, I imbed a revealed preference experiment that elicits teachers' valuation of AI technology. This is aimed at assessing whether teachers feel that there are material improvements to their job outside of its effects on their students. For example, many teachers report that AI increases their productivity on routine administrative tasks, freeing up their time (Doss et al., 2025).

Districts are making decisions now on AI policy. There is at this point no causal evidence from the US on how AI adoption changes teacher effectiveness nor how it has affected teaching as an occupation more generally (Fesler et al., 2026). My study seeks to provide guidance on how districts can mitigate bottlenecks in AI adoption, and promote uses that improve teacher effectiveness and improve teaching jobs.

References

Bresnahan, T. F., E. Brynjolfsson, and L. M. Hitt. 2002. "Information Technology, Workplace Organization, and the Demand for Skilled Labor: Firm-Level Evidence." *The Quarterly Journal of Economics* 117(1): 339–376.

Campos, C., and J. D. Singleton. 2026. *AI Diffusion Gaps: Unequal Integration of AI Across K-12 Schools*. NBER Working Paper 35347.

Doss, C. J., R. Bozick, H. L. Schwartz, L. Chu, L. R. Rainey, A. Woo, J. Reich, and J. Dukes. 2025. *AI Use in Schools Is Quickly Increasing but Guidance Lags Behind: Findings from the RAND Survey Panels*. RAND, RR-A4180-1.

Fesler, L., J. Martinez, C. Agnew, and S. Loeb. 2026. *The Evidence Base on AI in K-12: A 2026 Review*. AI Hub for Education, SCALE Initiative, Stanford University.

Sequeira, R. 2026. "Schools Spend Billions on AI, But Struggle to Figure Out What's Worth Buying." *Education Week*, August 20.

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Research interests: AI, education, and public finance

Education

Ph.D. Candidate, UC San Diego, Department of Economics, 2022–2028 (expected)
M.A. Economics, 2024

Visiting Ph.D. Student, U Penn Wharton Applied Economics, 2024–2025

B.A. Mathematical Economics, Temple University, 2016–2020

Dissertation committee and references

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Employment

Graduate Student Researcher, 2024–Present
UC San Diego, Department of Economics

Short-term Consultant, World Bank Group, 2025–2026

Research Analyst, 2020–2022
Federal Reserve Bank of Philadelphia, Research Department

Works in Progress

1. **Understanding teacher AI use and its effect on educational achievement**

   As AI use in education expands, teachers will shape its effects on students. I measure teachers' adoption and use of AI through a new survey linked to administrative data on teacher effectiveness. Using these data, I investigate three questions: (1) Which district and teacher characteristics predict AI adoption? (2) How does AI use change teachers' allocation of time across tasks? (3) Does teacher AI adoption causally affect student achievement?

2. **How should we design AI-powered tools for learning? Empirical evidence from a large research university**

   Frontier AI models hold the potential to transform education, as they can personalize responses to a student's level, provide largely accurate information, and operate at low cost. However, by default these models are not designed to help students build understanding and make discoveries in new

subjects, but rather to transmit information about them, making them a poor pedagogical tool. This project evaluates how a purpose-built AI platform for learning affects student achievement using rich data on student demographics and telemetry from UC San Diego.

3. **Population decline, school district finances, and student achievement** (with Julie Cullen, Jeffrey Clemens, and Yang Heppe)

   Many school districts face large and persistent declines in enrollment. This has driven a sharp rise in per-pupil spending, since adjusting expenditures downward—closing a school, laying off teachers—is difficult. Such costs may be justified, however, if the spending safeguards the learning of students who remain. In this project, we examine how state teacher labor market and school funding policies moderate the effects of enrollment decline on per-pupil spending and, in turn, student outcomes. Our current findings suggest that districts in states with stronger hold-harmless policies—which hold funding constant regardless of enrollment decline—raise per-pupil spending dramatically, with only small effects on test scores.

Published Articles

[1] Mallick Hossain, Igor Livshits, and Collin Wardius. "Not Cashing in on Cashing out: An Analysis of Low Cash-out Refinance Rates". In: *Real Estate Economics* (2026).

Honors & Awards

Research Fellowship, UC San Diego (2026)

Diversity Research Fellowship, UC San Diego (2024)

Regents Fellowship, UC San Diego (2022)

Presentations & Conferences

Southern California Graduate Conference in Applied Economics (2026)

UC Berkeley Gardiner Seminar on Higher Education (2026)

IPUMS Data-Intensive Research Conference (2026)

University of Chicago Price Theory Summer Camp (2026)

Urban Economics Association Summer Camp (2026)

IPUMS Data-Intensive Research Conference (2025)

Teaching

ECON 120A: Undergraduate Econometrics (UC San Diego)
Teaching assistant, Fall 2023, Winter 2024

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