The intent of incentive-based contracts – which tie compensation to performance in professions like teaching – is to improve productivity. In practice, the effects of such contracts have diverged markedly from predictions. An innovation of this work is to present a theoretical model that considers the effects of output-based incentives when agents lack knowledge of the production function. In the context of incentive contracts for teachers, I expand on contract theory by adding uncertainty around the marginal productivity of inputs – such as different classroom activities – towards student test outcomes. I test the theoretical predictions of this model using variation in the implementation of evaluation in the Washington D.C. teacher incentive program and in the setting of a laboratory experiment.

In my first paper, “Personnel Contracts with Production Uncertainty: Theory and Evidence from Teacher Performance Incentives,” I test the prediction that performance pay with uncertainty in the production function may induce inefficient effort allocation by separately identifying how two types of teacher incentives affect student outcomes. In the IMPACT program, teachers can be fired or receive large bonuses based on a combination of observational measures in unannounced in-class evaluations – which can be thought of as measures of teacher inputs – and test-based measures of the effect of teachers on student outcomes. I measure how teachers modify their behavior when they have no threat of an evaluation, and how those changes affect student test scores. Because the timing of in-class observations is random, the assignment of treatment – how many days a teacher has the threat of an evaluation – is exogenous. I find that increasing the number of days without the possibility of an evaluation leads to a decline in students’ tested scores, which is inconsistent with a model in which agents know the production function, but consistent with my model of production uncertainty. A takeaway from this analysis is that incentive-based compensation targeting production inputs may yield significant gains in the effectiveness of incentive contracts. These results also demonstrate that in-class observations are a key component for the measured effectiveness of the IMPACT program.

In my second paper, “Multi-tasking with Production Uncertainty: A Real-Effort Laboratory Experiment,” I test theoretical predictions of the production uncertainty model in a laboratory setting, which allows for controlled randomization in the production function in order to causally identify the effects of production uncertainty. I imitate uncertainty in the marginal value of inputs – analogous to inputs for student test scores – by asking participants to solve easy or hard problems to earn financial rewards that are drawn from known distributions. Treatments vary by changing the variance of the marginal payoff to each task. I find that, as predicted, increased production uncertainty reduces overall effort and induces participants to favor inputs with lower variance in marginal productivity, even if doing so reduces average productivity.

A third paper considers principal agent problems in the context of collegiate degree attainment and labor market outcomes. At issue is how the information content of degree fields leads employers to inefficiently favor non-labor inputs. In the paper “Measuring the Decreasing Distinctiveness of Skillsets for College Degrees,” I use the O*NET job task database to show that degree fields have become less distinct in their skillset bundles in the last 35 years.

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