For whom the reductions count: A quantile regression analysis of class size and peer effects on scholastic achievement*

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Abstract. In this paper the controversial educational topic of class size reduction is addressed. Controlling for a large number of observable characteristics and potential endogeneity in the class size variable, an educational production function is estimated using a quantile regression technique. The “conventional wisdom” that class size reduction is a viable means to increase scholastic achievement is discounted. Rather, the results point towards a far stronger peer effect through which class size reduction may play an important role. Due to heterogeneity in the newly identified peer effect, class size reduction is shown to be a potentially regressive policy measure.

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Key words: Quantile regression, class size, educational production, educational equity.

1. Introduction

Class size reduction is perhaps the most popular educational reform advocated by politicians and policy makers. Indeed the concept is quite simple, following the “conventional wisdom” smaller classes means allocating more instruction time per pupil, which should translate into marked increases in

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academic achievement. Much policy has been based on the premise that smaller classes benefit students in the form of higher achievement.\(^1\) Although the picture painted by the conventional wisdom seems plausible resulting in a large amount of resources devoted to its cause, little solid evidence has been found to support the claim that class size reduction is associated with significant improvements in scholastic achievement.

Among the earliest and certainly one of the most controversial studies of the effects of schooling inputs (including class size) on scholastic achievement was the infamous Coleman Report (1966). In general, the study concluded that schooling inputs have a negligible effect on scholastic achievement.\(^2\) Amidst the widespread claims of the benefits of class size reduction and subsequent outlay of resources towards reducing class size, it is no surprise that economists have undertaken much of the recent research on the issue. A summary of the earlier economic research on the subject includes an exhausting review by Hanushek (1986) of studies analyzing the effects of various inputs in the production of public schooling. The main finding of the survey is that the effect of class size reduction (and more generally increased expenditures on education) on achievement is ambiguous, wavering from positive to negative depending on the study. It is also noted that when the effect is found to be significantly negative (i.e. reduced class sizes increase achievement), the magnitude of the effect is minute.

Obviously, the empirical evidence up to this point by and large questions the validity of the conventional wisdom put forth above. However, past studies have for the most part addressed the causal effect of class size on scholastic achievement with a traditional ordinary least squares (OLS) approach. More recently researchers have applied an instrumental variables (IV) approach using two-stage least squares (2SLS) and, less often, field experiments in order to address the issue of potential endogeneity of class size with respect to achievement.\(^3\) Both OLS and 2SLS are designed to estimate the mean or average causal effect of class size on achievement. That is to say, most of the studies estimate the effects of a change in class size on the achievement of the average individual in the sample being analyzed. This provides the researcher with an estimate of how efficient a reduction in class size is at boosting the achievement of the average performer.\(^4\)

The alternative quantile regression (QR) approach goes further. It con-

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\(^1\) For example, since 1996 over $\$3.6$ billion of state funds in California have been put forth to reduce class size, particularly in the lowest grades. Florida, Indiana, Nevada, Tennessee, and Wisconsin are among 20 US states that are currently engaged in or formulating policy to reduce class sizes. On a more international level, Dutch policy-makers reached a major decision in 1997 to allocate over one billion guilders (approximately $\$500$ million) specifically for reducing class sizes in primary education.

\(^2\) However, the results have been challenged both methodologically and on the grounds of flawed data collection. See Hanushek (1986) for a brief summary of the Coleman Report findings.

\(^3\) Examples of IV applications can be found in Ackerheim (1995) and Hoxby (1998) whereas analysis of the Tennessee STAR experiment has been done by Finn and Achilles (1990) and later by Krueger (1997).

\(^4\) Krueger (1997) deviates from this by analyzing sub samples of the STAR experimental data. He finds substantial differences in the class size effect between boys and girls, blacks and whites, and inner city and out-of-city students. More recently, Lazez (1999) has put forth a theoretical framework in which optimal class size with respect to scholastic achievement differs between students that behave well and those that do not.