Analysis of External Cost Adjustment

Factors for Wyoming K-12 Public

Education Finance

Shelby Gerking

Department of Economics and Finance

University of Wyoming

Laramie, Wyoming 82070

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1. Introduction

The Wyoming State Legislature is finalizing the establishment of a new school finance system that must be "cost based." The State contracted with Management Analysis and Planning, Inc. (MAP) to conduct the cost study on which the new finance system is based. MAP recommended that the new finance system apply external cost adjustments, or inflation factors, to allow for rising wages and salaries of school personnel over time. It is important to note that the external cost adjustment would be used to change the level of funding for K-12 public education on a statewide basis. Regional adjustments might then be applied to account for different economic circumstances prevailing in different areas of the State. This report discusses how to select an appropriate external cost adjustment. It does not consider the issue of regional cost adjustments.

There are many possible choices of an external cost adjustment for use in Wyoming K-12 public education finance. For example, the U.S. Department of Labor, Bureau of Labor Statistics (BLS) publishes a number of inflation indices including variants of the Employment Cost Index (ECI) and the Consumer Price Index (CPI). Also, the Wyoming Economic Analysis Division (EAD) publishes cost of living indices specific to Wyoming and the Wyoming Department of Employment tabulates data each year from an occupational wage survey that, at least in principle, could be used to develop an index of employment costs for this State. Thus, the central question addressed in this report is this: Should one (or more) of these indices be applied or modified for use in the context of Wyoming K-12 education finance or should a new approach be developed? As

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demonstrated below, reasonable choices can be made between indices, but no index is without limitations.

The remainder of this report is organized into three additional sections. Section 2 describes the construction and interpretation of employment cost indices. It considers the ECI (actually a set of employment cost indices) published by the BLS as well as the feasibility and usefulness of developing employment cost indices that would be specific to Wyoming or to other states in the Rocky Mountain region. This discussion is important because Management Analysis and Planning, Inc. (1998) has suggested that wages and salaries of school personnel should be adjusted using one of the BLS employment cost indices. Section 3 describes the construction and interpretation of the CPI (again, actually a set of indices) published by BLS and the Wyoming Cost of Living Index (WCLI) published by the Wyoming EAD. This discussion is included for two reasons. First, consumer price indices arguably represent the best alternative to employment cost indices for use as an external cost adjustment in Wyoming public school finance. Second, the BLS consumer price indices have undergone considerable revision and improvement recently in light of findings by the CPI Commission (Boskin et al. 1997). Section 4 compares alternative approaches on both conceptual and empirical levels.

2. Employment Cost Indices

BLS prepares quarterly employment cost indices (ECI) to document increases in wages, salaries, benefits, and total compensation paid by employers across the nation. Total compensation includes employers' costs for wages, salaries and employee benefits including paid leave (vacations, holiday, sick leave, and other types of paid leave),

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supplemental pay (premium pay for overtime and work on weekends and holidays, shift differentials, and non-production bonuses such as lump-sum bonuses provided in lieu of wage increases), insurance benefits (life, health, sickness and accident), retirement and savings benefits (pensions and other retirement plans and savings and thrift plans), legally required benefits (Social Security, federal and state unemployment insurance, and workers' compensation), and other benefits (severance pay and supplemental unemployment benefits). The index covers 95 percent of all civilian wage and salary workers. It excludes federal, self-employed, farm, and household workers. The ECI has proven useful to policymakers to forecast wage and salary trends and to facilitate wage and benefit cost planning. Also, the ECI is used as a wage escalator in public and private sector collective bargaining agreements as well as in the federal pay setting process. (An excellent description of the ECI and its uses may be found in Garner 1998.)

The ECI is calculated from survey information on about 18,800 occupations in 4500 non-farm, private sector business establishments and about 4,200 occupations in 800 state and local government units. Establishments are grouped by industry so that the ECI can be calculated as a weighted sum of changes in compensation costs for individual industry/occupation categories. Weights applied are based on the relative size of each industry/occupation group and are taken from the 1990 Occupational Statistics Survey. Because the weights have been held fixed as compensation varies over time, the ECI measures changes in compensation over time, free from the influence of employee shifts among industries and occupations. This feature is important for two reasons. First, changes in output of different industries can alter the pattern of demand for different types of workers across economic sectors. Second, workers even in very narrowly

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defined occupations frequently are compensated differently in different industries. Many studies have documented this phenomenon, but none have been completely successful in explaining it (see, for example, Krueger and Summers 1988). Significant advantages of the ECI are its broad coverage of occupations and large sample size. In fact, these aspects are critical in allowing the ECI to be broken down into broad occupational categories.

Table 1 shows annual values of the ECI for total compensation of all workers as well as for total compensation of workers in two specific occupation categories, private sector professional workers and private sector nonprofessional workers. MAP recommended the indices for professional and nonprofessional workers for use in making external cost adjustments to administrators' and teachers' salaries and support staff salaries, respectively. MAP created these indices by special tabulations of BLS ECI data. The values of the indices presented in Table 1 are taken from their report (MAP 1998). Table 2 shows values of the annual external cost adjustments or inflation factors that would have been applied in recent years using each of the three indices. As shown Table 2 indicates that employer costs for professional workers have risen faster than employer costs for nonprofessional workers.

TABLE 1
Employment Cost Indices by Occupation
1989-97

Year	All Workers	Private Industry Professional	Private Industry Nonprofessional
1989	100.73	100.00	100.00
1990	105.93	105.60	105.00
1991	110.63	110.70	109.40
1992	114.63	114.90	113.30
1993	118.68	119.40	117.40
1994	122.70	123.50	121.30
1995	126.15	127.00	124.70
1996	129.65	130.90	128.20
1997	133.48	135.00	131.80

TABLE 2
Implied Rates of Inflation Using ECI by Occupation
1990-97

Year	All Workers	Private Industry Professional	Private Industry Nonprofessional
1990	5.2%	5.6%	5.0%
1991	4.4%	4.8%	4.2%
1992	3.6%	3.8%	3.6%
1993	3.5%	3.9%	3.6%
1994	3.4%	3.4%	3.3%
1995	2.8%	2.8%	2.8%
1996	2.8%	3.1%	2.8%
1997	2.9%	3.1%	2.8%

While the MAP recommendation is an entirely reasonable approach to computing external cost adjustment factors for school district personnel, it has at least five limitations. First, creation of special employment cost indices may give a false sense of precision for the resulting cost adjustment factors. The MAP report narrative presents a detailed explanation of how to incorporate various indices into the analysis. However, there is no evidence that extra calculations produce a more accurate external cost adjustment for professional and nonprofessional school district personnel than simply applying the ECI for all workers to both groups. The plain truth is that no index, no matter how carefully constructed, will yield an absolutely correct cost adjustment. Second, ECI data are collected by survey methods; thus, the resulting indices are subject to sampling errors. Third, the ECI does not capture all forms of labor compensation, such as stock options.

Fourth, the ECI includes the increase in compensation associated with labor productivity. In other words, growth in total compensation over time may occur partly because workers are better trained (or educated), are able to work with better equipment, and in many economic sectors, produce more as a result. Through the decade of the 1980s, economists and others worried about a possible productivity slowdown and its

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effects on the U.S. economy; however, through the decade of the 1990s, labor productivity appears to have been growing at a rapid rate by historical standards (by as much as 1-2% per year). Greater use of personal computers and other electronic equipment on the job has been thought to be at least partly responsible for this increase in the rate of expansion labor productivity. In any case, to the extent that growth of total compensation reflects worker productivity gains, it may well overstate the effects of inflation.

The MAP report counters this argument concerning the effect of productivity gains by correctly noting that teachers and school administrators must be attracted away from other lines of work, so compensation of educators must keep up with compensation paid in other sectors of the economy. However, educators are not perfectly substitutable with other types of professional workers and compensation is not the only dimension of job satisfaction. Training and experience of educators is usually specific to classroom teaching (rather than to a business career, for example) and working with young people is often a motivating factor in the choice of profession. Additionally, the "output" of educators is hard to measure making "productivity" an elusive concept in this situation. There is no question that educator salaries must grow over time if top quality talent is to be attracted into the teaching profession, but whether these salaries must grow by enough to reflect productivity gains of other economic sectors is not clear.

A fifth limitation of using the ECI to computing the external cost adjustments for the two types of school employees' salaries is that this index is based on national data, rather than on data from Wyoming or the region composed of states bordering Wyoming. The bases for such an objection are that: (1) economic conditions in Wyoming and in

surrounding states may well differ from those in the nation as a whole, (2) many industry/occupation classifications present at the national level may not be present in Wyoming, and (3) the relative proportion of workers in Wyoming industry/occupation categories differ from the relative proportion of workers in these categories nationwide. The first of these objections, however, is weakened by the fact that workers can and do relocate to take advantage of better job opportunities elsewhere; workers certainly are not trapped behind state or regional boundaries. Worker mobility tends to make compensation in different geographic areas more equal than it would be otherwise. Professional and technical workers, including educators, are generally more mobile than workers in other occupations. Nevertheless, costs of relocation prevent complete geographic equality in compensation from occurring, so it is useful to consider how an employment cost index might be constructed using state data. Also, differences between the industry/occupation structure in Wyoming and the U.S. argues for greater use of State data as well.

One approach along these lines would be to use occupational wage data gathered annually in a survey conducted by the Wyoming Department of Employment (see the website lmi.state.wy.us). These data are directly comparable with occupational wage data that are collected in other states. Thus, data are available for use in calculating a Wyoming employment cost index or a regional employment cost index in which the region could be comprised of any states desired. There are at least three problems with this approach, however. First, wage data are provided mainly by occupation with little industry detail. As previously noted, workers even in narrowly defined occupations often are compensated differently in different industries. Thus, a change in an employment

cost index for Wyoming or for other states in the region may reflect a change in the relative importance of certain industries, rather than wage inflation. Notice that, at least in principle, this problem could be ameliorated by more extensive data collection. Second, compensation data collected pertain only to wages and do not include fringe benefits. Figure 1 compares the growth in wage costs with the growth in fringe benefits for all workers at the national level. As Figure 1 indicates, fringe benefit costs grew faster than wage and salary costs in most years between 1981 and 1994. In the last few years, though, growth in benefit costs has slowed markedly and is now below the rate of growth in wage and salary costs. In consequence, at the national level and probably at the regional level as well, rates of growth in wages and salaries are probably not a good indicator of growth rates in total compensation inclusive of benefits. It is possible that in the future the Wyoming Department of Employment will collect data on fringe benefits on a regular basis. An initial survey along these lines is being conducted cooperatively with selected other states in this region and results will be published later in 1999. Whether this survey will be successful and continued on a regular basis in the future has not yet been decided (Gallagher 1999). If fringe benefit information is collected in the future, construction of a Wyoming employment cost index would become a more attractive alternative for use as an external cost adjustment.

FIGURE 1
ECI AND COMPONENTS
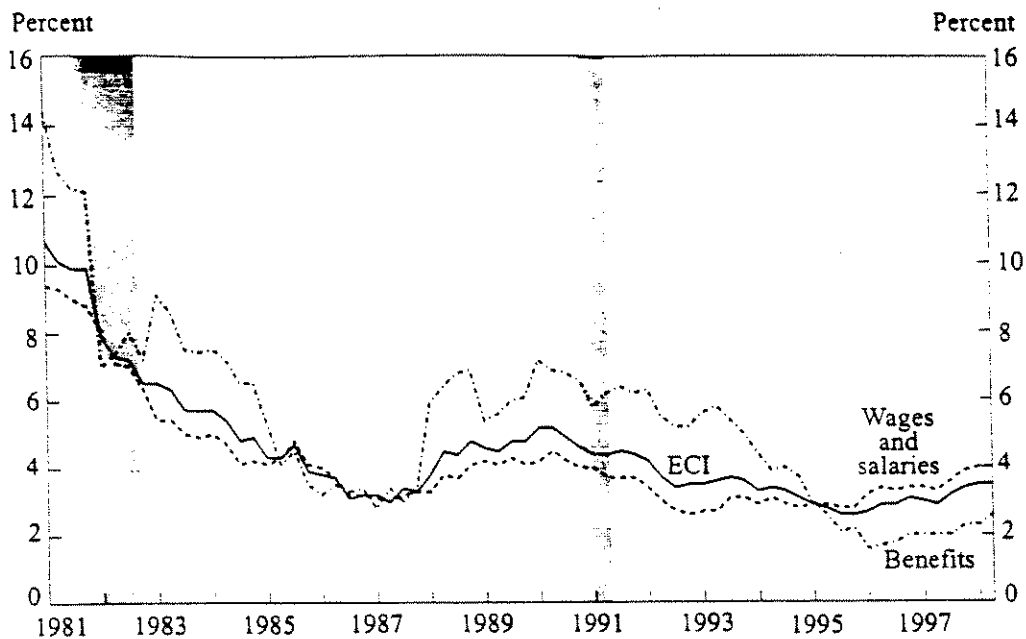
Percent   Percent

Notes: Percent changes are from four quarters earlier. ECI is not seasonally adjusted. Shaded areas represent recessions.
Source: Bureau of Labor Statistics.

Third, Wyoming's economy may be too small to permit construction of an

employment cost index that is useful for policy purposes. Relatively few workers are

present in occupational categories presently used by the Wyoming Department of

Employment and fewer still would be present if the wage (and possibly benefits) data

were classified on a finer industry/occupation grid. Thus the weights (relative

proportions) of workers in each industry/occupation category are likely to be subject to

large changes over short time periods. This problem appears to be more or less

unavoidable and represents an argument against development of an employment cost

index that would rely solely on Wyoming data. A broader regional employment cost

index would be an improvement in this regard; however, it may be difficult to ensure that

data collected by other states would be compatible with those collected in Wyoming.

3. Consumer Price Indices

The consumer price index (CPI) is perhaps the best-known index of price change published by the BLS. The CPI was developed during World War I to meet the need of the federal government in establishing cost-of-living adjustments for workers in shipbuilding centers. Regular publication of the index began in 1921 and it has been revised extensively since that time as coverage has been extended to more goods and better statistical methods have been applied. Historically, the CPI has been constructed as a fixed-weight index (in this respect, it is similar to the ECI) using prices of commodities in about 200 categories that are available to consumers nationwide. CPI weights are derived from data on spending habits of 29,000 families surveyed in the Consumer Expenditure Survey, which BLS conducts regularly on a nationwide basis.

To compute the CPI, prices of goods are sampled from 87 geographic areas. In consequence, the CPI can be broken down to reflect price changes in broadly defined regions (midwest, northeast, south and west), for particular major U.S. cities (e.g., New York, Washington D.C., Baltimore, Chicago, Los Angeles), and for different commodity groups (e.g., apparel, housing, transportation, and medical care). The CPI-U is the most widely reported of these and pertains to price movements in urban areas across the United States. The BLS also reports a CPI-W series that measures rates of inflation faced by urban wage earners and clerical workers. These individuals comprise a subset of all urban residents. Prices used to construct this series are the same as for the CPI-U, but the market basket of goods used is somewhat different. Rates of inflation calculated from these two series have been quite similar in recent years, so only the CPI-U is discussed

here. The CPI-W might be appropriate to use as an external cost adjustment for salaries and benefits for nonprofessional staff employed in Wyoming public schools.

Whereas the ECI measures the growth of total compensation costs seen by employers, the CPI is a measure of the growth in costs seen by employees who are attempting to maintain a particular standard of living. In other words, the CPI is seen as a way to answer the question: "How much more income will consumers need to be just as well off with the new set of prices as with the old?" Thus, the CPI has been widely used to escalate wages over time in collective bargaining agreements and the BLS website (see stats.bls.gov/cpihome.htm) contains a document that explains how it should be used in this context. One of the most important of these recommendations is that an all cities index, such as the CPI-U, be selected for use as a wage escalator. The BLS argues that the advantages of greater sample size and coverage of commodities available in a national index outweighs the advantages of relying more heavily on local information, as might be done when using a region or city index. Also, consumer goods are sold in national or international markets, so political subdivisions such as states, cities, towns, and counties should not be viewed as "island economies" having little interaction with the outside world. Differences in transportation costs can cause prices of goods to differ between geographic areas. However, competition will limit these price differences, except for goods such as housing that cannot change location. Other suggestions for using the CPI as a wage escalator may be found in "How to Use the Consumer Price Index for Escalation" which is available at the website cited above.

In recent years, the CPI has been criticized for not measuring the change in living costs as accurately as it might and in the mid-1990s a federal commission (the CPI

Commission) was appointed to recommend improvements. The Commission found that changes in the CPI tended to overstate the change in the cost of living by about 1.1 percentage points (Boskin et al. 1997). In other words, if the rate of inflation implied by the CPI is 3%, then the true change in the cost of living is about 2%. The most important source of upward bias in the estimated inflation rate is that fixed-weight price indices like the CPI do not account for the importance of substitution among commodities that occurs as relative prices change. Recall that the ECI also is a fixed weight index, so it does not account for shifts in workers between industry/occupation groups as relative rates of compensation change. However, it is easier for people to change consumption patterns than jobs. As a result, the substitution that occurs in the face of relative price changes is generally thought to be a greater problem for the CPI than for the ECI.

Substitution in consumption when relative prices change can take many forms and is more pervasive than it might at first appear. For example, think of a good such as ice cream. Substitution can occur between brands, carton sizes (pints vs. quarts), types of retail outlets (gourmet vs. discount food stores), close substitutes (ice cream vs. frozen yogurt), or more distant substitutes (ice cream vs. cupcakes). Failure to adjust for substitution patterns in the face of relative price changes leads the CPI to overstate the rate of inflation. In fact, the BLS recently introduced an experimental CPI series to ascertain how large a reduction in estimated inflation rates would have occurred over the decade of the 1990s had the CPI allowed for consumer substitution patterns. Official, published values of the CPI-U are compared with the experimental consumer price index series in Figure 2. As indicated, the experimental CPI series implies lower rates of inflation than the actual CPI series. Other sources of upward bias in the CPI include

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failure to introduce new goods (especially consumer electronic goods whose prices have fallen) into the index quickly enough, failure to account for shifts of consumer expenditures from full-service retail outlets to discount stores such as Wal-Mart and Circuit City, and failure to account for improvements in the quality of goods already in the index.

Figure 2
Implied CPI Inflation Rates – Urban vs. Experimental Urban
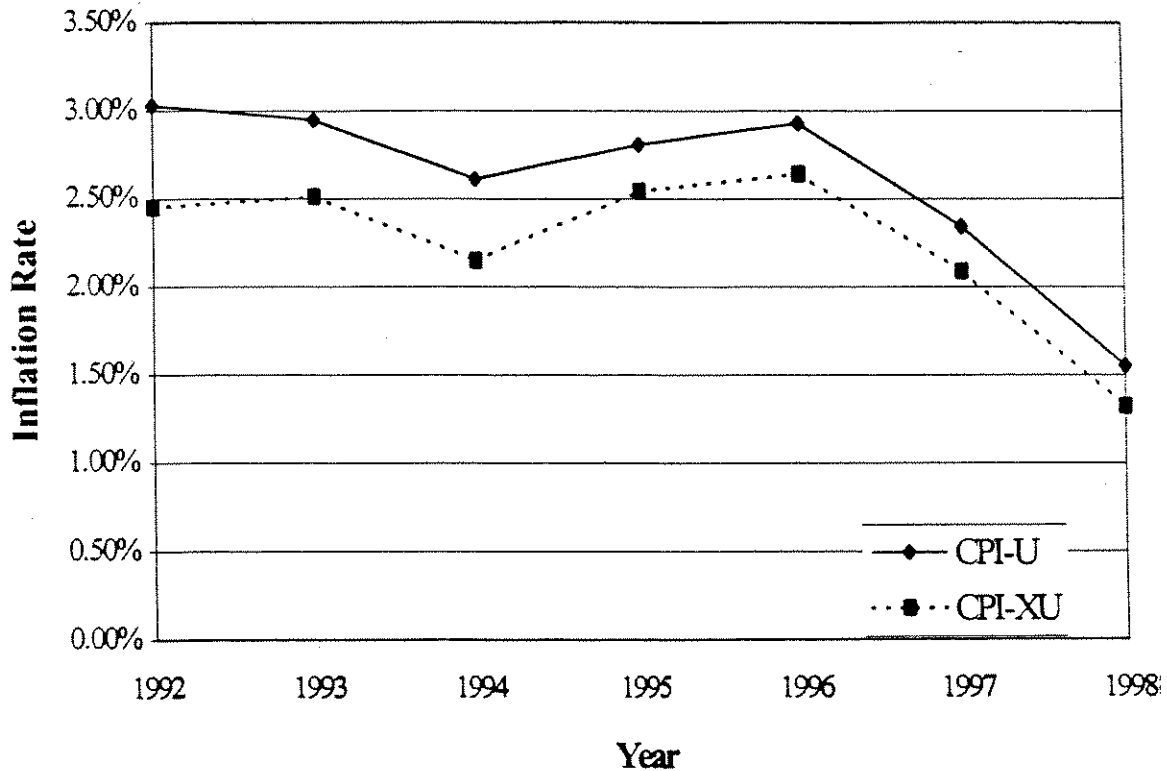
The BLS responded to the Commission report by extensively revising the methods used for computing the CPI. In January 1999, the BLS began computing the CPI as a geometrically-weighted average of prices, rather than as a fixed-weight average.

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This change was aimed at allowing for plausible substitution patterns between goods included in the index. Additional changes in the index are planned for introduction in the future. A discussion of these changes is available in various documents at the BLS website (previously cited).

Use of the CPI-U as an external cost adjustment for Wyoming public education expenditures might be criticized either because prices of goods in Wyoming differ from those in other parts of the U.S. or because the market basket of goods consumed in Wyoming is unique in some respects. As previously noted, price differences between locations for identical items, except for geographically immobile goods like housing, are probably small. However, possible differences in consumption patterns between Wyoming residents and residents of other states have never been thoroughly investigated. As previously noted, the data on which the CPI is based are sufficiently extensive to permit breakdowns by broad region of the U.S., but the BLS does not recommend using the regional indices for cost adjustment purposes. Moreover, Wyoming is in the West region, which contains California and a variety of other states that are in differing economic circumstances. This reason represents another factor suggesting that use of the CPI for the West region may not represent an improvement over the national index.

Another alternative for constructing an external cost adjustment would be to use the Wyoming Cost of Living Index (WCLI), which is published regularly by the Wyoming Department of Economic Analysis. The WCLI is composed of two parts. First, the WCLI computes a comparative index, comprised of the 23 counties in Wyoming on a semi-annual basis. Second, the WCLI computes inflation rates twice a

year for each of five Wyoming regions as well as for the State as a whole. It is the second part of the WCLI that is relevant to the discussion below.

The WCLI is based on price data for 140 items obtained in a quarterly survey conducted in 27 Wyoming cities and towns. The items in the index are classified into six categories: (1) housing, (2) transportation, (3) food, (4) recreation and personal care, (5) medical, and (6) apparel. An important advantage of this index is that the WCLI is able to capture price movements that are unique to Wyoming for geographically immobile goods such as housing. However, a limitation of this index is that it covers only goods that are widely available in Wyoming communities. For example, the WCLI excludes items that might be available only in Wyoming's larger communities, such as personal computers, whose prices have been falling over the past decade. Also, it does not include goods that may be unavailable in Wyoming or else available at lower prices from out-of-state vendors. Wyoming shoppers, especially those living near Billings, Salt Lake, Ft. Collins, and Scottsbluff, are notorious for taking their business out-of-state and "leakages" in retail purchases from the State's economy has long been a source of concern to local businesspeople. Catalogue and internet purchases are becoming increasingly significant sources of goods sold to Wyoming residents as well. Additionally, from a technical standpoint, the WCLI has not yet been adapted to incorporate the types of changes recommended by the CPI Commission. Figure 3 compares the implied rates of inflation for the WCLI with those from the CPI-U. As shown, the WCLI index has been higher than the CPI-U in recent years.

Figure 3
Implied Inflation Rates -- CPI-U vs. WY Cost of Living
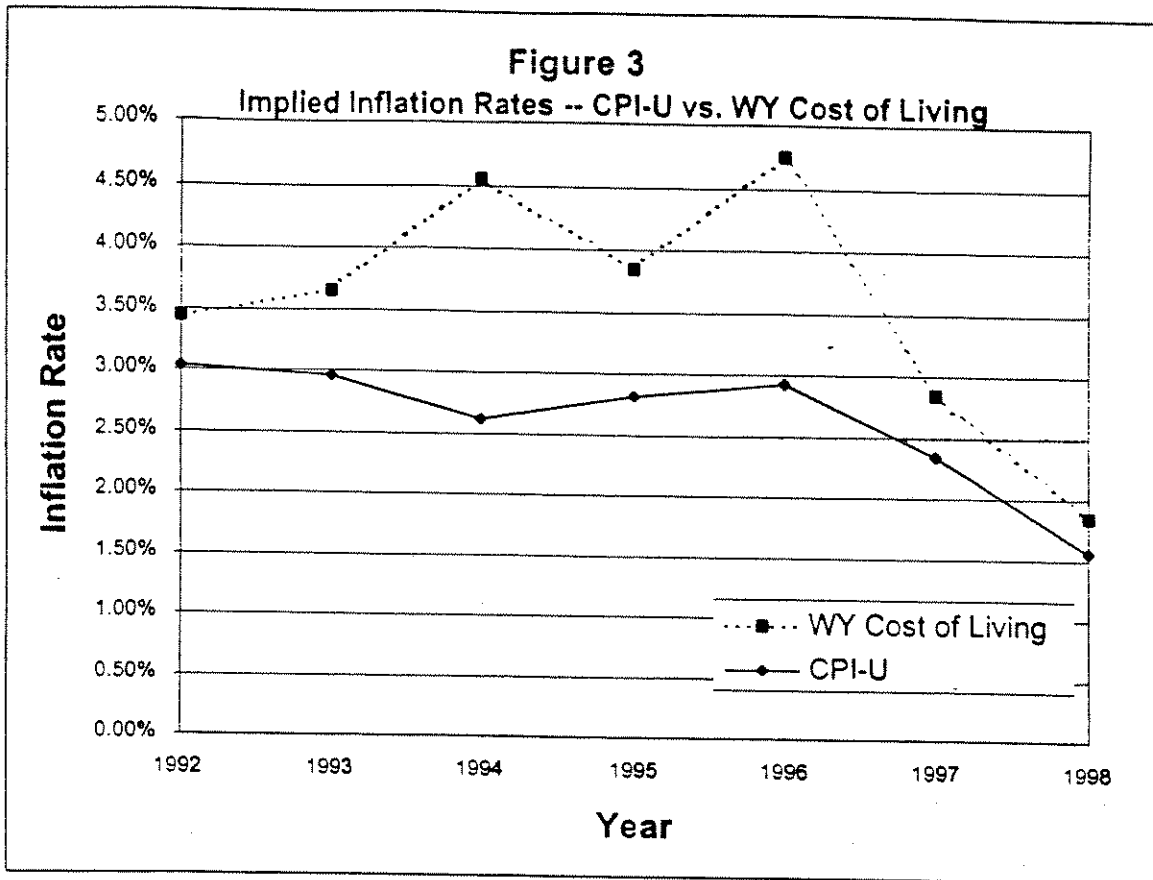
4. Conclusions

This report has addressed the question of how to choose an appropriate external cost

adjustment, or inflation factor, for use in Wyoming K-12 public education finance. It has

reviewed several alternative indices of inflation including the national employment cost

index as well as national and regional consumer price indices. Also, possibilities for

using and/or further developing Wyoming employment cost and price increase data were

explored. Choosing among the many alternatives is not easy; but the choice will be better

informed if three principles or facts are taken into account. First, there is no way to

design an external cost adjustment factor that will be unambiguously superior to other

approaches. All existing inflation indices have limitations and sources of inaccuracy.

Additionally, Wyoming could develop its own approach to computing an external cost

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adjustment. Yet, no matter how much money is spent and no matter how carefully this adjustment factor is calculated, there would be no way to "prove" that the resulting figure is an accurate estimate of inflation facing Wyoming public schools. In fact, there is no way to know whether it would be more accurate than another index value that can be downloaded in less than a minute from the U.S. Department of Commerce, Bureau of Labor Statistics website. Second, Wyoming's economy and the various regional economies within Wyoming are closely linked to market conditions prevailing elsewhere, including internationally. Links between Wyoming's economy and world markets for minerals is a simple, but very important, example in this regard. In consequence, it makes no sense to view wage and price movements in Wyoming as if they were independent of wage and price movements in the U.S. and in other parts of the world.

Third, as a practical matter, an accurate external cost adjustment probably is not currently available from current Wyoming data sources. The Wyoming Department of Employment collects occupational wage data, but does not presently publish data on employer costs of fringe benefits for Wyoming workers. Consequently, a Wyoming analogue to the BLS employment cost index of total compensation cannot now be developed. Also, the Wyoming Cost of Living Index (WCLI) covers a narrow range of goods purchased by Wyoming residents from within Wyoming and has not yet incorporated important changes recommended by the CPI Commission. In principle, additional data could be collected and improved statistical procedures could be implemented in the construction of either an employee compensation index or a price index. Whether these steps are worth taking for the purpose of making external cost adjustments for Wyoming K-12 education finance, however, is questionable. Data must

be collected by survey and any indices developed will be subject to sampling error. Also, Wyoming is a small state and many occupations that may be attractive alternatives for those trained as educators are all but unrepresented in the State's economy. Prices of items purchased out-of-state as well as through catalogues and the internet may be more difficult to obtain than the every-day, widely-available items currently included in the WCLI. Nevertheless, more appropriate external cost adjustment factors could be computed from Wyoming data with larger expenditures of public funds. If this approach is chosen, the cost and length of time needed to implement it should not be underestimated.

If an acceptable external cost adjustment cannot be developed from Wyoming data sources, federal data sources would be the only viable alternative remaining. As indicated above, the best two indices currently available for the purposes at hand are the Employment Cost Index (ECI) and the Consumer Price Index (CPI). If either of these indices is selected, annual values should be used rather than values from particular months or quarters in order to minimize seasonal effects. Whereas the ECI reflects costs of employee compensation seen by employers, the CPI reflects cost faced by employees attempting to maintain a particular standard of living. MAP has suggested that subindices of the ECI be applied to make the desired cost adjustment. This recommendation is consistent with a goal making educator salaries in Wyoming competitive with what can be earned in other lines of professional work in the United States. The CPI, on the other hand, is aimed at measuring how much additional income consumers will need to be just as well off with a new set of prices as with an old set of prices. Thus, part of the choice between the two classes of indices is philosophical: Is it

more appropriate to take the employer's perspective (the ECI) or that of the employee (the CPI) when making an external cost adjustment? Additionally, a portion of the decision rests on the particular limitations of each index. For example, use of the ECI would appear to grant compensation increases to educators and other school district personnel based on the expansion of labor productivity in non-teaching professions. Use of the CPI would grant compensation increases to people in rural (most) areas of Wyoming on the basis of price increases experienced in major U.S. cities. Finally, a portion of the decision just comes down to money. As noted above, the CPI-U has suggested lower rates of inflation than the ECI, even though the CPI-U is widely regarded as an overestimate of price inflation. After incorporating improvements recommended by the CPI Commission, the CPI-U will probably provide lower estimates of price inflation in the future.

Year	CPI-XU	Implied Inflation	CPI-U	Implied Inflation
1991	101.28		136.19	
1992	103.77	2.45%	140.32	3.03%
1993	106.38	2.51%	144.46	2.95%
1994	108.67	2.15%	148.23	2.61%
1995	111.43	2.54%	152.38	2.81%
1996	114.37	2.64%	156.85	2.93%
1997	116.76	2.09%	160.52	2.34%
1998	118.30	1.32%	163.01	1.55%

Notes: Both indices are yearly averages based upon the twelve monthly values for a given year.

The CPI-XU is the CPI using geometric means for all urban consumers.

The CPI-U is the CPI (original method) for all urban consumers.

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