Reference: Krueger, A. (2003). Economic considerations and class size. Economic Journal, 113, pp. 34-63.

STRUCTURED ABSTRACT

Background: A series of literature reviews published by researcher Eric Hanushek in the 1980s and 1990s found no meaningful relationship between class size and student achievement. Hanushek's findings are widely cited as evidence that small class size does not lead to gains in student achievement. However, controversy continues over the specific statistical procedures and selection rules Hanushek used when tabulating and calculating the various individual study results for his review. A researcher who reviewed the exact same studies at Hanushek but who used an alternative set of selection rules might arrive at the opposite conclusion as Hanushek.

Another important issue to consider when evaluating the effect of class size on student achievement is the economic question of how much class size reduction costs compared to the benefits conferred by small classes over the long term.

Purpose: This study had two aims: to re-examine a Hanushek review of evidence on the effect of class size on student achievement that appeared in 1997 in the journal *Educational Evaluation and Policy Analysis*; and to perform an economic cost-benefit analysis of class size reduction using the results from Tennessee's Project STAR, a landmark randomized-controlled field trial on class size in kindergarten through third grade.

Research Design: Secondary analysis and cost-benefit analysis.

Data Collection and Analysis: Hanushek provided the original classification of estimates and studies that he used in his 1997 review of 59 studies involving 277 estimates on class size. In the original analysis by Hanushek, multiple estimates from the same study were included in the summary if Hanushek deemed them sufficiently different from one another (e.g., estimates with different measures of student performance, with different grade levels, with different samples of students, etc.). This decision to include multiple estimates or not required considerable discretion on the part of Hanushek. Of the 59 studies included in the review, 9 studies had between 8 and 24 estimates each included in the review; as a result, 15% of the studies contributed 44% of the estimates. .

These data were reanalyzed using "individual studies" as the unit of analysis instead of "individual estimates" – in other words, all studies received equal weighting and each study was counted only once. The reanalysis also included an in-depth critique of the 9 class size studies with 8 or more estimates and the way Hanushek extracted estimates from each of them.

The cost-benefit analysis used data from Project STAR, the Tennessee randomized-controlled field trial on class size in the early elementary grades. It examines the relative costs and benefits of reducing class size from 22 students to 15 students in kindergarten through third grade. The cost-benefit analysis is based on the economic assumption that an increase of one standard deviation in math or reading scores in elementary school is associated with 8% higher earnings later in life, as suggested by prior research on the relationship between student

achievement and wage earnings. Benefits and costs, as well as internal rates of return, were calculated using discount rates ranging from 2% to 6% and annual productivity growth rates ranging from 0 to 2%.

Findings: The original Hanushek 1997 review placed disproportionate emphasis on a small number of class size studies that reported multiple estimates based on small subsamples. When this reanalysis assigned all studies in the Hanushek literature review equal weight, it found that class size was in fact systematically related to student achievement.

The cost-benefit analysis, based on Project STAR data and a set of economic assumptions about the future performance of the U.S. economy, showed that on average every dollar invested in reducing class size by 7 students in kindergarten through third grade eventually yields about $2 in benefits in total increased earnings for those students over their work careers between ages 18 and 65. The internal real rate of return under these assumptions is about 6%, in line with what economic theory would predict.

Conclusions: Hanushek does not provide justification for his decision to analyze study results using individual estimates as the unit of analysis, which inappropriately allows a small number of studies to be counted multiple times in his summary of class size research. When each study in his review is counted only once, the literature shows a systematic relationship between class size and student achievement.

The cost-benefit analysis, subject to the many assumptions used in performing the calculations, suggests that class size reduction represents a solid economic investment by society, as every $1 invested in reducing class size from 22 students to 15 students in kindergarten through third grade eventually yields about $2 in benefits in total increased earnings for those students over their work careers.