
RESEARCH STATEMENT

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OVERVIEW

My research concerns how public policy and socioeconomic contexts affect the production and unequal distribution of educational opportunities, consisting of three major areas. The first area identifies the causal effects that public policy choices and socioeconomic changes have on educational opportunity. In this causal work, I employ techniques from applied econometrics to understand how policy can be used to promote student learning and equal opportunity. The second area studies how educational resources and outcomes are distributed. In this descriptive work, I utilize quantitative methods to provide stylized facts about the distribution of achievement and school resources among different subpopulations and regions of the United States. The third area provides theoretical understanding for how and why educational interventions can be used to bolster equality of opportunity. In this area, I employ both empirical analysis as well as normative theory.

Large datasets with broad geographic coverage are important because they provide greater external validity. For this reason, my research tends to incorporate data with extensive coverage of the U.S. population. These datasets are often taken from publicly available sources. However, I have also generated new data to yield new insights. I worked on a team (with Sean Reardon and colleagues) to construct and disseminate data (the Stanford Education Data Archive) that provide district-level achievement for nearly all districts in the United States. Since its publication in May 2016, these data have been widely downloaded and used in subsequent scholarship by other researchers in different fields. I have also developed survey instruments to provide public opinion data for educational opportunity that were not available previously.

Methodologically, my work incorporates sophisticated quantitative methods for both causal and descriptive purposes. In descriptive work, I use statistical methods to generate stylized facts about the world, such as the distribution of academic and resource inequality. In this area, I have expertise in the use of regression and variance decomposition methods, as well as hierarchical (or mixed) models. In causal work, I use econometric methods to leverage aspects of the data for purposes of obtaining the effect of a policy or event on different outcomes. While I have substantial training in the use of a wide variety of quasi-experimental and experimental techniques, I have considerable expertise in the use of panel data methods. Depending on data and method, I have used different statistical software applications, including (in order of frequency of use) Stata, HLM, R, ArcGIS, Python, and Julia.

Ultimately, I incorporate the best statistical software and methods to suit the data and research questions.

— I. THE CAUSAL EFFECTS OF POLICIES & SOCIOECONOMIC CONTEXTS ON EDUCATIONAL OUTCOMES —

I pursue causal questions about the efficacy of school policy for improving student outcomes and the effects that students' environmental contexts have on their academic trajectories. For these questions, I use applied econometric tools, which have been developed to leverage different aspects of the data to yield causal estimates. To date, my research has emphasized panel data methods, and I have expertise using additional quasi-experimental (such as regression discontinuity and synthetic controls) and experimental techniques.

In education policy, the question “does money matter?” has been debated for at least five decades. There is now emerging evidence showing that money does, indeed, matter. One piece of evidence comes from “**Court-Ordered Finance Reforms in the Adequacy Era: Heterogeneous Causal Effects and Sensitivity**” (*Education Finance and Policy*, with Christopher Candelaria), in which we provide new evidence about the effect of court-ordered finance reforms that took place between 1989 and 2010 on per-pupil revenues and graduation rates. This paper combines a variety of sophisticated panel data methods—we control for correlated random trends and interactive fixed effects—to estimate the causal effect of overturning a state's finance system on school spending and graduation rates. We find that seven years after the reform, the highest poverty quartile in a treated state experienced a 11.5 to 12.1 percent increase in per-pupil spending and a 6.8 to 11.5 percentage point increase in graduation rates.

In this study, we noted that after court-order, not all states increased spending in poorer districts and not all states improved graduation rates in poorer districts, even if they received additional spending. Currently, we are implementing a case-studies approach using synthetic controls methods to estimate effects for all finance reforms that took place after 1990-1991, resulting in approximately 120 effect sizes (we have two outcomes for each of the finance reforms that occurred between 1990-1991 and 2012-13). With these estimates, we will be able to identify states that increased spending without improving academic outcomes as well as states that were able to improve academic outcomes with little additional spending. Linking these estimates to additional state-level covariates will help identify the local contexts in which money can be better leveraged for improving student outcomes.

It is known that the Great Recession was the most severe economic downturn in the United States since the Great Depression, and to date, there has been no large-scale evaluation of this event's effect on student outcomes. In “**The Impact of the Great Recession on Student Achievement: Evidence from Population Data**” (*Journal of Public Economics*, under review, with Matthew Steinberg), we document the heterogeneous effects the Great Recession had on student achievement in math and English language arts (ELA). Using data from the Stanford Education Data Archive, and employing a difference-in-differences strategy, we find that the onset of the Great Recession significantly reduced student math and ELA achievements. Moreover, the recessionary effect

on student achievement was concentrated among school districts serving more economically disadvantaged and minority students, indicating that the adverse effects of the recession were not distributed equally among the population of U.S. students. Among districts equally affected by the recession, effects on student achievements were concentrated in districts with the largest reductions in teacher personnel, providing evidence that the effects we observe are driven, in part, by the recession's negative effects on school resources.

One of the policy implications of this work is that aid from American Recovery and Reinvestment Act (ARRA) was not allocated to areas of the country most affected by the recession, in terms of both financial losses and academic effects. Specifically, ARRA was allocated based on a state's population (to ensure per capita equivalence across states) and the state's pre-existing funding formula. However, our research documents that the recession had profoundly divergent effects across the United States, and the allocation of ARRA was insensitive to this heterogeneity.

In ongoing research, we are documenting two features of the policy response to the Great Recession that have yet to be realized. First, because districts differed in how much revenues they lost as a result of the recession and because ARRA was allocated without regard to those differences, ARRA aid may have increased spending inequality after the recession. Second, despite how ARRA was allocated, school spending was likely higher than it would have been if ARRA had not been implemented. We therefore plan to estimate the causal effects of ARRA spending on student achievement. Together, these estimates will motivate future fiscal response in times of economic downturn, as well as provide guidance for the distribution of future federal fiscal aid.

II. THE DISTRIBUTION OF EDUCATIONAL RESOURCES & OUTCOMES

The first strand of my research provides descriptive information about the magnitude and distribution of educational inequality. Recent data made available through the Stanford Education Data Archive (SEDA), the Civil Rights Data Collection (CRDC), and the American Community Survey (ACS) Education Demographic and Geographic Estimates (EDGE) make it possible to understand geographic variation in the distribution of educational resources and outcomes. Previously, most of what was known about academic achievement gaps (demarcated either by race/ethnicity or income) came from nationally representative samples of test takers or for states and large metropolitan areas. Analyses based on these national, state and metropolitan assessments belied meaningful variation among school districts. Between-district variation is important because districts are a focal point for the allocation of school resources and because the demographic and socioeconomic contexts for students varies greatly among districts. With these new data, I have begun to provide rich descriptive statistics about how resources and outcomes are distributed among districts. Moreover, we can now see which types of districts—indicated by a rich set of covariate information—are more equitable with respect to the distribution of resources and student achievement.

In **"The Geography of Racial/Ethnic Test Score Gaps"** (*American Journal of Sociology*, revise and resubmit,

with Sean Reardon and Demetra Kalogrides), we provide the first estimates for racial/ethnic achievement gaps covering several hundred metropolitan areas and several thousand school districts in the United States. These data are based on the roughly 200 million standardized math and reading tests administered to public school students from 2009-2013. We demonstrate substantial and previously unknown variation in achievement gaps, ranging from nearly 0 in some places to larger than 1.2 standard deviations in others. About three-quarters of this variation can be explained by variation in economic, demographic, and segregation, denoting the inextricable linkage between students' out-of-school environments and their achievement.

In a subsequent study, I ask whether districts are likely to have multiple black-white gaps for different educational outcomes. Combining data from the CRDC and the SEDA, the paper **“Black-White Educational Inequality: Linking Disproportionality across Multiple Educational Outcomes”** (*American Education Research Journal*, under review, with masters students Ha Eun Kim and Mela Still whom I supervised) characterizes the extent to which black-white gaps in achievement, disciplinary rates, classification into special education and Gifted and Talented, and Advanced Placement course taking are linked across school districts in the United States. Overall, gaps in each of these outcomes are large in magnitude and highly correlated. Socioeconomic inequality and segregation are strikingly consistent predictors of these gaps, and districts with large gaps in one outcome are likely to have large gaps in another. Our final result is that socioeconomic and segregation variables explain 1.5 to 3 times more variance for achievement relative to non-achievement outcomes. These findings reveal that systemic patterns of racial socioeconomic inequality drive inequalities across multiple educational outcomes; however, discretionary policies at the district and school levels are more influential for non-achievement outcomes.

Given large *intra*-district achievement inequality among black and white, and Hispanic and white students, it is natural to ask whether black and Hispanic students receive a smaller share of a district's monetary resources. Such a discrepancy may partially explain observed differences in academic achievement. In **“Pulling Back the Curtain: Intra-District School Spending Inequality and its Correlates”** (*Sociology of Education*, under review, with Simon Ejdemyr), we provide descriptive statistics for *intra*-district spending inequality. Despite concerns about funding inequities between schools within districts, data constraints have limited large-scale analyses of *intra*-district inequality in the United States. We generate measures of vertical inequality for nearly all U.S. districts using new school-level finance data. Poor and minority students on average receive 1 to 2 percent more resources than non-poor and white students in the same district. However, between 29 to 44 percent of districts spend fewer resources on disadvantaged students. Districts that spend fewer resources on poor students relative to non-poor students tend to be poorer and have less income segregation (in other words, richer and more segregated districts tend to spend a greater share of resources on poor students). Districts that spend fewer resources on minority students relative to white students tend to have smaller racial income gaps, less racial segregation, and (when it comes to black-white spending inequality) larger white student populations.

Given evidence presented above that much of the between district variation in disciplinary disproportionality

is unexplained by socioeconomic and demographic variables, it stands to reason that unobserved school practices account for differences among districts (and schools). In future work, I plan to further study the effects that teachers have on school discipline disproportionality by estimating teacher value-added models on student discipline outcomes. Teacher characteristics can be linked to estimated teacher effects to see which kinds of teachers are more likely to over-react to student race when administering disciplinary policy.

III. THEORETICAL UNDERSTANDING OF EQUAL EDUCATIONAL OPPORTUNITY

The third strand of my research provides empirical and theoretical guidance about the importance of educational opportunity. Empirical information about what role education has in the production and distribution of educational opportunity is derived from opinion surveys, which I obtain from either new or existing data. I have generated survey instruments and used these instruments in a discrete choice framework to collect new data about the value of equal educational opportunity. Using existing data from the Current Population Survey, I have begun to document patterns and trends in gaps in civic engagement. Theoretical guidance is based on analytical approaches in political philosophy as well as common sense guidelines useful for practitioners and policy makers. This research strand provides fundamental information about education and its role in contemporary society.

A fundamental question in education research is whether we should spend additional resources to improve educational opportunity or to use those resources to increase societal income. An answer to this question is challenging because individuals may believe that improvements to educational opportunity will both increase societal income and reduce income inequality. In other words, preferences for equal educational opportunity are confounded by unobserved preferences for other societal outcomes. To solve this problem, our paper “**Identifying Preferences for Efficiency, Income Equality and Equal Opportunity**” (*American Economic Journal: Applied Economics*, under review, with Bernardo Lara), decomposes preferences of U.S. citizens for equal educational opportunity, equality of income and societal income. To isolate preferences for these different goods, we implement an online discrete choice experiment using social statistics generated from true variation among commuting zones obtained from the Equality of Opportunity Project. We find that the average societal income individuals are willing to sacrifice is (i) \$5,208 dollars to increase higher education enrollment by 1 standard deviation; (ii) \$3,298 to decrease income inequality by 1 standard deviation; (iii) \$1,408 dollars to decrease educational opportunity by 1 standard deviation. While respondents are willing to sacrifice meaningful societal income to improve educational opportunity, income equality is more valuable to them.

Educators, policymakers, and citizens have the challenge of allocating scarce resources in the pursuit of competing goals for children and youth. In “**Distributive Decisions in Education: Goals, Trade-Offs, and Feasibility Constraints**” (*Theory and Research in Education*, with Susanna Loeb), we provide decision-makers with a framework for considering allocative problems in education, explicitly highlighting the implications of relevant feasibility constraints. Using four representative cases to illustrate common situations any decision-maker faces, we show that the framework provides both an understanding of the distributive decisions that are made in practice

and a formal structure for thinking about how to optimize decisions in real-world settings.

In future work, I (with Sigal Ben-Porath) will use data from the Current Population Survey (CPS): November Supplement on Civic Engagement to document gaps in civic engagement among different sub-populations of the United States and to link these gaps to household and neighborhood characteristics. Theorists hypothesize that gaps in civic engagement may differ depending on whether the behavior is formal or informal (formal civic engagement includes organized political participation; informal civic engagement includes social activity). Our paper will be the first to document whether this hypothesis is true. The key theoretical contribution of the paper will be to categorize the different survey items from the CPS into formal and informal aspects of civic engagement. The key empirical contribution of the paper will be to use psychometric methods to estimate civic engagement scores for households in the United States based on items that have been categorized as formal and informal.

Taken together, my three areas of research incorporate advanced quantitative methods and a deep understanding of educational policy to provide descriptive, causal and theoretical information that both informs education policy and answers fundamental questions about the role of education in U.S. society.