

Research Statement

My research examines inequities in education and the factors that shape them. I have several projects investigating how teachers influence student outcomes and affect disparities between groups, and how institutional factors such as affirmative action policies influence teacher quality. My dissertation consists of three chapters:

1. In my job market paper, I investigate if and how teachers affect gaps in academic performance between boys and girls – through their impacts on cognitive and non-cognitive skills. I show that effective teachers have the strongest impacts on students in the dimension in which the students have a relative deficiency. In the context of gender gaps in test scores and grades, I argue that the observed empirical patterns imply a relative proficiency for boys in cognitive skills and a relative proficiency for girls in non-cognitive skills. As a result, teachers who improve cognitive skills improve girls' outcomes (test scores and course grades) more than boys' outcomes, while teachers who improve non-cognitive skills improve boys' outcomes more than girls' outcomes.
2. In my second chapter, my co-authors and I examine how an aggressive and binding affirmative action policy in faculty hiring influences the quality of instruction provided by teachers. We find that despite having weaker formal qualifications, faculty hired through the affirmative action policy deliver instruction of equal quality compared to faculty who were not hired through affirmative action, across multiple outcome measures. This paper is currently under second-round review at the *Journal of Political Economy Microeconomics*.
3. In my third chapter, my co-authors and I examine how faculty gender composition affects gender disparities in STEM educational outcomes. Using survey data, we find that increased exposure to female faculty improves female students' academic performance and reduces their STEM-related anxiety, while shifting male students away from stereotypical beliefs about women's ability in STEM. This paper is being prepared for submission to an interdisciplinary journal.

These three papers span a variety of contexts, from elementary school classrooms in North Carolina to engineering colleges in India, employing several methodological approaches that allow for causal inference. By examining a comprehensive set of outcomes—including cognitive measures (test scores), non-cognitive indicators (grades, attendance, and suspensions), faculty productivity metrics (research output, administrative service), and psychosocial factors (confidence, anxiety, and stereotypical beliefs) – my work provides a multidimensional understanding of educational outcomes and faculty effectiveness that extends beyond conventional achievement metrics. Beyond these dissertation projects, I am also pursuing several complementary projects that expand the contexts and mechanisms through which I study educational equity, including work on residential segregation and student outcomes in India, spillover effects of school sports on academic performance in Texas, and an experimental study on belief updating about gender disparities.

Dissertation Chapters

1. *Relative Skills in the Classroom: Teachers' Gender-Differentiated Impacts on Test Scores and Course Grades*
(Job Market Paper)

Gender gaps in educational achievement vary substantially across subjects and outcome mea-

tures. In math and science, test scores often show girls lagging behind boys—especially in early grades – while teacher evaluations and course grades tend to favor girls. In reading, both test score and grade gaps tend to favor girls, with gaps in course grades being larger. This gender gap in course grades emerges as early as elementary school, exists even after conditioning on test scores, and grows when children enter middle school. This suggests that grades capture non-cognitive or behavioral skills, in addition to cognitive achievement – and that boys and girls differ in their development of these skills as they progress through school.

There is a growing body of research suggesting that gender gaps in non-cognitive measures are important – not least because they help explain gaps in educational attainment. There is also growing evidence that teachers have persistent impacts on both cognitive and non-cognitive skills, and these effects are distinct from one another. Yet surprisingly, the literature has been slow to connect these two sets of findings. In particular, none has explored the questions that naturally follow: dual dimensions of teacher quality have systematically different impacts for boys and girls? And how might gender gaps in a school or classroom be affected by the strengths of their teachers?

In my job market paper, I investigate these questions using a teacher value-added framework. Using longitudinal administrative data from North Carolina, I estimate teacher value-added separately for test scores and course grades. I find that teachers with high value-added in test scores disproportionately benefit girls, particularly in math, while teachers with high value-added in course grades disproportionately benefit boys, particularly in reading. These patterns are consistent with a two-factor model in which test scores (course grades) are relatively intensive in cognitive (non-cognitive) skills – and observed gender gaps imply a relative proficiency in cognitive (non-cognitive) skills for boys (girls). Under this framework, teachers improve students most along the dimension where the students have a relative deficiency.

I provide evidence for this interpretation by constructing student-level measures of relative proficiency and showing that teachers have larger impacts on students in dimensions where those students are relatively weaker. This interpretation differs from explanations centered on role-model effects or teacher bias. These findings show that gender-differentiated teacher impacts reflect how teachers’ strengths interact with students’ underlying skill mixes, offering an alternative to explanations centered on role-model effects or teacher bias. The results suggest that understanding teachers’ multidimensional effectiveness and their heterogeneous impacts on different students is crucial for addressing educational disparities.

2. *Affirmative Action, Faculty Productivity and Caste Interactions: Evidence from Engineering Colleges in India* (with Robert Fairlie, Saurabh Khanna, and Prashant Loyalka)
Revise and Resubmit, *Journal of Political Economy Microeconomics*

My second chapter examines an aggressive affirmative action policy in Indian higher education, analyzing the productivity of faculty hired under a quota system. In India, public universities are constitutionally mandated to reserve approximately 50 percent of faculty positions for candidates from disadvantaged caste and social class groups (in addition to reserving 50% of seats for students from disadvantaged castes and classes). Using data from a nationally representative sample of 50 engineering and technology colleges in India – including some with random assignment of students to classrooms– we find that “reservation category” faculty (those hired through affirmative action) have lower levels of education, lower professorial ranks, and fewer years of

experience in academia than “general category” faculty not hired through reservations. Despite these differences in formal qualifications, our central finding is that reservation category faculty deliver instruction of equal quality across a comprehensive range of outcome measures. We evaluate multiple dimensions of instructional effectiveness—including students’ performance in course grades, follow-on course performance, standardized test scores, dropout rates, attendance, graduate school plans, and graduation rates – and find no differences between students assigned to reservation category and general category faculty. In fact, for immediate course grades, students taught by reservation category faculty perform slightly better than those taught by general category faculty. Compellingly, this pattern holds for general category students as well, demonstrating that the benefits of faculty diversity extend to all students, even in contexts where there might be potential discrimination or resentment against faculty hiring quotas. Importantly, we evaluate these productivity differences between different groups of faculty in a setting where a large-scale affirmative action program for students contributes a pool of candidates who are potentially equally productive, but may not have had the requisite minimum qualifications required to apply for such jobs had it not been for affirmative action in student admissions. These findings have significant implications for debates over affirmative action programs worldwide, as they provide rigorous evidence that faculty diversity can be achieved without compromising educational quality – even in highly technical fields like engineering – across multiple universities in the world’s most populous country.

3. *A STEM Professor Like Me: Female Faculty Improve STEM Outcomes Among Female Students* (with Robert Fairlie, Mridul Joshi, Saurabh Khanna, and Prashant Loyalka)
(Under preparation for submission)

My third chapter investigates gender disparities in STEM education in India and examines the role of female faculty representation in addressing these disparities. Leveraging random assignment of students to instructors across multiple engineering colleges, we study how faculty gender composition affects both academic and non-cognitive outcomes. Our findings reveal that being assigned to a higher share of female faculty improves female students’ academic achievement and reduces their STEM-related anxiety. These effects are most pronounced for female students with lower prior achievement and confidence levels. Additionally, exposure to female faculty shifts male students’ beliefs about gender and STEM ability away from traditional stereotypes.

Ongoing Projects

In ongoing research, I continue to study educational equity through three projects that explore new contexts and mechanisms. First, in a co-authored project, we examine how residential and school segregation along caste lines in India affects educational inequality by linking administrative education data with census data to analyze how the concentration of underrepresented groups correlates with school resources and student outcomes. Second, in another co-authored project, we investigate how school-wide factors beyond direct teacher-student interactions shape educational environments, by studying the spillover effects of high school football team success on academic and behavioral outcomes for non-athlete students in Texas. Third, I explore how confirmation bias in belief updating mechanisms contributes to persistence of gender-biased beliefs in STEM contexts, by conducting experimental research that tests whether the source of

corrective information about gender disparities affects how individuals update their beliefs. Together, these projects extend my research on educational equity by examining structural factors, institutional climate, and cognitive biases that influence outcomes across a variety of educational settings.