Bibliography of class size research

Smaller classes, higher achievement and narrowing the opportunity gap

- **Jackson, C. Kirabo., Johnson, Rucker C., Persico, Claudia. (forthcoming) The Effects of School Spending on Educational And Economic Outcomes: Evidence from School Finance Reforms** ***The Quarterly Journal of Economics. Analyses of school finance reforms reveal that a 10 percent increase in per-pupil spending each year for all twelve years of public schooling leads to 0.31 more completed years of education for students, about 7 percent higher wages, and a 3.2 percentage-point reduction in the annual incidence of adult poverty; with effects more pronounced for children from low-income families. Higher spending increases were associated with notable improvements in measured school inputs, including reductions in student-to-teacher ratios, increases in teacher salaries, and longer school years.***

- **Zyngier, David. (2014). Class size and academic results, with a focus on children from culturally, linguistically and economically disenfranchised communities.** ***Evidence Base, issue 1, 2014. In this research summary, the author examined class size reduction and its effect on student achievement by analyzing 112 peer-reviewed studies, and showed that the overwhelming majority of these studies found that smaller classes have a significant impact on student achievement and narrowing the achievement gap. The author writes, "Noticeably, of the papers included in this review, only three authors supported the notion that smaller class sizes did not produce better outcomes to justify the expenditure."***

- **Schanzenbach, D. W. (2014). Does Class Size Matter?** ***National Education Policy Center Policy Brief. "This policy brief summarizes the academic literature on the impact of class size and finds that class size is an important determinant of a variety of student outcomes, ranging from test scores to broader life outcomes. Smaller classes are particularly effective at raising achievement levels of low-income and minority children. Policymakers should carefully weigh the efficacy of class-size policy against other potential uses of funds. While lower class size has a demonstrable cost, it may prove the more cost-effective policy overall."***

- **Achilles, C. M., et al. (2012). Class-size Policy: The Star Experiment and Related Class-size Studies.** ***NCPEA Policy Brief,* 1.2. *"A reanalysis of the Tennessee STAR experiment found that small classes (15-17 pupils) in kindergarten through third grade (K-3) provide short- and long-term benefits for students, teachers, and society at large….poor, minority, and male students reap extra benefits in terms of improved test outcomes, school engagement, and reduced grade retention and dropout rates."***

- **Shin, Yongyun (2012). Do Black Children Benefit More From Small Classes? Multivariate Instrumental Variable Estimators With Ignorable Missing Data.** ***Journal of Educational and Behavioral Statistics, 37 (4). An analysis of experimental data from Tennessee's Student-Teacher Achievement Ratio study show that, for Black students, reduced class size caused higher academic achievement in the four domains (reading, mathematics, listening, and word recognition skills) each year from kindergarten to third grade, while for other students, it improved the four outcomes except for first-grade listening in kindergarten and first grade only. Evidence shows that Black students benefit more than others from reduced class size in first-, second-, and third-grade academic achievement, substantially narrowing the achievement gap.***

- **Dynarski, S., Hyman, J., & Schanzenbach, D. W. (2011). Experimental Evidence on the Effect of Childhood Investment on Postsecondary Attainment and Degree Completion. NBER Working Paper.** ***"The study concludes that attending a small class increases the rate of college attendance, with the largest positive impact on black and poor students. Among those students with the lowest predicted probability of attending college, a small class increased rate of college attendance by 11 percentage points. Attending a small class also increases the probability of earning a college degree, and to shift students toward earning degrees in high-earning fields such as science, technology, engineering and mathematics (STEM), business and economics."***

- **Bascia, N. (2010). Reducing Class Size: What do we Know?. *Ontario Institute for Studies in Education. Reviewed research base and analyzed statistical data collected by the Canadian Ministry of Education between 2003-04 and 2007-08. Involved field research in eight school districts, 24 schools, and 84 classrooms. Classroom observations were undertaken at each primary grade level, from K-3. All teachers were surveyed in each school. Parent surveys included representation from every school district in Ontario. "Nearly three-quarters of the primary teachers reported that the quality of their relationships with students had improved as a result of the smaller class size, and two-thirds said their students were more engaged in learning than before class size reduction…Many parents of children enrolled in smaller classes reported that their children appeared to be learning more and were more comfortable at school."***

- **Heilig, J.V., Williams, A. & Jez, S.U. (2010). Input and student achievement: An analysis of Latina/o –serving urban elementary schools. Association of Mexican American Educators (AMAE) Journal, 48 -58. *Examined readily available input variables in Texas Ed. databases in three of the four largest TX districts (Houston, Dallas and Austin) in 419 schools that are majority Latina/o over 4 years (2005-2008). Evaluated variables such as school funding expenditures, tests scores, ethnicity, and teacher certification, teacher-student ratio and degree obtainment to identify any impact on student achievement in urban elementary schools. "Most powerful predictor of changes in reading and math in all models was decreasing the student teacher ratio…. Essentially, decreasing the student teacher ratio by 1 percentage point would increase the percentage of students proficient on the TAKS by 3% for reading and by 4% for math (p54)."***

- **Jepsen, C., & Rivkin, S. (2009). Potential Tradeoff between Teacher Quality and Class Size. Journal of Human Resources, 44.1. *This paper investigates the effects of California's billion-dollar class-size-reduction program on student achievement;…."[T]here is little or no support for the hypotheses that the need to hire large numbers of teachers following the adoption of CSR [class-size reduction] led to a lasting reduction in the quality of instruction," according to the study. "Overall, the findings suggest that CSR increased achievement in the early grades for all demographic groups…."***

- **Konstantopoulos, S., & Chun, V. (2009). What Are the Long-Term Effects of Small Classes on the Achievement Gap? Evidence from the Lasting Benefits Study," American Journal of Education 116. *A summary of the effects of smaller classes on the achievement gap through eighth grade. Effects significant in all tested subjects, and for those in smaller classes for four years, very substantial. "The results … provided convincing evidence that all types of students (e.g., low, medium, and high achievers) benefit from being in small classes (in early grades) across all achievement tests…. in certain grades, in reading and science, the cumulative effects of small classes for low achievers are substantial in magnitude and significantly different from those for high achievers. Thus, class size reduction appears to be an intervention that increases the achievement levels for all students while simultaneously reducing the achievement gap."***

- **Babcock, P., & Betts, J.R. (2009). Reduced Class Distinctions: Effort, Ability, and The Education Production Function. Journal of Urban Economics, Vol. 65, pp. 314–322. *Empirical findings indicate that class-size expansion may reduce gains for low-effort students more than for high-effort students, Results here…suggest …that larger gains for disadvantaged students may have occurred because small classes allow teachers to incentivize disengaged students more effectively, or because students are better able connect to the school setting in small classes.***

- **Lubienski, S. T., et.al. (2008). Achievement Differences and School Type: The Role of School Climate, Teacher Certification, and Instruction. American Journal of Education, 115. *Multilevel analysis of National Assessment of Educational Progress (NAEP) mathematics data for over 270,000 fourth and eighth graders in over 10,000 schools finds that smaller class size is significantly correlated with higher achievement.***

- **Magnuson, K.A., Ruhm, C. & Waldfogel, J. (2007). The persistence of preschool effects: Do subsequent classroom experiences matter? Early Childhood Research Quarterly, 22(1), 18 –**

38. ***Using data from the Early Childhood Longitudinal Study-Kindergarten cohort (ECLS-K), it has been demonstrated that children who attended preschool enter public schools with higher levels of academic skills than their peers who experienced other types of child care. This study considered … the types of classrooms in which students who did not attend preschool "catch up" to their counterparts who did. The findings suggested that most of the preschool-related gap in academic skills at school entry is quickly eliminated for children placed in small classrooms and classrooms providing high levels of reading instruction. Conversely, the initial disparities persisted for children experiencing large classes and lower levels of reading instruction.***

- **Ready, D. D., & Lee, V. E. (2006/7). Optimal Context Size in Elementary Schools: Disentangling the Effects of Class Size and School Size. Brookings Papers on Education Policy, pp. 99-135.** ***Study finds that class size rather than school size makes a positive difference, and suggests that "if children remained in the same elementary school for five or six years … differences would be very substantial: a roughly 10-point advantage for children in small over large classes by the end of sixth grade, or 4.5 months of additional learning."***

- **Unlu, F. (2005). California Class Size Reduction Reform: New Findings from the NAEP. Princeton University.** ***Study found that California's fourth grade students who were in reduced class sizes in grades K-3 had substantially higher scores in math on the national assessments (NAEPs), of between 0.2 and 0.3 of a standard deviation, compared to closely matched students who were not in smaller classes.***

- **Finn, J. D., et. al. (2005). Small Classes in the Early Grades, Academic Achievement, and Graduating From High School. Journal of Educational Psychology.** ***"For all students combined, 4 years of a small class in K–3 were associated with a significant increase in the likelihood of graduating from high school; the odds of graduating after having attended small classes for 4 years were increased by about 80.0%. Furthermore, the impact of attending a small class was especially noteworthy for students from low-income homes. Three years or more of small classes affected the graduation rates of low-SES students, increasing the odds of graduating by about 67.0% for 3 years and more than doubling the odds for 4 years."***

- **Dee, T. (2004). Teachers, Race, and Student Achievement in a Randomized Experiment. Review of Economics and Statistics.** ***Study showing that student/teacher racial differences appear to negatively effect student achievement in regular size classes. Yet in small classes, students learn more, and racial disparity between teacher and student has no significant effect.***

- **Barton, P. (2003). Parsing the Achievement Gap. Educational Testing Service.** ***Despite the fact that class size reduction has been shown to narrow the achievement gap, this study reveals that schools with large numbers of black and/or limited English students are more likely to have classes of 25 or more.***

- **Institute of Education Sciences. (2003). Identifying and Implementing Educational Practices Supported by Rigorous Evidence: A User Friendly Guide. U.S. Department of Education.** ***Class size reduction identified as one of four K-12 education reforms proven to increase learning.***

- **Krueger, A. B., & Whitmore, D. M. (2002). Would Smaller Classes Help Close the Black-White Achievement Gap? from:** ***Bridging the Achievement Gap*****, Brookings Institution Press. "***Our analysis of the STAR experiment indicates that students who attend smaller classes in the early grades tend to have higher test scores while they are enrolled in those grades than their counterparts who attend larger classes….Moreover, black students tend to advance further… from attending a small class than do white students, both while they are in a small class and afterwards. For black students, we also find that being assigned to a small class for an average of two years in grade K – 3 is associated with an increased probability of subsequently taking the ACT or SAT college entrance exam, and 0.15-.20 standard deviation higher average score on the exam."***

- **Fidler, P., Phd. (2002). The Impact of class size reduction on student achievement. Los Angeles Unified School District, Publication No. 109. "***The purpose of this study was to examine the impact of*

class size reduction (CSR) on achievement among 3rd, 4th, and 5th grade students with different numbers of years of participation in CSR…. We believe that CSR will help to increase student achievement, especially for students who need it the most: low SES students, limited English-speaking students, and those students in inner-city schools…. It can be concluded from the results of this study that CSR does help to increase language achievement gains, especially for ELL students."

- **Biddle, B., & Berliner, D. (2002). What Research Says About Small Classes and Their Effects*.Wested*. "*When it is planned thoughtfully and funded adequately, long-term exposure to small classes in the early grades generates substantial advantages for students in American schools, and those extra gains are greater the longer students are exposed to those classes."***

- **U.S. Department of Education. National Center for Education Statistics. (2000). School-Level Correlates of Academic Achievement: Student Assessment Scores in SASS Public Schools. NCES 2000-303, by Donald McLaughlin and Gili Drori. Project Officer: Michael Ross. Washington DC.** ***The most authoritative study showing the importance of class size is in all grades, analyzing the achievement levels of students in 2,561 schools, as measured by performance on the NAEP (national) exams. After controlling for student background, the only objective factor found to be positively correlated with student performance was class size, not school size, not teacher qualifications, nor any other variable that the researchers could identify. Student achievement was even more strongly linked to smaller classes in the upper rather than the lower grades.***

- **Grissmer, D., et. al. (2000). Improving Student Achievement: What State NAEP Test Scores Tell Us. *RAND. "States with higher per-pupil spending, lower class sizes and more pre-K have higher achievement levels. Disadvantaged children are the most likely to gain benefits from such programs."***

- **Pritchard, I. (1999). Reducing class size: What do we know? U.S. Department of Education.** ***A comprehensive and wide-scale analysis of CSR analyses, experimental studies and state initiatives. "Researchers have used various techniques to study how class size affects the quality of education.… Overall, however, the pattern of research findings points more and more clearly toward the beneficial effects of reducing class size.***

- **Bracey, G. (1999) Distortion and Disinformation about Class Size Reduction. EDDRA.** ***Critique of Hanushek's analyses of class size reduction*.**

- **Cromwell, S. (1998). Are smaller Classes the Answer? Education World.** ***Thorough analysis of contemporary research articles evincing the benefits of smaller class sizes.***

- **Achilles, C. M. (1997). Small Classes, Big Possibilities. *The School Administrator*. "*Perhaps the idea of small classes for students in the early grades is so commonsensical today that educators don't consider it a challenge. Yet education's leaders must look beyond the surface variables to understand the systemic, domino-effect possibilities of class-size changes."***

- **NCTE: National Council of Teachers of English. (1996). Statement on Class Size and Teacher Workload: Elementary. *Guideline for NCTE's position on educational issues is in strong support of smaller class sizes, complete with facts and challenges. All of the major professional organizations in the field of composition recommend course sizes of no more than twenty students for K-1, based on the literature on class size and writing.***

- **Mosteller, F. (1995). The Tennessee Study of class size in the early school grades. (1995). The Future of Children, 5.2.** ***Formidable results from the historic large-scale experiment for early grades, Project STAR. "After four years, it was clear that smaller classes did produce substantial improvement in early learning and cognitive studies and that the effect of small class size on the achievement of minority children was initially about double that observed for majority children…."***

- **AEU Fact Sheet Number 1. (1995). Class sizes do matter. Australian Education Union.** ***Fact sheet with evidence from class size research projects and reading list for the general public.***

- **Boozer, M., & Rouse, C. (1995). Intraschool variation in class size: patterns and implications. *NBER Working Paper*, No.5144.** ***"We find that not only are blacks in schools with larger average class sizes, but they are also in larger classes within schools, conditional on class type…it appears that smaller classes at the eighth grade lead to larger test score gains from eighth to tenth grade and that differences in class size can explain approximately 15% of the black-white difference in educational achievement."***

Case studies

- **Tienken, C.H., & Achilles, C.M. (2006). Making Class Size Work in the Middle Grades. AASA Journal of Scholarship & Practice, 3.1, pp 26-36.** ***In a NJ middle school, reducing class size led to a reduction in the failure rate from 3-6% to only 1%, despite a concurrent increase in 40-60 students, and a 7% increase in poverty students, without any additional spending. Gains in test scores were statistically significant with .80 effect size.***

- **O'Neill, J., & Mercier, D. (2003). Incredible Shrinking Class Size. National Staff Development Council.** ***Describes how one school in Wisconsin reduced class size without additional funding.***

- **SERVE. (2002). How Class Size Makes a Difference.** ***One of the best and most readable summaries of the research, prepared by the Regional Educational Laboratory for the Southeast, funded by the U.S. Department of Education. And: "*** **A Parent's Guide to Class-Size Reduction," 2003.** ***A useful introduction, including suggestions on actions parents can take to encourage class-size reduction at their schools.***

- **Finn, J. D. (2002).** ***Small Classes in American Schools: Research, Practice, and Politics. Phi Beta Kappan. A summary of the research by one of the premier STAR investigators.***

- **Molnar, A., et al. (2000). Wisconsin's Student Achievement Guarantee in Education (SAGE) Class Size Reduction Program: Achievement Effects, Teaching and Classroom Implications. From: How Small Classes Help Teachers do their Best. Ed. Margaret Wang and Jeremy Finn, Philadelphia, PA : Temple University Center for Research in Human Development,(p.227-237).**

- **Haimson, L. (2000). Smaller is Better: First-hand Reports of Early Grade Class Size Reduction in New York City Public Schools.** ***Education Priorities Panel. This study was carried out during the first year of the class size reduction program for grades K-3 in the New York City public schools. "On the whole, the class size reduction experience as reported by principals and teachers has been overwhelmingly positive….Many of the students placed in smaller classes appear to be learning faster this year….The quality and quantity of teaching have been fundamentally enhanced…noticeable decline in the number of disciplinary referrals among students placed in smaller classes…all of the principals and teachers we interviewed urged that support for the class size program should be continued and expanded."***

- **Class Size: Project SAGE. (n.d.). American Youth Policy Forum.** ***SAGE studies in Wisconsin began as a five-year pilot program in the 1996-97 school year to test the hypothesis that smaller classes in elementary schools raise the academic achievement of disadvantaged students. SAGE is one of the largest class size reduction initiatives and found significant gains for African American students.***

Benefits for the upper elementary, middle and upper grades

- **Fredriksson, P., Öckert, B. & Oosterbeek, H. (2013). Long-Term Effects of Class Size. The Quarterly Journal of Economics, 128 (1). "*Analysis of administrative data from Sweden shows Smaller classes in the last three years of primary school (age 10 to 13) are not only beneficial for cognitive test scores at age 13 but also for non-cognitive scores at that age, for cognitive test scores at ages 16 and 18, and for completed education and wages at age 27 to 42. The estimated effect on wages shows the economic benefits outweigh the costs."*

- **Rumberger, R. W. (2011). Dropping Out: Why Students Drop out of High School and What Can Be Done about It. Cambridge, MA: Harvard UP.** ***There is more consistent and compelling evidence for two early interventions: preschool programs and class- size reduction in early elementary school. Both produce significant improvements in high school graduation rates.***

- **Blatchford, P., Bassett, P., & Brown, P. (2011). Examining the effect of class size on classroom engagement and Teacher-pupil interaction- Differences in relation to pupil prior attainment and primary vs. secondary schools. Learning and Instruction, 21.** ***An observational study involving nearly 700 students in 49 schools in the UK finds that in both the early and later grades, smaller classes leads to students receiving more individual attention from their teachers and having more positive interactions with them. Classroom engagement decreases in larger classes, and this is particularly marked for struggling students at the secondary level. Students are engaged in active interactions with their teachers two to three times more often in a class of 15 compared to class of 30, and for low achievers at secondary level there is more than twice as much off task behavior in classes of 30 compared to 15. A five student increase in class size is associated with the odds of off task behavior increasing by 40% for this group. No threshold effect was observed; in other words, there is no particular class size that must be attained for positive benefits to accrue to students in smaller classes.***

- **Malloy, C., Ph.D., & Vital Research, LLC., (2010). Lessons from the Classroom: Initial Success for At-Risk Students. California Teachers Association.** ***"An ongoing evaluation of the Quality Education Investment Act (QEIA) …. This report includes a comparative analysis of Academic Performance Index data for QEIA schools and non-QEIA schools as well as findings from an action research project in 22 QEIA schools statewide… most common goal noted by schools was class size reduction: at least one interviewee at all but one of the regular program schools cited class size reduction as a key goal of QEIA at their school…higher API growth schools cited class size reduction as one of the key factors that contributed to changes in teaching practices at their schools…spend more time with the "neediest, at-risk" students, differentiate instruction, and spend less time on classroom management issue."***

- **Lubienski, S. T., et.al. (2008). Achievement Differences and School Type: The Role of School Climate, Teacher Certification, and Instruction. American Journal of Education, 115.** ***Multilevel analysis of National Assessment of Educational Progress (NAEP) mathematics data for over 270,000 fourth and eighth graders in over 10,000 schools finds that smaller class size is significantly correlated with higher achievement.***

- **MiddleWeb. (2008). Teachers of the Year talk about the need for smaller classes in the middle and upper grades.** ***Excerpts from ED's Teacher of the Year listserve discussing need for small classes.***

- **Blatchford, P., et.al. (2008). Do low attaining and younger students benefit most from small classes? Results from a systematic observation study of class size effects on pupil classroom engagement and teacher pupil interaction. Paper delivered to the** ***American Educational Research Association Annual Meeting. "…[T]he main implication of this study is that smaller classes can benefit all pupils in terms of individual, active attention from teachers, but that the lower attaining pupils in particular can benefit from small classes at secondary level."***

- **Tienken, C.H., & Achilles, C.M. (2006). Making Class Size Work in the Middle Grades. AASA Journal of Scholarship & Practice, 3.1, pp 26-36.** ***In a NJ middle school, reducing class size led to a reduction in the failure rate from 3-6% to only 1%, despite a concurrent increase in 40-60 students, and a 7% increase in poverty students, without any additional spending. Gains in test scores were statistically significant with .80 effect size.***

- **Dustmann, C., et. al. (2003). Class Size, Education and Wages. Economic Journal.** ***UK study showing high school students in small classes more likely to stay through graduation.*** **See also Guardian UK summary.** ***Explanation of the previous analysis' findings.***

- **U.S. Department of Education. National Center for Education Statistics (2000) School-Level Correlates of Academic Achievement: Student Assessment Scores in SASS Public Schools. NCES 303, by Donald McLaughlin and Gili Drori. Project Officer: Michael Ross. Washington DC.** ***The most authoritative study showing the importance of class size is in all grades, analyzing the achievement levels of students in 2,561 schools, as measured by performance on the NAEP (national) exams. After controlling for student background, the only objective factor found to be positively correlated with student performance was class size, not school size, not teacher qualifications, nor any other variable that the researchers could identify. Student achievement was even more strongly linked to smaller classes in the upper rather than the lower grades.***

- **NCTE: National Council of Teachers of English. (1999). More than a Number: Why Class Size Matters.** ***Guideline for NCTE's position on educational issues is in strong support of smaller class sizes, complete with facts and challenges.***

- **Wenglinsky, H.(1997). When Money Matters. Educational Testing Service.** ***Shows how smaller classes in grades 4 and 8 are linked to higher test scores and improved student discipline.***

- **Boozer, M., & Rouse, C. (1995). Intraschool variation in class size: patterns and implications.** ***NBER Working Paper,*** **No. 5144.** ***"We find that not only are blacks in schools with larger average class sizes, but they are also in larger classes within schools, conditional on class type…it appears that smaller classes at the eighth grade lead to larger test score gains from eighth to tenth grade and that differences in class size can explain approximately 15% of the black-white difference in educational achievement."***

- **NCTE: National Council of Teachers of English. (1990). Statement on Class Size and Teacher Workload: Secondary. "***The Secondary Section of the National Council of Teachers of English recommends that schools, districts, and states adopt plans and implement activities resulting in class sizes of not more than 20 and a workload of not more than 80 for English language arts teachers by the year 2000."***

Long-term effects, health and economic benefits

- **Dynarski, S., Hyman, J., & Schanzenbach, D. W. (2011). Experimental Evidence on the Effect of Childhood Investment on Postsecondary Attainment and Degree Completion.** ***NBER,*** **Working Paper.** ***"The study concludes that attending a small class increases the rate of college attendance, with the largest positive impact on black and poor students. Among those students with the lowest predicted probability of attending college, a small class increased rate of college attendance by 11 percentage points. Attending a small class also increases the probability of earning a college degree, and to shift students toward earning degrees in high-earning fields such as science, technology, engineering and mathematics (STEM), business and economics."***

- **Fredriksson, P., Öckert, B. & Oosterbeek, H. (2013). Long-Term Effects of Class Size. The Quarterly Journal of Economics, 128 (1).** ***Analysis of administrative data from Sweden shows Smaller classes in the last three years of primary school (age 10 to 13) are not only beneficial for cognitive test***

scores at age 13 but also for non-cognitive scores at that age, for cognitive test scores at ages 16 and 18, and for completed education and wages at age 27 to 42. The estimated effect on wages shows the economic benefits outweigh the costs.

- **Chetty, R., et. al. (2011). How Does your Kindergarten classroom affect your earnings? Evidence from Project Star. The Quarterly Journal of Economics, 126:4. *Smaller classes in Kindergarten shown to lead to greater likelihood of attending college, owning a home and a 4101K as adults more than 20 years later.***

- **Dee, T., & West, M. (2011). The Non-Cognitive Returns to Class Size. Educational Evaluation and Policy Analysis, 33:23. "*Results show that smaller classes in 8th grade lead to improvements in non-cognitive skills like student engagement, persistence and self-esteem that have been strongly linked to success in schools and later in life. The authors estimate that in urban schools, the economic benefits from investing in smaller classes would be nearly twice the cost."***

- **De Giorgi, G., Pellizzari, M., & Woolston, W. G. (2009). Class size and class heterogeneity. IZA Discussion Papers, No. 4443. *"Our baseline results suggest that increasing class size by 20 students reduces a student's wage by approximately 6%. If we trust such estimate, it would be hard to dismiss class size reduction as an ineffective and inefficient policy….Such an intervention [reducing average class sizes to 20 students] would generate a gain of 80 euros x 1,500 students, or 120,000 euros in total each month, which are likely to be more than enough to pay the costs of acquiring the additional resources necessary to activate the two extra classes."***

- **Muennig, P., & Woolf, S. H. (2007). Health and Economic Benefits of Reducing the Number of Students per Classroom in US Primary Schools. American Journal of Public Health. "*Reducing class sizes may be more cost-effective than most public health and medical interventions, with large savings in health care costs and almost two years of additional life for students who were in smaller classes in the early grades."* See also 2007 summary in *Slate magazine* by Dr. Sydney Spiesel.**

- **Finn, J. D., et. al. (2005). Small Classes in the Early Grades, Academic Achievement, and Graduating From High School. Journal of Educational Psychology. *"For all students combined, 4 years of a small class in K–3 were associated with a significant increase in the likelihood of graduating from high school; the odds of graduating after having attended small classes for 4 years were increased by about 80.0%. Furthermore, the impact of attending a small class was especially noteworthy for students from low-income homes. Three years or more of small classes affected the graduation rates of low-SES students, increasing the odds of graduating by about 67.0% for 3 years and more than doubling the odds for 4 years."***

- **Dustmann, C., et. al. (2003). Class Size, Education and Wages. The Economic Journal. *UK study showing high school students in small classes more likely to stay through graduation.* See also Guardian UK summary. *Explanation of the previous analysis' findings.***

- **Krueger, A. K. (2003). Economic Considerations and Class Size. The Economic Journal, 113. *Concludes that "the benefits of reducing class size are estimated to be around twice the cost." Also includes an authoritative critique of Hanushek's work: "Hanushek's pessimistic conclusion about the effectiveness of schooling inputs results from the fact that he inadvertently places a disproportionate share of weight on a small number of studies that frequently used small samples and estimated misspecified models."***

- **Viadero, D. (2000). Study Links Smaller Classes To Higher Earnings. Education Week. *Summary of Krueger's economic analysis.***

Benefits for teachers and students

- **Achilles, C. M., et al. (2012). Class-size Policy: The Star Experiment and Related Class-size Studies. NCPEA Policy Brief 1.2. *"A reanalysis of the Tennessee STAR experiment found that small classes (15-17 pupils) in kindergarten through third grade (K-3) provide short- and long-term benefits for students, teachers, and society at large….poor, minority, and male students reap extra benefits in terms of improved test outcomes, school engagement, and reduced grade retention and dropout rates."***

- **Bascia, N. (2010). Reducing Class Size: What do we Know?. *Ontario Institute for Studies in Education. Reviewed research base and analyzed statistical data collected by the Canadian Ministry of Education between 2003-04 and 2007-08. Involved field research in eight school districts, 24 schools, and 84 classrooms. Classroom observations were undertaken at each primary grade level, from K-3. All teachers were surveyed in each school. Parent surveys included representation from every school district in Ontario. "Nearly three-quarters of the primary teachers reported that the quality of their relationships with students had improved as a result of the smaller class size, and two-thirds said their students were more engaged in learning than before class size reduction…Many parents of children enrolled in smaller classes reported that their children appeared to be learning more and were more comfortable at school."***

- **King, J. (2008). Bridging the Achievement Gap: Learning from three charter schools (part 1), (part 2), (part 3), (part 4). Columbia University (Doctoral Dissertation). *"School size and class size are linked to the five key cultural values ….: a culture that teaches effort yields success; a culture of high expectations; a disciplined culture; a culture built on relationships; and a culture of excellence in teaching. Small classes and small overall student loads allow teachers to spend more time working with individual students to help them track their own progress and develop their skills – thus reinforcing the principle that effort yields success. High expectations are easier to maintain when teachers know their students well (because of small school and class size), can identify whether a student's poor performance on an assessment reflects deficiencies in their effort or their understanding, and can respond accordingly."***

- **Graue,E., et. al. (2007). The Wisdom of Class-Size Reduction. American Educational Research Journal, 44.3. "*SAGE in particular, and CSR in general, allows teachers the space to create meaningful learning opportunities for students. Giving teachers support to develop new strategies for teaching smaller groups makes it more likely*."**

- **Finn, J.., Pannozzo, Gina M., and Achilles, Charles M. (2003) The Why's of Class Size: Student Behavior in Small Classes, Review of Educational Research, Vol. 73, No. 3, pp. 321-368. *This article summarizes theory and data on [the] hypothesis- that the key to the academic benefits of small classes resides in student behavior. ..students become more engaged academically and more engaged socially when class sizes are reduced, and this increased engagement in the classroom is a compelling explanation for increased learning in all subject areas.***

- **Wilson, V. (2002). Does Small Really Make a Difference? University of Glasgow. *Good literature review on the effects of class size on teaching and student behavior.***

- **Fidler, Penny, Phd. (2002). The Relationship between teacher instructional techniques and characteristics and student achievement in reduced size classes. Los Angeles Unified School District, Publication No. 120. "*The purpose of this study was to examine the impact of class size reduction (CSR) on achievement among 3rd, 4th, and 5th grade students with different numbers of years of participation in CSR…. We believe that CSR will help to increase student achievement, especially for students who need it the most: low SES students, limited English-speaking students, and those students in inner-city schools…. It can be concluded from the results of this study that CSR does help to increase language."***

- **Wang, M., & Finn, J. (2000). How Small Classes Help Teachers do Their Best: Recommendations from a National Invitational Conference. Philadelphia, PA: Temple University Center for Research in Human Development.**

- **Bernstein, K. J. (2000). Class size does matter. Prince George's and Montgomery Journal Newspapers. *Excellent essay by a high school teacher, explaining why both smaller classes and a smaller teaching load is essential to improve student achievement.***

Surveys of parents, teachers and students

- **The Friedman Foundation for Educational Choice. (2014). School Choice Signals, Research Review and Experiments. The survey indicated that respondents on average perceive that the most effective way to reform education in the U.S. is to reduce class sizes, ahead of technology or school choice.**

- **New York City Department of Education. (2012). School Survey Citywide Results. NYC DOE Learning Environment Surveys. *Smaller classes have been the top priority of NYC parents for their children's schools every year since they've been given (2009). See also p. 9 summary slides* School Survey Citywide Results(2011).**

- **Teach Plus. (2012). Great Expectations: Teachers' Views on Elevating the Teaching Profession. Survey. "*Just 4 percent of veteran teachers and 6 percent of New Majority teachers would be willing to increase class sizes in exchange for a higher salary. Slightly over half of teachers at all levels of experience suggest raising taxes as their preferred strategy for paying for larger salaries, indicating disinterest in trading off class size, a longer year, or a new pension system to pay for the potential increase."***

- **Scholastic & Bill and Melinda Gates Foundation. (2012.) Primary Sources: America's Teachers on the Teaching Profession. Survey. *90 percent of teachers said that having fewer students in their class would have a "very strong" (62 percent) or "strong" impact (28 percent) on student achievement, while only 26 percent said that merit pay would have a strong and/or very strong impact.***

- **MetLife, Inc.. (2012). The MetLife Survey of the American Teacher: Teachers, Parents and the Economy. *A 2011 survey of teachers, parents and students. "Teacher job satisfaction has dropped 15 points since 2009, from 59% who were very satisfied to 44% who are very satisfied, the lowest level in over 20 years….Teachers with lower job satisfaction are more likely to report that in the last year they have seen increases in: average class size (70% vs. 53%)…One in seven (14%) students agrees that their classes are so big that their teachers don't really know them…."***

- **Lopez, S. J., Ph.D.(2009). Well-Being, Success, and the Gallup Student Poll. Gallup, Inc.. *The larger the class size, the lower the sense of student well being.***

- **New South Wales.(2004-08). Evaluations of class size reduction program. *"Overwhelmingly the judgment of parents, principals and teachers has been that the impact of the Class Size Reduction Program has been positive. It has been exceptionally well regarded by these groups as an important educational initiative. High levels of satisfaction were reported with the program's impact on class organization, teaching practices, student learning outcomes, behavior and social skills.*"**

- **Bridgeland, J. M., et. al. (2006). The Silent Epidemic: Perspectives of High School Dropouts. *National survey showing that 75% of high school dropouts say that if they had had been provided with smaller classes they would likely have stayed in school.***

- **Beddard, K., & Kuhn, P. (2005). Where class size really matters: Class size and student ratings of instructor effectiveness. Working Paper. University of California, Santa Barbara: Department of Economics. *The researchers examined the impact of class size on student evaluations of instructor***

performance using data on all economics classes offered at the University of California, Santa Barbara from Fall 1997 to Spring 2004. The researchers controlled for both instructor and course fixed effects. The researchers found a large, highly significant, and nonlinear negative impact of class size on student evaluations of instructor effectiveness that is highly robust to the inclusion of course and instructor fixed effects.

- **New York City Council Investigation Division. (2004). Report on Teacher Attrition and Retention. "*Nearly a third (30%) of new teachers (1-5 years of experience) in NYC said that it was unlikely that they would be teaching school in the next three years. For those teachers who were thinking of leaving NYC public schools, the top three changes in their work conditions most likely to entice them to stay include a new contract with higher pay; class size reduction; and better discipline."***

- **Public Agenda. (2003).Rolling Up Their Sleeves: Superintendents and Principals Talk About What's Needed to Fix Public Schools. "*Superintendents and Principals agree that reducing class size would significantly improve quality of teaching, with principals saying it would be the best way (at 36%), over higher salaries (35%) or merit pay (25%)."***

- **Public Agenda. (2001). Sizing Things Up. "** ***70% of teachers say that small classes are more important to student achievement than small school size. Parents: 47% say class size more important, only 8% school size, and 43% say both. In focus groups across the country, Public Agenda has repeatedly heard parents and teachers talk about how students benefit from – and thrive—in small classes.*****"**

- **Public Agenda. (1999). A Sense of Calling: Who Teaches and Why. "*86% of teachers say that reducing class size would be a very effective way to improve the quality of instruction, far above any other reform, including requiring a major in the subject taught, increasing professional development or salaries, providing more mentoring, requiring graduate degrees, or merit pay."***

- **Carbone, E., & Greenberg, J. (1998). Teaching large classes: Unpacking the problem and responding creatively. *To Improve the Academy*. Paper 399. *The researchers found that most students agreed that class size affected their ability to learn, and large classes negatively affected their ability to interact (in and out of class) with faculty*.**

- **Fischer, C. G., & Grant, G. E. (1983). Intellectual levels in college classrooms. In C. L. Ellner, & C. P. Barnes (Eds.), Studies of college teaching: Experimental results. Lexington, Mass.: D.C. Heath. *In an analysis of audiotapes of 155 class sessions in 40 undergraduate courses at multiple institutions, the researchers found that class size significantly affected the level of cognitive skills used by students in the classroom. In small classes (15 or fewer students), when students spoke in response to instructor-posed questions, the average level of thinking displayed by their discourse was that of analysis; in medium-size classes (16-45 students) student discourse was characterized by a lower level of thinking—comprehension; and in large classes (46 or more students), the discourse of students who participated in class most often reflected factual recall.***

Non-cognitive skills

- **Fredriksson, P., Öckert, B. & Oosterbeek, H. (2011). Long-Term Effects of Class Size. IZA Discussion Paper # 5879. "*Analysis of administrative data from Sweden shows Smaller classes in the last three years of primary school (age 10 to 13) are not only beneficial for cognitive test scores at age 13 but also for non-cognitive scores at that age, for cognitive test scores at ages 16 and 18, and for completed education and wages at age 27 to 42. The estimated effect on wages shows the economic benefits outweigh the costs."***

- **Dee, T. & West, M. (2011). The Non-Cognitive Returns to Class Size. Educational Evaluation and Policy Analysis, 33:23. *Results show that smaller classes in 8th grade lead to improvements in non-cognitive skills like student engagement, persistence and self-esteem that have been strongly linked to***

success in schools and later in life. The authors estimate that in urban schools, the economic benefits from investing in smaller classes would be nearly twice the cost.

- **Babcock, P., & Betts, J.R. (2009). Reduced Class Distinctions: Effort, Ability, and The Education Production Function. Journal of Urban Economics, Vol. 65, pp. 314–322.** ***Empirical findings indicate that class-size expansion may reduce gains for low-effort students more than for high-effort students, Results here…suggest …that larger gains for disadvantaged students may have occurred because small classes allow teachers to incentivize disengaged students more effectively, or because students are better able connect to the school setting in small classes.***

- **Blatchford, P., et.al. (2008). Do low attaining and younger students benefit most from small classes? Results from a systematic observation study of class size effects on pupil classroom engagement and teacher pupil interaction. Paper delivered to the** ***American Educational Research Association Annual Meeting. "…[T]he main implication of this study is that smaller classes can benefit all pupils in terms of individual, active attention from teachers, but that the lower attaining pupils in particular can benefit from small classes at secondary level."***

- **Wilson, V. (2002). Does Small Really Make a Difference? University of Glasgow .** ***Good literature review on the effects of class size on teaching and student behavior.***