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Thesis Abstract

The Determinants of Teaching Effectiveness: Evidence from a Model of Teachers' and Students' Interactions (Job Market Paper)

Standard models of educational production usually treat teachers' contribution to test score growth, which is commonly referred to as teachers' effectiveness, as invariant across classrooms. However, teachers' effectiveness may be determined by teachers' behavior and interaction with students in the classroom, and so, teachers' effectiveness may not be a fixed attribute. In this paper, I estimate a model of the effort choices of students and teachers in a classroom to study how students' academic achievement is produced. The model allows for flexible distributions of student initial knowledge and home environment, classroom environment, and teacher general teaching skill and effort cost. I estimate the model using the Measures of Effective Teaching Longitudinal Database, which contains multiple measurements of different educational inputs. I treat these measurements as noisy measures of underlying latent inputs. I find that, all else equal, teachers with high general teaching skills are more effective in classrooms with high initial knowledge. In contrast, teachers with low effort costs are more effective in classrooms with low initial knowledge. Commonly used value-added estimates of teacher effectiveness ignore effort choices and usually do not account for measurement error, all of which render extrapolations of teachers' effectiveness to different classrooms problematic. In a counterfactual exercise, I assign teachers measured to be highly effective using value-added estimates to classrooms with a high proportion of minority students. The model suggests that the reassigned teachers are less effective than what was originally predicted by their value-added estimates. This result is consistent with recent findings suggesting that similar reassignment policy efforts did not achieve their main goal of promoting low-achieving students' academic performance.

Group or Individual Teacher Bonuses? An Estimation of the Potential Gains

Evidence that teachers play a key role in promoting students' academic achievement has led to considerable policy interest in implementing teacher performance pay schemes. In this regard, the empirical literature shows a variety of schemes that have been evaluated under randomized controlled trials. However, there is no conclusive evidence about their relative performance. In this paper, I estimate the potential gains from paying teachers using different types of optimally designed linear schemes. I use a public-available dataset, which comes from a teacher incentive experiment that contains both individual- and group-based piece-rate bonuses in Andhra Pradesh, India. A possible deficiency in group-based schemes is the presence of the so-called free-riding effect: if teachers' responsibility over the total students' achievement production decreases, they may exert less effort because their impact on the total production would be smaller. However, there are also potential benefits of using group-based schemes. First, averaging teachers' output reduces noise, which benefits risk-averse teachers. Second, peer pressure can increase effort. I exploit the experimental nature of the data to test the presence of peer pressure in the group-based scheme. I first document the existence of peer pressure in the group-based scheme, which mitigates the free-riding incentives. Based on this result, I estimate the structural parameters of my model to recover the optimal incentive schemes that maximize the expected value of students' achievement, minus the expected payment to teachers. I find that an optimally designed group-based scheme could increase students' academic achievement by about twice as much as the results obtained from an optimally designed individual-based incentive scheme.

Students' Achievement, Study Effort, and Homework Across Subjects

The empirical evidence suggests that the time spent doing homework is an important determinant of students' academic achievement. However, little evidence exists on the extent to which the amount of homework assigned in a particular subject would affect students' performance in other subjects. A natural channel through which homework may affect students' performance in other subjects is through students' allocation of study time. To better understand the impact of homework on different subjects, I develop and estimate a model of student allocation of study time in math and language. The model defines a flexible student utility function that allows the equilibrium efforts choices to depend on the amount of homework in both subjects. I estimate the model using the rich information contained in the Measures of Effective Teaching Longitudinal Database. Ignoring students' allocation of study time may miss important consequences of commonly suggested guidelines indicating the optimal amount of homework.