Rationalizing School Spending: Efficiency, Externalities and Equity, and Their Connection to Rising Costs

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ABSTRACT

Nobody today believes that our schools are doing particularly well. Widespread dissatisfaction with the performance of schools propelled education to a position high on the policy agenda. Yet, the source of this dissatisfaction varies across people. Some focus on student outcomes—whether the products of the schools can read and compute at an acceptable or desirable level. Others are more concerned with distributional aspects, concentrating on racial and economic differences in schooling and the rewards of schooling. Still others identify cost growth as the key problem, at least cost growth when compared to perceptions of performance of the schools.

As is frequently the case, a portion of the difference in viewpoints comes from differences in preferences. Some people simply value education for themselves and for others more or less than other people do, and this tends to affect the evaluation of school performance. But a substantial part of the difference comes from people looking at the same data and interpreting them differently. A good part of this seems to reflect long standing issues about the measurement of educational outcomes, but basic analytical questions also intrude.

The analytical base for much of the current discussion is built on school attainment—simple years of school completed. This choice is convenient for both theoretical and empirical discussions and is undeniably useful in many contexts. Nevertheless, the central focus of current policy deliberation is quality of schooling, not quantity, and the arguments and analysis pertaining to quantity do not readily transfer to quality. This paper considers both quantity and quality arguments and then pursues issues of quality, particularly quality of elementary and secondary schools. Central concerns in the discussion are issues of efficiency and of equity. These issues are directly intertwined in education debates because of the measurement and policy approaches commonly taken in distributional assumptions: Efficient spending is assumed so that expenditure variations can be used to gauge the distribution of educational services. Obviously, if expenditure is not a good measure of education quality, equity discussions based on expenditure can be misleading. Available evidence points to substantial inefficiency to the production of educational quality.

The central thesis of this paper is straightforward. Much of the policy discussion about education is built on a poor understanding of the underlying structure of education and schools, but the ambiguities and uncertainties lead to systematic biases toward increased spending on schools. Evidence on high rates of return to investment in quantity of schooling are translated into increased spending aimed at improving quality, yet with little assurance of actual improvement. Similarly, concerns about equity and about externalities from schooling push spending up without satisfying these objectives. A related issue, addressed at the end of the paper, is how citizens view spending in the context of their local districts. Preliminary analysis of voting on school budgets in New York State suggests no systematic relationship between performance of schools (measured in terms of student achievement) and willingness to support proposed budgets.

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By shear size consideration, schools deserve the attention of policy makers. Annual direct expenditure on education has been running at about seventy percent of total business spending on new plant and equipment. In terms of industry comparisons, education expenditure exceeds the combined value of shipments from primary and fabricated metals and is roughly equal to shipments of transportation equipment. In terms of government spending, education is one-quarter of total social welfare spending—slightly less than governmental spending on all health and medical care and approaching twice the amount spent on public aid. These comparisons also illustrate common alternative ways of viewing education. It's an investment in the productive capacity of the nation; it's a raw material used in production; and it's an expenditure that from the governments' viewpoint relates to general social welfare and to distributional concerns. These are all issues that will be covered later in this paper.

Nobody, however, believes that our schools are doing particularly well. Widespread dissatisfaction with the performance of schools, as opposed merely to size of the sector, has propelled education to a position high on the policy agenda. Yet, the source of this dissatisfaction varies across people. Some focus on student outcomes—whether the products of the schools can read and compute at an acceptable or desirable level. Others are more concerned with distributional aspects, concentrating on racial and economic differences in schooling and the rewards of schooling. Still others identify cost growth as the key problem, at least cost growth when compared to perceptions of

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performance of the schools. Another group focuses its attention on the role of government in providing education, arguing variously that government does a poor job (in terms of costs and performance) or too good a job (in terms of introducing specific values, moral views, and the like).

As is frequently the case, a portion of the difference in viewpoints comes from differences in preferences. Some people simply value education for themselves and for others more or less than other people do, and this tends to affect the evaluation of school performance. But a substantial part of the difference comes from people looking at the same data and interpreting them differently. A good part of this seems to reflect long standing issues about the measurement of educational outcomes, but basic analytical questions also intrude.

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spending aimed at improving quality, yet with little assurance of actual improvement. Similarly, concerns about equity and about externalities from schooling push spending up without satisfying these objectives. A related issue, addressed at the end of the paper, is how citizens view spending in the context of their local districts. Preliminary analysis of voting on school budgets in New York State suggests no systematic relationship between performance of schools (measured in terms of student achievement) and willingness to support proposed budgets.

A Brief History of Schooling in America

A. Quantity Considerations

Economists view schooling as an investment both by individual students and by the society at large. Both incur costs and both reap rewards. For an individual student, the costs of education include the direct costs of tuition, books and other school-related expenditures as well as the income that the student forgoes when attending school instead of taking a paying job. Similarly society incurs direct costs in subsidizing a school system that provides free education to millions. It also forgoes the opportunity to devote to other projects the skills, people and resources that are engaged in education. This viewpoint - regarding education as an investment - was brought into mainstream economics over three decades ago by Schultz (1961, 1963) and Becker (1964[1993]) and has been the basis of a steady stream of subsequent theoretical and empirical analyses.

A look at the history of the twentieth century suggests that schooling has generally been a good investment. Individuals have dramatically increased their own investments in education. At the turn of the twentieth century, only six percent of the adult population had finished high school. After the first world war, high school graduation rates began to increase rapidly. But changes in education

work their way only slowly through the overall population. By 1940, only half of Americans aged 25 or older had completed more than eight years of school - that is, had had any high-school education at all. Not until 1967 did the median adult aged 25 or over complete high school.[2]

Since 1967, however, the increase in the number of years of schooling completed by Americans has slowed. The young adult population, aged 25 to 29, has had stable completion rates for almost two decades (see fig. 1). Since the overall schooling level is determined by the accumulation of prior school attainment, this stabilized schooling has slowed dramatically the growth in schooling for the adult population as a whole. Today, the median years of school completed by Americans over 25 rests at slightly less than 13 years.

The benefits of education to individuals are clear. The average incomes of workers with a high school education remain significantly above those of the less educated, and the incomes of workers with a college education now dwarf those of the high-school educated. The explosion in the earnings of college-educated workers, charted in fig. 2, provides them with a premium of more than 70 percent higher earnings than a high school graduate with similar job experience.[3] Not only are wages higher for the better educated, but they also enjoy greater job opportunities and suffer less unemployment. The common interpretation is that our high technology economy produces ever larger demands for skilled workers, workers who can adapt to new technologies and manage complicated production processes effectively. So for individuals, at least, the increased relative incomes of more

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[2]See U.S. Bureau of the Census (1975, 1992) and Goldin (1994a,b)

[3]More detail on the patterns of earnings can be found in Murphy and Welch (1989, 1992) and Kosters (1991). McMahon (1991) reports slightly lower private rates of return for high school completion than for college completion, although they remain substantial. These calculations all rely on just salary differentials, and greater equality in the provision of fringe benefits may act to compress the differences for total compensation. However, no analysis of schooling returns in terms of total compensation is available.

Figure 1.
Median Years of Schooling by Year:
Population age 25-29 and age 25 and over

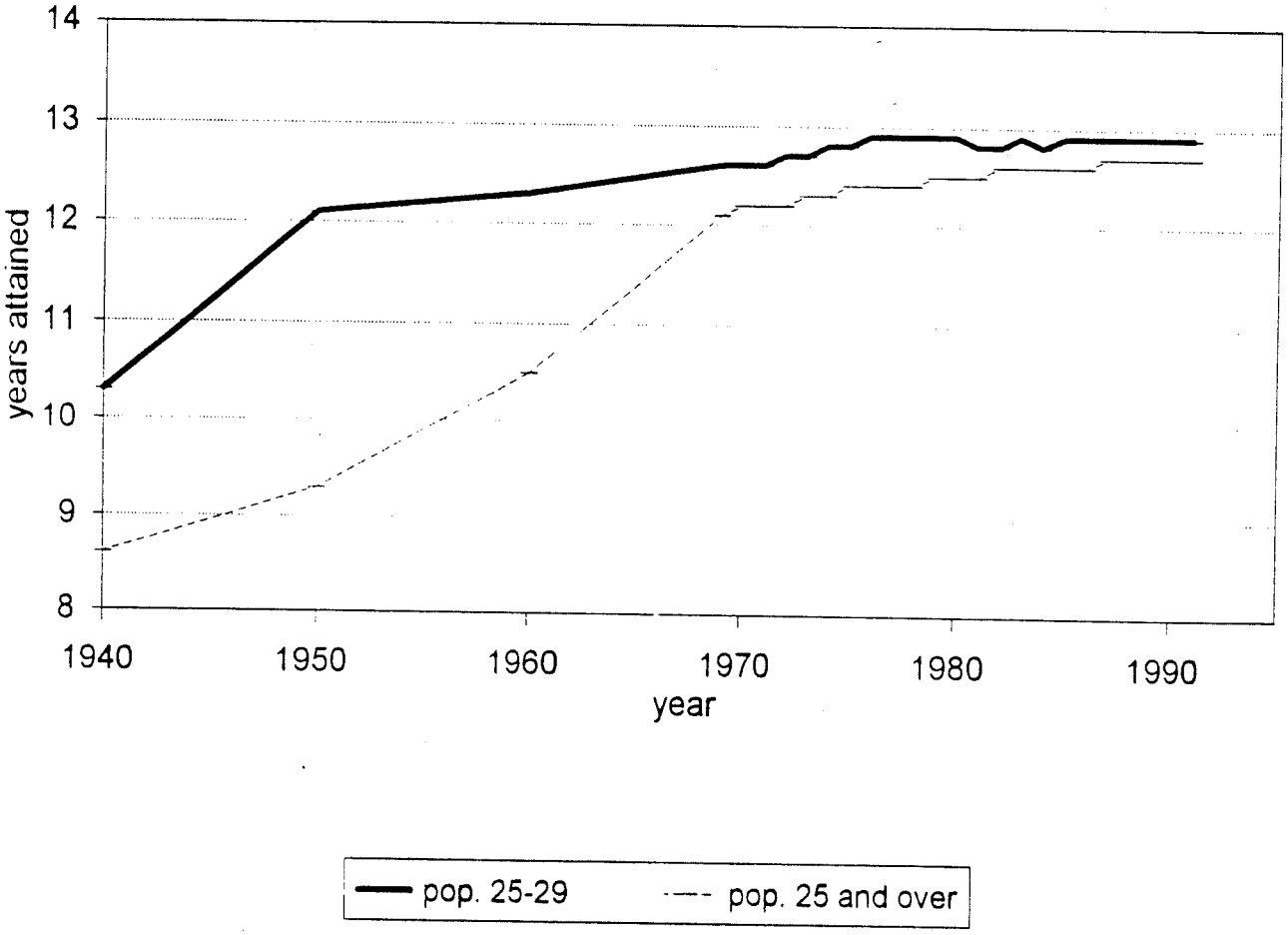
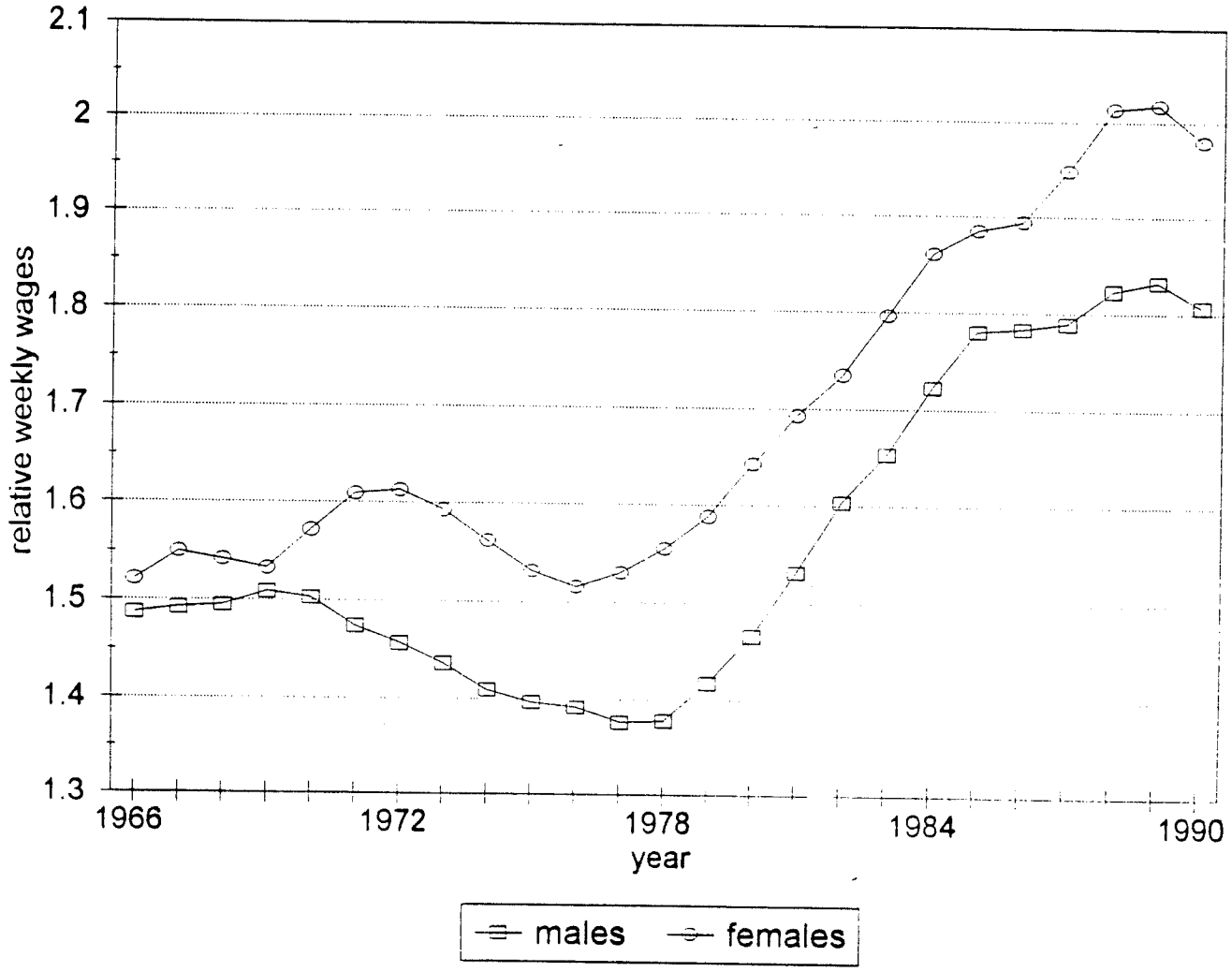


Figure 2.
Ratio of Wages of Average College to High School Workers:
Young White Workers by Sex



educated people has been sufficient to offset the costs. An individual can expect significant financial benefit from extended schooling, even after appropriately considering costs.

Individuals also reap non-financial benefits from education. For example, there is evidence that more educated people make better choices concerning health, so they tend to live longer and to have healthier lives. There is also evidence that the children of more educated parents get more out of school. They attend longer and learn more. Such benefits of schooling simply reinforce those from the labor market.[4]

Society as a whole also benefits from education. The nation is strengthened economically by having workers with more and better skills. National income rises directly with individual earnings. Moreover, recent economic studies argue that education may provide economic benefits to society greater than the sum of its benefits to individuals - by providing a rich environment for innovation, scientific discovery, education can accelerate the growth rate of the economy.[5] The more educated are more prone to vote in local and national elections, and a better informed and more responsible electorate improves the workings of a democratic society.[6] Increases in the level of education are associated with reductions in crime (e.g., Ehrlich 1975).

Education has also helped to achieve both greater social equality and greater equity in the distribution of economic resources. Schooling was quite rightly a centerpiece of the War on Poverty in the 1960s, and the benefits of improved schooling are demonstrated in comparisons of the earnings

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[4]Michael 1982; Haveman and Wolfe 1984; Wolfe and Zuvekas 1994; and Leibowitz 1974. Many factors are unclear, however, because of questions of causality; see, for example, Farrell and Fuchs (1982).

[5]See, for example, the analyses of growth by Lucas 1988, Romer 1990, Barro 1991, and Jorgenson and Fraumeni (1992).

[6]The pattern of voting over time can be found in Stanley and Niemi 1992. An analysis of the partial effects of educational attainment (which are positive in the face of overall declines in voter turnout over time) is presented in Teixeira 1992.

of different social and ethnic groups. Earnings by blacks and whites have converged noticeably since the Second World War, and much of this convergence is attributable to improved educational opportunities for African-Americans.[7] Providing an exact accounting for the benefits of education to society is difficult, because many of the benefits education provides are hard to value. But for the purposes here it is safe to say that education has historically been a good investment both for society and for individuals.

B. Quality Considerations

If schooling has been such a good investment, what leads to the widespread concern about schools? For most of this century, debate over the economic consequences of schooling concentrated on the amount of school attained or, simply, the quantity of schooling of the population. Policy deliberations focused on school completion rates, on the proportion of the population attending postsecondary schooling, and the like. And analyses of the benefits of schooling were most concerned with the effects of quantity of schooling—whether benefits are seen in terms of individual incomes or social benefits like improved voting behavior of citizens. For many reasons, however, today's attention is focused on the quality dimension of schooling.

As the growth in the number of years which Americans spend in school virtually stopped, many benefits which Americans might have expected from a continuously growing educational system have not materialized. Income growth has slowed,[8] and children no longer routinely surpass the

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[7]See Smith and Welch 1989; Jaynes and Williams 1989.

[8]See, for example, Levy and Murnane (1992) for a review of recent earnings patterns.

earnings of their parents. Income convergence between blacks and whites also has stopped — coincident with a slowing in the convergence of the schooling completion rates for the two groups.[9]

At the same time, nations around the world have increased their levels of schooling dramatically, with completion rates from secondary schools in a number of industrial competitors now rivaling those of the United States. Thus, America can no longer be easily assured of a higher quality work force than that of its trading partners. Both of these new realities shift the focus of the educational debate from quantity to quality. Improving the quality of schooling, or how much is learned for each year, has been seen as a possible way of counteracting the effects of U.S. slowdown in quantity of schooling.

The reason for questioning American education is straightforward. There is no evidence that increases in the quality of education is making up for the slowdown in the growth of schooling; on the contrary, declining quality may be making things worse. As described subsequently, data from a variety of sources suggest that the knowledge and skills of students are not as high as those measured in America in the past or in other nations currently. Moreover, achieving these current levels of student performance is costing much more than in the past.

The economic effects of differences in the quality of graduates of our elementary and secondary schools are much less understood than the effects of quantity, particularly with regard to the performance of the aggregate economy. The incomplete understanding of the effects of educational quality clearly reflects difficulties in measurement. Although quality of education is hard to define precisely, we mean the term quality to refer to the knowledge base and analytical skills that are the focal point of schools. Moreover, to add concreteness to this discussion, we will tend to rely

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[9] Discussion of distributional issues including earnings differences by race can be found in Smith and Welch (1989), O'Neill (1990), Kane (1990), Juhn, Murphy, and Pierce (1991), Card and Krueger (1992b), Grogger (forthcoming), Levy and Murnane (1992), Bound and Freeman (1992), Boozer, Krueger, and Wolkon (1992), and Hauser (1993).

on information provided by standardized tests of academic achievement and ability. Relying on standardized tests to provide measures of quality is controversial—in part because of gaps in available evidence and in part because of the conclusions which tend to follow (as discussed below).[10] Nevertheless, such measures appear to be the best available indicators of quality and do relate to outcomes that we care about.

A variety of studies of the labor market have been concerned about how individual differences in cognitive ability affect earnings (and modify the estimated returns to quality). The early work was subsumed under the general topic of "ability bias" in the returns to schooling. In that, the simple question was whether the tendency of more able individuals to continue in school led to an upward bias in the estimated returns to school (because of a straightforward omitted variables problem).[11] The correction most commonly employed was the inclusion of a cognitive ability or cognitive achievement measure in the earnings function estimates.[12] While focusing on the estimated returns to years of schooling, these studies generally indicated relatively modest impacts of variations in cognitive ability after holding constant quantity of schooling.[13] In this work, there was no real discussion of what led to any observed cognitive differences, although much of the work implicitly

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[10]A substantial part of the controversy relates to the implications for effectiveness of expenditure or resource policies, as discussed below. The contrasting view emphasizes measuring "quality" by the resources (i.e., inputs) going into schooling. Most recent along this line is Card and Krueger (1992a); see also the reviews of the discussion in Burtless (1994) and Betts (1994).

[11]See, for example, Griliches (1974).

[12]The appropriate measure of earnings ability generally has received little attention, and the empirical work has tended to use any standardized test measure that is available. Therefore, differences in the results across studies may partially reflect the specific measure of ability employed.

[13]This limited impact of cognitive achievement was also central to a variety of direct analyses of schooling such as Jencks and others (1972) and Bowles and Gintis (1976). An exception to the generally modest relationship of cognitive performance and income is the work of Young and Jamison(1974). Using a national sample of data on reading competence, they find a strong influence of test scores on income for whites (but not blacks). This held in both recursive and simultaneous equations models of the joint determination of achievement and income.

treated it as innate, and not very related to variations in schooling.[14] Further, all of this work relied on nonrepresentative samples of the population.

The most recent direct investigations of cognitive achievement, however, have suggested generally larger labor market returns to measured individual differences in cognitive achievement. For example, Bishop(1989, 1991), O'Neill(1990), Ferguson (1993), Grogger and Eide (1993), and Murnane, Willett, and Levy(1994) each find that the earnings advantages to higher achievement on standardized tests are quite substantial. These results are derived from quite different approaches. Bishop(1989) worries about the measurement errors that are inherent in most testing situation and demonstrates that careful treatment of that problem has a dramatic effect on the estimated importance of test differences. O'Neill (1990), Ferguson(1993), Grogger and Eide (1993), and Bishop(1991) on the other hand, simply rely upon more recent labor market data along with more representative sampling and suggest that the earnings advantage to measured skill differences is larger than that found in earlier time periods and in earlier studies (even without correcting for test reliability). Murnane, Willett, and Levy (1994), considering a comparison over time, demonstrate that the results of increased returns to measured skills hold regardless of the methodology (i.e., whether simple analysis or error-corrected estimation).

The NAS/NRC study on employment tests (Hartigan and Wigdor 1989) also supports the view of a significant relationship of tests and employment outcomes, although the strength of the relationship appears somewhat less strong than that in the direct earnings investigations. It considers the relationship between the General Aptitude Test Battery (GATB), the standard employment test of the Department of Labor, and job performance. Their synthesis of a wide number of studies

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[14]Manski (1993) represents more recent work with this same general thrust. He recasts the issue as a selection problem and considers how ability or quality interacts with earnings expectations to determine continuation in schooling. Currently, however, no empirical work along these lines identifies the quantitative importance of selection or the interaction of school quality and earnings in such models.

suggests a systematic but somewhat modest relationship with correlations to performance on the order of .2 to .4. The analysis also finds that the validity of these tests in predicting performance has gone down over time. These results, being somewhat at odds with the recent studies, may simply reflect the specialized nature of GATB.[15] Specifically, the GATB may not be a good measure of the cognitive outcomes of schools and may not correspond well to standard measures of cognitive achievement.

An additional part of the return to school quality comes through continuation in school. There is substantial evidence that students who do better in school, either through grades or scores on standardized achievement tests, tend to go farther in school (see, for example, Dugan 1976 and Manski and Wise 1983). Rivkin (1991) finds that variations in test scores capture a considerable proportion of the systematic variation in high school completion and in college continuation. Indeed, Rivkin(1991) finds that test score differences fully explain black-white differences in schooling. Bishop (1991) and Hanushek, Rivkin, and Taylor [1994] find that individual achievement scores are highly correlated with school attendance. Behrman *et al.* (1994) find strong achievement effects on both continuation into college and quality of college; moreover, the effects are larger when proper account is taken of the endogeneity of achievement. Hanushek and Pace (1995), using the High School and Beyond data, find that college completion is significantly related to higher test scores at the end of high school.

I conclude from these diverse studies that variations in cognitive ability, as measured by standardized tests, are important in career success. Variation in measured cognitive ability is far from everything that is important, but it is significant in a statistical and quantitative sense.

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[15]The GATB is a very old test that may not reflect changes in the economy. It also suffers from some psychometric problems (see Hartigan and Wigdor 1989). The central purpose of the study was assessment of the Department of Labor practice of providing test information normed to racial groups.

The linkage of individual cognitive skills to aggregate productivity growth is much more difficult to establish. There is no clear consensus on the underlying causes of improvements in the overall productivity of the United States economy, nor on how the quality of workers interacts with economic growth.[16]

C. The Pattern of Quality Changes

First warning of problems came when national average SAT scores fell from the mid-1960s through the end of the 1970s.[17] As shown in fig. 3, there has been some recovery, but it has been neither consistent nor sufficient to return performance to its previous highs. If we compare the peak to the trough, we find that the average test-taker in 1979 was performing at the 39th percentile in math and 33rd percentile in reading of the 1963 test takers. While the declines in the college admission tests (SAT and ACT) were among the largest, other tests also showed very significant falls.

Results from the National Assessment of Educational Progress (NAEP) are particularly significant because these are the only tests which provide data for a sampling of students which is statistically representative of the overall student population. These tests cover reading, mathematics, and science for a random selection of students of given ages. While there are some differences between different tests in the series, these data (which are summarized in figures 4-6) suggest that the

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[16]One observation is useful, however. When looking at the history of productivity increase in the United States economy, several distinct time periods stand out. Productivity growth continued at some two percent per year through the 1960s, but fell off subsequently - first to one percent in the 1970s and then to virtually zero in the 1980s. Noting that productivity changes in these time periods mirror the aggregate pattern of scholastic test scores (shown below), some have gone on to presume that the test scores are driving the productivity changes. Such could not, however, be the case -- since, as Bishop (1989) makes clear, the test takers with lower scores remained a small proportion of the total labor force through the 1980s. Lower test scores in the 1980s may signal forthcoming problems, but they cannot be an explanation for past changes in the economy.

[17]The Scholastic Aptitude Test (SAT) is subject to questioning because of the selective nature of test takers—essentially high school students who wish to go to a geographically and academically select group of schools. While some of the change in test scores can be attributed to changes in the test-taking population, it is clear that real performance changes are also included. See Congressional Budget Office (1986, 1987).

performance of the average 17-year-old student changed little between the early 1970s and 1990. While reading performance may be up slightly over the entire period, mathematics performance has shown no improvement, and science performance has slipped. (Note also that these tests were first employed after a substantial portion of the fall in SAT performance had already occurred, i.e., suggesting that performance stabilized at a lower level than that of the 1960s).

Comparing the performance of whites and blacks on both SAT and NAEP exams, two facts stand out. First, the black-white gap in performance has generally been narrowing over time. Second, the gap remains unacceptably large.

International comparisons provide a different perspective on student performance. The most telling of the several different testing projects which have been undertaken over the past three decades is the International Assessment of Educational Progress (IAEP). The IAEP results come from science and mathematics, subjects less affected by possible language and cultural differences. They also use the general tests developed for United States students, so any differences in curricular objectives or instructional approaches work in the Americans' favor. American students scored near the bottom, and the gap is particularly large on more complex tasks (Lapointe *et al.*, 1989). As the report on the first IAEP mathematics results notes, however, the students from the United States seemed unworried by their performance: "Despite their poor overall performance, about two-thirds of the United States' thirteen-year-olds feel that they are 'good at mathematics.' Only 23 percent of their Korean counterparts, the best achievers, share the same attitude". A smaller and different group of countries participated in a follow-up to the IAEP in 1991 (U.S. Department of Education 1993). On this collection of tests, 9-year-old students from the United States scored in the middle of the range on the science examination and at the bottom on the mathematics examination. By contrast 13-year-old American students scored at the bottom in both mathematics and science. The one examination showing a somewhat different result is the 1991 Reading Literacy Study. U.S. 14-year-olds placed

Figure 3.
SAT Scores: Total and by Race, 1967-1993

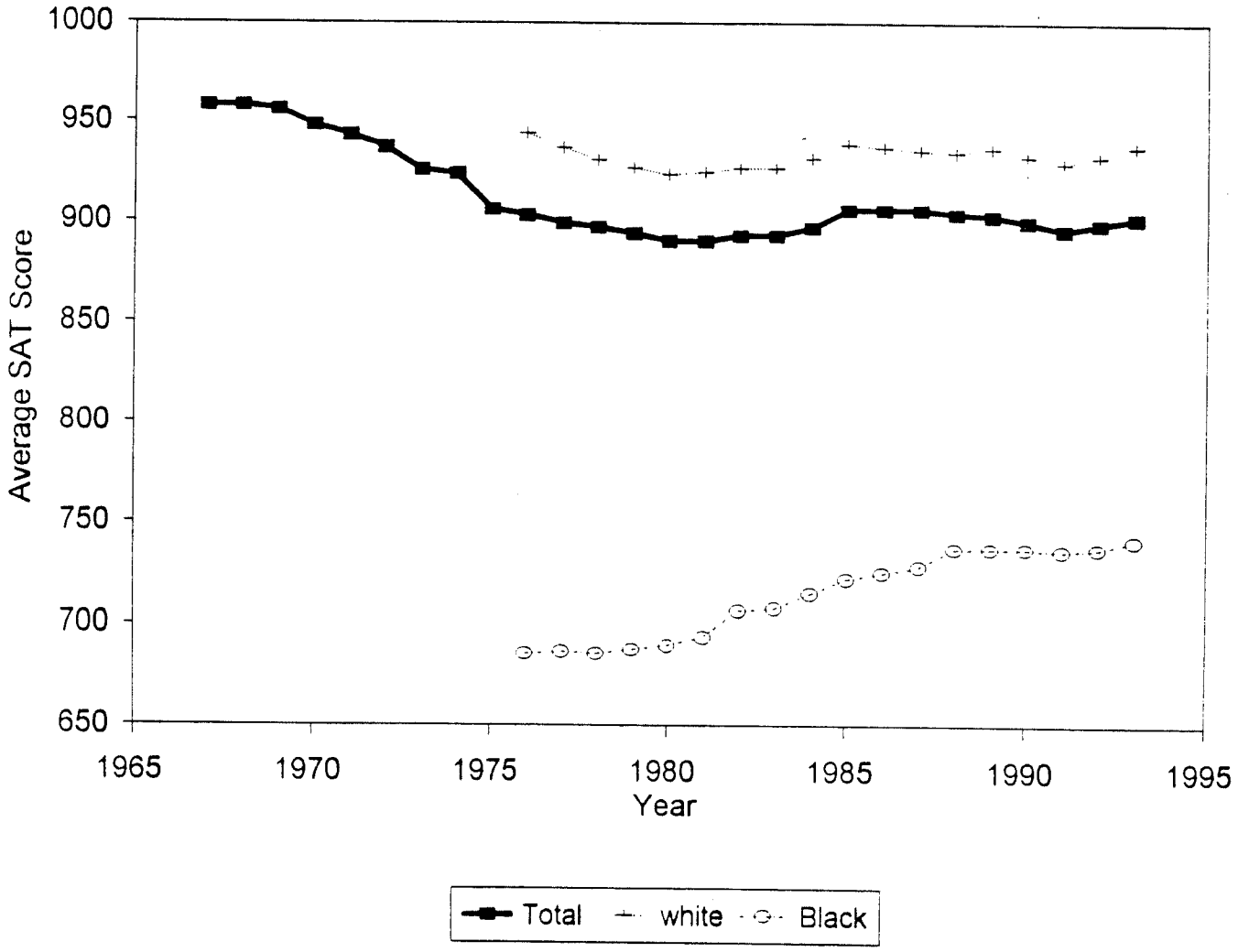


Figure 4.
Science Achievement as Measured by National Assessment of Educational Progress: 17-year-olds, 1970-1992

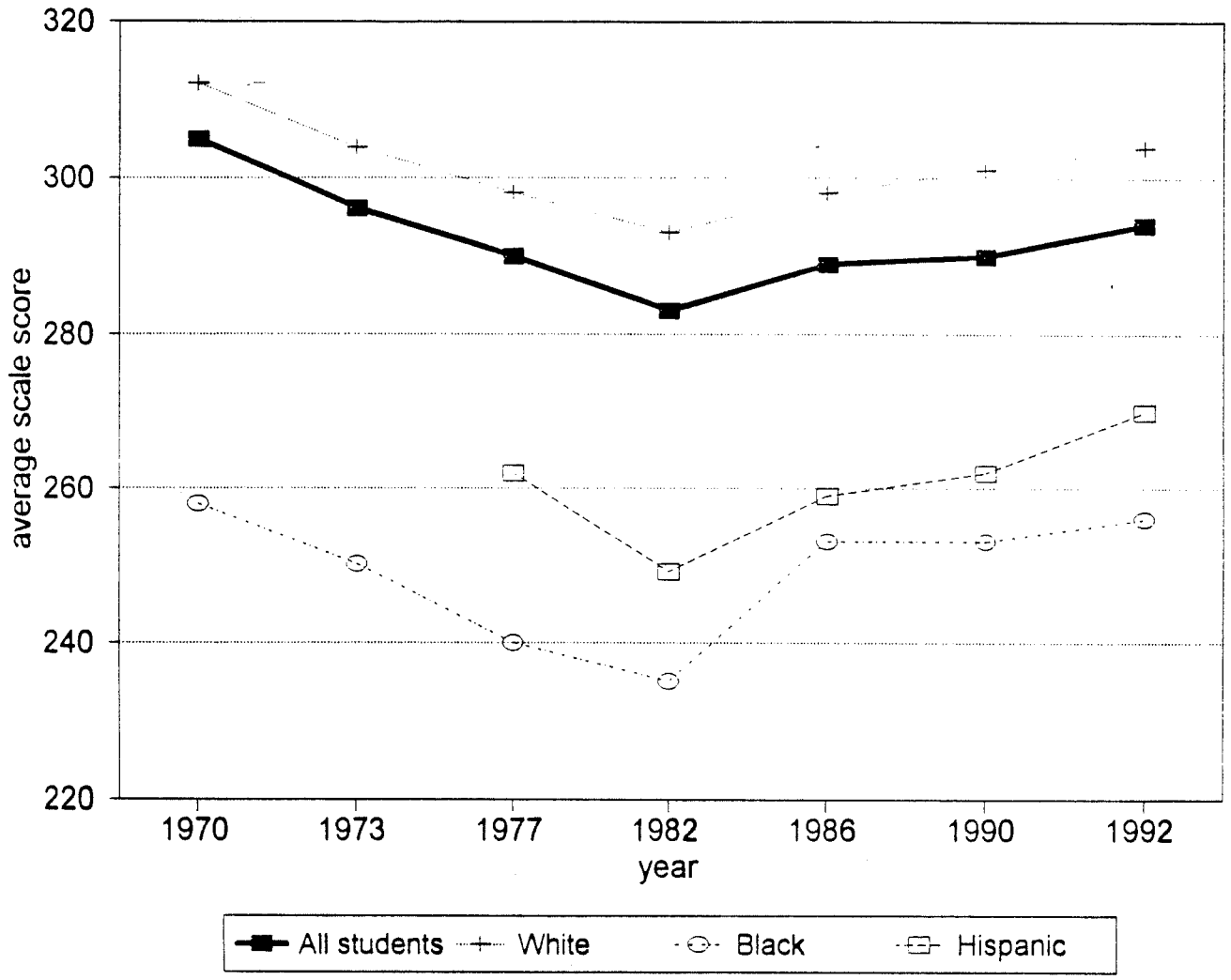


Figure 5.
Mathematics Achievement as Measured by National Assessment of Educational Progress: 17-year-olds, 1973-1992

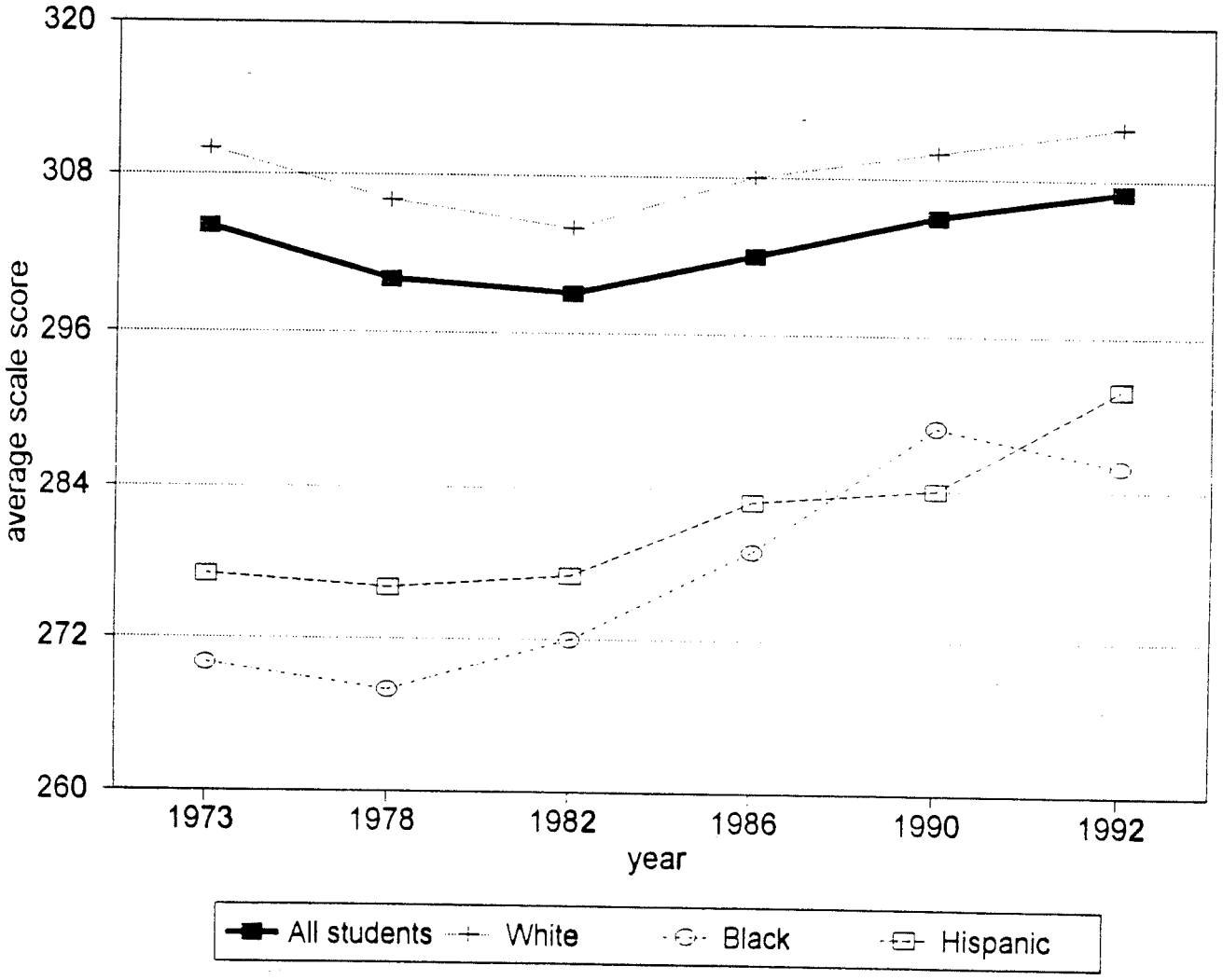
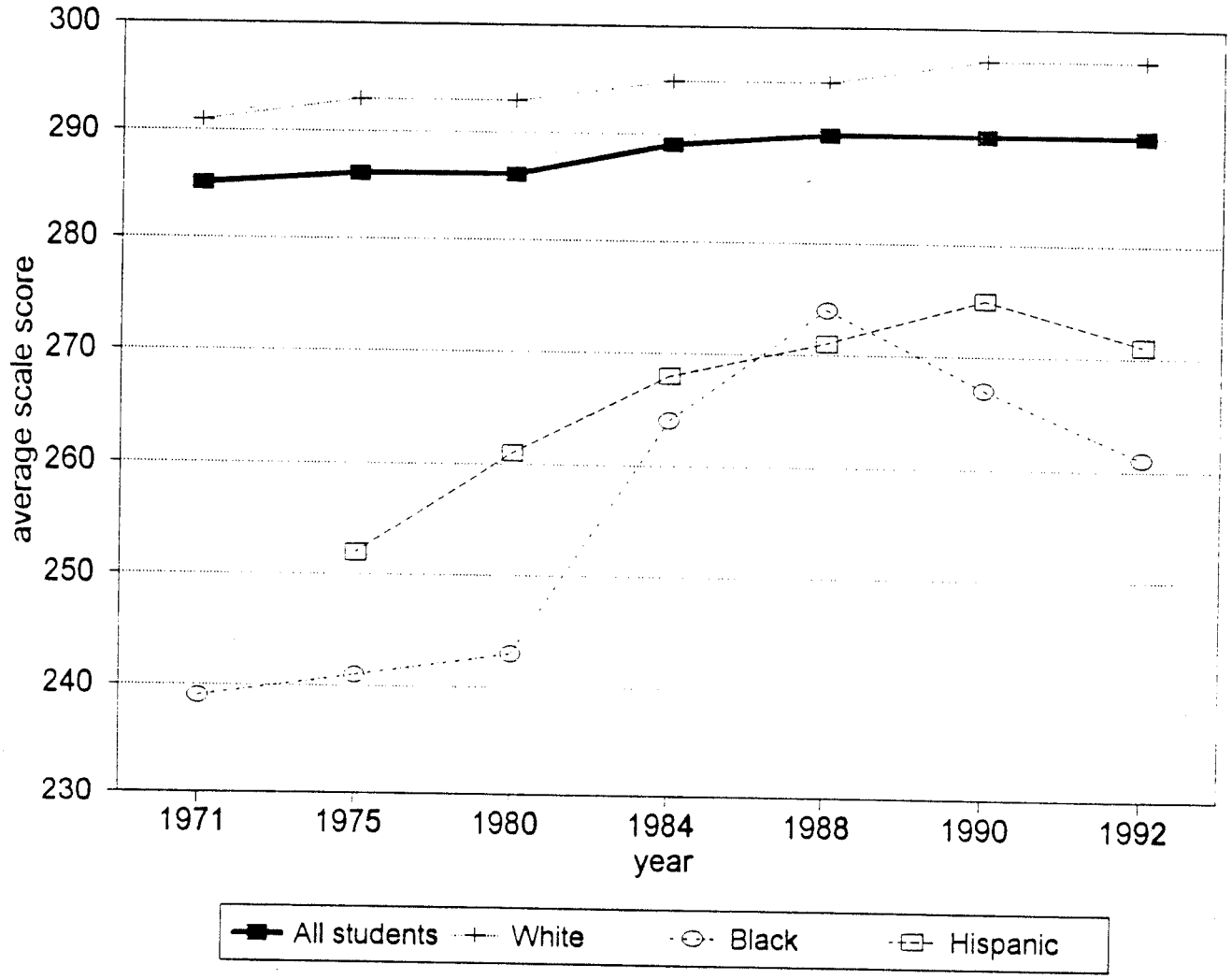


Figure 6.
Reading Achievement as Measured by National Assessment of Educational Progress: 17-year-olds, 1971-1992



seventh out of 19 international testing groups (U.S. Department of Education 1993). Unfortunately, no historical data exist on reading performance, so it is impossible to say anything about changes over time.

Related to concerns about the performance of the average student are questions concerning the performance of the very top students. Many suggest that the very highly skilled, for example, scientists and engineers, have a particularly important role in determining the viability of the economy and its future growth. Thus, a fall in the performance of the highest performing students - particularly a disproportionate fall - might have especially adverse effects. While there are suggestions of a decline in top students, existing data and testing methodology make it very difficult to ascertain with confidence the extent of any such change. No evidence, however, indicates that performance of top students has improved.[18]

D. Cost Considerations[19]

These results have not been for lack of trying. The U.S. has continually increased the resources devoted to public schools throughout the twentieth century. By some measures, expenditure on education has grown faster than that on health over the past two decades. Yet while health-care costs are the subject of vigorous debate, the unremitting growth in educational expenditures receives only passing attention in most policy discussions. More ironically, when attention is focussed on education expenditure, it is usually to suggest that spending should rise. But educational expenditure has risen strongly and steadily in real terms throughout the century. Some of the increase is a simple consequence of the increased numbers of school-aged children, but a larger part reflects active policy

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[18]See, for example, the discussion in Educational Testing Service (1991) and Congressional Budget Office (1986).

[19]This section summarizes the more detailed analysis of costs found in Hanushek and Rivkin 1994.

choices to increase expenditure on the schooling of each student - through more and higher-paid teachers, working in schools with a steadily declining pupil-teacher ratio. These increases are magnified by even larger increases in expenditure other than for instructional staff.

Between 1890 and 1990 real public expenditure on elementary and secondary education in the United States rose from $2 billion to almost $190 billion. (All monetary measures are adjusted by the GNP deflator to constant 1990 dollars; expenditure excludes capital costs.) This almost 100-fold increase was more than triple the growth rate of the GNP during the same period. Educational expenditure increased from less than one percent of the GNP in 1890 to over three and a half percent of the GNP in 1990.

Spending on public schooling as a percentage of the GNP actually peaked in 1975, at almost four percent, when baby boomers reached their maximum school-going years. But demographics are only the lesser part of the story of rising educational spending. Rising per-student expenditure explains the bulk of the change in educational outlays. Figure 7 plots increases in per-student expenditure from 1890 to 1990. Real, per-student expenditure rose from $164 in 1890 to $772 in 1940, and on to $4,622 in 1990 - roughly quintupling in each fifty-year period. The figure also separates expenditure on instructional staff--mainly teachers and principals--from other school expenditure. Today, expenditure on instructional staff accounts for roughly 45 percent of total school spending. In 1940, by contrast, it accounted for about two thirds.

Three factors drive spending on instructional staff (which I frequently refer to simply as teachers). First is the absolute size of the school population, which is determined by the numbers of children of the relevant ages, by whether or not they are enrolled in school, and by their choices between public and private schools. Second comes choices in the intensity of instruction - including varying average class sizes and the length of the school year. The third force driving instructional costs is wage rates and other personnel costs, most importantly for teachers. Table 1 illustrates how

Figure 7.
Real Instructional Staff and Other Current Expenditure per Student: 1890-1990

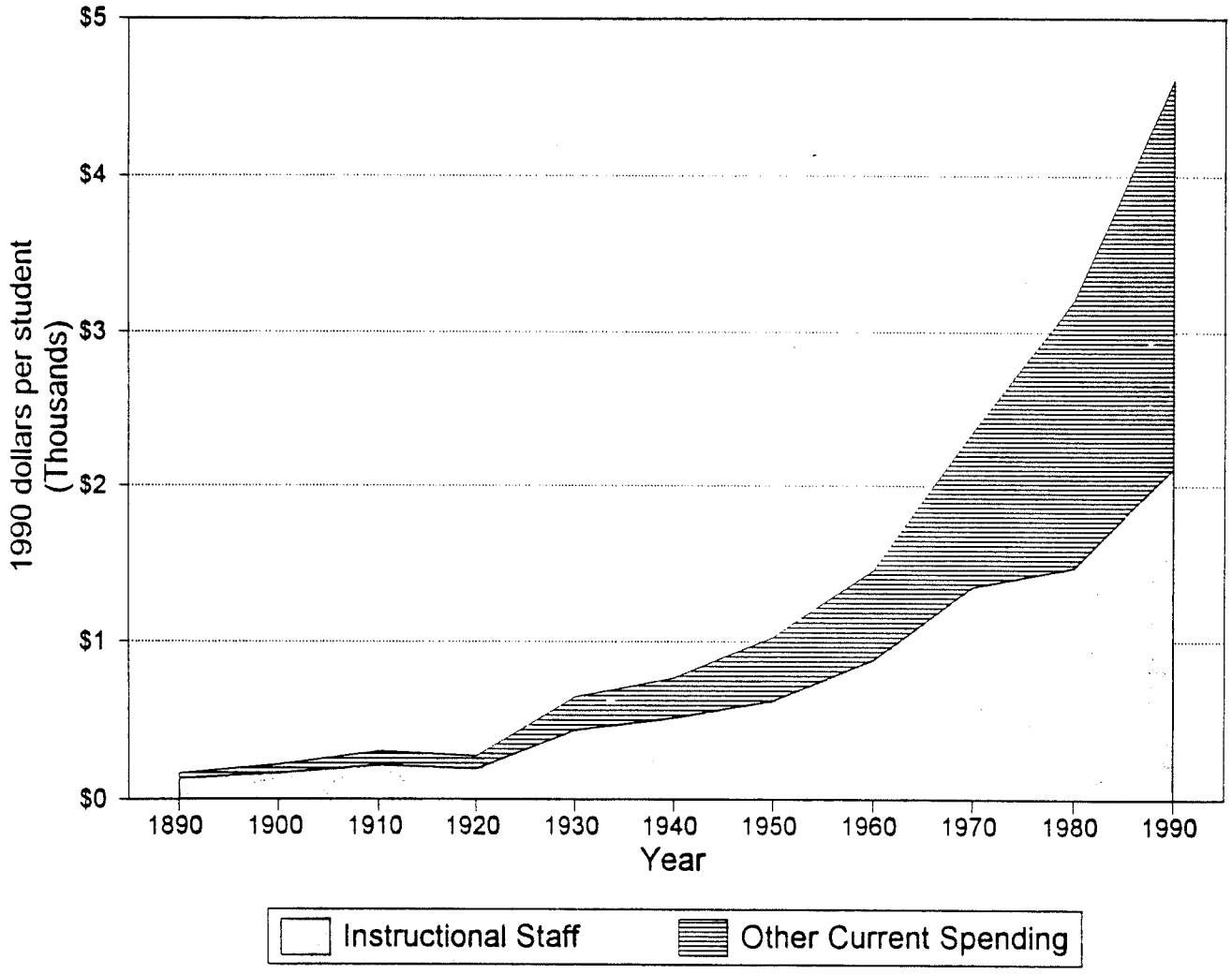

Table 1. Changes in Instructional Staff Expenditure Attributed to Input Changes by Periods: 1890-1990 (Percentages)

	PERIOD				
	1890-1940	1940-1970	1970-1990	1980-1990	1890-1990
QUANTITY					
SCHOOL AGE POPULATION	24	35.3	-36.1	-16.9	23.3
ENROLLMENT RATE	8	4	3.0	11.8	6.0
PUBLIC SCHOOL ENROLLMENT	1.5	-1.3	-2.1	-2.7	0.2
INTENSITY					
PUPIL TEACHER RATIO	10.7	20.3	85.4	36.1	20.8
DAYS PER YEAR	12.7	1.4	0	0	7.2
INPUT COST					
PRICE OF TEACHERS	43.1	40.3	49.9	71.6	42.6
TOTAL	100	100	100	100	100

Source: Hanushek and Rivkin 1994.

these three separate forces have affected the growth in instructional staff expenditure over the past century.[20]

Over the entire century from 1890 to 1990, 29.5 percent of the growth in instructional staff spending was attributed to increases in public school population, with most of that coming from pure growth in the school age population. An almost equal share came from a rise in the intensity of instruction, most notably from declines in class sizes. Pupil-teacher ratios fell from 35 in 1890 to 25 in 1960 to 15 in 1990.[21] The remaining 42.6 percent of overall increases came from increases in the real wages of teachers. The aggregation across the full century, however, masks some very different periods. Specifically, 1970-1990 exhibited marked declines in the school age population (the "baby bust") with continued declines in pupil-teacher ratios and increases in teacher wages that exceeded those of the earlier periods. The net effect was the continued growth in per pupil spending that was, in the aggregate, masked by a falling population.

The pupil-teacher ratio has declined steadily, regardless of whether the price of instructional personnel increased or decreased. While technological change has led to substitution of capital for labor elsewhere in the economy, the opposite has occurred in education. One contributing factor in the decline in the average pupil-teacher ratio might be an increase in the number of difficult-to-educate children, such as handicapped children or children from low-income families. But

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[20]Table 1 employs a multiplicative decomposition of cost growth to attribute the overall increases in instructional costs to specific factors. See Hanushek and Rivkin 1994.

[21]Over the century, a portion of the fall in pupil-teacher ratios can be attributed to a proportionate increase in the secondary school population. Secondary schools have maintained 20-25 percent lower pupil-teacher ratios, at least during the post-World War II period, so an increase in the proportion of secondary students will imply a reduction in average class sizes even if no fundamental changes occurred. At the same time pupil-teacher ratios within both elementary and secondary schools have continuously fallen over the last fifty years. Overall private school pupil-teacher ratios have been roughly equal to public school ratios, although part of this comes from aggregating over very heterogeneous situations. Private secondary schools have had lower pupil-teacher ratios, while the opposite holds at the elementary school level. Further, there is a very different mix of elementary and secondary student populations in private schools as compared to public.

the general nationwide decline in the pupil-teacher ratio—which occurs across schools in communities with a wide variety of student populations—suggests that this is not the fundamental reason for change. Direct analysis of the growth in the handicapped populations also indicates that this can explain only a minority of spending growth (Hanushek and Rivkin 1994).

The growth in teacher salaries is also interesting. While wage increases have contributed significantly to the growth in school expenditure, teacher earnings have, at least since World War II, slipped relative to earnings opportunities elsewhere in the economy. This unfortunate situation appears to reflect simply the low growth in productivity of education relative to other sectors in the economy.[22] It is interesting, however, that schools (and, through bargaining, teacher unions) have responded to cost pressures by accepting falling relative wages along with reduced pupil-teacher ratios. The pattern of wage changes is complicated and differs significantly for men and women, but increased alternative work opportunities for women is likely to put added strain on schools in the future (see Hanushek and Rivkin 1994).

Expenditure other than on instructional staff, the final component of cost growth, has had dramatic impacts on overall spending, but interpreting changes is difficult. Other expenditure grows from $0.4 billion in 1890 to $6.4 billion in 1940 and to over $100 billion in 1990. As figure 7 shows, other expenditure has actually risen more rapidly over the entire century than instructional staff expenditure. On average since 1960, this noninstructional-staff expenditure per student rises at 5 percent per year, compared to only 3 percent per year for instructional expenditure. The relative growth of other expenditure is most rapid during the decade of the 1970s, a period when the total

[22]The general pressures toward increasing costs in low productivity industries is set out in Scitovsky and Scitovsky (1959), Baumol and Bowen (1965), and Baumol (1967). The interpretation in the education industry is more complicated, however, because educated labor is both an input and an output—implying that the value of output is going up at the same time that input costs are rising.

school age population drops significantly.[23] If, for example, other expenditure had grown at the same per student rate as instructional staff expenditure between 1960 and 1990, the 1990 per student expenditure would have been $3,480 instead of over $4,622. This would implicitly allow for increased noninstructional-staff spending intensity because the growth in instructional staff expenditures includes a fall in the pupil-teacher ratio of a third.

The attention that is given to other expenditure (outside of that for instructional staff) flows in part from a common interpretation that, if it does not relate to instructional staff, it must be growth of administrative bureaucracy.[24] Unfortunately, it is difficult to tell exactly what changes have occurred, let alone to judge the efficacy of any such changes. Little consistent data are available to permit any detailed analysis of what lies behind this growth. Moreover, the data that do exist are somewhat misleading since the other category actually includes a variety of items that are conceptually part of instructional expenditure but are labelled noninstructional by accounting convention. For example, the "noninstructional" component includes employer paid health care and retirement contributions for teachers. Other components left out of instructional staff spending include items like books and supplies which are legitimately part of classroom instruction. Thus, the break between instructional and noninstructional expenditure is difficult to make.

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[23]In terms of absolute growth rates, the decades of the 1950s and 1960s are the largest of the postwar period; this holds for both per capita expenditure and total current expenditure. During these decades, however, both instructional staff and other expenditure were growing in parallel. During the 1970s, instructional staff expenditure was constant in the aggregate and rose less than 1 percent annually on a per student basis, while other expenditure per student grew at an annual real growth rate of 5.6 percent.

[24]For example, former Secretary of Education William J. Bennett writes, "Too much money has been diverted from the classroom; a smaller share of the school dollar is now being spent on student classroom instruction than at any time in recent history. . . . . It should be a basic goal of the education reform movement to reverse this trend toward administrative bloat and to reduce the scale of the bureaucratic 'blob' draining our school resources." (Bennett[1988, p. 46]).

E. Uncertainty about School Performance

The aggregate data motivate a concern about the performance of public schools. Nevertheless, they are inconclusive, because they reflect factors that go beyond just the core activities of the schools..

First, achievement is affected by a variety of influences, not just schools. Parents, friends, and others outside of the school all contribute to a student's achievement, so that the aggregate scores do not simply reflect what is happening over time in the schools. Moreover, the aggregate character of these outside factors has clearly been changing through time. It is natural to point to such things as the upsurge in immigrant populations, the increase in child poverty, and the tilt toward single parent families as adversely affecting the preparation of students for school and the support they receive for obtaining high performance. But even the aggregate story is complicated and difficult to sort out by simple consideration of trend data. Offsetting favorable factors for education include the increased education of parents, the movement toward smaller families, and the increase in government interventions such as Head Start that are aimed at compensating for poorer family support. The net impact of these and similar factors is difficult to infer from the aggregate (see, also, Congressional Budget Office 1987).

Second, on the expenditure side there also may be interpretive problems. Not all expenditure is aimed at improving performance in core areas. Thus, for example, expansion of the social agenda of schools undoubtedly takes resources but contributes little to the improvement of science ability of students (see Committee for Economic Development (1994)). Similarly, as mentioned before, expenditures on handicapped children are unlikely to have much impact on average achievement scores, in part because such students are frequently excluded from routine testing. Additionally, performance at each point in time should be related to the cumulative past expenditure contributing to

a cohort's schooling. The generally smooth nature of increases, however, suggests that such timing issues are not particularly important.

The import of all of these issues is to introduce caution in the interpretation of aggregate performance data. While the overall level of performance is a clear concern, the consideration of the role of schools and school policy requires further analysis. Importantly, however, more detailed consideration of the circumstances behind the aggregate data does not change the overall picture and conclusions to be drawn. The key finding of more direct evidence on school performance, described below, is that schools have a performance problem that has not been solved by increased resources for schools.

Conventional Policy Interpretations

This lengthy review of the data and the state of education in the United States is really meant as a preamble to the main thesis of this paper. Specifically, much of the debate and policy discussion appears based on a flawed understanding of the data that is compounded by translating observations about quantity of schooling into policy statements about quality of schooling. First, based on extensive evidence that increasing school attainment has had powerful effects on individual earnings and aggregate economic performance, many quite naturally argue for an expansion of schooling. Expanding schooling with a relatively constant level of school attainment implies devoting more resources to schools and, in effect, increasing the intensity of the resources provided to a fixed pool of students. This translation, as described in the next section on improving quality, is unlikely, however, to yield the economic benefits presumed. Second, pursuing the objective of increased equity falls prey to similar problems. Equity is viewed in two somewhat different ways: in terms of race or income and in terms of geographic variation in school spending. Both begin with a concern

about quality differences but then tend to confuse such concerns with very imperfect measurement of quality differences among schools. Third, while less central to much of the current policy debate, the notion that education is a "high externality" area provides a backdrop for many arguments aimed at changing the quality of schooling, but little evidence relates to this at all.

The unifying feature of these perspectives on school policy is the pressure generated for increased spending on schools. Each revolves around a plausible sounding and widely-accepted argument for increased public support of schools. And each incorrectly applies evidence about returns to quantity of schooling to support expenditure expansion.

This paper does not, however, "test" its main thesis. Instead it lays out the ideas as a way of organizing thinking about much of the current educational debate. As such, it tries to rationalize the existing evidence and the existing rhetoric.

A. Improving Quality through Expanding Resources

The most common policy proposal for dealing with the performance problems of schools described previously is to expand the resources available for schools.[25] Such proposals tend to ignore the aggregate data presented above that indicate a steady expansion of resources before and during the period of concern about lagging school performance. A common justification for increased resources is estimates of high rates of return to schooling investments, but these estimates of high rates of return rely almost exclusively on characterizations of earnings improvements from quantity of schooling. As

[25]An example, typical of the large number of reform proposals appearing in the past decade, is the Committee for Economic Development (1985) statement appearing in bold on page 4, "We believe that any call for comprehensive improvement in the public schools that does not recognize the need for additional resources is destined for failure." Interestingly, Committee for Economic Development (1994) takes a very different tack, arguing that management and governance issues are much more important than additional resources if our schools are to improve.

is obvious, increasing spending on schools without a commensurate improvement in student performance will only decrease the rate of return on schooling (even though common methods of calculating rates of return will frequently not show such true effects).

The aggregate data on spending and performance are suggestive but far from conclusive, because, as mentioned, many other factors enter into overall changes in student outcomes over time. Much more persuasive is the evidence from a large number of detailed econometric studies of the determinants of student achievement. The econometric evidence comes from various estimates of the effects of either spending or real resources on student performance (holding constant student family background and other characteristics). These studies, initiated in response to the "Coleman Report" (Coleman *et al.* (1966)), are designed to separate the various influences on student performance. The basic summary table of econometric results, reproduced from Hanushek (1989), is found in Appendix Table A1. This table summarizes the sign of estimated coefficients for the effects of major school resources and their statistical significance. The primary determinants of variations in expenditure per students across classrooms and schools are teacher education and teacher experience—which determine teacher salaries—and teacher-student ratios—which determine over how many pupils the teacher's salary is spread. There is little confidence of any consistent resource effects related to these factors, based on conventional statistical standards, and many studies even suggest that increased resources are associated with decreased student performance.[26]

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[26]Expenditure effects are best viewed in terms of real resource differences that vary across classrooms and schools, i.e., class sizes, teacher education levels and teacher experience levels. A limited number of studies directly investigate measured expenditure per pupil. Since such measures are generally available only at the school district level, studies employing such measures tend to be highly aggregated and less reliable. See Hanushek (1986, 1989, 1994b). A re-analysis of the expenditure data can be found in Hedges *et al.* (1994), which attempts to conduct formal statistical tests combining the estimated coefficients of expenditures. As reviewed in Hanushek (1994a, 1994b), there is agreement that some schools employ resources effectively, but this does not support any broad resource-centered policies.

This evidence makes it clear that there is no systematic and consistent relationship between school resources and student performance.[27] These findings are categorized under efficiency simply because they imply that increased resources are associated with no gains in outcomes, an obvious case of economic inefficiency. The research does not imply that resources *never* could or do improve performance, just that they currently do not.[28] Most policy appeals for expanding school resources do not offer any substantial change in the organization and incentives of schools, and thus the available evidence on past lack of success appears relevant for these appeals.

The general situation is best illustrated in Figure 8. Society's resources can be devoted either to producing more human capital or to any other (public or private) good. The frontier traces the maximum consumption of all other goods given the level of human capital chosen. But inefficient use of resources in education places us somewhere inside this possibilities curve. Pure resource or spending policies, of the type frequently proposed and pursued, appear by the evidence to lead to additional inefficiency instead of added human capital production. Thus, they tend to drive resource allocation in the direction of A. On the other hand, since elimination of existing inefficiencies can improve the amount of human capital produced without expending additional resources, policies moving us in the direction B should be the focus of attention. The debate about interpretation of existing evidence (Hedges *et al.* (1994) and Hanushek (1994a)) can be interpreted simply as a debate about whether spending policies might not be purely vertical but instead might move us slightly to the

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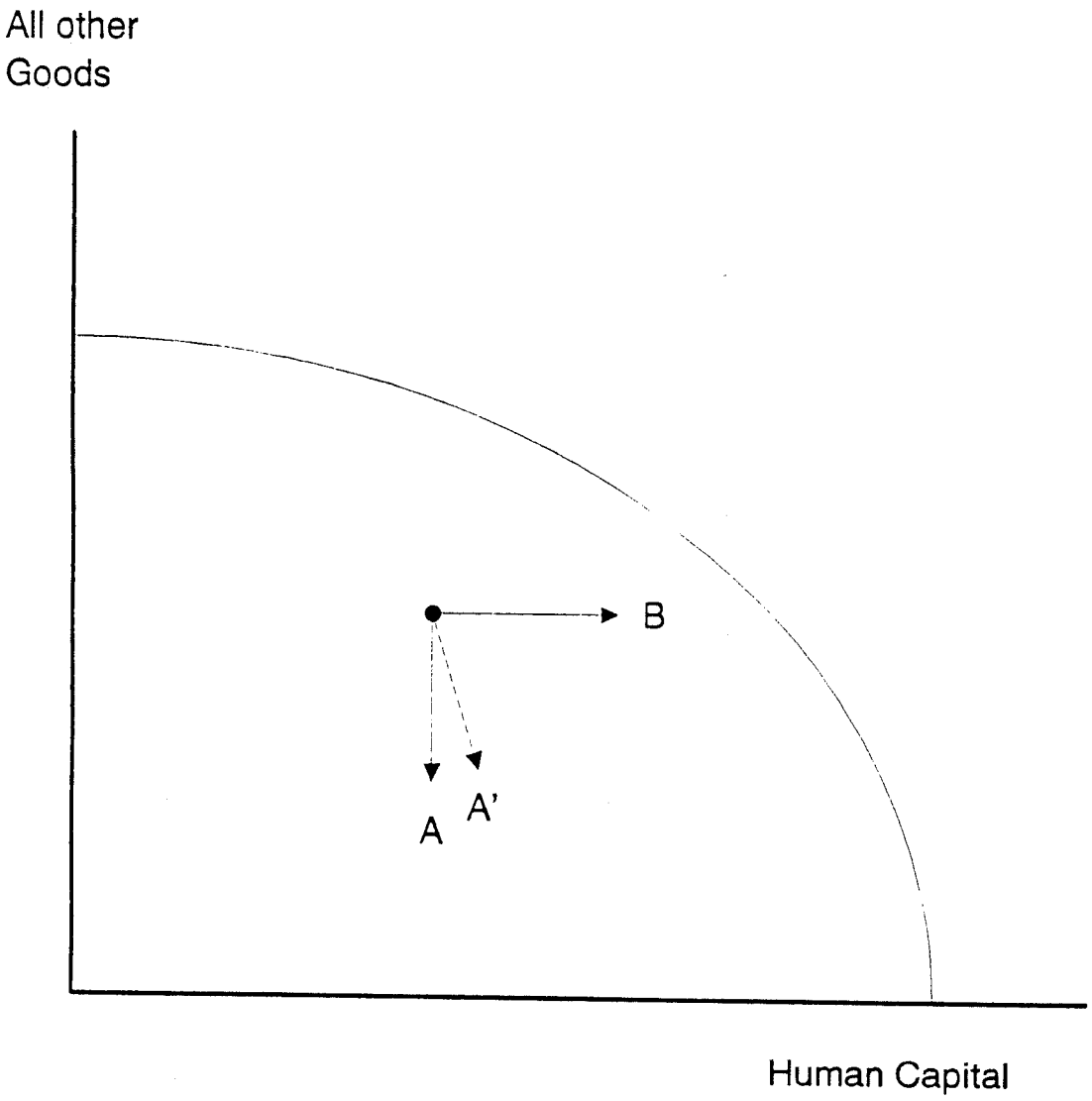
[27]The basic articles (Hanushek 1986, 1989) provide information about the underlying studies. While a few studies were missed, this analysis attempted to include an exhaustive set of underlying estimates that met minimal criteria (published studies which included both resource and family background measures and that reported sign and significance of estimated effects). About three-quarters of the 187 studies included employ standardized test scores as the measure of student performance, while the remainder include such things as subsequent incomes, college continuation, or school drop out behavior.

[28]The recent exchange on the statistical nature of the evidence (Hedges, Laine, and Greenwald 1994 and Hanushek 1994a) underscores agreement that some schools appear currently to use resources effectively while a counterbalancing set do not.

Figure 8.
Production Possibilities and Inefficiencies in Educational Production



right as depicted by the dashed line moving in the direction A'. Even if movement toward A' could be achieved, such policies would remain very inferior to policies pushing toward B.

One way some view this evidence is that varying levels of resources may have powerful effects at low levels of investment, but, given the current amount spent on U.S. schools, there is no obvious impact. Such an interpretation is consistent with evidence that minimal levels of resources have important effects in promoting quality in the schools of developing countries (see, e.g., Harbison and Hanushek 1992). It may also help reconcile the findings of Card and Krueger (1992a) with those presented here, because their study finds significant resource impacts on earnings when variations across pre-World War II schools are considered.[29] None of this evidence suggests, however, that one should expect significant differences in student performance to follow expansion of school resources from current levels and within the current incentive structure.[30] Similar to what has been suggested for medical care, we may simply be on the flat of the performance curve, where added resources yield little marginal pay-off.

Arguing simply that schooling, broadly defined, is a high return investment does not provide adequate justification for increased direct expenditure on schools. The arguments of investments to improve quality must consider the nature of the investment in ways that arguments to expand the quantity of schooling usually do not. This confusion over returns to quantity and quality and over the

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[29]Significant controversy over the findings of Card and Krueger (1992a) and their relevance for current schools remains and is unresolved; see Burtless (1994) and other papers presented at the Brookings conference, "Do School Resources Matter?" (Washington, June 6, 1994). Re-estimation of the basic earnings relationships by Heckman, Layne-Farrar, and Todd (1994) also suggests that the original estimates of Card and Krueger are very sensitive to sample and model specification and that the resource effects are weakened or disappear in alternative estimates.

[30]An alternative set of incentives—ones emphasizing student performance—may well be able to change this situation. These arguments, nonetheless, go well beyond the scope of this paper. The evidence on performance effects is also very limited today. See Hanushek with others 1994.

kinds of investment to be undertaken has, in my opinion, quite distorted the educational policy debate.

B. Equity

Another thrust of the general consideration of educational policy concentrates on equity matters—the distribution of outcomes by identifiable characteristics. The historical review of schooling highlighted some of the concerns. First, the gap in measured performance by race and ethnic background is very large. Second, although not discussed, the gap in achievement by parents' education, income, and social status is likewise large. Together, these observed outcome differences (and the income and employment ramifications) have formed the basis for a large amount of the attention to schools serving disadvantaged groups.

But the education policy debate has concentrated more on a different equity concern—that of differential spending across local school districts. Since the first decisions in the landmark school finance case of *Serrano v. Priest* in the late 1960s, attention has focused on the structure of local and state finance.[31] The simple argument that now has been repeated in over half of the states is that local schools supported by local property taxes are inequitable because they make the quality of school provision dependent on the "wealth of one's neighbors." Decisions in these state cases have depended on specific state circumstances and the separate state constitutions. But there is no doubt that they have been popular in large part because supporters of the suits and judges in the cases view them as addressing the more general equity concerns—differential outcomes by race and income.[32] The attention given to Jonathan Kozol's recent book (Kozol 1991), provides some evidence on that score.

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[31]Following a 1974 ruling in *Rodriguez v. San Antonio*, these school finance issues have been a matter of strictly state concern, and the federal government has not been involved.

[32]It is generally presumed that places with low tax bases are the ones with most of the population of poor children. This presumption, however, is far from true, in large part because of the powerful influence of the distribution of commercial and industrial property on the size of the local tax base but also because of the substantial variation in incomes within most communities.

His book provides a vivid description of the contrast between the country's very best and very worst schools. He then suggests that bringing all schools up to the funding of the wealthiest will eliminate the racial and income disparities in student performance and lifetime success, a position that simply is not supported by the evidence. Nevertheless, this book has been featured in the popular press and is widely quoted as illustrating both the existing equity problems and the obvious solutions.

Various aspects of local inefficiencies, tax equity, interjurisdictional mobility, Tiebout outcomes, and the like immediately spring to mind when local property taxes and different tax bases are discussed. But the educational equity aspects are less clear. In simplest terms, if the distribution of funding does not relate to the quality of schools, the equity aspects of the school financing debates and court cases that focus on spending variations are significantly less clear.

One part of the evidence and the debate needs clarifying at this point. As a general matter, it is important to recognize that schools are but one input to a student's learning and achievement. The student's own ability and motivation, the education from parents and families, and the input of community and friends each enters.[33] The common observation that students in wealthy suburban areas who attend high spending schools do well on standardized achievement tests frequently sends the message that duplicating those schools in poor areas will equalize achievement. In fact, the previous evidence (from econometric analysis that standardizes for parental inputs and, sometimes, individual ability differences) indicates these conclusions are wrong on two counts. First, one should not simply equate high student achievement with well-functioning schools, because the high achievement frequently just implies strong parental influences. Second, providing equal resources is unlikely to

[33]This discussion takes the general view that family inputs are very important but are not very manipulable from a policy viewpoint. This position probably understates some possibilities. See, for example, Fuchs and Reklis (1994) on the importance of readiness for school, which might be affected by policy interventions.

close gaps given the current functioning of schools which does not consistently employ resources effectively.[34]

Most recently these financing cases have gone one step further by introducing the concept of "adequacy." In one form, adequacy is simply an appeal for more resources. Even if a state's funding shows little variation, so the argument goes, the level of funding may be inadequate to provide high quality schools. Such an argument was employed, for example, in a 1992 school finance suit in Alabama where very little variation in spending was matched with a ranking of 47th among the states in average expenditure in 1991.[35] Yet, the evidence presented previously indicates that simple expansion of school resources is unlikely to yield much overall improvement in student performance, even though the state could clearly move up in national spending rankings.[36] A second, and somewhat more appealing, version of adequacy is that sufficient funding should be provided to ensure that all students can perform at an acceptable level. This version is more appealing because it focuses attention on student performance, but it is no more practical, regardless of one's views about appropriate social goals for equity. Its impracticality derives from an inability to specify how added resources translate into better achievement.

The primary message is that equity concerns cannot be separated from efficiency. If there is no direct way to transform resources into improved student performance, policies aimed at more

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[34]The overall trends toward convergence of black and white test scores have led some to infer that increased compensatory spending on schools has finally begun to be seen. This conclusion is not, however, the result of explicit analysis, and it ignores other trends such as increased education of black parents, declining family sizes, and (going in the other direction) increased illegitimacy rates and stagnant incomes. Direct analyses of the effectiveness of compensatory programs further does not support this as an explanation (see Mullin and Summers 1983).

[35]Wyckoff(1992) provides comparative inequality measures for all states in 1987. Only four states (excluding Hawaii with its unified school system) had a lower coefficient of variation in current expenditure per pupil than Alabama. Spending by state is found in U.S. Bureau of the Census 1993.

[36]See the description of projected achievement effects in Hanushek 1993.

equity through equalizing resources have little hope of improving equity as defined in terms of student outcomes. Policies of redistribution are not neutral, however, because seldom is there a simple change in existing funding patterns when increased equality of spending is sought. Instead of moving funds from high spending districts to low spending districts, changes invariably involve expansion of total spending—i.e., it is easier to redistribute a larger pie. Thus, equity inspired policies are probably best thought of in terms of their other potential purposes or effects—whether that is increasing the overall level of spending, moving toward more equal tax rates across jurisdictions, or whatever.

C. Externalities

A final area where policy rhetoric and evidence seem at odds involves the extent of externalities in education. In general, activities that are perceived to have significant externalities are prime candidates for increased governmental support. As is also well-recognized, externalities are noticeably elusive, and, while optimal tax and subsidy policies in the face of externalities are well understood conceptually, few estimates of the magnitude of externalities exist anywhere. Nevertheless, if economists were polled on externalities in education, I suspect that they would substantially support the view that education involves extensive externalities.

As described previously, leading candidates for areas of external benefits involve citizen involvement in the community and government, crime reduction, family decision making and child upbringing, and economic growth. There is evidence that more schooling does have a positive impact in each of these areas. But what does that imply for the current debates?

In each area, a significant portion of the beneficial effect of education appears to come from comparing very low levels of school attainment with significantly higher levels. Thus, extensive discussions of the social benefits of schooling in developing countries would seem both warranted and

correct.[37] It is difficult to have, for example, a well-informed citizenry when most of the population is illiterate. It may also be difficult to introduce advanced production technologies, at least in a timely manner, if workers cannot be expected to read the accompanying technical manuals.

On the other hand, even if accepting the importance of externalities at minimal levels, there is little reason to believe that there are constant marginal externalities.[38] Specifically, arguments about the social benefits of expanded education seem much stronger in the case of developing countries of Africa than in the case of the United States during the 21st century. Where half of the population has attended some postsecondary schooling, another year of average schooling seems unlikely to change dramatically the political awareness of the U.S. population. Similarly, if the average high school student scores 950 on the SAT instead of 900, I do not think many would expect noticeable changes in the identified extra social benefits of education.

My leading candidate for potential externalities of education in the United States and other developed countries would revolve around economic growth. If a highly skilled workforce permits entirely different kinds of technologies to be introduced, or to be introduced earlier in a development cycle, expanded education of an individual may indeed affect other workers in the economy. Or, if improved abilities of the best students leads to more rapid invention and development of new technologies, spillovers of educational investments may result. Nevertheless, I know of little evidence

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[37]Interestingly, policy discussions of education in developing countries tend to concentrate most on private rates of return and the market advantages of schooling, even though they make some reference to other social benefits such as political participation and lower fertility. See, for example, Heyneman and White 1986, Psacharopoulos, Tan, and Jimenez 1986, and Lockheed and Verspoor 1991.

[38]This issue is raised by Friedman (1962) and remains for the most part in the discussions of college education in Hartman (1973) and Mundel (1973). None of these, however, provides empirical evidence on the existence or magnitude of any externalities. The early primer on externalities in education (Weisbrod 1964) concentrates chiefly on geographic spillovers and fiscal effects and downplays the issues raised here. A discussion of the magnitude of externalities that is similar to the one here is found in Poterba (this volume).

that distinguishes externalities in economic growth from simply the impact of better workers and more human capital.

The consideration of externalities ties into the previous discussion by offering another argument for the expansion of resources devoted to schools that appears to me to come from inappropriate application of evidence. While externalities may support expansion of schools to provide basic literacy and numeracy, their application in the case of college education or providing more resources to improve student quality is stretched.

What Supports Spending?

The motivation behind public spending on schools still remains mysterious. What determines increases in spending and, specifically, is spending at all related to a school's performance? Here we provide a preliminary look at citizen decisions on school budgets in New York State.

New York State requires citizen approval of school budgets for a majority of school districts in the state.[39] This analysis builds on voter reactions to proposed school budgets.[40] It combines votes on school budgets with information about the district's students and parents and about student performance. The focus of this analysis is the percentage favoring the initial budget proposal of each

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[39]The "big five" districts (New York City, Buffalo, Rochester, Syracuse, and Yonkers) are dependent districts getting their budgets from the city government and are excluded from requirements for voter approval. Another group of 50 cities (an historical definition that does not uniformly include the next largest jurisdictions) are also excluded. Over 500 districts remain with annual voting on proposed budgets.

[40]This analysis considers only the first vote for a school budget. By New York law, communities can have subsequent votes (on budget proposals that are the same, higher, or lower than the initially rejected budget) after a budget is rejected. Further, districts can operate under a "contingency budget" for which it does not require voter approval.

district. The models estimated consider income and other characteristics of the population, the impact on current tax rates and the history of tax rates, and alternative measures of student test performance.

The models are meant to characterize the various influences on voter preferences for spending. Since school systems do not readily provide information on performance, even though there is mandatory student testing at various grades in New York State, alternative formulations of information employed by voters are tested. Specifically, one measure of student performance is the change in reading and math passing percentages from third grade in 1987-88 to sixth grade in 1990-91. This measure is designed to proxy value-added of schools, since these are the same cohort of students. The second measure is the simple percent achieving passing scores on sixth grade reading and math tests. Neither is perfect as a measure of school system performance. The first is error prone because of intervening student mobility, while the second mixes school effects with the effects of family and peers. But the object is understanding how citizens might use available information to assess performance of their schools, and each of these measures plausibly conditions voters' views on the performance of their schools.

Table 2 presents two alternative models of the determinants of voter approval, differing only by the measure of student performance. (Variable definitions are found in Appendix Table A2). The estimated effects are very consistent across the different versions, since voters do not seem to react to either of the measures of performance. The primary result is clear: Neither estimated value-added nor the level of performance is systematically related to voter approval of budgets.

The models do not explain much of the variation in voter approval with R^2's of only .06. Nonetheless, a number of systematic effects do come through. Higher income communities are more supportive of proposed budgets, as are communities with a greater proportion of elderly (population over age 60). Communities with proportionately more teachers residing in them also tend to support

Table 2. Explanations of Voter Approval of School Budgets for 550 New York State School Districts: 1991-92 (t-statistics in parentheses)

Dependent variable: Proportion YES

Variable	Value-added achievement	Level of achievement
Proportion teachers	570.66 (4.0)	579.78 (4.0)
Public school enrollment (white)	0.074 (1.0)	.072 (0.9)
Elderly	0.286 (2.7)	.282 (2.6)
Median income ($1,000)	0.923×10^{-3} (2.1)	0.889×10^{-3} (2.0)
Tax rate growth (1988-1990)	-0.038 (-1.3)	-.038 (-1.3)
Requested tax rate increase	-2.860 (-1.9)	-2.81 (-1.9)
Δreading score (grade 3-6)	-0.853×10^{-4} (-0.1)	
Δmath score (grade 3-6)	-0.416×10^{-3} (-0.4)	
Reading Score (grade 6)		0.6×10^{-3} (0.6)
Math score (grade 6)		$-.107 \times 10^{-2}$ (-1.0)
Constant	.411 (4.8)	.461 (4.6)
R^2	.063	.064

proposed budgets. While less precisely estimated, voters also vote against larger tax increases in the proposed budget and are less supportive of current budgets if there has been larger past growth.

These preliminary estimates are subject to various statistical and methodological concerns.[41] Nonetheless, the lack of relationship between voter approval of expenditure and student performance raises serious questions about what does drive spending and citizen demands for school spending. Knowledge of citizen preferences is a key element in understanding the likely course of school spending.

I do believe that these results bode continued difficulty for improved political decision making in education. One interpretation of the results is that voters are quite in the dark about which schools are performing well and which are providing a good return on resource investments. An alternative is that parents in fact know well what their schools are doing and are simply less concerned about student cognitive achievement than other things. Either way one has to be concerned about prospects for "high return" investments—those that most directly improve the skills of students and that provide most of the justification for public support of the schools.

Some Concluding Thoughts

The underlying story is that problems of inefficiency in the provision of education pervade most discussions. As soon as concern moves away from simple quantity of schooling, as it invariably does today in the United States, it is not possible to neglect how resources are transformed into student outcomes. Yet, because of the difficulty of this and because of uncertainties about the production process, this step is frequently not taken. Instead, inappropriate use is often made of

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[41]One important issue is the low turnout for school budget votes. This low, and certainly selective, turnout leads to concerns about measurement errors. Additionally, this analysis employs a limited range of test scores (in terms of both grade level and subject matter).

general conclusions about investments in quantity of schooling to justify spending programs aimed at quality.

Two outcomes flow from this. First, the policy debates, the court deliberations, and the related academic analyses all tend to founder on conflicting assumptions about how to achieve specific goals. In other words, even if everybody could agree completely about objectives, real controversy about strategy typically remains. Second, the controversy appears to be frequently resolved in favor of increased expenditure on schools. The goals and objectives—increased performance and greater equity—are legitimate and worthy of support, and there is a surface plausibility to dealing with these with greater resources. The history of spending and performance indicates disappointing results.

It is difficult for economists to think about areas that are marked by important inefficiencies of the kind described here. Economists have found notions of efficiency to be very useful, convenient, and frequently plausible. If efficiency reigns, spending levels provide a ready measure of opportunities, variations in spending speak to equity concerns, and policy can be developed directly in terms of resources devoted to the area. Each disappears with substantial inefficiency.

On the other hand, it should not really surprise economists or others to find substantial inefficiency in the delivery of schooling. Even though there are very large differences among schools and teachers, successful schools and teachers receive essentially the same rewards as unsuccessful ones. Areas of economic activity where efficient provision occurs generally involve more direct and obvious incentives for performance. With few incentives related to school outcomes inefficiency should not be totally unexpected.

Setting out the alternative way to address performance and equity concerns is beyond the scope of this paper. The most plausible approach, however, seems to be application of quite straightforward economic principles: align incentives with goals and evaluate alternative ways of achieving goals. These ideas, described in detail elsewhere (Hanushek with others, 1994), provide

ways of dealing with the cost and performance difficulties in today's schools. The important point for this discussion is that improving schools calls for radically different policies than the traditional approach of simply throwing money at schools. Ultimately arriving at the proper level of investment in schools—a level that best meets our achievement and equity goals—may cost more or less than what we are currently spending. We simply do not know the answer, given the current organization and performance of the schools.

There is every reason to believe that investment in education is a good one, yielding high returns to individuals and to society. Substantial evidence also supports using quality education as a useful tool in altering income distributions and achieving general equity goals of society. The central message here is simply that not every investment is equal. There are good and bad investments in education. Much of recent policy has pushed toward generally bad investments—those that increase costs without any substantial benefits. Little evidence suggests that the primary problem facing schools has been lack of resources, and we should not treat that as the central issue.

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Appendix A

Hanushek (1989) summarizes available published econometric evidence through 1988. The selection of studies is described in that article. Subsequent re-analyses and consideration of the interpretation of these results can be found in Hedges, Laine, and Greenwald 1994, Hanushek 1994a,1994b.

Appendix Table A1. Summary of the Estimated Relationship Between Student Performance and Various Components of School Expenditure (187 studies)

Input	Number of Studies	Statistically Significant		Statistically Insignificant			
		+	-	Total	+	-	Unknown
Teacher/pupil	152	14	13	125	34	46	45
Teacher Education	113	8	5	100	31	32	37
Teacher Experience	140	40	10	90	44	31	15
Teacher Salary	69	11	4	54	16	14	24
Expenditure/pupil	65	13	3	49	25	13	11
Administrative Input	61	7	1	53	14	15	24
Facilities	74	7	5	62	17	14	31

Source: Hanushek (1989).

Appendix Table A2. Variable Definitions for Factors Affecting Voter Approval

Variable	Definition
Proportion YES	Proportion of voters favoring proposed school budget (1991-92)
Proportion teachers	Proportion of families in school district with a teacher
Public school enrollment (white)	Proportion white students attending public schools
Elderly	Proportion person age 60 or more
Median income ($1,000)	Median household income 1989
Tax rate growth (1988-1990)	Change in (local revenues/property tax base) between 1988 and 1990
Requested tax rate increase	Proposed change in local revenues/property tax base
Δreading score (grade 3-6)	Percent 6th graders passing reading test (1990-91) minus percent 3rd graders passing reading test (1987-88)
Δmath score (grade 3-6)	Percent 6th graders passing math test (1990-91) minus percent 3rd graders passing math test (1987-88)
Reading Score (grade 6)	Percent 6th graders passing reading test (1990-91)
Math Score (grade 6)	Percent 6th graders passing math test (1990-91)

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