School Size and Student Outcomes: A Nontechnical Paper [1]

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In the middle of the twentieth century, a not-so-quiet revolution remade American public education. As late as 1930, schools in the United States were small, community-run institutions, most employing but a single teacher. Over the next four decades, the number of schools fell by more than 100,000, as nearly two-thirds of all schools were eliminated through a process of consolidation. Average school size increased fivefold over this short period. In the process, school districts evolved into professionally run educational bureaucracies, some educating hundreds of thousands of students.

Despite the scale and pace of these changes in the organization of public education, little is known about the consequences of consolidation. Did the quality of public education rise as schools became larger and more professional, as proponents of consolidation promised? Answering this question takes on particular importance in the context of the contemporary "small-schools" movement, which includes education heavyweights such as the Gates Foundation, the Annenberg Foundation, and school systems in New York, Chicago, and other big cities. The historical experience with consolidation provides a valuable context for contemporary reformers because seldom have we seen such dramatic changes in school size over such a short period of time.

This paper aims to begin filling the gap in our understanding of the consequences of the consolidation movement. We use data from the Public-Use Micro-Sample of the 1980 U.S. census to estimate the effects of changes in school and district size on students' labor market outcomes and educational attainment. Our results indicate that students born in states with smaller schools obtained higher returns to education and completed more years of schooling. While larger *districts* were associated with somewhat higher returns to education and increased educational attainment in most specifications, any gains from consolidation were outweighed by the harmful effects of larger *schools*. Reduced form estimates of the effects of consolidation on labor market outcomes confirm that students from states with larger schools earned substantially lower wages later in life.
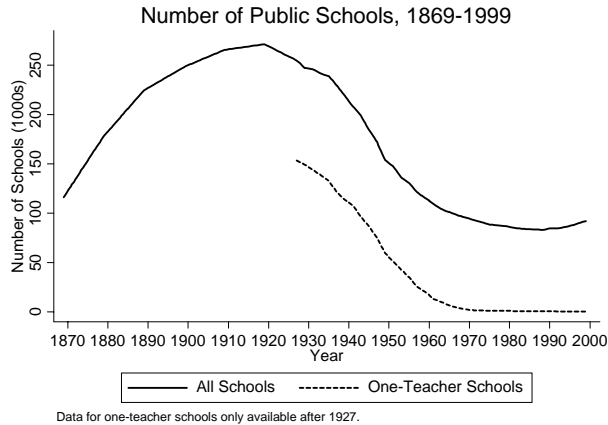
BACKGROUND

The consolidation of schools was part of a larger effort to professionalize education that began in the late nineteenth century (Tyack 1974). To the "administrative progressives" of the day, the concentration of authority over schools in the hands of professional educators seemed a cure for both the corruption of city school systems and the parochialism of rural ones. In imagining a professionally run school, reformers drew their inspiration from the modern corporation, with its principles of "scientific" management by experts. To these reformers, consolidated schools seemingly offered economies of scale in administration, instruction, and facilities.

It is clear that the impetus for consolidation seldom came from local communities. Local resistance to consolidation was often fierce, especially in rural areas where the school was the central institution of the community. In the face of local resistance, state governments often resorted to using fiscal incentives to induce consolidation or simply mandated consolidation by unilaterally redrawing district boundaries (Hooker and Mueller 1970; Strang 1987). "Defensive consolidation," in which districts rushed to consolidate in anticipation of a more radical plan proposed by the state, was also common (Reynolds 1999).

Few communities withstood the financial and political pressures for long. Figure 1, which is based on data from the federal government's *Biennial Survey of Education*, shows that the number of American public

Figure 1

Number of Public Schools, 1869-1999

Data for one-teacher schools only available after 1927.

Figure 2

Number of School Districts, 1931-1999

schools peaked at 217,000 in 1920 and declined rapidly over the succeeding 50 years.[2] The decline's pace slowed in the 1970s, and the number of schools reached a nadir in the late 1980s at around 83,000. Since then, approximately 10,000 schools have been added nationwide, in the first significant burst of (net) new school construction in over 60 years.[3]

The number of districts also declined dramatically from the 1930s to the 1970s. The earliest reliable data on the number of school districts in each state come from the 1931–32 edition of the *Biennial Survey* and show that the number of districts fell by half between 1931 and 1953, as over 60,000 districts were dissolved (Figure 2). It declined by half again between 1953 and 1963 and by yet another 50 percent over the following ten years. The number of districts stabilized in the early 1970s and has not changed appreciably since.

As schools and districts were consolidating, the number of pupils attending public schools was on the rise. From 1929 to 1969, average daily attendance (ADA) in public elementary and secondary schools doubled, rising from approximately 21 to 42 million students.[4] The combination of declining numbers of schools and districts and rising attendance produced substantially larger educational institutions over the course of the twentieth century. From 1930 to 1970—the period of most rapid consolidation—ADA per school increased from 87 to 440 students (see figure 3). At the same time, ADA per school district increased from approximately 170 to 2,300 students (see figure 4).[5] Both schools and districts witnessed their most rapid burst of growth in the years from
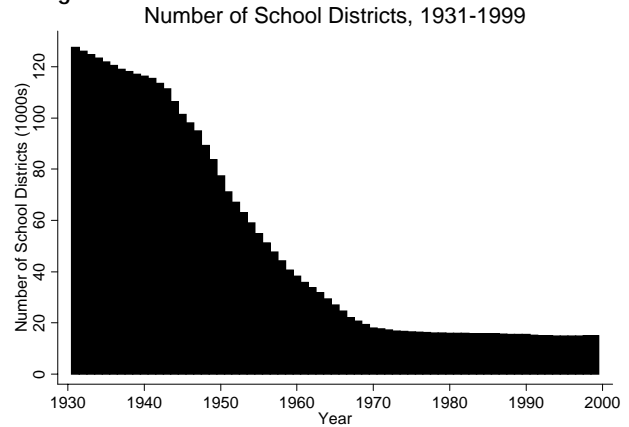
1950 to 1970, as increasing attendance rates, the baby boom, and institutional consolidation coincided.

As discussed above, school consolidation was part of a broader movement of school reform. Between 1930 and 1970, the school term grew longer, class sizes shrank, and teachers became better paid. The average state share of funding for public education more than doubled between 1930 and 1950, from less than 20 percent to roughly 40 percent, and made a smaller jump again in the late 1970s. The overall effect of these changes was to transform the small, informal, community-controlled schools of the nineteenth century into centralized, professionally run educational bureaucracies. The American public school system as we know it today was born during this brief, tumultuous period.

PREVIOUS RESEARCH

There have been two identifiable waves of literature on school size (Howley 1996). The first wave studies, appearing roughly from the 1920s through the 1970s, focused primarily on input measures of school quality.[6] Larger schools were consistently found to be superior in this regard, with better facilities, more qualified teachers and administrators, and a greater depth and variety of course offerings and extracurricular activities. The well-known Conant Report, in which former Harvard University president James Conant reported on a nationwide survey of 2,000 high schools, represents the high point of this first wave of literature (Conant 1959, 1967).

Beginning in the 1980s, the focus of the school-size literature shifted from school inputs to student
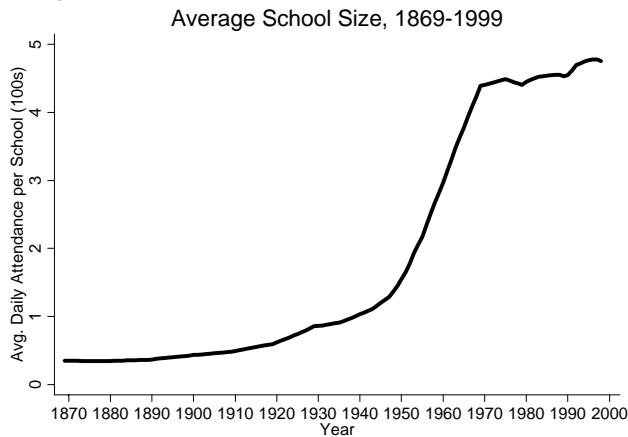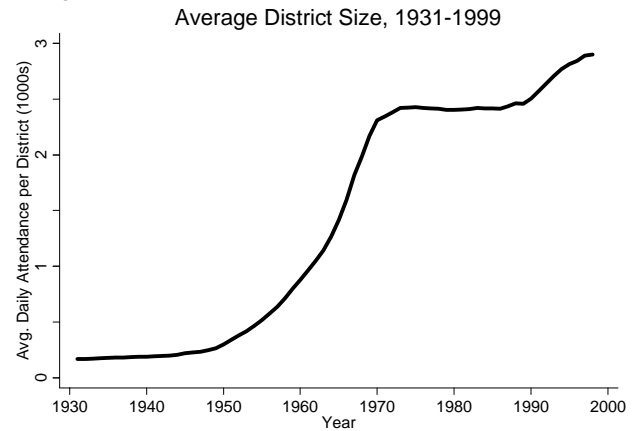
Figure 3

Average School Size, 1869-1999

Figure 4

Average District Size, 1931-1999

outcomes. This ongoing second wave of studies has been less favorable to large schools. In fact, six of the seven studies of school size and student performance reviewed by Andrews et al. (2002) found decreasing returns to scale.[7] Summers and Wolf (1977) find that African American students in particular are harmed by large school size, while Lee and Smith (1997) find that students of low socio-economic status do especially poorly in large schools. Although the reasons for the superior performance of students in small schools have not been identified, speculative explanations have focused on non-academic factors such as a greater sense of community belonging among students, closer interaction with adults, and more parental involvement (e.g., Cotton 1996).

ANALYTICAL FRAMEWORK AND DATA

A key shortcoming of the recent literature on school and district size and student outcomes is its general inattention to methodological challenges inherent in the estimation of economies of size. Schools and districts that are smaller than the norm likely share other unusual features that are not well measured by the variables included in standard education-production functions. Absent random assignment of students, they are also likely to draw a population of students that differs from the students in larger schools and districts in unmeasured ways. The expected direction of these biases due to unobserved differences is theoretically unclear. In addition, over time, highly effective schools and districts may attract more students, creating a general bias in observational studies toward finding increasing returns to size.

We chose the empirical approach taken in this paper with these issues in mind. Our empirical analysis uses the Public-Use Micro-Sample of the 1980 U.S. census to relate changes in school and district size during the consolidation movement to student outcomes in the labor market later in life. We focus in particular on the effects of consolidation on the *slope* of the relationship between earnings and education. That is, we examine how changes in school and district size affected the labor market value of an additional year of schooling. We implement this strategy in two stages: In the first stage, we identify the state-of-birth-specific component of the return to education, and in the second stage we relate these state-of-birth-specific returns to characteristics of each state's public schools.[8]

By relating differences in state-average district and school size to long-term outcomes of students raised in that state, we avoid the problem of families choosing where to live based on the size or quality of the school. (It seems implausible that families would choose to move to a new state because of the average size of its schools.) We also restrict our analysis to within-state, over-time variation (to eliminate the influence of time-invariant state characteristics) and control for a range of institutional and demographic variables likely to be associated with changes in size. Finally, although we present reduced form estimates of the relationship between school and district size, our main analysis centers on the return to an additional year of schooling, which appears less likely to be affected by unmeasured background characteristics (Card and Krueger 1992).

RESULTS

The Rate of Return to Education

Using this analytical approach, we found that smaller schools had a significant positive effect on students' wages as adults. Moreover, the effects are substantial. Our findings suggest that an increase of one standard deviation in average school size is associated with a decrease of 1.23 standard deviations in the rate of return to education. Put differently, increasing a state's average school size by 145 students, equivalent to the difference in average school size between the median state in the 1920–29 cohort and the median state in the 1940–49 cohort, is associated with about a 9 percent decline in earnings for high school graduates (those with exactly 12 years of education).

In the same analysis, we also found a positive effect of large district sizes on students' adult wages. In other words, the results suggest that larger schools were detrimental—whereas larger districts were beneficial—to the return to education. An increase of district size by 947 students, again the difference in average size between the 1920–29 and 1940–49 median states, is associated with a 2.1 percent increase in earnings for high school graduates. However, the findings on district size were not robust enough to further analytical checks, so we are cautious about putting much weight on the positive effect of larger districts.

A concern with these results is that consolidation did not occur randomly. As discussed above, consolidation was one of a series of progressive-movement reforms in American politics that centralized and professionalized public education. The timing of consolidation varied across states, and it is possible that states whose residents put a higher priority on education also embraced reform more readily. Thus, one might be concerned that the effects of consolidation reported above merely reflect the influence of being raised in a community that places a high value on education. Because we cannot directly measure the value placed on education in a state, and therefore cannot control for it statistically, it is possible that these unobservable background characteristics bias the estimated effects of consolidation.

With respect to the findings on school size, the influence of such unobservable background characteristics

is less of a concern. According to prominent education experts of their day, such as Ellwood Cubberley and James Conant, larger schools were better. Moreover, we also find a positive correlation between the income of the parents' generation in a state and the average school size. Therefore, there is ample reason to believe that education-minded parents would have had a preference for larger schools, not smaller ones. If early community influence was really driving the results, increases in school size would be associated with higher wages. But we find just the opposite. In addition, when we control for state background characteristics, such as parental income and percent rural, our estimates of the effects of school size do not change significantly. That school size displays a negative relationship with educational returns, contrary to the relationship with district size *and* contrary to the expectations of contemporary education experts, bolsters the interpretation of this as a causal relationship rather than as an artifact of unobserved early community influences. Thus, the findings on school size appear to be relatively safe from concerns about unobserved community influences.

On the other hand, the findings on district size are open to question. Because consolidation was pushed by education reformers, the positive association between district size and wages might simply reflect the effects of being raised in a state where parents placed a higher value on education. In addition, the district-size results are not significant in alternative statistical models.

Educational Attainment

The results discussed thus far pertain to the returns to education, that is, the wage increase that a worker can expect to earn for each additional year of schooling completed. A related issue is what effect consolidation had on the average number of years of education completed. For instance, if consolidation discouraged students from staying in school, then the additional return to education would be offset by reduced attainment. To get at this issue, we estimated models of the school-size effect on educational attainment using an analytical approach similar to that described previously. We find students born in states with larger schools also completed significantly fewer total years of schooling. This relationship persists even after controlling for the percentage of the state's population that is rural and for average parental-generation income. For instance, increasing a state's average school size by 145

students, equivalent to the difference in average school size between the median state in the 1920–29 cohort and the median state in the 1940–49 cohort, is associated with a decline of about 0.12 years of completed education. In other words, smaller schools were associated with more years of education completed as well as with a greater labor market return to each year of education.

SUMMARY AND POLICY IMPLICATIONS

Our results indicate that students educated in states with smaller schools earned higher wages as adults by both completing more years of schooling and earning a higher return to education. Thus, our study provides general support for the growing small-schools reform movement in contemporary education circles.

Implications for contemporary education policy, however, must be drawn only with caution from the analysis presented here, for several reasons. First, we have not examined any school- or district-size data more recent than 1966. Second, the findings pertain to state *average* school size. One must therefore be cautious in trying to ascertain the "right" size for any individual school or district based on our results.

Finally, and perhaps most importantly, the results presented here do little to explain what it is about small schools that affects student outcomes. Potential explanations for the positive effects of school size range from participation in extracurricular activities and attachment to the community to parental involvement and self-esteem (Cotton 1996). Narrowing the analysis from general considerations of size to identify the specific mechanisms by which size matters is essential for effective policy design.

ENDNOTES

[1] This paper, on which Christopher Berry based his remarks at the conference, is a nontechnical version of the following research paper: "Growing Pains: The School Consolidation Movement and Student Outcomes," by Christopher Berry, Harris School of Public Policy, University of Chicago, and Martin West, Harvard University, available at *www.ksg.harvard.edu/pepg/PDF/Papers/ PEPG05-04%20Berry%20West.pdf*.

[2] The *Biennial Survey of Education*, which began publication in 1869, was the federal government's first attempt to track statistics related to state and local education. In 1960, it changed its title to the *Digest of Education Statistics*.

[3] This same period—the 1920s to the 1970s— was also notable for a pronounced shift away from one-teacher schools. In 1927, the first year for which data on one-teacher schools are available, they composed 60 percent of all public schools. By 1970, the one-teacher school was all but extinct; only about 400 remained as of 1999.

[4] Average daily attendance is a better indicator of size than is enrollment. Early in the century, there were often substantial discrepancies between the number of students nominally enrolled in schools and those who attended regularly. Today, the two are nearly identical. For a comparison of the average daily attendance and enrollment over time, see Heckman et al. (1996).

[5] From 1970 to 2000, average district size continued to increase, reaching 2,900 students in the latter year.

[6] This literature is reviewed by Fox (1981) and Stemnock (1974).

[7] The exception, Kenny (1982), found increasing returns to scale. Four of the studies also identified constant returns to scale over at least some range of the data, suggesting that returns to scale in school size may be nonlinear.

[8] Although our model is inspired by Card and Krueger (1992), the identification strategy also differs in important respects.

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