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## Reward or punishment? Class size and teacher quality

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## ABSTRACT

The high stakes testing and school accountability components of our K-12 education system create an incentive for principals to behave strategically to maximize school performance. One possible approach is the adjustment of class sizes based on observed teacher effectiveness. Conceptually, this relationship may be positive or negative. On one hand, performance-maximizing principals may place more students in the classrooms of more effective teachers. But because administrators may have compensation constraints, it is also plausible that they may reward more effective teachers with fewer students in the classroom. This paper examines whether principals reward effective teachers by decreasing their class size or whether they increase the size of classes of more effective teachers as a means of enhancing the school outcome. Results overall indicate that more effective teachers do have larger classes. This result holds implications for prior policy studies of class size as well as for education policy more generally.

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## 1. Introduction

Education policy often seeks to improve student outcomes through broad based initiatives designed at the federal and state levels and implemented through local school districts. By setting standards for student achievement and addressing procedures for the provision of educational inputs, these initiatives create the constraints under which local administrators operate. One of the larger efforts in education policy research has been the study of the effect of resource constraints on student achievement, and within that, one policy studied has been the effect of class size on achievement. From a policy perspective, states typically establish a maximum number of pupils per class for schools. Districts allocate resources to schools based on estimates of the number of students and the resulting number of teachers required to satisfy the state class size

mandate. Principals then determine the number of students to place in a classroom.

There is a large literature that has examined these policies and the effect of class size on student performance. The assumption is that class size influences student learning because it directly affects the degree to which the teacher can react to individual student learning differences and, thus, alters the effectiveness of the teacher.<sup>2</sup> The assumption, of course, is that smaller classes facilitate more effective teaching, *ceteris paribus*. The Tennessee STAR experiments are the most prominent of positive findings in this research area (Finn, Gerber, Achilles, & Boyd-Zaharias, 2001; Krueger, 2003; Nye, 2000). There are also results from numerous studies indicating that class size does not systematically affect achievement, although significant reductions in class size do appear to increase student performance on standardized exams. For example, a reduction in class size of about ten students would lead to gains in student achievement comparable to what could be achieved through the

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improvement of teacher quality by one standard deviation (Nye, Hedges, & Konstantopoulos, 2001).<sup>3</sup>

This paper takes a new policy look at class size. For the purpose of this paper, we are not directly interested in whether class size influences student performance. We address whether class size is used as a policy instrument of principals and school administrators in response to demonstrated teaching effectiveness. More explicitly, do principals consider a teacher's prior effectiveness when determining the current class size for that teacher? We argue that theoretically, class size can be reduced as a means of compensating or "rewarding" teachers for good performance or it can be increased by principals in an effort to put more students in the classrooms of effective teachers. This, of course, has the effect of "punishing" the more effective teachers. We empirically examine this question with a data set that matches students to teachers in a longitudinal panel that allows us to measure prior teacher effectiveness. We find that more effective teachers do receive punishment in the form of larger class sizes. Our results hold implications for prior policy studies regarding the effects of class size on student achievement as well as for education policy more generally.

## 2. Teacher effectiveness

A major focus in both education research and in education policy currently is on teacher quality. Recent research has emphasized the importance of quality teachers in explaining student achievement (Darling-Hammond, 2000; Guarino, Santibanez, & Daley, 2006; Rivkin, Hanushek, & Kain, 2005; Rowan, Correnti, & Miller, 2002; Sanders & Rivers, 1996). This finding is so critical that it became one of the focal points for the No Child Left Behind legislation (NCLB) enacted in 2001 and continues to be a driver of the emphasis on data collection in the federal Race to the Top competition. Indeed, researchers, policy-makers, and families appear not to question the common sense finding that teachers matter in student outcomes.

While most agree anecdotally that teachers matter, a challenge remains from a research perspective. Studies attempting to identify the characteristics of teachers that define "quality" are beset by mixed results.<sup>4</sup> While new teachers are generally identified as relative weak teachers, other characteristics are less straightforward (Clotfelter et al., 2007; Harris & Sass, 2011).<sup>5</sup> Degree held by the teacher, salary earned, gender and ethnicity, and other observed characteristics seem to generate few consistent effects when measuring teacher effectiveness. Generally, evidence shows that teachers do have differential effects on student learning but the task of explaining why some teachers perform better than others remains open.

<sup>3</sup> Recent work by Konstantopoulos and Sun (2010) suggests that the earlier works have failed to take into account the importance of unobserved differences in teacher effectiveness in estimating the effects of class size.

<sup>4</sup> We assume teacher quality to be the impact teachers have on student outcomes.

<sup>5</sup> In this context, new teachers can be considered to be those with less than three to five years of experience.

The lack of measurable characteristics to define teacher quality has been viewed as an argument against teacher performance evaluations and differential compensation for teachers. The concern has been that subjectivity and possible bias on the part of principals and superintendents will mean that administrators' favorite teachers are rewarded and their disliked teachers will be penalized unfairly in such a schema. As a result, tenure and salary schedules remain an important part of teacher compensation packages and constrain the ability of the administrator to reward or punish differential performance.

Consistent with evidence from Jacob and Lefgren (2008) and Jacob (2011), this paper argues that schools, either through pressure from parents, or independent behavior of principals, do recognize that teachers are not equally effective.<sup>6</sup> We develop a conceptual framework based on this implicit recognition and explore the possible behavioral responses of the principal with regard to class size. Beyond the implications for the class size effects' literature, this model and the empirical findings are policy relevant. If principals are using class size strategically, then this holds implications for the broader issues of teacher evaluation and compensation. We return to these implications later in the paper.

## 3. Class size as a policy instrument

As stated above, virtually all stakeholders agree that teacher quality is an important input into the education production process. The importance of enhanced teacher quality has grown in recent years with federal and state laws that have increased school accountability. High stakes testing is now a significant part of the K-12 educational system (Airasian, 1988; Dorn, 1998; Bracey, 2000). Given this environment, principals of schools face increased pressure to produce better test results and view teachers as a significant way to improve the school performance measures. Beteille, Kalogrides, and Loeb (2009) find evidence that effective schools use the recruitment and retention of effective teachers as a means of influencing student outcomes. This paper argues that schools may also use class size as a means of capitalizing on effective teachers.

Principals face constraints such as tenure and salary schedules that limit their in-period ability to reward or punish teachers. They are also limited by teacher mobility. For example, effective teachers have been shown to move from worse to better schools in urban areas (Clotfelter, Ladd, & Vigdor, 2006) and this influences the teacher pool within any given school. But class size remains a potential margin at which the school can exercise some influence within a school year and, thereby, affect the progress of its students. Although we do not suggest that class size is the only instrument available to school administrators within the school year, we limit our focus on this variable in an effort to assess whether class size is a significant policy instrument within schools.

<sup>6</sup> They found evidence for this in the form of subjective evaluations of the teachers by the principals and in firing practices of the principal.

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