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**U. S. Department of Education**
**Office of Educational Research and Improvement**

# *Measuring Inflation in Public School Costs*

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**December 1997**

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# Measuring Inflation in Public School Costs

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Prepared for:

U.S. Department of Education
Office of Educational Research and Development
National Center for Education Statistics

December 1997

# Measuring Inflation in Public School Costs

by

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October 1997

# *Executive Summary*

The desire to understand the patterns of variation in educational services over time has increased the need for meaningful and reliable measures of the patterns of educational cost differences. Measuring these patterns of variations, however, is not a simple undertaking. To account for these variations, it is necessary to adjust the *actual* values of expenditures that are commonly reported by public school systems in order to determine the *real* differences in educational services over time[1]. What is needed is a cost-of-education index that measures the changes in the prices of school inputs (personnel and nonpersonnel items used in the provision of school services) in the United States over time.

Specifically, an inflationary cost-of-education index (ICEI) would measure the level of inflation in the salaries of comparable teachers, school administrators, and noncertificated school personnel, as well as the prices paid for nonpersonnel inputs *at different points in time*. An ICEI would measure how much more or less it costs to provide the same quantities and qualities of school inputs at these different points in time.

An inflationary cost adjustment for education would, in fact, be helpful in providing important accountability data for policymakers and educators who increasingly want to know what the nation is getting for its investment in education. This report addresses the following question:

- *Are the dollars invested in U.S. education today buying the same level of educational services or resources as in previous years?*

## Purpose

The purpose of this report is to develop an inflationary cost-of-education index that improves upon measures of inflation previously proposed and used by researchers in the field. Until now, NCES and others attempting to adjust actual data that have been reported over time for educational expenditures have had to use the consumer price index (CPI), the gross domestic product deflator (GDPD), and the elementary-secondary school price index (SPI) developed by the Research Associates of Washington, DC (1994). More recently, Mishel and Rothstein (1996) have proposed the net services index (NSI), a modified version of the service index of the CPI, as an alternative measure of inflationary trends.[2] The Bureau of Labor Statistics also publishes an employment cost index (ECI) which measures inflation in hourly wage rates for public elementary and secondary school personnel.

In contrast, this report presents a comprehensive measure of inflation for the prices of school inputs. The methodological approach builds on the same hedonic wage model used in previous work by Chambers (1995b) to develop a geographic cost-of-education index[3]. The analysis presented in this

[1] The term *actual* refers to the values of expenditures reported by school districts or state agencies. The term *real* (or *cost-adjusted*) refers to measures that have been adjusted by dividing the actual values by a cost index—in this case, the inflationary cost-of-education index—so that comparisons may be made between figures from different time points.

[2] *Services index* refers to the portion of the consumer price index that measures changes in the prices paid for consumer services such as medical care, shelter, utilities, personal services, or legal services.

[3] *Hedonic wage model* refers to a model of wage determination based on the characteristics of workers and the work place.

report uses this model to estimate patterns of wage inflation and makes several significant improvements in the empirical application of the model:

- ***Improvements in explanatory measures[4].*** The present analysis incorporates additional measures of teacher quality (for example, quality of the undergraduate college attended), explores alternative ways of measuring teacher experience, includes more accurate data on local crime rates, controls for the effects of collective bargaining, and uses a more sophisticated measure of labor market competitiveness—the Herfindahl index.[5]

- ***Extension to additional school inputs.*** This report extends Chambers' (1995) earlier work on teachers to include school administrators, selected categories of noncertificated school personnel, and specific categories of nonpersonnel inputs. Major data sources include the NCES *Schools and Staffing Survey (SASS)* for teachers and administrators and the *Current Population Surveys* for noncertificated personnel. Component indexes (indexes of specific goods and services used to make up the consumer price index or any other overall index) from the *Consumer price index* and the *Producer Price Index* are used for nonpersonnel inputs.

- ***Application to expenditure data.*** The inflationary cost adjustment developed in this report is applied to national level expenditure data to illustrate how such an index may be utilized to adjust actual expenditure data reported by NCES.

- ***Comparison with alternative indices.*** This report will compare the *ICEI* with alternative cost adjustments indexes such as the consumer price index (CPI), the gross domestic product deflator (GDPD), the school price index (SPI) created by the Research Associates of Washington, DC (1995), the net services index (NSI) proposed by Rothstein and Mishel, and a modified version of the employment cost index (MECI) for public elementary and secondary school personnel produced by the Bureau of Labor Statistics (BLS).

In addition to focusing directly on school inputs, the *ICEI* attempts to adjust for the qualitative differences in those inputs employed over time. The index controls for variations in a fairly wide range of personal and job characteristics that affect the supply of, and demand for, school personnel. It reflects differences over time in factors that underlie cost-of-living differences and differences in the characteristics of regions that affect their desirability as places to live and work. In addition, the methodology reduces the influence of forces within the control of school decisionmakers by including in the *ICEI* only those factors that are beyond local control. Finally, the inflationary cost adjustments contribute to the school finance policy debate by improving how the NCES can report fiscal information over time. This *ICEI* enhances an understanding of factors that affect changes in the patterns of demand for school inputs over time.

[4] *Explanatory measures* are those measures (e.g., independent variables) that are used to explain the patterns of variations in some specific variable (for example, wage rates).

[5] See Chambers (1997a), the **Technical Report,** which is a companion to this report for a more complete discussion of the use of the Herfindahl index.

The purpose of the comparison between the *ICEI* and the alternative indexes is to illustrate the extent of difference between these alternative measures. While each of these indexes measure something different, they are theoretically linked to one another, and the comparison will provide some evidence as to how close the patterns of change are among these alternative measures of inflation.

## Methodology

The *ICEI* uses a *hedonic wage model* to examine the overall patterns of variation in the salaries and wages of certificated (for example, teachers and principals) and noncertificated (for example, teachers' aids, secretaries, custodians) personnel. This model provides a comprehensive framework for understanding the various factors that underlie variations in the patterns of employee compensation. These factors include both *discretionary (demand-side) factors* which are within the control of local school decisionmakers (e.g., district demand for the personal qualifications of its employees), and *cost (supply-side) factors*, which are outside local control (e.g., cost of living, local amenities that affect labor supply). In short, the hedonic wage model is well suited as a tool to isolate the impact of regional amenities and costs of living on the salaries of school personnel, while controlling for various personal and job characteristics.

Applying the hedonic wage model to develop an inflationary cost index involves separate equations for each year for which data are available. The estimates of wage inflation derive from the differences in the parameter estimates over time and changes in the distribution of the *cost factors* across local jurisdictions.

The *ICEI* analyses presented in this report draw upon several major data sources:

- Analyses of certificated school personnel use data from the *Schools and Staffing Survey (SASS)* administered by the NCES in 1987-88, 1990-91 and 1993-94.

- Analyses of noncertificated school personnel use data from the *Current Population Surveys (CPS)* administered by the Bureau of Labor Statistics.

- Analyses of cost factors (e.g., characteristics of the labor market and the communities within which public school districts are located) use data from the *U.S. Geological Survey*, the *National Weather Service*, the *Uniform Crime Reports of the FBI*; and the *City and County Databook*.

- The price indices for the nonpersonnel inputs are derived from components of the *consumer price index* (*CPI*) and the *producer price index*.

To calculate the *ICEI*, each district is compared to itself in some base year, which is 1987-88 for this analysis. All districts have an index of 100 in the base year. The *ICEI* in a subsequent year reflects the relative difference in cost of school inputs in that particular district. The simulations of school personnel costs over time are based on statistical models that involve estimation of separate salary and wage equations for each sample year (i.e., 1987-88, 1990-91, and 1993-94). Comparing these simulations over time compares the cost of a fixed set of personal and job characteristics at different points in time. Inflation measures the net impact of changes in the relative supply of, and demand for, school inputs with specific characteristics. Overall, the *ICEI* compares the cost of a fixed

collection of educational resources both with respect to their quantities and the quality characteristics embodied in them.

## Inflation and the Patterns of Education Spending Over Time

The analyses presented in this report examine the variations in the level of investment in K-12 public education over time. They compare results of analyses using the *ICEI* developed for this report with results using five alternative measures of inflation mentioned earlier: the CPI, GDPD, SPI, NSI, and the a modified ECI (MECI). The comparisons include analyses of both inflationary cost differences in *actual* expenditures, and differences in *real* expenditures over time, which correspond, respectively, to the following questions:

- *Approximately how much does it cost to provide the same quantities and qualities of educational resources over time?*

- *What are the implications of these variations in cost for differences in the real levels of educational spending over time?*

Principal findings are highlighted below, followed by a discussion of the advantages and disadvantages of each method used to generate inflation estimates.

- *Estimated inflation rate*: The mean estimated rate of inflation based on the *ICEI is 15.0 percent* for the period 1987-88 to 1990-91. This inflation rate is lower than rates estimated by the CPI (15.6 percent), GDPD (15.5 percent), SPI (17.6 percent), NSI (15.5 percent), and the MECI (17.2 percent). During the time interval 1990-91 to 1993-94, the *ICEI* measured inflation in school costs at 9.9 percent which falls in the middle of the inflation estimates measured by the other indexes. The GDPD is lowest at 8.1 percent followed by the CPI at 9.3 percent and the MECI at 9.5 percent. The SPI at 10.5 percent and the NSI at 13 percent both exceed the *ICEI* inflation rate of 9.9 percent in this time interval.

- *Increase in actual expenditures*: Total *actual* educational expenditures increased 28.6 percent from 1987-88 to 1990-91, while they increased at a rate of only 14.6 percent from 1990-91 to 1993-94. *Actual* total expenditures per pupil increased almost 25 percent in the first time interval, but increased only 8.6 percent in the second time frame.

- *Increase in real or cost-adjusted expenditures*: Analyses using *real or cost-adjusted expenditures* yield dramatically different patterns of change over time, compared to changes in *actual* expenditures. Over the entire six year interval, the CPI- and *ICEI*-adjusted expenditures exhibit very similar patterns of growth: the CPI-adjusted expenditures show a growth rate of 7.4 percent versus 7.3 percent for the *ICEI*-adjusted expenditures. The SPI- and NSI-adjusted expenditure figures exhibit considerably slower rates of growth at 4.3 and 3.9 percent, respectively. The MECI falls in between these figures and implies a growth rate in real expenditures of 5.7 percent. The GDPD-adjusted figures exhibit an 8.7 percent growth rate. The bottom line is that the CPI and the ICEI measures are quite similar. However, if one breaks this time interval into two equal segments, the magnitudes of the patterns of

growth in *real* expenditures differ depending on which measure of inflation is used for adjustment. The *ICEI*-adjusted expenditures exhibit the fastest growth rate (8.6 percent) in the first time interval, while they exhibit a decline of 1.2 percent in the second time interval. The change in cost-adjusted expenditures per pupil range from a low of -3.8 percent (the NSI-adjusted figures) to a high of 0.5 percent (the GDPD-adjusted figures).

The analyses in this report prominently indicate that cost adjustments are extremely important in estimating measures of inflation. Unadjusted expenditure data are difficult to interpret because they do not distinguish between changes in expenditures resulting from changes in the prices paid for school inputs and changes based on the quantities and characteristics of school inputs. The patterns of change over time in unadjusted versus cost-adjusted expenditures are quite different.

## Advantages and Disadvantages of the ICEI Versus Other Measures of Inflation

*CPI:* Adjustments of expenditures that account for changes in the CPI reflect the differences in the value of educational dollars in terms of consumer goods and services. Adjustments of expenditures that account for changes in the *GDPD* reflect the differences in the value of educational dollars in terms of all domestic consumer and investment goods and services.

An argument on behalf of the CPI is that over the long run, the CPI reflects differences in the costs of consumer goods and services that are faced by school personnel and is one factor which affects the supply of qualified individuals willing to offer their services to the public education sector. If public school decision makers do not maintain the purchasing power of the dollars paid to school personnel in the form of salaries, then one might expect a change over time in the qualifications of those willing to offer their services.

For the period of time covered by the present study, the CPI provides a fairly close estimate of the pattern of change that occurred in the costs of public schools as measured by the *ICEI*. Whether or not this similarity in the pattern of change would hold over a longer period of time or be consistent with changes over specific shorter time intervals is a matter for further empirical analysis.

It is important to recognize that while the CPI does play a role in the determination of the salaries of school personnel, it still represents a different set of goods and services than those purchased by school districts. The changes in the CPI do not reflect all of the other factors that affect the supply of, and demand for, individuals within the public education sector. Changes in the economy that affect job opportunities across sectors and relative differences in supply of, and demand for, labor are not reflected in the overall changes in the CPI. Moreover, changes in the CPI do not directly reflect the changes in the prices of other inputs used by the education sector to produce school services.

*SPI:* The *ICEI* is preferable to the SPI because the SPI is primarily based on average price differences over time.[6] Specifically, the SPI measures inflationary trends for school personnel with variations in the average salaries of teachers, administrators, and other personnel. Such average salary or wage indices are not adjusted for differences in the attributes of the individuals or their job

[6] For a more detailed description of the methods and data sources for the SPI, see Research Associates of Washington, DC, 1994.

assignments. In contrast, the *ICEI* analysis *explicitly accounts* for differences in the attributes of the personnel inputs being employed. The price differences reflected in the *ICEI* control for differences in the *qualifications* of personnel that may affect the nature and quality of the educational services provided. Stated another way, the intent of the *ICEI* methodology is to include only those differences in costs that are *outside the control* of the agencies that make the decisions about which resources are used to produce educational services: that is, changes in the cost of living and changes in the amenities or disamenities that affect the supply of, and demand for, school personnel and ultimately the wages paid for their services.

The results of the analysis indicate that cost adjustments are important. Cost-adjusted data tell a potentially very different story about the patterns of change in educational investments than unadjusted data. Moreover, the SPI tells a very different story about changes in the costs of education than the *ICEI* because it does not control for differences in the characteristics and qualifications of school employees. It is similar to comparing the prices of automobiles over time without taking into account the differences in the features or the quality of the materials used to construct them. Over the 1987-88 to 1993-94 time period, the SPI exhibits a higher overall rate of increase in prices than virtually any of the other cost-adjustments. In fact, the SPI suggests that the overall inflation rate is about 3.6 percent higher than the *ICEI*.

*Others:* While the differences in the magnitudes of change in the CPI, the GDPD, and the *ICEI* are all smaller than the changes in the SPI or the NSI, the patterns are somewhat different within the time intervals analyzed. The MECI falls in between these two groups. For example, compared to the CPI and the GDPD, the *ICEI* exhibits the lowest rate of cost increase in the period 1987-88 to 1990-91 (15 percent relative to 15.6 for the CPI and 15.5 for the GDPD and the NSI). Between 1990-91 and 1993-94, the *ICEI* exhibits the largest rate of increase in costs (9.9 percent) when compared to the CPI (9.2 percent) and the GDPD (8.1 percent), but is smaller in magnitude than the SPI (10.6 percent) and the NSI (13.0 percent).

***To what factors can these differences be attributed?*** To some extent, these differences in price adjustments can be attributed to the obvious: differences in the types of goods and services included and differences in methodology. The CPI measures price differences for consumer goods and services, while the GDPD measures price differences for all consumer and investment goods and services in the domestic economy. The SPI, MECI, and the *ICEI* purport to measure the prices of school inputs. Each of these indices measures price or cost changes of different inputs between two points in time.

Differences between the SPI, MECI, and the *ICEI* are more subtle, mostly due to different methodologies. While, for the most part, the nonpersonnel components are comparable because some of the same data sources are used, the major difference lies in the assumptions upon which the personnel cost indices are based. The SPI and MECI assume that average salaries and wages are a good estimate of inflation, while the *ICEI* attempts to control for differences in average salaries and wages associated with the characteristics and qualifications of the individual employees. The *ICEI* is intended to reflect only those factors that affect the willingness of comparable teachers and other school personnel to supply their services to local school districts.

***Why are such small percentage differences important?*** While relatively small percentage differences in estimates of inflation may not appear to mean much on a year-to-year basis, such differences can amount to considerable differences over a longer period of time. For example, a one-half of one percent difference in two alternative indices compounded over a 20-year period amounts

to a 10.5 percent difference in the costs of education. Over a 30-year period, it amounts to 16 percent. A difference of 2.5 percent like the one observed between the SPI and the *ICEI* in the first time interval amounts to about a 64 percent difference compounded over 20 years, and a 110 percent difference compounded over 30 years.

Unfortunately, the real patterns of differences are often not so clear cut. For example, in the analysis for this report, the CPI exhibits a higher rate of inflation than the *ICEI* in the first time interval, but a lower rate of inflation in the second. In this case, the importance of the differences will depend more critically upon the measurement issues—that is, the assumptions underlying the alternative indices and the conceptual framework upon which the measures are based.

It is important to remember that the cost adjustments used in the *ICEI* analysis are designed to capture differences only in the prices of school inputs and do not reflect differences in many other factors that are outside local control and that affect the costs of educational services. Nevertheless, this analysis has made a significant step forward by including estimates of price differences for virtually all categories of school inputs. While the *ICEI* and the CPI are virtually identical over the six year period, it is still important to recognize that these two inflationary measures, while connected theoretically to one another, measure price changes in different collections of goods and services. Over the long run, one would expect these two numbers to move together somewhat. But if major factors are included in either of these indexes that impact the supply of, and demand for, the composition of goods and services may cause them to diverge in specific time intervals. To track these patterns of divergence, one needs to measure price changes that are specific to the relevant goods and services. In other words, if one truly wants to understand inflation in education, then one needs to focus on measuring the changes in prices of inputs used by the educational enterprise.

## Implications for Future Research

The inflationary cost-of-education index presented in this report makes a significant methodological contribution by including estimates of price differences for virtually all categories of school inputs. The *ICEI* provides a tool for educational researchers to use in future analyses of the variations in educational expenditures and resource allocation.

At the same time, it is important to remember that the cost adjustments used in the *ICEI* analysis are designed to capture differences only in the prices of school inputs and do not reflect differences in many other factors that are outside local control and that affect the costs of educational services, such as student needs (for example, disabilities or limited-English proficiency).

Future research efforts should refine the databases upon which these analyses are based, as well as the methodology and the empirical application of the *ICEI* to improve the measures that have been developed in this report. Research in the following areas merits consideration:

- *Use of CPS data for estimates of inflation between SASS administrations.* The sophisticated methodology applied to certificated school personnel requires a detailed database like the one developed from the *Schools and Staffing Survey* (SASS). Unfortunately, the *SASS* is not scheduled to be administered again until the 1998-99 school year. *What can one do in the years between SASS applications?*

Based on findings presented in this report, inflationary trends are likely to change substantially from one time interval to another. It would be useful to have data sources that would permit annual updates so that historical trends in educational spending could be analyzed more completely. One annual source of data that could be explored for updating the inflationary estimates is the *CPS* dataset, which provides data on noncertificated school personnel for the *ICEI* analysis. If the *CPS* data could be used to replicate the results obtained in this analysis, it might provide an adequate sample for estimating inflationary trends for certificated school personnel in the same way it was used for noncertificated in this analysis.

- *Improved data on fringe benefits*. The analysis of certificated and noncertificated personnel focuses entirely upon salaries and wages. The impact of adding benefits to this analysis is unknown. Unfortunately, accurate and consistent benefit data are difficult to gather and incorporate into cost analyses. NCES needs to address this issue through improved data gathering within the *Schools and Staffing Survey (SASS)* or its other fiscal data collection efforts.

Continued work on educational cost analysis is essential as NCES begins to explore the issues of productivity in education and recognizes the need to measure educational resource levels more accurately. Understanding productivity requires comprehension of the decisions that underlie the patterns of resource allocation in local school systems, and understanding resource allocation in local school systems requires an understanding of the patterns of variation in the factors that affect the costs of educational services over time.

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# *Acknowledgments*

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# *Chapter I*

## INTRODUCTION

### Background and Motivation for Developing an Inflationary Cost-of-Education Index

The desire to understand the patterns of variation in educational services across geographic locations and over time has increased the need for meaningful and reliable measures of the patterns of educational cost differences. Government agencies, researchers, and the popular press produce and publish data on the patterns of expenditures over time. Often, however, their perspectives on the measurement of these different patterns of expenditures are simplistic.

Actual patterns of educational expenditure are a result of two components: (a) variations in the levels of educational services reflected in the quantity and quality of the resources used to produce those services (e.g., teachers, aides, administrators, and computers); and (b) variations in the prices paid for each unit of a given resource. To account for these variations, it is necessary to adjust the *actual* values of expenditures that are commonly reported by public school systems in order to determine the *real* differences in educational services across geographic jurisdictions or over time[1]. It would be possible to make this adjustment using a price index that reflected only that portion of the variation in the prices of educational resources due to factors beyond the control of local school decisionmakers (for example, inflation and cost-of-living differences, geographical amenities like climate, competition in the educational labor market).

For example, an inflationary cost-of-education index *(subsequently referred to as ICEI)* would be useful in measuring the level of inflation in the prices of school inputs (personnel and nonpersonnel items used in the provision of school services) over time. The I*CEI* is an index that reflects overall variations in the salaries of comparable teachers, school administrators, and noncertificated school personnel, and the prices paid for similar nonpersonnel inputs *at different points in time.* The *ICEI* measures how much more or less it costs to provide the same quantities and qualities of school inputs at these different points in time. Such inflationary adjustments could be used to help address the current debate over how the investment in U.S. education has changed over time.[2]

An inflationary cost adjustment for education would, in fact, be helpful in providing important accountability data for policymakers and educators who increasingly want to know what the nation is getting for its investment in education. This report addresses the following question:

> *Are the dollars invested in U.S. education today buying the same level of educational services or resources as in previous years?*

[1] The term *actual* refers to the values of expenditures reported by school districts or state agencies. The term *real* (or *cost-adjusted*) refers to measures that have been adjusted by dividing the actual values by a cost index—in this case, the inflationary cost-of-education index—so that comparisons may be made between figures from different time points.

[2] The issues surrounding this debate are discussed in Hanushek and Rivkin (1996), Rothstein and Miles (1995), and Mishel and Rothstein (1996).

Addressing this question requires an appropriate price deflator for school inputs.[3] A price deflator would reflect changes in the prices of *comparable* school inputs which, when applied to *actual* expenditures, would provide an estimate of the *real (*or cost-adjusted*)* expenditure or the *real (*or cost-adjusted*)* level of school resources invested in educational services.

## Previous Literature in Measuring Inflation in Education

Several previous studies focused on the development of cost-of-education indexes, however, few have attempted to measure the costs of school inputs over time.[4] Following the output perspective, Hanushek and Rivkin (1996) and Hanushek (1996) propose the use of the implicit deflator for the Gross Domestic Product (GDPD) as a way of measuring changes in what individuals have given up, or sacrificed, to achieve the outcomes of the educational system. Hanushek and Rivkin's contribution provides a long-term perspective in tracking society's investment in education.

Mishel and Rothstein (1996) focus attention on the measurement of inputs and propose a *net-services* index *(NSI).* The NSI is a modified version of the *services* index calculated by the Bureau of Labor Statistics (BLS)[5]. The *NSI* represents an attempt to get a better handle on the inflation that occurs in specific personal service industries in which productivity growth tends to be difficult to achieve. Mishel and Rothstein argue with Hanushek and Rivkin's perspective as follows:

> *...(W)e have argued that because education is an inherently low productivity industry in the sense that cost efficiencies are hard to achieve, analysts should not assume education faces an average inflation rate. A consumer price index measures the average inflation of all goods and services, weighted by their importance in the consumption of urban families. A GDP deflator measures the average inflation of consumption, investment, government, purchases and net exports in the economy. We suggest that a "net services" index corresponds more closely to the inflation facing industries such as education where cost efficiencies are hard to achieve. (Mishel and Rothstein, 1996, p. 5)*

Yet another inflationary measure is published by the *Research Associates of Washington, DC (1995)* is the elementary-secondary school price index (SPI), which measures the inflation in the prices of the various inputs purchased by our nation's schools. This index purports to measure directly the changes in the purchasing power of the educational dollar. It uses components of the consumer and producer price indices derived from the BLS, as well as average salary and wage data for certificated and noncertificated school personnel published by Educational Research Services, Inc.[6]

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[3] *Price deflator* refers to an index used to adjust actual input prices for differences associated with factors that are outside the control of local decisionmakers.

[4] For example, for studies of inflationary cost differences see Augenblick, J. & Adams, K. (1979), Barro, S. M. (1992), Brazer, H.E. (1974), Wendling (1979), Chambers (1978c, 1980b, 1981a, and 1995), Chambers and Parrish (1984), and Duncombe, Ruggiero, and Yinger (1996). To date, the only previous studies that specifically address the issue of measuring inflation in education include Mishel and Rothstein (1996), Hanushek and Rivkin (1996), Hanushek (1996b), and Research Associates of Washington, DC (1994).

[5] *Services index* refers to the portion of the consumer price index that measures changes in the prices paid for consumer services such as medical care, shelter, utilities, personal services, or legal services.

[6] The certificated salaries are derived from the ERS, Inc. publication *National Survey of Salaries and Wages in Public Schools, Part 2, Salaries Paid Professional Personnel in Public Schools.* The noncertificated salaries are derived from the *National Survey of Salaries and Wages in Public Schools, Part 3, Wages and Salaries Paid Support Personnel in Public Schools.*

One could argue with all of these approaches. At the same time, each contributes something important to the debate. Hanushek and Rivkin's use of the GDP deflator (hereafter referred to as GDPD) is a useful and meaningful approach to assessing the change in what the public has given up to achieve any change that may occur in student outcomes. Mishel and Rothstein attempt to measure inflation in schools by measuring inflation in other related service industries. They suggest that direct measures of school input prices cannot reliably be used to measure inflation because it is not possible to know what the dollars are purchasing. For example,

> *The higher salary level might be more than is necessary to attract the desired quality of college graduates into the teaching profession, or it might be more than is necessary to attract better quality teachers from neighboring school districts (Mishel and Rothstein, 1996, p. 10).*

While markets external to school labor markets certainly influence what is going on in education, it is important to determine and measure as specifically as possible what is happening in the *educational* labor market. While controlling for differences in the characteristics of the personnel and the working conditions that characterize schools, what changes in the salaries of school personnel are occurring? What are the wages paid to comparable school personnel at different points in time? The focus of this kind of analysis is to measure and control for as many of the valued attributes of individuals as possible in order to control for what the market determines quality to be. This is precisely the problem with both the Mishel and Rothstein (1996) assumptions and the SPI produced by the *Research Associates of Washington, DC.* Mishel and Rothstein assume that it is not possible to control for differences in the "quality" of school personnel, and the SPI makes no attempt to control for differences in the supply of, and demand for, personnel attributes or working conditions. In fact, Mishel and Rothstein contend that their intention is to examine "how much the inputs into the education process grew." If this, indeed, is their goal, then what is required is a direct measure of the prices of comparable inputs derived from data in the educational sector.

## Purpose of This Report

With these issues in mind, the purpose of this report is to develop a comprehensive inflationary cost index for school inputs (i.e., services and resources) that improves upon the alternative measures of inflation that are available. The analyses presented in this report focus on the prices of the inputs purchased by schools and do not attempt to account for the impact on educational costs of changes in the levels of pupil needs over time.

The approach offered in this report is unique. It builds on previous work by Chambers (1995b) in which the NCES *Schools and Staffing Survey (SASS)* for 1990-91 is used to develop a geographic teacher cost index. More specifically, this report applies the *hedonic wage model,* which in the past has been used to estimate geographic cost adjustments, to the development of inflationary cost adjustments.[7] This model is well suited as a tool to isolate the impact of regional amenities and costs of living, while controlling for various personnel and job characteristics.

[7] For a discussion of the previous work on inflationary cost of education indices, the reader is referred to Chambers (1981a) and Chambers (1997-I), which is a companion to the current report. *Hedonic wage model* refers to a model of wage determination based on the characteristics of workers and the work place.

The analysis contained in this report goes beyond the initial work report in Chambers (1995b) to make several significant contributions:

- ***Improvements in explanatory measures[8].*** The analysis improves upon the previous work by incorporating additional measures of teacher quality (e.g., quality of the undergraduate college attended), exploring alternative ways of measuring teacher experience, including more accurate data on local crime rates, controlling for the effects of collective bargaining, and using a more sophisticated measure of labor market competitiveness (i.e., the Herfindahl index).[9]

- ***Extension to additional school inputs.*** The report takes a significant step toward developing a comprehensive nationwide geographic and inflationary cost index by developing separate school input price indices for school administrators, selected categories of noncertificated school personnel, and specific categories of nonpersonnel inputs. Data derived from the public school administrator questionnaires of the NCES *Schools and Staffing Survey (SASS)* are used to estimate hedonic salary equations in much the same way as was done for teachers' salaries earlier (Chambers, 1995). The hedonic wage methodology was also applied to selected samples of individuals who hold jobs similar to those of noncertificated school personnel throughout the United States (derived from the *Current Population Surveys).*

- ***Application to expenditure data.*** The inflationary cost adjustment developed in this report is applied to national level expenditure data to illustrate how such an index may be utilized to adjust actual expenditure data reported by NCES. Using the *ICEI* developed across the three sample years included in the *SASS* data, analysis of the patterns of actual and real (cost adjusted) school spending for the United States are presented.

- ***Comparison with alternative indices.*** Over the years, many indices have been used to adjust educational expenditure data for variations in costs. This report will compare the *ICEI* with alternative indices previously used to adjust educational expenditure data. Specifically, the *ICEI* will be compared to the consumer price index (CPI), the implicit deflator for the gross domestic product (GDPD) used by Hanushek and Rivkin (1996), and the school price index (SPI) produced by the *Research Associates of Washington, DC (1994),* the net services index (NSI) proposed by Mishel and Rothstein (1996), and a modified version of the employment cost index (MECI) for public elementary and secondary schools produced by the BLS.

The inflationary cost adjustment presented in this report focuses directly on school inputs with an effort to adjust for the qualitative differences in those inputs employed over time. The *ICEI* controls for variations in a fairly wide range of personal and job characteristics which are important dimensions in the analysis of the supply of, and demand for, school personnel. It reflects differences over time in factors that underlie cost-of-living differences and differences in the characteristics of

[8] Explanatory measures are those measures (e.g., independent variables) that are used to explain the patterns of variations in some specific variable (for example, wage rates).

[9] See Chambers (1997a-III), the **Technical Report,** which is a companion to this report for a more complete discussion of the use of the Herfindahl index.

regions that affect the desirability of these locations as places to live and work. In addition, the methodology used in this analysis reduces the influence of forces within the control of school decision makers by including in the estimates of the *ICEI* only those factors that are beyond local control. Finally, the inflationary cost adjustments developed in this report contribute to the policy debate surrounding school finance in two ways.

- The *ICEI* improves the way in which the National Center for Education Statistics (NCES) can report fiscal information over time. Expenditure and salary data can be expressed in terms that reflect real service levels rather than simply actual current dollars.

- The *ICEI* can be utilized to further understand the factors that affect changes in the patterns of demand for school inputs over time. Economists and other analysts may use the component price indices as explanatory variables in such analyses.

## Organization of this Report

The remainder of this report is organized into three chapters. Chapter II briefly describes the underlying variables and methodology used to develop the inflationary cost-of-education index. Chapter III applies the index to examine the distribution and patterns of variations in the costs of education over time, as well as the implications for the variations in educational spending at the state level. Chapter IV concludes the report with a summary of the accomplishments of the analysis and a view toward future research on cost adjustments in education.

This report focuses on measuring inflation in the prices of school inputs and is one of three companion reports. The other two reports are listed below:

- *Geographic Variations in Public School Costs* is similar in format to this report, but focuses on the development of a *geographic* (i.e., cross-sectional) cost-of-education index. This index measures variations in the prices of school inputs across local school districts and geographic regions of the United States

- *A Technical Report on the Development of Geographic and Inflationary Differences in Public School Costs* (a) describes the methodological and empirical framework for the analyses used to produce both the geographic and inflationary cost-of-education indices; (b) discusses the methods used for estimating costs for certificated school personnel, noncertificated school personnel, and nonpersonnel school inputs; (c) presents some of the empirical results of the analyses; and (d) includes technical appendices that support the analyses contained in the other two reports.

# *Chapter II*

## METHODOLOGY

This section provides the methodological and empirical context for the analyses presented in this report. First, it defines the three major categories of school inputs that are included in the analysis of expenditures used to create the inflationary cost-of-education index (*ICEI*). Then, it briefly describes the conceptual and empirical frameworks and data sources used to develop the *ICEI*, and concludes by discussing the development of the index.

### Major Categories of School Inputs

As mentioned earlier, this report goes beyond previous efforts (Chambers, 1995b) to develop an inflationary cost-of-education index by developing separate school price indices for three categories of school inputs. These three categories of inputs are described briefly below:[10]

- ***Certified school personnel inputs:*** teachers, instructional support and related service personnel, school level administrators, and district-level administrative and support personnel. Certificated personnel, by and large, account for the largest portion of educational expenditures. Teachers alone account for approximately 50 percent of school district budgets, while instructional support personnel and administrators add another 10 to 12 percent.

- ***Noncertified school personnel inputs*:** instructional aides (paraprofessionals), clerical and office staff, custodial and maintenance staff, transportation personnel, food service personnel, and administrative and technical personnel. Noncertificated personnel account for approximately 18 to 20 percent of school district budgets.

- ***Nonpersonnel school inputs:*** purchased services (for example, professional services from specialists, therapists, or technical personnel not employed by the school district), books (texts and other), supplies and materials, furnishings and equipment, travel, utilities, and facilities. Nonpersonnel inputs account for approximately 15 to 20 percent of the average school district budget.

Although each of these input categories require a slightly different conceptual or empirical foundation for the analysis presented in this report, they follow the basic approach described below.

[10] The index previously developed by Chambers (1995b) incorporated was strictly an inflationary index and focused exclusively on teachers.

## Conceptual Framework—Hedonic Wage Model

Analyses of personnel utilize the *hedonic wage model* to examine the overall patterns of variation in the salaries and wages of certificated and noncertificated personnel. This model provides a comprehensive framework for understanding the factors that underlie variations in the patterns of employee compensation. It is well suited as a tool to isolate the impact of regional amenities and costs of living on the salaries of school personnel, while controlling for various personal and job characteristics.[11]

The explanatory factors included in the hedonic wage analysis represent *discretionary (demand-side) factors* and *cost (supply-side) factors*. The *discretionary factors* are those that are within the control of local school decision makers (for example, district preferences for the personal qualifications of its employees), while the *cost factors* are those that are outside local control (for example, cost of living, regional amenities).[12] Using the hedonic wage equation to calculate geographic personnel cost indices involves running simulations of the salaries and wages paid to comparable personnel across local school districts. More concretely, these simulations involve examination of the *variations in wages or salaries associated only with the variations in the cost factors, while controlling for—holding constant—the influence of the discretionary factors.*[13]

To calculate the *ICEI*, each district is compared to itself in some base year. All districts have an index of 100 in 1987-88, which is selected as the base year for this analysis. The *ICEI* in a subsequent year reflects the relative difference in cost of school inputs in that particular district. The simulations of school personnel costs over time are based on statistical models that involve estimation of separate salary and wage equations for each sample year (i.e., 1987-88, 1990-91, and 1993-94). Comparing these simulations over time compares the cost of a fixed set of personal and job characteristics at different points in time. Inflation measures the impact of changes in the relative supply of, and demand for, school inputs with specific characteristics.[14] Overall, the *ICEI* compares the cost of a fixed collection of educational resources both with respect to their quantities and the quality characteristics embodied in them.

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[11] For a more detailed discussion of the theoretical and empirical application of the hedonic wage method to the analysis of salaries of school personnel, see Chambers (1981b). For a comprehensive review of the literature and empirical issues in utilization of the hedonic wage model see Chambers (1981a).

[12] In the traditional economics literature, these *discretionary* and *cost factors* have been referred to as the *demand* and *supply factors* which affect teachers salaries. The terms *discretionary* and *cost factors* have been adopted here to convey the critical distinction between the *demand* and *supply factors*—that is, the extent of control by local school district decisionmakers. Local decisionmakers have control, at least in the long run, over the *demand factors* which includes the characteristics and qualifications of personnel, while they have no control over the factors which affect the willingness of school personnel to *supply* their services to local school districts. By virtue of their effect on the *supply* of school personnel, these factors affect the *cost* of comparable personnel at different points in time—hence the name *cost factors*.

[13] See Chambers (1997b) for a comprehensive description of the empirical methods used to derive the inflationary cost-of-education index.

[14] The parameters or coefficients of the regression models are assumed to be constant within any given year, but may vary over time. Variations in the costs across years (that is, the inflationary or time cost differences) are based on differences in the parameter values of all of the *explanatory variables* (that is, the regression coefficients estimated for both the *discretionary* and *cost factors*) as well as variations over time in the actual values of the *cost factors* (e.g., changes in the demographics of the regions or districts). The values of the *discretionary factors* themselves (e.g., the teacher qualifications and characteristics and the job assignment characteristics) are held constant at their mean values for the base year (1987-88 in this case). Variations in the parameters of these hedonic wage equations over time presumably reflect the influence of supply and demand factors over time.

## Data Sources for the *ICEI*

The primary data source for the analysis of certificated school personnel (that is., teachers and school administrators) is the *Schools and Staffing Survey (SASS)* administered in 1987-88, 1990-91 and 1993-94 by the NCES.[15] The primary data source for the analysis of noncertificated school personnel (for example, teacher aides, custodial personnel, secretaries/ clerical personnel, and accounting or technical service personnel) is the *Current Population Surveys (CPS)* administered by the Bureau of Labor Statistics. *CPS* samples were obtained to correspond to the same years as the *SASS* data for certificated school personnel. The *SASS* and the *CPS* data provide information on the salaries and wages, terms of employment, personal qualifications and background characteristics, and the specific characteristics of jobs and job assignments for these noncertificated school personnel. The *SASS* sample is limited to the two specific categories of public school district employees. However, the *CPS* sample includes individuals who held occupations similar to those typically found in public school districts, but who were employed by virtually all public or private sector employers. Extending the sample to other nonpublic school employers not only increases the sample size, but also recognizes that these categories of noncertificated occupations are quite similar to those employed in other sectors of the economy.

The data on *cost factors* include a variety of characteristics of the labor market and the communities within which public school districts are located. Data items and sources include district size and race-ethnic composition of students from NCES sources; distance from the district office to the nearest central city derived from data provided by the *U.S. Geological Survey*; climatic conditions from the *National Weather Service*; violent crime rates for cities derived from the *Uniform Crime Reports of the FBI*; a measure of competition in the market for school personnel based on the concentration of county enrollments (using the Herfindahl index); and demographic and urban factors derived from the *City and County Databook* (for example, population, population density, and population growth of the region—county or metropolitan area in which the district is located—and the median value or cost of housing in the county). These data were merged with the detailed personnel data derived from the *SASS* and *CPS* sources.

The price indices for the nonpersonnel items are derived from the related components of the *consumer price index* (CPI) and the *producer price index* (PPI). For example, the CPI component indexes are used for utilities and books, while the PPI component indexes are used for hardware and office machinery. The costs of certain contracted services purchased by school districts are estimated from the personnel cost indices for certificated and noncertificated school personnel. For example, the index derived from the analysis of technical personnel included in the *CPS* sample is used to estimate inflation for data processing and statistical services, and the teacher cost index estimated using the *SASS* data is used to estimate inflation for teacher education consultants.

## Data Sources for the Alternative Indexes

Data on the comparison indexes are derived from a variety of sources. The net services index (NSI) data are provided by Mishel and Rothstein following the procedures described in Mishel (1995). The values of the NSI presented in this report for the specific sample years under analysis were derived

[15] The statistical analysis underlying the certificated school personnel indices focuses on the salaries of teachers and school administrators. Unfortunately, there are no data on instructional support and related service personnel or on district-level administrators that would support similar analyses. The teacher cost index is used as an estimate of the costs of instructional support and related service personnel, and the school administrator cost index is used as an estimate of the district-level administrative personnel.

by a research assistant and are not currently published in any other previously available source. The NSI is a modified version of the BLS services index used in the CPI. The modification involves removing the components corresponding to medical care and shelter.

The school price index (SPI) is published by the *Research Associates of Washington, DC (1994)*. It is based on data from the Educational Research Services on the salaries and wages of school personnel and from the BLS for certain sub-indexes of the CPI and PPI on related nonpersonnel items used by schools.

The employment cost index (ECI) for public elementary and secondary school personnel is taken from a survey which is conducted annually by the Bureau of Labor Statistics. The ECI is essentially an index of average hourly wage rates of these school employees with each category weighted by its relative importance in overall employment.[16] Since the ECI includes only personnel components, a modified ECI (MECI) is created for this study which combines the ECI for elementary and secondary school employees with the nonpersonnel indices used to construct the *ICEI* produced in this report. These ECI and nonpersonnel indices are combined using the same basic budget weights used to combine the personnel cost indexes produced under this project with these same nonpersonnel indices.[17] This MECI reflects an estimate of the overall variations in the prices of all public school inputs.

Other indexes which are included for comparison are the consumer price index (CPI) and the gross domestic product deflator (GDPD) which are widely available from published sources in the U.S. government. The CPI for urban consumers published by the BLS is the price index used most commonly by NCES to deflate current dollars. Prior to using the CPI, the NCES modifies the CPI to reflect price changes corresponding to the school year rather than the calendar year. For the purposes of comparison, this same modification has been applied to the GDPD data presented in this report.

## Development of the Overall Inflationary Cost-of-Education Index (*ICEI*)

The I*CEI* is a composite index of all of the prices of the personnel and nonpersonnel school inputs purchased by school districts. Specifically, it is a weighted average of these personnel and nonpersonnel school inputs, where the weights are the average district budget shares for each school input—that is, the average proportion of total current expenditures allocated to the corresponding input (certificated personnel, noncertificated personnel, nonpersonnel).[18] This is commonly referred to as a *fixed-market-basket* index, and is similar to the procedure used in the development of the overall *consumer price index* (CPI).[19]

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[16] The methodology for development of the ECI is described in considerable detail in the appendix A of the following publication: *Employment Cost Indexes and Levels, 1975-95* published by the U.S. Department of Labor, Bureau of Labor Statistics, October 1995, Bulletin 2466, pp. 130-136.

[17] Again see the technical report (Chambers, 1997b) for a discussion and presentation of the budget weights used.

[18] Data on budget shares used to calculate the ICEI are derived from a combination of state databases created for Ohio and California. Ohio data were used because Ohio's educational expenditures are at about the average for the United States, and because they provided relatively good detail on budget shares for nonpersonnel inputs. The California data were used to break down the relatively aggregated categories for school personnel in the Ohio data. California also includes a relatively diverse set of school districts in terms of size and urbanization, which is similar to those throughout the remainder of the country.

[19] The CPI is a composite of the various component price indices for consumer goods and services published by the Bureau of Labor Statistics.

The companion technical report, Chambers (1997b), provides a comprehensive description of the development of the inflationary cost-of-education indices, as well as overall results of analyses of salaries paid to certificated and noncertificated school personnel.

The next chapter of this report describes the results in terms of variations in costs and real educational spending over time across the nation.

# *Chapter III*

## INFLATION AND THE PATTERNS OF EDUCATION SPENDING OVER TIME

This chapter uses the simulated wages and salaries for school personnel, combined with the estimates of changes in prices of nonpersonnel inputs, to explore the patterns of variations in educational costs and expenditures between points in time. The analysis focuses on the development and utilization of an index of the cost-of-educational services over time—the *ICEI*. The *ICEI* represents a measure of inflationary trends as they have affected the inputs used to deliver public elementary and secondary educational services within the United States. Although the *ICEI* has been calculated for each school district in the nation, the discussion and tables presented in this chapter focus attention on the overall inflationary rate and the changes in the average investment in education for the entire country.[20]

This chapter addresses two questions:

> *How much, more or less, does it cost to provide the same quantities and qualities of educational resources over time?*
>
> *What are the implications of these variations in cost for differences in the real levels of educational spending over time?*

Addressing the first question involves development of the *ICEI*. Addressing the second question involves deflating or adjusting the expenditure figures for the cost differences reflected by the *ICEI*. In both cases, the inflationary estimates obtained from the *ICEI* are compared to those obtained from a series of alternative indexes which measure inflationary trends.

### Inflationary Cost Differences

Tables III-1A and III-1B compare several alternative measures of inflationary trends. Table III-1A provides a comparison of a series of overall measures of inflation which may be used to adjust educational expenditure data. For the purpose of comparison with the *ICEI* produced in this report, the indexes derived from other sources (e.g., CPI, GDPD, SPI, NSI, ECI, and the MECI) are rescaled so that 1987-88 equals 100.0.

During the first time interval (1987-88 to 1990-91), the *ICEI* exhibits a lower rate of inflation in school input prices than the rates of inflation measured by the other indexes. During this time interval, the *ICEI* measures inflation at 15.0 percent, while the NSI and the GDPD exhibit a 15.5

[20] The changes in the implicit prices (i.e., regression coefficients) attached to the *discretionary* and *cost factors* are fixed across the nation. Thus, any variation in the estimates of inflation across states or local jurisdictions would be attributable entirely to differences in the values of the *cost factors* between the sample years. As one would expect, the standard errors of individual district estimates for inflation are substantially larger than the overall estimates. Because of the relatively large standard errors of the jurisdictional inflation rates and the fact that no attempt was made to examine variations in the implicit prices across regions, analysis of the inflation rates is appropriately limited to national estimates.

percent inflation, the CPI exhibits a 15.6 percent, the MECI shows an inflation rate of 17.2 percent, and the SPI shows an inflation rate of 17.6 percent, and the ECI shows the highest rate of 18.1 percent.

During the second time interval (1990-91 to 1993-94), the *ICEI* falls in the middle of these indexes with an inflation rate of 9.9 percent. The GDPD exhibits the lowest rate of inflation in this time interval at 8.1 percent, and the NSI exhibits the highest rate of inflation at 13.0 percent.

Differences in the rates of inflation among these alternative measures are not surprising for a number of reasons. Each of these indexes reflects something different. The CPI reflects changes in the prices of consumer goods and services, while the GDPD reflects changes in the prices of consumer goods and services combined with investment or capital goods.

Over the long run, one may expect the salaries of various categories of school personnel, and hence the costs of public education, to follow the CPI fairly closely. The reason is that if salaries paid in public education do not maintain their purchasing power, public schools would have difficulty recruiting new entrants and maintaining existing work forces. For different time intervals, changes in real wages may be caused by variations in the patterns of supply of, and demand for, specific categories of personnel. Differences in the real wages may be the result of changes in the patterns of demand for the qualifications and characteristics of the personnel which the public wants employed in the school system. But ultimately, the relationship between the *ICEI* and the CPI is more complicated since public schools purchase many kinds of physical inputs and employ many categories of personnel, and each of these inputs is subject to a variety of market forces which impact the prices paid by local school systems.

The NSI developed by Rothstein and Mishel (1996) is intended as a proxy for the inflation in educational services. According to Rothstein and Mishel, the NSI reflects inflation in the sectors with relatively low labor productivity and is used to proxy the spending increases necessary to maintain input levels. The key word here is "proxy." Rothstein and Mishel attempt to reflect what they believe is happening in the education sector with a proxy measure. As one can see in viewing the numbers in table III-1A, the NSI follows fairly closely the CPI and the *ICEI* in the first time interval, but is substantially different in magnitude from the CPI and the *ICEI* in the second time interval. In fact, the NSI exhibits an almost 13 percent increase as compared to 9.3 percent for the CPI and 9.9 percent for the *ICEI*.

The SPI and the MECI are quite similar in what they represent. The certificated components of the SPI reflect annual rates of pay, while the MECI subcomponents appear to reflect hourly rates of pay. Thus, changes in the annual rates of pay in the SPI may reflect a combination of changes in hourly rates and hours of work. The noncertificated personnel components of both reflect average hourly rates of pay. Both the SPI and MECI use a combination of CPI and PPI (*producer price indexes*) components for the nonpersonnel components though slightly different choices are made for the specific sources.

A major difference between the *ICEI* and both the SPI and the MECI lies in the conceptual and empirical methodology underlying the development of the personnel cost adjustments. While the SPI and MECI rely primarily upon estimates of average rates of pay by personnel category, the *ICEI* uses the regression methodology to control for differences in the characteristics of personnel and their job assignments over time. That is, if some of the changes in average salaries of school personnel are associated with changes in personal qualifications of staff (for example, greater levels of education and experience), such changes will be included as part of inflation in the SPI and MECI estimates,

while these personal qualifications will be specifically excluded from the measure of inflation reflected in the *ICEI*.

In the first time interval, both the SPI and the MECI exhibit a rate of price increase which is substantially larger than the *ICEI*. The SPI measures inflation at 17.6 percent, the MECI measures inflation at 17.2 percent, while the *ICEI* measures inflation at 15.0 percent. In the second time interval, the *ICEI*, which exhibits a 9.9 percent growth, falls in between the SPI at 10.5 percent and the MECI at 9.5 percent.

It is important to recognize that these rates of change differ by as little as 0.4 percentage points (9.9 for the *ICEI* versus 9.5 percent for the MECI) and by as much as 2.6 percentage points (17.6 percent for the SPI versus 15.0 percent for the *ICEI*).

Table III-1B provides some additional detail which reveals more information about the differences in the underlying estimates of inflation in the salaries of school personnel. The top row of table III-1B presents the ECI for public elementary and secondary school personnel produced by the BLS. The ECI is produced quarterly by the BLS, and for the purposes of comparison in this study, the index value corresponding to the quarter ending in September is used so that the data correspond to the school year.

The remainder of the table is divided into sections according to the category of school input. For teachers and school administrators, indexes are presented that reflect the changes in average salaries. One estimate is based on the *SASS* sample used for the present study which includes all regular full-time classroom teachers. A second index is based on the SPI classroom teacher component which is essentially derived from Educational Research Service data (used by the Research Associates of Washington, DC to estimate salaries of certificated school personnel) on average teacher and principal salaries, respectively, for a sample of school districts.

**Table III-1A— A comparison of alternative measures of inflationary trends in school resources**

| Description of Index | Index of inflation by sample year | | | Percentage change by time interval | |
|---|---|---|---|---|---|
| | *1987-88* | *1990-91* | *1993-94* | *FY88 to FY91* | *FY91 to FY94* |
| (1) | (2) | (3) | (4) | (5) | (6) |
| **Standard Price Deflators** | | | | | |
| Consumer price index (CPI) - school year | 100.0 | 115.6 | 126.3 | 15.6% | 9.3% |
| Gross Domestic Product Deflator (GDPD) | 100.0 | 115.5 | 124.8 | 15.5 | 8.1 |
| School Price Index (SPI) | 100.0 | 117.6 | 130.0 | 17.6 | 10.5 |
| Net Services Index (NSI) | 100.0 | 115.5 | 130.5 | 15.5 | 13.0 |
| Modified Employment Cost Index (MECI) | 100.0 | 117.2 | 128.3 | 17.2 | 9.5 |
| **Cost-of-Education Index (ICEI)** | **100.0** | **115.0** | **126.4** | **15.0** | **9.9** |

**SOURCES**: The SPI was taken from the Inflation Measures for Schools, Colleges, & Libraries -- 1994 Update, Research Associates of Washington, D.C., September 1995; Overall SPI - Table 5.1. The Consumer price index and the Gross Domestic Product Deflator: the Digest of Educational Statistics, 1995. The Net Services Index (NSI) was provided by a research assistant working under instructions from Rothstein and Mishel

The Employment Cost Index for elementary and secondary schools is taken from *Employment Cost Indexes and Levels, 1975-95* published by the U.S. Department of Labor, Bureau of Labor Statistics, October 1995, Bulletin 2466, Table 9, p. 64. The modified ECI (MECI) is a weighted combination of the ECI (presented in the table) produced by the BLS and nonpersonnel price indices presented in table III-1B and used for this project in the ICEI. Budget weights used for this combination are those presented in the companion technical report (Chambers, 1997b) and are the same as those used to combine the nonpersonnel cost indices with the wage and salary indices which make up the ICEI. They represent the average proportion of school district budgets allocated to personnel for the ECI and for nonpersonnel inputs.

The inflationary cost-of-education indexes (ICEI) are based on statistical analyses of the patterns of differences in the wages and prices of school inputs. Data sources include the following: (a) Bureau of the Census: *Current Population Surveys, 1987- 1994;* 1990 Census of Governments, *Survey of Local Government Finances; County level census files*; (b) Bureau of Labor Statistics: *Producer Price Indices*-1985 - 1994 data; *Consumer Price Indices.* 1985 - 1994 data; (c ) California Department of Education and Ohio Department of Education, databases on expenditures by object codes; (d) Geographic Names Information Systems (GNIS) CD-ROM (Latitudes and longitudes for most United States cities, towns and geographic locations; (e) *Higher education Research Institute at the Graduate School of Education*, Electronic database on SAT scores for entering Freshman, 1972, 1977, 1982 in approximately 2,300 colleges in the United States; (f) National Climatic Data Center and the National Center for Atmospheric Research, *The World Wealth Disc: Climate Data for the Planet Earth. CD-ROM*; (g) U.S. Department of Education, National Center for Education Statistics, *Common Core of Data; Schools and Staffing Survey;* 1990 Census School District Special Tabulation (summary file set I); (h) U.S. Federal Bureau of Investigation. (1995). The Uniform Crime Report (UCR), Return A, for the United States Washington, D.C.: U.S. Department of Justice.

A third index, which is included under teachers, is the combined index for teachers and other instructional support personnel (for example, librarians, social workers, counselors). This index shows that there is little difference between teachers and the combined category. It should be noted that the categories of inputs used for the *ICEI* and the SPI do not always line up exactly. For example, the analysis underlying the *ICEI* includes only classroom teachers and school administrators (principals), but these indices are used to estimate the inflation rates for other categories of certificated school personnel included in the *ICEI*. Similarly, only four categories of noncertificated school personnel are used as the basis for the estimated inflationary cost adjustments for the *ICEI*. On the other hand, the SPI uses a very detailed listing of personnel and nonpersonnel categories on which to base the overall inflation estimates.

The next two rows of numbers present simulated salaries. The first of these indexes is based on simulated salaries derived from the statistical analysis underlying the *ICEI* presented in this report (see the technical report for details, Chambers, 1997a), and these equations control for the quality of the undergraduate college attended by the teacher. The second of these indexes is based on simulated salaries derived from equations that do not control for the quality of the undergraduate college. The goal is to determine whether including more and better information on teacher quality makes a significant difference in the estimates of inflation. *The difference in magnitude of the indexes and*

*estimates of inflation between these two equations suggest that the inclusion of the college quality measures in this analysis has negligible impact on the magnitude of the index.*

For noncertificated school personnel, table III-1B presents a comparison of the CPS and SPI data series on *average* hourly rates of pay used to reflect inflationary trends. The *simulated* wage rate presented in the table controls for the qualifications of the individuals included in the CPS sample used for calculation of the *ICEI*.

The differences between the indexes based on average rates of pay for these various categories of personnel and the simulated wage indexes suggest that controlling for personal characteristics does make a difference in the value of the inflationary index. For example, the average full-time teacher salary increased by 17.4 percent in the first time interval according to the SASS sample, while controlling for personal characteristics in this same sample resulted in an estimate of inflation of 16.0 percent in this same time interval (1987-88 to 1990-91). In the second time interval, the average salary increase for teachers was 8.7 percent, while the simulated salary index for teachers revealed a 10.1 percent increase. Comparisons of the indexes based on average pay rates versus simulated pay rates for other categories of personnel also exhibit some important differences in magnitudes. That is, controlling for personal characteristics does appear to result in differences in the estimates of inflation.

There are variations in each of the elements, both personnel and nonpersonnel, between the *ICEI* and the SPI. The differences between these two inflationary indexes and their components reflect a combination of the differences between the conceptual and empirical methodologies, the availability of detailed data that support these indices, and choices made about certain external series that are used for the nonpersonnel components. More extensive data on *other* certificated and noncertificated school personnel (that is, personnel not represented in this analysis) could provide the foundation for improving these estimates and determining the meaningfulness of the conceptual and empirical differences in methodology. Similarly, a more detailed analysis would be required to assess the importance of the differences in the choices of series underlying the nonpersonnel estimates of inflation.[21] Alternatively, data gathered through existing NCES data collection programs, such as the *SASS*, might provide additional school-specific information on which to base estimates of inflationary trends. The last chapter of this report addresses this issue further.

[21] Table II-1 in the Technical Report (Chambers, 1997b) contains a description of the specific price series used in the present analysis for construction of the inflationary cost indices.

**Table III-1B— A comparison of average pay rates from alternative data sources and of selected components of the overall inflationary cost adjustments presented in table III-1A**

| Description of Component Index | Index of inflation by sample year | | | Percentage change by time interval | |
|---|---|---|---|---|---|
| | *1987-88* | *1990-91* | *1993-94* | *FY88 to FY91* | *FY91 to FY94* |
| (1) | (2) | (3) | (4) | (5) | (6) |
| Employment Cost Index (ECI) | | | | | |
| - public elem/sec school personnel | 100.0 | 118.1 | 129.5 | 18.1 | 9.7 |
| **Teachers** | | | | | |
| Index of average salaries based on: | | | | | |
| SASS | 100.0 | 117.4 | 127.6 | 17.4 | 8.7 |
| SPI-classroom teachers | 100.0 | 116.6 | 129.4 | 16.6 | 11.0 |
| SPI-teachers & other instr. support personnel | 100.0 | 116.6 | 129.3 | 16.6 | 10.9 |
| Inflationary cost index based on: | | | | | |
| Simulated salaries: | | | | | |
| Equation controlling for college quality | | | | | |
| *(included in ICEI)* | **100.0** | **116.0** | **127.6** | **16.0** | **10.1** |
| *Equation with NO control for college quality* | *100.0* | *115.9* | *127.7* | *15.9* | *10.1* |
| **School Administrators** | | | | | |
| Index of average salaries based on: | | | | | |
| SASS | 100.0 | 116.6 | 128.3 | 16.6 | 10.1 |
| SPI - school principals | 100.0 | 117.6 | 129.6 | 17.6 | 10.2 |
| Inflationary cost index based on: | | | | | |
| Simulated salaries: | | | | | |
| Equation controlling for college quality | | | | | |
| *(included in ICEI)* | **100.0** | **117.5** | **133.1** | **17.5** | **13.2** |
| *Equation with NO control for college quality* | 100.0 | 117.5 | 133.2 | 17.5 | 13.4 |
| **Noncertificated School Personnel** | | | | | |
| *Category 1: Management, accounting & technical services* | | | | | |
| Index of average hourly wage rates based on: | | | | | |
| CPS data for category 1 occupations | 100.0 | 115.0 | 128.3 | 15.0 | 11.5 |
| SPI - finance, bus., pub. relations, personnel, data proc. | 100.0 | 117.2 | 127.0 | 17.2 | 8.3 |
| Inflationary cost index based on: | | | | | |
| Simulated wage rates *(included in ICEI)* | **100.0** | **114.0** | **123.9** | **14.0** | **8.7** |
| *Category 2: Buildings, grounds, maintenance, trades, crafts, security, and transportation* | | | | | |
| Index of average hourly wage rates based on: | | | | | |
| CPS data for category 2 occupations | 100.0 | 111.8 | 117.5 | 11.8 | 5.1 |
| SPI - Custodians, maintenance, & bus drivers | 100.0 | 114.6 | 123.9 | 14.6 | 8.2 |
| Inflationary cost index based on: | | | | | |
| Simulated wage rates *(included in ICEI)* | **100.0** | **111.4** | **118.5** | **11.4** | **6.4** |
| *Category 3: Paraprofessionals, teaching aides, and food service personnel* | | | | | |
| Index of average hourly wage rates based on: | | | | | |
| CPS data for category 3 occupations | 100.0 | 115.2 | 126.8 | 15.2 | 10.2 |
| SPI-teachers aides, paraprofessionals, & food service svs. | 100.0 | 115.5 | 125.2 | 15.5 | 8.4 |
| Inflationary cost index based on: | | | | | |
| Simulated wage rates *(included in ICEI)* | **100.0** | **112.5** | **124.8** | **12.5** | **11.0** |
| ***Category 4: Secretaries, clerical, health service personnel*** | | | | | |
| Index of average hourly wage rates based on: | | | | | |
| CPS data for category 4 occupations | 100.0 | 113.0 | 126.2 | 13.0 | 11.7 |
| SPI - secretaries and clerical personnel | 100.0 | 115.2 | 126.6 | 15.2 | 9.9 |
| Inflationary cost index based on: | | | | | |
| Simulated wage rates *(included in ICEI)* | **100.0** | **111.9** | **124.3** | **11.9** | **11.1** |

**Table III-1B— A comparison of average pay rates from alternative data sources and of selected components of the overall inflationary cost adjustments presented in table III-1A-continued**

| Description of Index | Index of inflation by sample year | | | Percentage change by time interval | |
|---|---|---|---|---|---|
| | *1987-88* | *1990-91* | *1993-94* | *FY88 to FY91* | *FY91 to FY94* |
| (1) | (2) | (3) | (4) | (5) | (6) |
| **Nonpersonnel Cost Indices:** | | | | | |
| *Inflationary index based on SPI:* | | | | | |
| Energy and utilities | 100.0 | 121.6 | 114.0 | 21.6 | -6.2 |
| Contracted services | 100.0 | 113.7 | 121.5 | 13.7 | 6.8 |
| Supplies and materials | 100.0 | 114.3 | 113.0 | 14.3 | -1.2 |
| Text books, library books and periodicals | 100.0 | 135.1 | 154.2 | 35.1 | 14.2 |
| Other nonpersonnel items | 100.0 | 112.7 | 125.9 | 12.7 | 11.8 |
| *Inflationary cost index (included in ICEI):* | | | | | |
| Energy and utilities | **100.0** | **105.2** | **113.6** | **5.2** | **8.0** |
| Contracted services | **100.0** | **113.5** | **124.0** | **13.5** | **9.2** |
| Supplies and materials | **100.0** | **114.4** | **122.4** | **14.4** | **7.0** |
| Text Books, library books and periodicals | **100.0** | **138.2** | **169.4** | **38.2** | **22.6** |
| Other non-personnel items | **100.0** | **111.7** | **119.7** | **11.7** | **7.1** |

**NOTE**: The index numbers and percentage changes printed in **bold** are components of the **ICEI** presented.

**SOURCES**: For SPI data: Inflation Measures for Schools, Colleges, & Libraries -- 1994 Update, Research Associates of Washington, D.C., September 1995; Teachers - table 5.2; Teachers & instruct support pers - table 5.2; Principals - table 5.4; finance, business, public relations, personnel, elec data proc - table 5.3; custodial, maintenance, and bus drivers - table 5.5; teacher aides, paraprofessions, and food service personnel - table 5.5; secretaries & clerical personnel - table 5.5. Data on the SPI non-personnel indices are derived from tables 5.8, 5.9, 5.12 and 5.13. In each case, the budget weights used in the publication from which the SPI data are taken are used to aggregate separate indices into the components presented in the table above.

The average hourly wage rates for noncertificated personnel are derived from the samples of individuals with the appropriate job titles selected for this study from *Current Population Surveys* of the U.S. Census Bureau.

The average salaries of certificated school personnel based on SASS are derived from the samples of personnel selected for this study from the NCES *Schools and Staffing Survey*, Public School Teacher Questionnaire and the Public School Principal Questionnaire databases.

The inflationary cost-of-education indexes (ICEI) are based on statistical analyses of the patterns of differences in the wages and prices of school inputs. Data sources include the following: (a) Bureau of the Census: *Current Population Surveys, 1987- 1994;* 1990 Census of Governments, *Survey of Local Government Finances; County level census files*; (b) Bureau of Labor Statistics: *Producer Price Indices*-1985 - 1994 data; *Consumer Price Indices.* 1985 - 1994 data; (c ) California Department of Education and Ohio Department of Education, databases on expenditures by object codes; (d) Geographic Names Information Systems (GNIS) CD-ROM (Latitudes and longitudes for most U.S. cities, towns and geographic locations; (e) *Higher education Research Institute at the Graduate School of Education*, Electronic database on SAT scores for entering Freshman, 1972, 1977, 1982 in approximately 2,300 colleges in the United States; (f) National Climatic Data Center and the National Center for Atmospheric Research, *The World Wealth Disc: Climate Data for the Planet Earth. CD-ROM*; (g) U.S. Department of Education, National Center for Education Statistics, *Common Core of Data; Schools and Staffing Survey;* 1990 Census School District Special Tabulation (summary file set I); (h) U.S. Federal Bureau of Investigation. (1995). The Uniform Crime Report (UCR), Return A, for the United States Washington, D.C.: U.S. Department of Justice.

## Differences in Real Expenditures Over Time

Table III-2 compares alternative estimates of the change in the level of investment in educational services over time. Part A of the table shows the actual changes in expenditures and enrollments in K-12 education in the United States for each of the three sample years. The last two columns present the percentage change for each of the 3-year time intervals (from 1987-88 to 1990-91 and from 1990-91 to 1993-94). Total expenditures increased from $157.1 billion in the 1987-88 school year to $202.0 billion in 1990-91 and finally to $231.5 billion in 1993-94. This represents a substantial increase (28.6 percent) in total educational spending from 1987 to 1990. However, this rate of increase declined substantially in the second time interval to 14.6 percent.

Fall enrollment increased in both time intervals. However, unlike total spending, the rate of increase in fall enrollment was actually greater between 1990-91 and 1993-94, when enrollment increased by 5.5 percent school year, while from 1987-88 to 1990-91, fall enrollment increased by just 3.0 percent.

Actual total expenditures per pupil increased from $3,927 in 1987-88 to $4,902 in 1990-91—an increase of almost 25 percent. However, between 1990-91 and 1993-94, actual total expenditures per pupil increased by only 8.6 percent—from $4,902 to $5,325.

Part B of table III-2 presents the alternative inflationary measures that are used in parts C and D to adjust both total expenditures and per pupil expenditures, respectively. These are the same values originally presented in table III-1A. Over the entire six year interval, the inflation rates reflected in the *CPI* and the *ICEI* are relatively close. The *CPI* measures inflation in consumer goods and services at 15.6 percent in the first time interval and 9.2 percent in the second time interval. The I*CEI* measures inflation among school inputs at 15.0 percent in the first time interval and 9.9 percent in the second. In the first time period, the prices of consumer goods and services increased more rapidly than the school inputs, while in the second period, the prices of consumer goods and services increased less rapidly than the school inputs. Over the two periods together, the CPI measures inflation at 26.3 percent and the ICEI measures inflation for school inputs at 26.4 percent. At least over this six year span, the differences between the CPI and *ICEI* are negligible.

The *GDP deflator* exhibits an implicit inflation rate for domestic consumption and investment goods that is very close to the *CPI* for the first time interval, but shows a much lower rate of increase (8.1 percent) relative to the *CPI* (9.2 percent) in the second interval. One would expect that, for the most part, these differences are based simply on the combination of goods and services included in the two price indices. The SPI and the NSI both exhibit relatively high rates of inflation (over 30 percent over the six year period) when compared to the ICEI estimates (just over 26 percent). The MECI displays an inflation rate for the six year period which is about 2 percentage points higher than the CPI and *ICEI*.

**Table III-2. Measuring changes in educational investment over time**

| Statistic | School Year | | | Percentage Change by Time Interval | | |
|---|---|---|---|---|---|---|
| | 1987-88 | 1990-91 | 1993-94 | 87 to 90 | 90 to 93 | 87 to 93 |
| **A. Actual expenditures & enrollment:** | | | | | | |
| Total expenditures (in billions) | $157.1 | $202.0 | $231.5 | 28.6% | 14.6% | 47.4% |
| Fall enrollment (in millions) | 40.0 | 41.2 | 43.5 | 3.0% | 5.5% | 8.7% |
| Total expenditures per pupil (enr) | $3,927 | $4,902 | $5,325 | 24.8% | 8.6% | 35.6% |
| B. Alternative inflation measures: | | | | | | |
| Consumer Price Index (CPI) | 100.0 | 115.6 | 126.3 | 15.6% | 9.2% | 26.3% |
| Gross Domestic Product deflator (GDPD) | 100.0 | 115.5 | 124.8 | 15.5% | 8.1% | 24.8% |
| School Price Index (SPI) | 100.0 | 117.6 | 130.0 | 17.6% | 10.6% | 30.0% |
| Net Services Index (NSI) | 100.0 | 115.5 | 130.5 | 15.5% | 13.0% | 30.5% |
| Modified Employment Cost Index (MECI) | 100.0 | 117.2 | 128.3 | 17.2% | 9.5% | 28.3% |
| Cost-of-Education index (ICEI) | 100.0 | 115.0 | 126.4 | 15.0% | 9.9% | 26.4% |
| C. Total expenditures adjusted by alternative measures of inflation: | | | | | | |
| Consumer Price Index (CPI) | $157.1 | $174.7 | $183.4 | 11.2% | 5.0% | 16.7% |
| Gross Domestic Product deflator (GDPD) | $157.1 | $175.0 | $185.5 | 11.4% | 6.0% | 18.1% |
| School Price Index (SPI) | $157.1 | $171.9 | $178.1 | 9.4% | 3.6% | 13.4% |
| Net Services Index (NSI) | $157.1 | $174.9 | $177.4 | 11.3% | 1.4% | 12.9% |
| Modified Employment Cost Index (MECI) | $157.1 | $172.4 | $180.4 | 9.7% | 4.6% | 14.8% |
| Cost-of-Education index (ICEI) | $157.1 | $175.7 | $183.2 | 11.9% | 4.2% | 16.6% |
| D. Total expenditures per pupil adjusted by alternative measures of inflation: | | | | | | |
| Consumer Price Index (CPI) | $3,927 | $4,239 | $4,218 | 8.0% | -0.5% | 7.4% |
| Gross Domestic Product deflator (GDPD) | $3,927 | $4,246 | $4,267 | 8.1% | 0.5% | 8.7% |
| School Price Index (SPI) | $3,927 | $4,170 | $4,097 | 6.2% | -1.8% | 4.3% |
| Net Services Index (NSI) | $3,927 | $4,244 | $4,081 | 8.1% | -3.8% | 3.9% |
| Modified Employment Cost Index (MECI) | $3,927 | $4,182 | $4,149 | 6.5% | -0.8% | 5.7% |
| Cost-of-Education index (ICEI) | $3,926 | $4,264 | $4,214 | 8.6% | -1.2% | 7.3% |

**SOURCES**: The SPI was taken from the Inflation Measures for Schools, Colleges, & Libraries -- 1994 Update, Research Associates of Washington, D.C., September 1995; Overall SPI - table 5.1. The Consumer price index and the Gross Domestic Product Deflator: the Digest of Educational Statistics, 1995. The Net Services Index was provided by Rothstein and Mishel. The Employment Cost Index for elementary and secondary schools is taken from *Employment Cost Indexes and Levels, 1975-95* published by the U.S. Department of Labor, Bureau of Labor Statistics, October 1995, Bulletin 2466, table 9, p. 64.

The modified ECI (MECI) is a weighted combination of the ECI (presented in the table) produced by the BLS and nonpersonnel price indices presented in table III-1B and used for this project in the ICEI. Budget weights used for this combination are those presented in the companion technical report (Chambers, 1997b) and are the same as those used to combine the nonpersonnel cost indices with the wage and salary indices which make up the ICEI. They represent the average proportion of school district budgets allocated to personnel for the ECI and for nonpersonnel inputs.

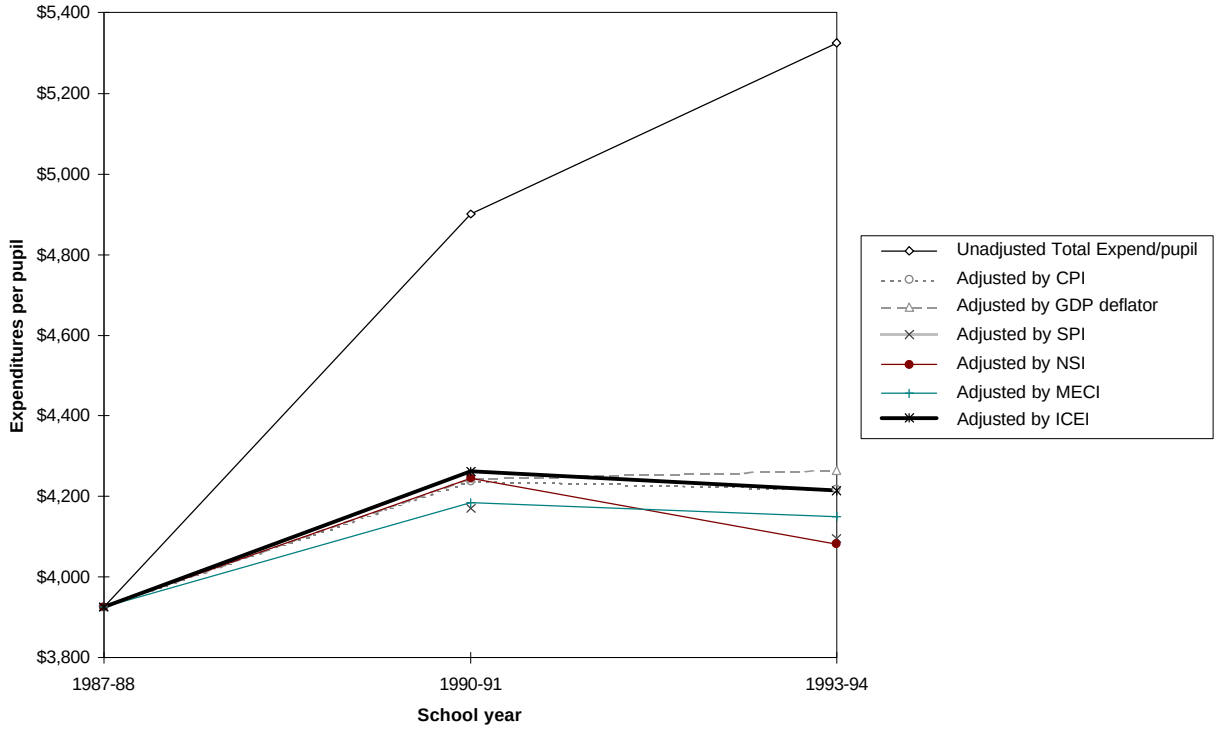
The inflationary cost-of-education indexes (ICEI) are based on statistical analyses of the patterns of differences in the wages and prices of school inputs. Data sources include the following: (a) Bureau of the Census: *Current Population Surveys, 1987- 1994;* 1990 Census of Governments, *Survey of Local Government Finances; County level census files*; (b) Bureau of Labor Statistics: *Producer Price Indices*-1985 - 1994 data; *Consumer Price Indices.* 1985 - 1994 data; (c ) California Department of Education and Ohio Department of Education, databases on expenditures by object codes; (d) Geographic Names Information Systems (GNIS) CD-ROM (Latitudes and longitudes for most U.S. cities, towns and geographic locations; (e) *Higher education Research Institute at the Graduate School of Education*, Electronic database on SAT scores for entering Freshman, 1972, 1977, 1982 in approximately 2,300 colleges in the United States; (f) National Climatic Data Center and the National Center for Atmospheric Research, *The World Wealth Disc: Climate Data for the Planet Earth. CD-ROM*; (g) U.S. Department of Education, National Center for Education Statistics, *Common Core of Data; Schools and Staffing Survey;* 1990 Census School District Special Tabulation (summary file set I); (h) U.S. Federal Bureau of Investigation. (1995). The Uniform Crime Report (UCR), Return A, for the United States Washington, D.C.: U.S. Department of Justice. Enrollment data and total expenditure data are taken from the *Digest of Educational Statistics, 1996*, National Center for Education Statistics, Washington, DC.

Figure III-1 presents a graphic comparison of the *actual* per pupil expenditures on educational services for the three sample years compared with alternative estimates of the *cost-adjusted* per pupil expenditures using the CPI, the GDP deflator, the SPI, the NSI, the MECI, and the *ICEI*. This figure reveals the dramatic difference between the patterns of change for *actual* versus *cost-adjusted* expenditures. It also illustrates the degree of similarity or dissimilarity among the alternative *cost-adjusted* expenditure figures. The data for figure III-1 are from part A (total expenditures per pupil) and part D of table III-2.

Based on these alternative adjustments for inflation, the I*CEI*-adjusted educational expenditures show the fastest rate of growth in the first time interval (11.9 percent for total expenditures and 8.6 percent for per pupil expenditures). During the second time interval, the I*CEI*-adjusted expenditures show the third fastest growth rate (4.2 percent) for total expenditures. The SPI exhibits the slowest rate of growth in the second time interval. In fact, with respect to per pupil expenditures, five of the six inflation rates suggest a decline in the *real* level of educational expenditures during the second time interval. Only the GDPD implies an increase in the *real* investment in educational services. The SPI-adjusted expenditures suggest a decline of 1.8 percent in *real* educational spending, while the *ICEI* estimates the decline at 1.2 percent.

Over the entire six year interval, the CPI- and *ICEI*-adjusted expenditures exhibit very similar patterns of growth: the CPI-adjusted expenditures show a growth rate of 7.4 percent versus 7.3 percent for the I*CEI*-adjusted expenditures. The SPI- and NSI-adjusted expenditure figures exhibit considerably slower rates of growth at 4.3 and 3.9 percent, respectively. The MECI falls in between these figures and implies a growth rate in real expenditures of 5.7 percent. The GDPD-adjusted figures exhibit an 8.7 percent growth rate. The bottom line is that the CPI exhibits a magnitude which is similar to the I*CEI*.

**Figure III-1. Actual and cost adjusted expenditures per pupil**




**SOURCES**: The SPI was taken from the Inflation Measures for Schools, Colleges, & Libraries -- 1994 Update, Research Associates of Washington, D.C., September 1995; Overall SPI - table 5.1. The Consumer price index and the Gross Domestic Product Deflator: the Digest of Educational Statistics, 1995. The Net Services Index was provided by Rothstein and Mishel. The Employment Cost Index for elementary and secondary schools is taken from *Employment Cost Indexes and Levels, 1975-95* published by the U.S. Department of Labor, Bureau of Labor Statistics, October 1995, Bulletin 2466, table 9, p. 64.

The modified ECI (MECI) is a weighted combination of the ECI (presented in the table) produced by the BLS and nonpersonnel price indices presented in table III-1B and used for this project in the *I*CEI. Budget weights used for this combination are those presented in the companion technical report (Chambers, 1997b) and are the same as those used to combine the nonpersonnel cost indices with the wage and salary indices which make up the *I*CEI. They represent the average proportion of school district budgets allocated to personnel for the ECI and for nonpersonnel inputs.

The inflationary cost-of-education indexes (ICEI) are based on statistical analyses of the patterns of differences in the wages and prices of school inputs. Data sources include the following: (a) Bureau of the Census: *Current Population Surveys, 1987- 1994;* 1990 Census of Governments, *Survey of Local Government Finances; County level census files*; (b) Bureau of Labor Statistics: *Producer Price Indices*-1985 - 1994 data; *Consumer Price Indices.* 1985 - 1994 data; (c ) California Department of Education and Ohio Department of Education, databases on expenditures by object codes; (d) Geographic Names Information Systems (GNIS) CD-ROM (Latitudes and longitudes for most U.S. cities, towns and geographic locations; (e) *Higher education Research Institute at the Graduate School of Education*, Electronic database on SAT scores for entering Freshman, 1972, 1977, 1982 in approximately 2,300 colleges in the United States; (f) National Climatic Data Center and the National Center for Atmospheric Research, *The World Wealth Disc: Climate Data for the Planet Earth. CD-ROM*; (g) U.S. Department of Education, National Center for Education Statistics, *Common Core of Data; Schools and Staffing Survey;* 1990 Census School District Special Tabulation (summary file set I); (h) U.S. Federal Bureau of Investigation. (1995). The Uniform Crime Report (UCR), Return A, for the United States Washington, D.C.: U.S. Department of Justice. Enrollment data and total expenditure data are taken from the *Digest of Educational Statistics, 1996*, National Center for Education Statistics, Washington, DC.

## Differences in Real Wages Over Time

Suppose one wanted to examine the changes in real wages over time. Which combination of indexes would one select to determine the changes in real wages? Table III-4 illustrates a number of different ways to think about real wages of teachers: two from the supply side and one from the demand side. The first three rows of table III-4 present the basic data used in this analysis. Row A contains the index based on the average salaries of regular full-time teachers as measured in the *SASS* samples used for the *ICEI* analysis conducted for this project. Row B contains the index based on simulated teachers' salaries which is the teacher cost index component used in the calculation of the I*CEI*. Row C contains the consumer price index (CPI) which has been used throughout this report for comparative purposes. Rows A and B duplicate information previously presented in table III-1B, and row C is the same index presented in table III-1A.

The traditional way to think of this issue is to compare changes in average wages or salaries to changes in the purchasing power of the dollar as measured by the CPI. For example, the index of average teachers' salaries exhibits values of 117.4 and 127.6 in 1990-91 and 1993-94, respectively (using 1987-88 = 100.0). The CPI exhibited index values of 115.6 and 126.3 in these two years. Dividing the index of average teachers' salaries by the CPI (row A by row C) for that year provides an index of real purchasing power of the salaries paid to the average teacher (row D1): that is, 101.5 (=117.4/115.6) in 1990-91 and 101.1 (=127.6/126.3)

**Table III-3. Measuring changes in real wages of teachers over time**

| | School Year | | | Percentage Change by Time Interval | | |
|---|---|---|---|---|---|---|
| *Index* | *1987-88* | *1990-91* | *1993-94* | *87 to 90* | *90 to 93* | *87 to 93* |
| A. Average teachers' salaries (SASS) | 100 | 117.4 | 127.6 | 17.40% | 8.69% | 27.60% |
| B. Simulated teachers' salaries (costs)* | 100 | 116.0 | 127.6 | 16.00% | 10.00% | 27.60% |
| C. Consumer price index (CPI) | 100 | 115.6 | 126.3 | 15.63% | 9.19% | 26.25% |
| D. Real purchasing power of: | | | | | | |
| D1. the average teacher (=A/C) | 100 | 101.5 | 101.1 | 1.53% | -0.46% | 1.07% |
| D2. comparable teachers (B/C) | 100 | 100.3 | 101.1 | 0.32% | 0.75% | 1.07% |
| E. Real teacher services (=A/B) | 100 | 101.2 | 100.0 | 1.21% | -1.19% | 0.00% |

*This is the teacher cost index component used in the CEI calculations.

**SOURCES**: Data sources include the following: (a) Bureau of Labor Statistics: *Consumer Price Indices*. 1985 -1994 data; (b) Geographic Names Information Systems (GNIS) CD-ROM (Latitudes and longitudes for most United States cities, towns and geographic locations; (c) *Higher education Research Institute at the Graduate School of Education*, Electronic database on SAT scores for entering Freshman, 1972, 1977, 1982 in approximately 2,300 colleges in the United States; (d) National Climatic Data Center and the National Center for Atmospheric Research, *The World Wealth Disc: Climate Data for the Planet Earth. CD-ROM*; (e) U.S. Department of Education, National Center for Education Statistics, *Common Core of Data; Schools and Staffing Survey;* 1990 Census School District Special Tabulation (summary file set I); (f) U.S. Federal Bureau of Investigation. (1995). The Uniform Crime Report (UCR), Return A, for the United States Washington, D.C.: U.S. Department of Justice. The index of simulated teachers salaries is based on statistical analyses of the patterns of differences in the salaries of public school teachers using the data sources listed above.

in 1993-94. This suggests that the average teacher exhibited a gain in purchasing power of 1.53 percentage points between 1987-88 and 1990-91 and lost 0.46 percentage points between 1990-91 and 1993-94.

Suppose one wants to compare two comparable teachers at these two points in time—that is, teachers with identical personal qualifications and working conditions. This comparison would require deflating the simulated salaries of teachers in row B by the CPI in row C. Using this standard of comparison, one finds that real teachers' salaries increased by 0.32 percentage points in the first time interval and 0.75 percentage points in the second time interval.

These two ways of examining real wages of teachers focus on the supply side of the market— that is, on the purchasing power of the teacher. However, these index numbers may also be used to assess the change in purchasing power of the average school district for teacher services. What do these indexes reveal about changes in the real level of teachers' services available to school districts? Dividing row A (the average salaries of teachers) by row B (the teacher cost index), one obtains an index of real teacher services (row E). In its simplest form, this index reflects differences in wages associated with the characteristics of the average teacher employed by school districts or a measure of the value of teacher services. This index exhibits an increase of 1.21 percentage points in the first time period, and a decline of 1.19 percentage points in the second time interval. The net result of which suggests virtually no change in the value of teacher services over the six year period.

While the statistics presented above are themselves of some interest, it is even more interesting to think about the implications of using some of the assumptions underlying the development of some of the alternative indexes. If one accepts the assumption underlying the SPI, then average teachers salaries become the teacher cost index. That is, teacher costs are estimated by average salaries in the construction of the SPI. Row B and A in table III-4 would become identical and the calculations of real purchasing power of "comparable teachers" (row D2) and "real teacher services" (row E) become meaningless concepts under the SPI assumptions. This clearly demonstrates how inappropriate it is conceptually to use average salaries as an estimate of a teacher cost index as is done by the SPI or, for that matter, by the MECI.

This is not to say that the data on average hourly wage rates gathered by the BLS or any other agency are inappropriate. These data are critical in helping policy makers track the trends in various labor markets. It is simply to point out that these hourly wage rates or salary figures represent only a starting point to the analysis. Ultimately, these data on hourly rates or average annual pay rates need to be enhanced by information on what one gets for the money. That is, what do these wages purchase in the way of services for employers in terms of employee characteristics (the demand-side of the issue), and what do these wages purchase in the way of goods and services for employees who use these dollars to support themselves and their families (the supply-side of the issue).

## Summary of Findings

The data presented in this chapter examine the variations in the level of investment in K-12 public education over time. The purpose of the analysis is to illustrate, using alternative methods and measures of inflation, how one might adjust *actual* expenditures per pupil for differences in the costs of educational services over time. It also demonstrates alternative ways of adjusting teacher wages to measure *real* differences over time in the purchasing power of wages.

Currently, NCES and other agencies present per pupil expenditure data over time either in its unadjusted form or deflated by one of three cost adjustment tools: the CPI, the GDPD, or the SPI.

The NSI and MECI represent two other alternative indexes of inflation which could be considered by NCES to adjust for inflation. The *ICEI* presented in this report is yet another inflationary cost adjustment, which has some important advantages as well as disadvantages when compared to the alternatives. First, it is important to recognize that unadjusted data on expenditures are difficult to interpret because they do not distinguish between changes resulting from differences in the prices paid for school inputs and changes based on the quantities and characteristics of school inputs. That is, one cannot determine whether the differences in expenditures are due to increases in the educational qualifications or experience levels of the teaching staff as opposed to increases in wage levels associated with cost of living increases.

Adjustments of expenditures that account for changes in the CPI reflect the differences in the value of educational dollars in terms of consumer goods and services. Adjustments of expenditures that account for changes in the *GDPD* reflect the differences in the value of educational dollars in terms of all domestic consumer and investment goods and services.

An argument on behalf of the CPI is that over the long run, the CPI reflects differences in the costs of consumer goods and services that are faced by school personnel and is one factor that affects the supply of qualified individuals willing to offer their services to the public education sector. If public school decision makers do not maintain the purchasing power of the dollars paid to school personnel in the form of salaries, then one might expect a change over time in the qualifications of those willing to offer their services.

For the period of time covered by the present study, the CPI provides a fairly reasonable estimate of the pattern of change that occurred in the costs of educational services as measured by the *ICEI*. Whether or not this similarity in the pattern of change would hold over a longer period of time or be consistent with changes over specific shorter time intervals is a matter for further empirical analysis.

It is important to recognize that while the CPI does play a role in the determination of the salaries of school personnel, it still represents a different set of goods and services than those purchased by school districts. The changes in the CPI do not reflect all of the other factors that affect the supply of, and demand for, individuals within the public education sector. Changes in the economy that affect job opportunities across sectors and relative differences in supply of, and demand for, labor are not reflected in the overall changes in the CPI. Moreover, changes in the CPI do not directly reflect the changes in the prices of other inputs used by the education sector to produce school services.

The *ICEI* is preferable to the SPI because the SPI is primarily based on average price differences over time.[22] Specifically, the variations in the average salaries of teachers, administrators, and other personnel are used to measure inflationary trends for school personnel in the construction of the SPI. Such average salary or wage indices are not adjusted for differences in the attributes of the individuals or their job assignments. In contrast, the *ICEI* analysis *explicitly accounts* for differences in the attributes of the personnel inputs being employed. The price differences reflected in the *ICEI* control for differences in the *qualifications* of personnel that may affect the nature and quality of the educational services provided. Stated another way, the intent of the *ICEI* methodology is to include only those differences in costs that are *outside the control* of the agencies that make the decisions about which resources are used to produce educational services: that is, changes in the cost of living and changes in the amenities or disamenities that affect the supply of, and demand for, school personnel and ultimately the wages paid for their services.

[22] For a more detailed description of the methods and data sources for the SPI, see Research Associates of Washington, DC, 1994.

The results of the analysis indicate that cost adjustments are important. Cost-adjusted data tell a potentially very different story about the patterns of change in educational investments than unadjusted data. Moreover, the SPI tells a very different story about changes in the costs of education than the *ICEI* because it does not control for differences in the characteristics and qualifications of school employees. It is similar to comparing the prices of automobiles over time without taking into account the differences in the features or the quality of the materials used to construct them. Over the 1987-88 to 1993-94 time period, the SPI exhibits a higher overall rate of increase in prices than virtually any of the other cost-adjustments. In fact, the SPI suggests that the overall inflation rate is about 3.6 percent higher than the *ICEI*.

While the differences in the magnitudes of change in the CPI, the GDPD and the *ICEI* are all smaller than the changes in the SPI or the NSI, the patterns are somewhat different within the analyzed time intervals. The MECI falls in between these two groups. For example, compared to the CPI and the GDPD, the *ICEI* exhibits the lowest rate of cost increase in the period 1987-88 to 1990-91 (15 percent relative to 15.6 for the CPI and 15.5 for the GDPD and the NSI). Between 1990-91 and 1993-94, the *ICEI* exhibits the largest rate of increase in costs (9.9 percent) when compared to the CPI (9.2 percent) and the GDPD (8.1 percent), but is smaller in magnitude than the SPI (10.6 percent) and the NSI (13.0 percent).

*To what factors can these differences be attributed?* To some extent, these differences in price adjustments can be attributed to the obvious: differences in the coverage of goods and services and differences in methodology. The CPI measures price differences for consumer goods and services, while the GDPD measures price differences for all consumer and investment goods and services in the domestic economy. The SPI, MECI, and the *ICEI* purport to measure the prices of school inputs. Each of these indices measures price or cost changes of different inputs between two time points.

Differences between the SPI, MECI, and the *ICEI* are more subtle. They are due to different methodologies. While, for the most part, the nonpersonnel components are comparable because some of the same sources of data are used, the major difference lies in the assumptions upon which the personnel cost indices are based. The SPI and MECI assume that average salaries and wages are a good estimate of inflation, while the *ICEI* attempts to control for differences in average salaries and wages associated with the characteristics and qualifications of the individual employees. The *ICEI* is intended to reflect only those factors that affect the willingness of comparable teachers and other school personnel to supply their services to local school districts.

*Why are such small percentage differences important?* While on a year-to-year basis relatively small percentage differences in estimates of inflation may not appear significant, such differences can amount to considerable differences over a longer time periods. For example, a one-half of one percent difference in two alternative indices compounded over a 20-year period amounts to a 10.5 percent difference in the costs of education. Over a 30-year period, it amounts to 16 percent. A difference of 2.5 percent like the one observed between the SPI and the *ICEI* in the first time interval amounts to about a 64 percent difference compounded over 20 years, and a 110 percent difference compounded over 30 years.

Unfortunately, the real patterns of differences are often not so clear cut. For example, in the analysis for this report, the CPI exhibits a higher rate of inflation than the *ICEI* in the first time interval, but a lower rate of inflation in the second. In this case, the importance of the differences will depend more critically upon the measurement issues—that is, the assumptions underlying the alternative indices and the conceptual framework upon which the measures are based.

It is important to remember that the cost adjustments used in the *ICEI* analysis are designed to capture differences only in the prices of school inputs and do not reflect differences in many other factors that are outside local control and that affect the costs of educational services. Nevertheless, this analysis has made a significant step forward by including estimates of price differences for virtually all categories of school inputs. While the *ICEI* and the CPI are virtually identical over the six year period, it is still important to recognize that these two inflationary measures, while connected theoretically to one another, measure price changes in different collections of goods and services. Over the long run, one would expect these two numbers to move together somewhat. But major factors that impact the supply of, and demand for, the composition of goods and services included in either of these indexes may cause them to diverge in specific time intervals. To track these patterns of divergence requires the analyst to focus attention on measuring price changes that are specific to the collection of goods and services.

# *Chapter IV*

## CONCLUSIONS AND IMPLICATIONS FOR FUTURE RESEARCH

The analysis of the previous chapter indicates that the rate of inflation in the prices of consumer goods and services as measured by the CPI is fairly close in magnitude to the rate of inflation for school inputs as measured by the *ICEI*. This is not surprising since most school spending is allocated to personnel, and schools must maintain real wage levels of school personnel in order to retain qualified staff. Maintenance of real wages requires that wages of school personnel increase at the same rate as consumer prices.

Nevertheless, the analysis of the previous chapter also demonstrates that the potential for both short term and long term differences in the rates of inflation exist. It is important in both the long run and the short run to ascertain the extent to which the costs of similar schooling inputs have changed. This information is important for understanding the patterns of resource allocation and the patterns of change in productivity. Thus, even though the CPI may provide a reasonable estimate of the *ICEI* in some interval of time, it is important to verify the patterns of variation over time between these two estimates. Each measures inflationary trends of separate sets of goods and services, though the relationship between them should not be lost in the process.

Indeed, the important message to be taken away from the presentation of the alternative estimates of inflation presented in the previous chapter is that each of these indexes measures something different. That is, they are not just alternative ways of measuring inflation for schools. Each measures inflationary patterns for a different collection of goods and services. The *ICEI* measures inflation for a different collection of goods and services than do the CPI, the GDPD, the NSI.

The SPI and the MECI, however, are intended to measure the changes in the prices of school inputs. Nevertheless, they employ different assumptions about what constitutes inflation. The SPI and MECI include the characteristics of staff as part of inflation, while the *ICEI* does not. The *ICEI* controls for differences in personnel qualifications and characteristics. The intent is to include only those factors which reflect changes in the equilibrium wages paid to comparable school personnel at different time points.

Future research efforts should refine the databases upon which these analyses are based, as well as the methodology and the empirical application of the *ICEI* to improve the measures that have been developed in this report. The following pages examine several areas for future research.

### Use of *CPS* Data for Estimates of Inflation Between SASS Administrations

The sophisticated methodology applied to certificated school personnel requires a detailed database like the one developed for this project from the *Schools and Staffing Survey* (SASS). Unfortunately, the *SASS* is not scheduled to be administered again until the 1998-99 school year. *What can one do in intervening years?*

Based on the results of analyses presented in this report, inflationary trends are likely to change substantially from one time interval to another. Moreover, it would be useful to be able to obtain data sources that would permit annual updates so that historical trends in educational spending could be analyzed more completely.

One annual source of data that could be explored for updating the inflationary estimates is the *CPS* dataset, which is used in the *ICEI* analysis as a data source for noncertificated school personnel. If the focus of this analysis is to estimate inflation for the nation, the *CPS* might provide an adequate sample that could estimate inflationary trends for certificated school personnel in the same way it was used for noncertificated in this analysis. To determine whether the CPS would be a fruitful source of information, it would be necessary to test how well the *CPS* data could be used to replicate the results obtained in this analysis. If the results could be replicated, it may be possible to use the *CPS* data to estimate educational input inflation rates for intervening years, as well as to develop more historical data to be compared with alternative indices.

## Improving Data on Fringe Benefits

The analysis of certificated and noncertificated personnel presented in this report focuses entirely upon salaries and wages. To date, there have been no comprehensive studies suggesting what the impact of adding benefits to this analysis would be. If a high correlation exists between salaries, wages, and the value of benefits to employees, then the existing analysis of salaries may be sufficient. Unfortunately, benefit data are difficult to gather and incorporate into cost analyses.

Collection of benefit data requires a careful delineation of benefits (for example, health and major medical insurance) that are paid on a per employee basis versus those that are specified as a percentage of salary (for example, retirement, disability insurance, worker's compensation). In some instances, benefits are not necessarily paid by the district employing the individual, but rather are paid for by the state. For example, at one time the state of New York made payments to the retirement system on behalf of teachers, and the state of Kentucky provides a benefit package to certain categories of school personnel. While this may not be as important in comparing salaries within states, it is certainly important in conducting cross-state analyses of salaries and benefits.

Another complicating factor in the determination of benefits for school employees revolves around the differences in the contract year for various categories of school personnel. That is, some school district employees, such as teachers and instructional aides, are employed only for the academic year, while others, such as district-level administrators and certain categories of maintenance or support personnel, are employed year-round. For year-round employees, benefit calculations may require inclusion of vacation or other leave time.

Current fiscal data gathered by NCES are inadequate to the task for at least two reasons. First, NCES data do not accurately identify all of the benefit payments made on behalf of employees (i.e., districts versus states). Second, NCES fiscal data do not distinguish between benefits paid per employee and those based on a percent of salary. This limitation distorts benefits for individuals

making widely varying salaries even within the same job category.[23] NCES needs to address this issue through improved data gathering within *SASS* or its other fiscal data collection efforts.

## Improved Data on Noncertificated School Personnel

This report relies entirely upon samples of public and private employees derived from the *Current Population Surveys (CPS)*. One problem with the *CPS* data is that the samples of school personnel are not large enough to support the kind of analyses conducted in this study. It was necessary to include a wider range of individuals employed in the public and private sector and who had occupational categories similar to those commonly found in schools. The advantage of this approach is that it recognizes that these types of individuals are not unique to schools and that school districts must compete in a labor market that extends beyond that for school personnel. The disadvantage to using a wider sample of individuals is that the characteristics of individuals relevant for school district jobs are generally not available on a dataset like the *CPS*.

Perhaps the most significant problem with the *CPS* database is that it does not identify the county in which the individual resides or is employed. The database only identifies the metropolitan area within a state or the fact that the individual is located in any county outside a metropolitan area. This makes it impossible to assess variations in costs that might occur within metropolitan areas by county or within the vast numbers of nonmetropolitan counties within the United States This limitation is clearly more problematic for developing geographic cost of education indexes, but improved data on smaller geographic regions may also provide more accurate estimates of inflationary trends as well.

The NCES *Schools and Staffing Survey* may offer potential for collecting data on samples of certain categories of noncertificated school personnel for the purpose of improving the quality of information on patterns of wage variations over time.

[23] For example, consider two teachers in the same district: one earning $25,000 per year and the other earning $50,000 per year. Suppose that each is entitled to full medical coverage at a cost to the district of $5,000 per year per employee. In addition, assume the district contributes 12 percent of salary to a combination of retirement and other payroll taxes for each employee. Benefits for the teacher earning $25,000 per year amount to $8,000 per year (=$5,000 + .12 × $25,000), while benefits for the teacher earning $50,000 per year amount to $11,000 (=$5,000 + .12 × $50,000). In the first case, the benefit rate is 32 percent (=100 × $8,000 /$25,000), while in the second case, the benefit rate is 22 percent (=100 × $11,000/$50,000).

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## Data Sources

Bureau of the Census, *Current Population Surveys, 1987- 1994.*

Bureau of the Census, 1990 Census of Governments, *Survey of Local Government Finances.*

Bureau of the Census, Electronic databases (CD-ROMs) containing County and city level census information.

Bureau of Labor Statistics, *Producer Price Indices*. 1985 - 1994 data.

Bureau of Labor Statistics, *Consumer Price Indices.* 1985 - 1994 data.

California Department of Education and Ohio Department of Education, databases on expenditures by object codes.

Educational Research Services, Inc. *National Survey of Salaries and Wages in Public Schools, Part 2, Salaries Paid Professional Personnel in Public Schools.*

*Employment Cost Indexes and Levels, 1975-95* published by the U.S. Department of Labor, Bureau of Labor Statistics, October 1995, Bulletin 2466.

Geographic Names Information Systems (GNIS) CD-ROM (Latitudes and longitudes for most U.S. cities, towns and geographic locations.

*Higher education Research Institute at the Graduate School of Education*, Electronic database on SAT scores for entering Freshman, 1972, 1977, 1982 in approximately 2,300 colleges in the United States.

National Climatic Data Center and the National Center for Atmospheric Research, *The World Weath Disc: Climate Data for the Planet Earth. CD-ROM*. Produced by the Weather Disc Associates, Inc.

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**Listing of NCES Working Papers to Date**

Please contact Ruth R. Harris at (202) 219-1831
if you are interested in any of the following papers

| Number | Title | Contact |
|---|---|---|
| 94-01 (July) | Schools and Staffing Survey (SASS) Papers Presented at Meetings of the American Statistical Association | Dan Kasprzyk |
| 94-02 (July) | Generalized Variance Estimate for Schools and Staffing Survey (SASS) | Dan Kasprzyk |
| 94-03 (July) | 1991 Schools and Staffing Survey (SASS) Reinterview Response Variance Report | Dan Kasprzyk |
| 94-04 (July) | The Accuracy of Teachers' Self-reports on their Postsecondary Education: Teacher Transcript Study, Schools and Staffing Survey | Dan Kasprzyk |
| 94-05 (July) | Cost-of-Education Differentials Across the States | William Fowler |
| 94-06 (July) | Six Papers on Teachers from the 1990-91 Schools and Staffing Survey and Other Related Surveys | Dan Kasprzyk |
| 94-07 (Nov.) | Data Comparability and Public Policy: New Interest in Public Library Data Papers Presented at Meetings of the American Statistical Association | Carrol Kindel |
| 95-01 (Jan.) | Schools and Staffing Survey: 1994 Papers Presented at the 1994 Meeting of the American Statistical Association | Dan Kasprzyk |
| 95-02 (Jan.) | QED Estimates of the 1990-91 Schools and Staffing Survey: Deriving and Comparing QED School Estimates with CCD Estimates | Dan Kasprzyk |
| 95-03 (Jan.) | Schools and Staffing Survey: 1990-91 SASS Cross-Questionnaire Analysis | Dan Kasprzyk |
| 95-04 (Jan.) | National Education Longitudinal Study of 1988: Second Follow-up Questionnaire Content Areas and Research Issues | Jeffrey Owings |
| 95-05 (Jan.) | National Education Longitudinal Study of 1988: Conducting Trend Analyses of NLS-72, HS&B, and NELS:88 Seniors | Jeffrey Owings |

**Listing of NCES Working Papers to Date--Continued**

| Number | Title | Contact |
|---|---|---|
| 95-06 (Jan.) | National Education Longitudinal Study of 1988: Conducting Cross-Cohort Comparisons Using HS&B, NAEP, and NELS:88 Academic Transcript Data | Jeffrey Owings |
| 95-07 (Jan.) | National Education Longitudinal Study of 1988: Conducting Trend Analyses HS&B and NELS:88 Sophomore Cohort Dropouts | Jeffrey Owings |
| 95-08 (Feb.) | CCD Adjustment to the 1990-91 SASS: A Comparison of Estimates | Dan Kasprzyk |
| 95-09 (Feb.) | The Results of the 1993 Teacher List Validation Study (TLVS) | Dan Kasprzyk |
| 95-10 (Feb.) | The Results of the 1991-92 Teacher Follow-up Survey (TFS) Reinterview and Extensive Reconciliation | Dan Kasprzyk |
| 95-11 (Mar.) | Measuring Instruction, Curriculum Content, and Instructional Resources: The Status of Recent Work | Sharon Bobbitt & John Ralph |
| 95-12 (Mar.) | Rural Education Data User's Guide | Samuel Peng |
| 95-13 (Mar.) | Assessing Students with Disabilities and Limited English Proficiency | James Houser |
| 95-14 (Mar.) | Empirical Evaluation of Social, Psychological, & Educational Construct Variables Used in NCES Surveys | Samuel Peng |
| 95-15 (Apr.) | Classroom Instructional Processes: A Review of Existing Measurement Approaches and Their Applicability for the Teacher Follow-up Survey | Sharon Bobbitt |
| 95-16 (Apr.) | Intersurvey Consistency in NCES Private School Surveys | Steven Kaufman |
| 95-17 (May) | Estimates of Expenditures for Private K-12 Schools | Stephen Broughman |
| 95-18 (Nov.) | An Agenda for Research on Teachers and Schools: Revisiting NCES' Schools and Staffing Survey | Dan Kasprzyk |
| 96-01 (Jan.) | Methodological Issues in the Study of Teachers' Careers: Critical Features of a Truly Longitudinal Study | Dan Kasprzyk |
| 96-02 (Feb.) | Schools and Staffing Survey (SASS): 1995 Selected papers presented at the 1995 Meeting of the American | Dan Kasprzyk |

**Listing of NCES Working Papers to Date--Continued**

| Number | Title | Contact |
|---|---|---|
| | Statistical Association | |
| 96-03 (Feb.) | National Education Longitudinal Study of 1988 (NELS:88) Research Framework and Issues | Jeffrey Owings |
| 96-04 (Feb.) | Census Mapping Project/School District Data Book | Tai Phan |
| 96-05 (Feb.) | Cognitive Research on the Teacher Listing Form for the Schools and Staffing Survey | Dan Kasprzyk |
| 96-06 (Mar.) | The Schools and Staffing Survey (SASS) for 1998-99: Design Recommendations to Inform Broad Education Policy | Dan Kasprzyk |
| 96-07 (Mar.) | Should SASS Measure Instructional Processes and Teacher Effectiveness? | Dan Kasprzyk |
| 96-08 (Apr.) | How Accurate are Teacher Judgments of Students' Academic Performance? | Jerry West |
| 96-09 (Apr.) | Making Data Relevant for Policy Discussions: Redesigning the School Administrator Questionnaire for the 1998-99 SASS | Dan Kasprzyk |
| 96-10 (Apr.) | 1998-99 Schools and Staffing Survey: Issues Related to Survey Depth | Dan Kasprzyk |
| 96-11 (June) | Towards an Organizational Database on America's Schools: A Proposal for the Future of SASS, with comments on School Reform, Governance, and Finance | Dan Kasprzyk |
| 96-12 (June) | Predictors of Retention, Transfer, and Attrition of Special and General Education Teachers: Data from the 1989 Teacher Followup Survey | Dan Kasprzyk |
| 96-13 (June) | Estimation of Response Bias in the NHES:95 Adult Education Survey | Steven Kaufman |
| 96-14 (June) | The 1995 National Household Education Survey: Reinterview Results for the Adult Education Component | Steven Kaufman |
| 96-15 (June) | Nested Structures: District-Level Data in the Schools and Staffing Survey | Dan Kasprzyk |

**Listing of NCES Working Papers to Date--Continued**

| Number | Title | Contact |
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| 96-16 (June) | Strategies for Collecting Finance Data from Private Schools | Stephen Broughman |
| 96-17 (July) | National Postsecondary Student Aid Study: 1996 Field Test Methodology Report | Andrew G. Malizio |
| 96-18 (Aug.) | Assessment of Social Competence, Adaptive Behaviors, and Approaches to Learning with Young Children | Jerry West |
| 96-19 (Oct.) | Assessment and Analysis of School-Level Expenditures | William Fowler |
| 96-20 (Oct.) | 1991 National Household Education Survey (NHES:91) Questionnaires: Screener, Early Childhood Education, and Adult Education | Kathryn Chandler |
| 96-21 (Oct.) | 1993 National Household Education Survey (NHES:93) Questionnaires: Screener, School Readiness, and School Safety and Discipline | Kathryn Chandler |
| 96-22 (Oct.) | 1995 National Household Education Survey (NHES:95) Questionnaires: Screener, Early Childhood Program Participation, and Adult Education | Kathryn Chandler |
| 96-23 (Oct.) | Linking Student Data to SASS: Why, When, How | Dan Kasprzyk |
| 96-24 (Oct.) | National Assessments of Teacher Quality | Dan Kasprzyk |
| 96-25 (Oct.) | Measures of Inservice Professional Development: Suggested Items for the 1998-1999 Schools and Staffing Survey | Dan Kasprzyk |
| 96-26 (Nov.) | Improving the Coverage of Private Elementary-Secondary Schools | Steven Kaufman |
| 96-27 (Nov.) | Intersurvey Consistency in NCES Private School Surveys for 1993-94 | Steven Kaufman |
| 96-28 (Nov.) | Student Learning, Teaching Quality, and Professional Development: Theoretical Linkages, Current Measurement, and Recommendations for Future Data Collection | Mary Rollefson |
| 96-29 (Nov.) | Undercoverage Bias in Estimates of Characteristics of | Kathryn Chandler |

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| | Adults and 0- to 2-Year-Olds in the 1995 National Household Education Survey (NHES:95) | |
| 96-30 (Dec.) | Comparison of Estimates from the 1995 National Household Education Survey (NHES:95) | Kathryn Chandler |
| 97-01 (Feb.) | Selected Papers on Education Surveys: Papers Presented at the 1996 Meeting of the American Statistical Association | Dan Kasprzyk |
| 97-02 (Feb.) | Telephone Coverage Bias and Recorded Interviews in the 1993 National Household Education Survey (NHES:93) | Kathryn Chandler |
| 97-03 (Feb.) | 1991 and 1995 National Household Education Survey Questionnaires: NHES:91 Screener, NHES:91 Adult Education, NHES:95 Basic Screener, and NHES:95 Adult Education | Kathryn Chandler |
| 97-04 (Feb.) | Design, Data Collection, Monitoring, Interview Administration Time, and Data Editing in the 1993 National Household Education Survey (NHES:93) | Kathryn Chandler |
| 97-05 (Feb.) | Unit and Item Response, Weighting, and Imputation Procedures in the 1993 National Household Education Survey (NHES:93) | Kathryn Chandler |
| 97-06 (Feb.) | Unit and Item Response, Weighting, and Imputation Procedures in the 1995 National Household Education Survey (NHES:95) | Kathryn Chandler |
| 97-07 (Mar.) | The Determinants of Per-Pupil Expenditures in Private Elementary and Secondary Schools: An Exploratory Analysis | Stephen Broughman |
| 97-08 (Mar.) | Design, Data Collection, Interview Timing, and Data Editing in the 1995 National Household Education Survey | Kathryn Chandler |
| 97-09 (Apr.) | Status of Data on Crime and Violence in Schools: Final Report | Lee Hoffman |
| 97-10 (Apr.) | Report of Cognitive Research on the Public and Private School Teacher Questionnaires for the Schools and Staffing Survey 1993-94 School Year | Dan Kasprzyk |

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| 97-11 (Apr.) | International Comparisons of Inservice Professional Development | Dan Kasprzyk |
| 97-12 (Apr.) | Measuring School Reform: Recommendations for Future SASS Data Collection | Mary Rollefson |
| 97-13 (Apr.) | Improving Data Quality in NCES: Database-to-Report Process | Susan Ahmed |
| 97-14 (Apr.) | Optimal Choice of Periodicities for the Schools and Staffing Survey: Modeling and Analysis | Steven Kaufman |
| 97-15 (May) | Customer Service Survey: Common Core of Data Coordinators | Lee Hoffman |
| 97-16 (May) | International Education Expenditure Comparability Study: Final Report, Volume I | Shelley Burns |
| 97-17 (May) | International Education Expenditure Comparability Study: Final Report, Volume II, Quantitative Analysis of Expenditure Comparability | Shelley Burns |
| 97-18 (June) | Improving the Mail Return Rates of SASS Surveys: A Review of the Literature | Steven Kaufman |
| 97-19 (June) | National Household Education Survey of 1995: Adult Education Course Coding Manual | Peter Stowe |
| 97-20 (June) | National Household Education Survey of 1995: Adult Education Course Code Merge Files User's Guide | Peter Stowe |
| 97-21 (June) | Statistics for Policymakers or Everything You Wanted to Know About Statistics But Thought You Could Never Understand | Susan Ahmed |
| 97-22 (July) | Collection of Private School Finance Data: Development of a Questionnaire | Stephen Broughman |
| 97-23 (July) | Further Cognitive Research on the Schools and Staffing Survey (SASS) Teacher Listing Form | Dan Kasprzyk |
| 97-24 (Aug.) | Formulating a Design for the ECLS: A Review of Longitudinal Studies | Jerry West |
| 97-25 (Aug.) | 1996 National Household Education Survey | Kathryn Chandler |

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| | (NHES:96) Questionnaires: Screener/Household and Library, Parent and Family Involvement in Education and Civic Involvement, Youth Civic Involvement, and Adult Civic Involvement | |
| 97-26 (Oct.) | Strategies for Improving Accuracy of Postsecondary Faculty Lists | Linda Zimbler |
| 97-27 (Oct.) | Pilot Test of IPEDS Finance Survey | Peter Stowe |
| 97-28 (Oct.) | Comparison of Estimates in the 1996 National Household Education Survey | Kathryn Chandler |
| 97-29 (Oct.) | Can State Assessment Data be Used to Reduce State NAEP Sample Sizes? | Steven Gorman |
| 97-30 (Oct.) | ACT's NAEP Redesign Project: Assessment Design is the Key to Useful and Stable Assessment Results | Steven Gorman |
| 97-31 (Oct.) | NAEP Reconfigured: An Integrated Redesign of the National Assessment of Educational Progress | Steven Gorman |
| 97-32 (Oct.) | Innovative Solutions to Intractable Large Scale Assessment (Problem 2: Background Questionnaires) | Steven Gorman |
| 97-33 (Oct.) | Adult Literacy: An International Perspective | Marilyn Binkley |
| 97-34 (Oct.) | Comparison of Estimates from the 1993 National Household Education Survey | Kathryn Chandler |
| 97-35 (Oct.) | Design, Data Collection, Interview Administration Time, and Data Editing in the 1996 National Household Education Survey | Kathryn Chandler |
| 97-36 (Oct.) | Measuring the Quality of Program Environments in Head Start and Other Early Childhood Programs: A Review and Recommendations for Future Research | Jerry West |
| 97-37 (Nov.) | Optimal Rating Procedures and Methodology for NAEP Open-ended Items | Steven Gorman |
| 97-38 (Nov.) | Reinterview Results for the Parent and Youth Components of the 1996 National Household Education Survey | Kathryn Chandler |

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| 97-40 (Nov.) | Unit and Item Response Rates, Weighting, and Imputation Procedures in the 1996 National Household Education Survey | Kathryn Chandler |
| 97-41 (Dec.) | Selected Papers on the Schools and Staffing Survey: Papers Presented at the 1997 Meeting of the American Statistical Association | Steve Kaufman |
| 97-42 (Dec.) | Improving the Measurement of Staffing Resources at the School Level: The Development of Recommendations for NCES for the Schools and Staffing Survey (SASS) | Mary Rollefson |
| 97-43 (Dec.) | Measuring Inflation in Public School Costs | William J. Fowler, Jr. |