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## *Economic Education*



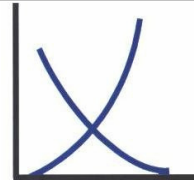
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### *Economics of Education, National and Local*

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# **Economics of Education, National and Local**

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## **Abstract**

There are many reports of the differences in school quality and ways that could be related to difference in expenditures on schooling and teacher salaries, within the U.S. and internationally. Lower amounts spent are sometimes taken to mean lower-quality schooling or sometimes to mean higher efficiency in production of education. The distinguishing criterion between these judgments is often an outcome measure like standardized test scores. This paper updates on Hanushek's 1986 overview of the economics of education and compares national and local data on changes since then in Chicago and the rest of the country. The Chicago school system, described by U.S. Secretary of Education William Bennett as "the worst school system in the country" in 1987, has made sustained efforts to improve. Chicago's results provide some insights into evaluating and improving the education system elsewhere.

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## **I. Introduction**

Hanushek's 1986 literature review is a landmark in the literature of the economics of education. This paper updates Hanushek (1986) on and compares national and local changes since 1986 for Chicago and the rest of the country. For a variety of reasons, Chicago is an interesting case study. The Chicago school system, described by U.S. Secretary of Education William Bennett as "the worst school system in the country" in 1987, has made sustained efforts to improve. Chicago's results provide some insights into evaluating and improving the education system elsewhere.

A major policy and scientific issue is explaining differences in school quality and outcomes. Within the U.S. and internationally, there are numerous reports of differences in school quality and hypothesized ways that these differences could be related to differences in expenditures and teacher salaries. But the empirical issues are complicated. For example, lower expenditures are sometimes taken to mean lower-quality schooling but it is has also been suggested that this indicates higher efficiency in production of education. These hypotheses can be distinguished by examining an outcome measure like standardized test scores, but test scores as measures of quality or output have also been questioned. .

## **II. Public versus Private and National versus Local Control**

Most elementary and secondary schools in the U.S. are public. The issue of school reform inevitably raises the issue of local versus national control of public elementary and secondary schools. In the U.S., state and local governments provide schools, certify teachers, and mandate and regulate school curricula. Another perennial reform issue is the role of private schools in this largely public market. Since the 1970s, about 10% of elementary and secondary students attend private schools.

About three fourths of these private schools are religiously affiliated which is a point of contention in the voucher debate. While the overall share of private schools has fluctuated some since the 1960s, the share of Catholic schools in the private schools has fallen from almost 90% in 1960 below two-thirds in 1980. For some the significant role of religiously affiliated schools makes private education a charged issue. (See Table 1.) Catholic schools are combined with other religious schools in the *Statistical Abstract of the United States*.

In addition to test scores, educators have been concerned about students dropping out of high school for decades. Along with test scores, completion rates are an important indicator of school quality and effectiveness. In the aggregate, the high school completion data don't appear to warrant a great deal of concern. Nationwide, 87% of U.S. adults aged 25 to 64 have finished high school or higher levels of education. This aggregate number puts the U.S. in relatively good company. The countries with over 80% upper secondary education or higher in 2002 included Canada, Czech Republic (which, with 88% was highest in the OECD list), Denmark, Germany, Japan, Norway, Sweden, and Switzerland. (See Table 2.)

The issue of local control of schools has been a hot button politically. The share of state and national funding of primary and secondary education has been growing. Part of this trend arises as districts move away from using property taxes as the main funding source. Local property taxes used to provide over 50% of school funding. This revenue source was successfully challenged in the courts and legislatures in the 1970s, so that states increased support for schools. States now provide, on average, about 45%, with local government support at about 40%. Between 6% and 8% of elementary and secondary schools funding comes from the federal government, which has held steady since doubling in the 1960s. Finally, the share of non-revenue receipts (sales of bonds, property, loans, and insurance payments) has risen sharply, from about 4% in 1980 to over 7-1/4% in 2004.

School choice in public schools has been increasing, but from a low base. In 1993, 12% of public school students chose which public school to attend and the rest were assigned, usually by home location. In 2003, 17% of public school students attended choice schools. Milton Friedman advocated school choice and vouchers in 1955. His arguments and presentation of the issues are lively, lucid, and pertinent, whether you agree or not. He advocates school vouchers that reimburse (either partially or fully, depending on the dollar value of the voucher) parents who send their child to a private school. Friedman advocates voucher that pay the average per pupil cost of educating a child in a public school, or in a more refined version, the average cost of educating their child in the public schools system which would taken into account children with special needs. If school choice (or vouchers—they are potentially separate arrangements) were widely adopted, there is evidence that some current teachers would benefit while others would lose. If teachers in the voucher schools come mainly from the existing stock of teachers, then those with characteristics highly desired by charter schools, for example the ability to teach enriched science and math courses, will the reap the higher salaries and perks from greater demand. This may not be the case—Caroline Hoxby (2002) states that while charter schools in Arizona enrolled only 4.4% of the students, they provided about a third of new teaching positions.

The arguments for vouchers include that they would remove at least some of the financial constraints preventing schools from experimenting to better educate students, that parents could better match schools to students, that competition among schools would increase variety and quality while lowering costs. The arguments against vouchers include concerns about educational quality at schools without track records, equity issues about using lotteries to allocate scarce spots, and concerns that giving vouchers to religious schools amounts to state support for religion. (See also the Fall 2002 *Journal of Economic Perspectives*, especially the Ladd and Neal articles.) Concerns have also been

raised about the education of special children which are on average much more costly to educate. Opponents of vouchers have also argued that vouchers will lead to more discrimination and segregation across various types of students that may make other social goals more difficult to attain.

Chicago Public Schools is the 4<sup>th</sup> largest school district in the country, behind NYC, LA, and Puerto Rico. In 2002-2003, Chicago had 436,000 students at 608 schools (roughly 500 elementary and 100 high schools) and 24, 584 teachers. CPS graduated 15,653 students in 2002. This year (2006-7), CPS has 623 schools, including 31 elementary and 16 high school charter schools. Chicago has some public charter schools in addition to its traditional public schools. School choice is available, in that students may apply to “magnet” schools outside their neighborhood. Except for their “neighborhood” school, their chosen school does not have to accept them, however, if space is scarce. Admission practices to schools and programs vary. In practice, most students (or their parents) choose the schools close to where they live, despite wide differences in schools’ programs and rigor. See Correa et al. (2004) for tables and maps of where students attend school and Roderick et al. (2006) for information on programs at different schools.

### **III. Producing Education Efficiently**

The traditional economic framework used to analyze education takes a production function approach. (See Ashenfelter and Krueger, Ashenfelter and Rouse, Cutler and Lleras-Muney, Hoxby (1996), and many others.) In this approach, schools take inputs like previous knowledge and habits and then along with teachers, buildings, student time, produces something called that is hard to define exactly, but called education. In short, the education production function uses inputs to produce learning. If we can accurately define inputs and outputs, the production function can be estimated and then used to see if resources are allocated in the most cost-effective manner.

The first wave of schooling production functions generated more questions than answers. Educators discounted these early estimates -- the relationships between inputs and output didn't make sense. The early studies failed to give inconsistent evidence that any measurable inputs were systematically related to student performance. As some of these initial flaws were fixed, a second puzzle has emerged. Both the quantity and quality of school inputs when measured by expenditures has increased or remained steady but the output, measured by tests nationally and internationally, is falling. One problem with these studies are questions about the how valid and meaningful are the expenditure measures. More provocatively, measures of student learning by individuals show definite teacher effects, that is, some teachers are systematically better than others. This has been used to justify teacher merit pay initiatives.

Economic reasoning also indicates holes in the conventional wisdom about education and schools. Statistics can be that are not properly interpreted in context, such as when additional information is overlooked, can be very misleading. The next section describes widely reported statistics as well as some background information that can change the implications of these statistics. Sometimes, national measurements are not very informative and can even be misleading. Looking at national versus local school data can provide significant insights. The issue of national versus local control highlights the role of school structure, financing, and incentives. Put differently, because states and school districts have different conditions and respond individually to varying incentives, national data does not always give a reasonable and true picture. Looking at alternative measures, national and local, provides more information and more complete view.

#### **IV. Issues with Measuring Results**

School quality is commonly measured by standardized test scores, teacher pay, per-student spending, and high-school graduation rates. These criteria are reported in sensational ways, but the

reported numbers can be misleading. In this section these school quality measures are listed and reviewed.

Standardized Test Scores. News reports indicated last year that the class of 2006 had the “sharpest decline in SAT scores in 31 years”. (See the ABC News Quiz.) The statement is true. Combined average reading and math test scores did drop from 1028 to 1021. Though unstated, the implication is that 2006 graduates are less-well-trained and educated than earlier cohorts. There may also be something wrong with the tests. Changes over time may also reflect changes in the composition of the test taking population of students. For example, average scores could be lower if the entire student body takes the test and not just the top college bound half. Test scores could also change over time if the test questions were more difficult or the scores calculated differently, and/or if the test and test-taking conditions changed.

The SAT test is expected to average 500 for reading and 500 for math. Average scores above 500 might indicate that the test is too easy (being “dumbed-down”). According to the College Board Report, the decline came mainly from fewer students taking the SATs a second time. This has been a concern. In 1972, average reading SAT scores were 530 and average math SAT scores were 509. In 2006, average reading SAT scores were 503, lower than 30 years ago but higher than the 499 average of 1994. In 2006, average math SAT scores were 518, higher than 30 years ago and about the same as 2003-4. Averages of 500 for each test could be a sign of good test design, and a goal for the testing company.

The SAT tests had a major change for the class of 2006. The writing test was added as a required third section. The testing day became longer by several hours. Assume students plan to exhaust their mental and physical strength on these important tests. If students taking the test acted rationally, they should have energy they might have spent on the reading and math portions to save



some for the writing portion. If students are spreading a fixed amount of energy inputs over a longer time span, the average quality of the output would be lower. Alternatively, they might be more exhausted or hungry when taking the test sections that are later, also lowering their scores. The College Board report analysis does not indicate that fatigue from a longer test day lowered the 2005 scores.

One way to get some sense of whether these mechanisms explain the drop in SAT scores is to compare SAT results with other test results. There is a comparison test, the ACT. Average ACT test scores did not decline in 2006. They are reported on a different scale (maximum of 36, with 18 the minimum score consistent with admission to 4-year colleges). Averages have hovered around 21 since 1999, and were a tenth of a point higher in 2006. (See Table 3.) Illinois average scores are lower. In 2001, Illinois began requiring all high school students to take the ACT, not just those college-bound. The average scores predictably dropped. Average test scores of Chicago Public Schools students have been improving relative to the state and national average scores. Details on the Illinois use of the ACT in its Prairie State Achievement Exams and Chicago student performance 2001-2004 are in Ponisiak (2005).

The NAEP tests are behind the international comparisons of student achievement. These are administered for comparison, instead of the comparisons being secondary to tests given for graduation or admission to college. However, test-taking fatigue by students makes test result subject to question. Students in Chicago have staged protests and boycotts of the extra testing. There is evidence for Chicago that even students willing to take the extra tests show some evidence of not taking them as seriously. Teachers report that students will leave blank any writing sections, for example, and guess randomly at multiple-choice sections. Between 1971 and 2001, U.S. scores on reading for 17-year-olds rose very slightly, from 304 to 307. They didn't move for math: 285 in 1971 and 285 in 2001.

High-stakes testing is a major issue for schools. During the spring “testing season” some schools focus so intensively on testing that it is hard to see how subject mastery can continue. For example, teachers of students in testing grades reported to me that they may be required to spend more than half of their time explicitly on test preparation—not reviewing their subject, but working on test-taking skills. The testing process may cause less instruction and in turn less learning of fundamental subject matter. Standardized tests are also criticized for not testing sophisticated reasoning or higher levels of learning, for moving schools toward over-emphasis on drills, for omitting important subjects (many states test only reading and math; Illinois also tests science but doesn’t test social studies).

There are several important statistical problems with testing. The most important measures of additional student learning are the gains students make from year to year. Schools also tend to publicize rising average test scores. Both individual gains and school average gains are measured unreliably by the tests. Kane and Staiger suggest that a simple average of the past 10 years of test scores is much more likely to predict schools which will perform well one or two years in the future than the previous year’s scores. Indeed, they have created a sophisticated measure that weights the past performance more heavily when the previous year’s performance is less reliable than usual.

Teacher Pay and Per-Pupil Spending. The average salary for U.S. teachers is almost \$46,000, but it varies significantly by state. Highest average pay is in California (\$55,693 in 2004) and lowest is South Dakota (\$31,000 in 2004). Average teacher salaries in Illinois have been about 10% higher than the national average and increasing. In 2006, the average salaries of Chicago Public School teachers exceeded \$61,000. Are teachers over-paid? Simple demand and supply would suggest that if teacher salaries were too high, there would be a surplus of high-quality teachers. But this is not the case. Teachers are perceived as scarce and openings difficult to fill, especially in disciplines where there are

high-paying alternatives, such as math and science (and economics). Standard economic theory suggests, therefore, that the salaries for this group of teachers is not excessive.

Retaining teachers in Chicago Public Schools is also a problem. If salaries are “too high”, then the issue would be convincing people to leave, not retaining them. Yet as many as 39% of CPS teachers leave within 1 year, higher than the state range of 32% to 40% leaving within 5 years. Schools have introduced support programs to help new teachers. There is evidence, however, that support systems for novice teachers do not affect teachers’ retention decisions (Kapadia 2007).

Per-pupil spending nearly doubled in inflation-adjusted 2001 dollars from 1971-2001 and continues to grow faster than the rate of inflation. It increased nearly 19% from 2000 to 2004 in the U.S., and 42% in Illinois. Chicago Public Schools per-pupil spending has been about 10% lower than the state’s since 2001. The state averages mask a huge disparity. The highest-spending Illinois district spends nearly twice as much as the average and four times as much as the lowest-spending district in Illinois. (See Table 5.)

High School Graduation Rates. U.S. high school graduation rates declined 1971-2001 from 75.6% to 72.2%. This is puzzling since dropout rates have been declining (5.2% in 1985, 3.8% in 2003) and the percent of high-school (and above) graduates in the U.S. population rose from 74.4% in 1985 to 85.2% in 2004. (See Table 6.) The apparent discrepancy stems from the difficulties in measuring dropout rates and graduation rates consistently. Allensworth (2005) provides a detailed look at these issues for the Chicago Public Schools from 1991 through 2004.

This is a problem at the national level as well. The national solution is a step in the right direction. Dropouts are reported in two categories. The first is similar to the Illinois calculations, and are termed event-based dropouts (left school this year). The second category, called status dropouts, is

the pool of 18-24-aged people not attending school who also haven't graduated from high school. This is closer to the general-public concept of dropout rates.

In Illinois, officially reported dropout rates are measured as the percent of students leaving in their senior year. Therefore the reported figures can be misleading. In the Chicago Public Schools, the largest number of students leaving school occurs between 9<sup>th</sup> and 10<sup>th</sup> grades, when students reach 16 and school attendance is no longer compulsory. Second largest is between 8<sup>th</sup> and 9<sup>th</sup> grades. (See Ponisciak 2005, Table 7.) The reductions in students attending school throughout the high school years explain how an 8<sup>th</sup> grade class of 19,379 in 2001 shrinks to an 11<sup>th</sup> grade class of 11,077 in 2004. The picture is similar to previous cohorts. Allensworth (2005) follows CPS students aged 13 in 1997 and 1998 until high school graduation or age 19 in 2004, and finds that about 54% had graduated. The graduation rates reported by Illinois in the school report cards are much higher, representing the percent of high-school seniors who earn the diploma. Official drop out rates significantly understate high school completion rates for the city of Chicago.

## **V. Conclusion**

There are discrepancies in the national data and reports with what local information provides. In the era of high-stakes testing, understanding the validity of changes in test scores is increasingly important. Yet it is not clear what increases or decreases in average test scores of widely-used and cited tests mean.

Another example is dropout rates. Official dropout rates do not measure the proportion of students not graduating from high school as a percent the 8<sup>th</sup> grad population. Instead, they measure those leaving in the last year. Again, the relevance of increases or decreases in the reported statistics is not clear. Comparing national data and local information informs how the data should be interpreted.

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**Table 1: Elementary and Secondary School Pupils, Staffing, Type of Control and Graduates as Percent of Population, 1970-2003**

	1970	1980	1993	2003
<u>Enrollment (000)</u>				
Total	51,272	45,949	42,500	47,800
Elementary (K-8)	31,553	27,779		
Secondary (9-12)	19,719	18,170		
<u>Classroom Teachers (000)</u>				
Total	2,288	2,439		
Elementary	1,238	1,365		
Secondary	1,007	1,099		
<u>Private School Enrollment (% of Total Enrollment)</u>				
Total	10.5	10.8	9.2	10.7
Elementary	12.8	13.0		
Secondary	6.6	7.4		
<u>Religious School Enrollment (% of Private Enrollment)</u>				
Total	81.4	62.6	82.1	78.4
Elementary	82.9	62.6		
Secondary	76.9	62.6		

Source: *Statistical Abstract of the U.S.* 2007

[http://www.census.gov/compendia/statab/education/elementary and secondary education schools and enrollment/](http://www.census.gov/compendia/statab/education/elementary_and_secondary_education_schools_and_enrollment/) and earlier years (1985 and 1994) and Hanushek (1986).

**Table 2: International Comparison**

Country	1996	1998	2000	2002	2003	2003
			Upper Secondary Education (Percent)	Upper Secondary Education (Percent)	Upper Secondary Education (Percent)	Mean Score on Reading Literacy
United States			87	87	87.3	495
Australia			59	61	60.9	525
Austria			76	78	77.9	491
Belgium			58	61	60.8	
Canada			81	83	82.6	528
Czech Republic			86	88	87.9	488
Denmark			81	80	80	
Finland			74	75	74.8	543
France			64	65	64.8	496
Germany			83	83	83	491
Greece			50	50	50.5	472
Hungary			70	71	71.4	
Iceland			64	59	59	
Ireland			58	60	60.3	
Italy			45	44	44.4	476
Japan			83	84	83.7	498
Luxembourg			0	57	56.6	
Korea, South			68	71	70.8	534
Mexico			22	13	12.6	400
Netherlands			31	66	66.5	
New Zealand			76	76	76.2	
Norway			86	86	86.3	
Poland			81	47	47	497
Portugal			20	20	20.4	
Spain			41	41	41.3	480
Sweden			81	82	81.6	514
Switzerland			88	82	82.4	499
Turkey			25	25	25.2	
United Kingdom			83	64	64.3	

Source: *Statistical Abstract of the U.S.* 1996, 1998, 2000, 2002, 2004, 2007

<http://www.census.gov/compendia/statab>



**Table 3: Test Scores**

Test	Description	Past Comparison	2002	2003	2004	2005	2006
CPS ISAT (% Meeting Standards)	Elementary	(1995) 23.6	Reading 41.5 Math 37.7	43.3	47.4	47.3	62.5
CPS ACT (Scores)	Min=1 Max=36	18 is min. for 4-year colleges	16.5	16.7	16.9	17.1	17.4
IL ACT (Scores)	All 11 <sup>th</sup> graders take ACT	20.6 (2001)	20.1	20.1	20.2	20.3	20.5
US ACT (Scores)	College-Bound	21.0 (1999-2001)	20.8	20.8	20.9	20.9	21.1
US SAT Reading-Math (Scores)	Min=400 Max=1600	College-Bound	1019	1020	1026	1028	1021
US NAEP Math Grade 4	Scale: 0-500	Public Schools Only	224 (2000)	234		237	
IL NAEP Math Grade 4	Scale: 0-500	Public Schools Only	223 (2000)	233		233	
US NAEP Reading Grade 4	Scale: 0-500	Public Schools Only		216		217	
IL NAEP Reading Grade 4	Scale: 0-500	Public Schools Only		216		216	
US NAEP Science Grade 4	Scale: 0-300	Public Schools Only	145 (2000)			149	
Illinois NAEP Science Grade 4	Scale: 0-300	Public Schools Only	150 (2000)			148	

Source: Chicago Public Schools: <http://www.cps.k12.il.us/>

Students First Illinois: <http://www.StudentsFirst.us>

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National Center for Education Statistics: <http://nces.ed.gov>

**Table 4: Average Annual Salaries for Full-Time Elementary and Secondary Teachers**

	1985	1990	2000	2001	2002	2003	2004	2005	2006
US Public (Table 239)	\$23,587	\$31,278	\$42,213	\$43,658	\$43,802	\$45,026	\$45,646	\$45,884	
US Public (Table 238)	\$23,600	\$31,400	\$41,800	\$43,400	\$44,700	\$45,800	\$46,800		
Illinois			\$46,500	\$47,800	\$49,400	\$51,500	\$54,200		
Illinois Rank			9	11	10	6	7		
Chicago Public Schools									
CPS Budget -Teacher Salaries			\$1573.4 Million	\$1639.1 Million	\$1690.4 Million	\$1750.0 Million	\$1840.1 Million for 30,008	\$1890.7 Million for 29,854	
# CPS Teachers					24,084	24,584			24,664
# CPS Students					437,418	436,048			420,982
CPS Average Teacher Salary								Increase 4.95%	\$61,178

Source: Statistical Abstract of U.S.: <http://www.census.gov/compendia/statab>  
2006 and earlier years  
Chicago Public Schools website: <http://cps.k12.il.us>  
National Center for Education Statistics: <http://nces.ed.gov>

**Table 5: Per Pupil Spending, Public Schools (\$)**

	1985	1997	2000	2001	2002	2003	2004	2005	2006
US	\$3,483	\$4,966 (1990)	\$7,418	\$7,841	\$8,183	\$8,630	\$8,807		
Illinois			\$7,643	\$9,118	\$9,788	\$10,312	\$10,866		
Illinois Rank				10	9	11	9		
Chicago		\$6,882	\$8,047	\$8,325	\$8,482				\$9,758
Highest in IL		\$16,260	\$17,871	\$18,225	\$18,193				
Lowest in IL		\$3,342	\$5,220	\$5,216	\$4,340				

Source: Statistical Abstract of U.S.: <http://www.census.gov/compendia/statab>  
2006 and earlier years

Chicago Public Schools website: <http://cps.k12.il.us>

National Center for Education Statistics: <http://nces.ed.gov>

**Table 6: Dropout and Educational Attainment Rates (%)**

	1985	1990	2000	2001	2002	2003	2004	2005
U.S.	5.2	4.5	4.5	4.7	3.3	3.8		
IL			6.2 (1998)	5.7	5.1	4.9		
IL excluding Chicago			3.7 (1998)	3.5	2.6	3.1		
CPS		16.6 (1995)	15.8 (1998)	16.3	14.4	13.9	11.9	10.4
U.S. HS Grads or more (% of pop.)	74.4	75.2	84.1		84.1	84.6	85.2	
IL HS Grads		76.2	85.5	83.2	85.5	85.9	86.8	
IL Rank		27	29		30	31	29	
Chicago		61.2 (1995)	64.9 (1998)	67.5	68.5	69.8	70.7	

Source: Statistical Abstract of U.S.: <http://www.census.gov/compendia/statab>  
2006 and earlier years

Chicago Public Schools website: <http://www.cps.k12.il.us>