Developing a Regional Cost Adjustment for the Wyoming Education Finance Model

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Overview

Regional cost adjustment in Wyoming is meant to adjust school funding to account for uncontrollable cost differences among districts. While these cost differences may occur due to regional differences with respect to fuel, procurement costs, etc, the primary determinant of a district's operating costs are labor costs thus the regional cost adjustment in Wyoming is performed by estimation of district labor cost variations. Since 2001, regional cost adjustment in the Wyoming school finance model has been determined by use of the Wyoming Cost of Living Index (WCLI). The reasoning behind this use was simple; it was assumed that labor costs in an area would need to compensate a teacher for local variations in the cost of living; therefore the cost of living index should proxy local wage variations. Use of the WCLI in this way, which was never its intended use, has many shortcomings. Principle among these is the fact that compensation differences among districts are determined by many other considerations as well, including remoteness, recreational opportunities, climate, natural amenities, local service levels, and benefits levels. Omission of these other considerations will create a bias in the index toward those places where costs of living are of more importance (more urban centers) and away from those places where cost of living is not as important (more rural areas). Additionally, if some areas include access to benefits or attractions that are not usually priced, such as would be the case in an area of unusual recreational opportunities, a cost of living index may overestimate the importance of consumer goods to a person's well-being and therefore over-estimate the local price of labor.

To avoid these problems, development of a regional cost index should include consideration of those other factors affecting compensation levels. It is the position of this report that to estimate such an index, a hedonic wage estimation be used. A hedonic wage identifies the factors that affect a teacher's willingness to accept a salary, such as their own qualifications, characteristics of the teacher's environment, characteristics of the district making the offer and characteristics of the community in which the district is located. It then uses measures of these factors to estimate a predicted salary level statistically. Using these salary predictions an index of regional labour costs can then be constructed. Such and analysis will account for the fact that

- A worker cares about the benefits and monetary compensation they receive.
- A worker's own personal qualifications will influence the amount they are willing to accept in salary. Such qualifications include years of experience and educational attainment.
- A worker will care about the conditions in which they work. For a teacher, conditions that matter include characteristics of the classroom, including pupil/teacher ratio, and characteristics of the student population.
- A worker will care about the characteristics of the community in which they work. These characteristics can be measured directly by considering such community characteristics as local climate, distance to metropolitan centers, national parks, mountains or other natural features deemed potentially important to personnel, and population density characteristics, which allow one to proxy the presence of local services such as theaters, restaurants and retail outlets.

The index is then used to define uncontrollable cost variations districts face locally. Using these results, it is then possible to construct a regional cost adjustment index. Such an index will have the ability to predict the increases in salaries required to attract teachers to more remote districts or to more expensive areas to live based on what current teachers have accepted in salary to compensate them for these challenges. It is important to recognize that such an estimation will not predict what a teacher *should* earn, but rather how teachers' salaries will vary when changes occur in personal qualifications or as the characteristics and conditions experienced in districts vary.

This report describes how such an index could be developed in Wyoming. The resulting index has several advantages over the current index used.

1. It considers the affect of additional factors that impact regional compensation levels required to attract teachers and estimates their impact on teacher salaries.
2. It reduces the funding bias toward larger more urban districts.
3. It avoids the incentive to offer salary levels below levels funded for. As described in the report, annual re-estimation of regional costs will reduce funding to districts that do not pay compensation levels commensurate with funding levels. The current law will not and therefore actually creates an incentive for districts that receive more funding than local labor costs require to utilize the funding for other uses.
4. The total variation between lowest and highest cost districts in the State is grossly over-estimated under the current system based on current salary outcomes. The current system imposes a funding variation between the highest and lowest funding rate of 59.6% in adjustments allocated to districts. Evidence presented here suggests the appropriate variation based on current salary data is only 29.4% between highest and lowest cost districts. This problem in the current law exacerbates the problem in Point 2.
5. The use of the WCLI as implemented in the current law actually reduces total funding to the school finance system because the current index used has a base value of less than 100. The school finance model uses school prototypes to define the required district funding given programs and student numbers. The implementation of the current regional cost adjustment then reduces funding by approximately 0.73% because the index base is 3.6% below the level consistent with the statewide average levels used in the prototype models. Total funding is not reduced by the full 3.6% because of the funding bias in Point 2. Larger, more urban districts tend to receive larger funding increases relative to the funding reductions smaller or more remote districts receive. The proposed index is centered at a value of 100 and therefore does not reduce funding levels in the system as the current system does.

Total cost of the proposed regional cost adjustment is $20.1 over current education funding levels. This increase in funding is primarily due to the fact the index is centered at a higher value than the index used in the current law (as described in Point 5 above). This is also partially due to the fact that smaller more remote districts are treated more generously under the new index due to the consideration of a wider set of salary influences. If it were the case that the index used in the current law was re-centered at 100, however, total cost of the index would be higher than that proposed here (by approximately $4 million).

The estimation of regional cost differences is a difficult issue, both statistically and legally. As described in the report, regional cost adjustment may require that the State consider its responsibility with respect to district retention outcomes. If the State is required to fund districts to ensure all districts have equity in inputs then the interpretation of the proposed index is more difficult. In districts where retention problems are more severe, salaries may buy less retention than those with less severe outcomes. Under such circumstances, the proposed index will only reflect the lower bound of the cost difference between two districts with widely different retention outcomes. If it is the case the state is required to ensure only that student outcomes are equivalent then district differences in retention do not matter and the proposed index is a valid estimate for regional cost variations among districts. In Wyoming, available evidence suggests that retention does not affect student assessment scores and this may imply that the State is not be responsible to ensure district retention outcomes are equivalent. Whether the State is required to provide funding levels to ensure input equity or outcome equity has to be determined explicitly. The answer to this question will then define exactly how any regional cost index (including the one used under the current law) should be interpreted.

If the State is required to ensure input equity, the proposed regional cost adjustment method cannot estimate the required amount needed to reverse poor retention outcomes (the WCLI cannot either). In fact, there is no way to estimate this using current data. If it is the State's will to fund retention, given that estimates of appropriate compensation levels cannot be defined, this report recommends that in such cases hold harmless funding be implemented to ensure that a negative change in funding levels does not exacerbate any pre-existing retention problems. Further, if the State decides to support retention, it is the recommendation of this report that funding meant to improve retention outcomes be earmarked for salary compensation only. Using funds for another function only indicates a district is over-funded and therefore should have its compensation funding reduced. Districts should be accountable not only to ensure that teachers are properly compensated to ensure the expected quality of teacher is hired, but if the State is required to support retention outcomes and foes so with additional funding for salaries, districts should not be able to undermine such efforts through discretionary reallocations of school funds. To determine whether retention problems exist and whether they are caused by compensation problems, it is the recommendation of this report that a retention study be conducted to answer these questions. This adds an estimated $150,000 to the costs of the recommendations in this report.

Overall, this report recommends that a new regional cost index computation be put into practice. The proposed index methodology will ensure that future funding biases currently contained in the index computation are avoided and will allow a more accurate estimation of regional cost differences than the current law provides for. The total cost of the regional cost recommendations contained in this report is $22.5 million (if the State determines it is responsible for retention outcomes). By removing existing biases and improving funding to districts that currently experience compensation challenges that the existing funding model ignores, the implementation of the proposed adjustment can only be to the benefit of the Wyoming public education system and that would appear to make it well worth the investment.

I. Introduction:

The Constitution of Wyoming demands equity in opportunity of education across the State, and court judgments have determined that equity be defined on a cost basis. In response to a series of Supreme Court judgments in the mid-1990s, the State of Wyoming and Management Analysis & Planning Associates, L.L.C. (MAP) embarked upon development of a cost-based education finance model that met the demands of the State Supreme Court.[1] While a full description of this model is outside the scope of this work, conceptually the model can be described very simply. A district's education block grant is the product of two computations. First, the basic education block grant level is determined by estimating the operating costs within a district using a series of instructional-cost prototypes developed by MAP. These prototypes are computed using statewide average costs and estimated using district-provided data. Once the level of the block grant is computed, a second adjustment, referred to as the Regional Cost Adjustment, is used to modify district funding levels for uncontrollable cost differences in the provision of education present across districts.[2] Such differences may arise due to two general sources of cost variation:

(a) Input price differences: Such differences may arise due to local energy, labor or other input cost variations. Labor costs may differ regionally if some districts face higher living costs, are more remote, if local amenities, services, conveniences or other local advantages make employment in certain areas of the State more desirable, or due to differences in local labor market outcomes.

(b) Productivity: Regional productivity differences may be present across districts. Most often these occur due to differences in potential "economies of scale". Such economies may arise due to the presence of relatively small schools or districts, which require a higher average level of inputs per student to provide an equivalent quality of education.

Regional cost adjustment in Wyoming attempts to adjust funding levels across districts to account for the first type of cost variation; that due to input price differences. Separate adjustments are made in the current finance model to adjust for differences in cost due to productivity variation.[3]

In practice, a district's regional cost adjustment is computed through the definition and estimation of an index that describes how the uncontrollable cost variations every district experiences compare to those other districts in the State face. These index values are then used to scale district block grants accordingly. For example, if a district faced input costs that are 10% greater than the average in the State, the district would be assigned a regional cost index value of 110, and they would receive 110% of the block grant level estimated using the prototype models in the first stage of the school finance computation. A district that faced input costs 5% lower than the average would receive 95% of the basic block grant level, as without this adjustment their block grant would allow the district to finance programs and expenditures other

[1] This model is described in Guthrie, *et al.* (1997).

[2] Previously this adjustment has been referred to as the Regional Cost of Living Adjustment (RCOL), which was appropriate when only the Wyoming Cost of Living Index (WCLI) was used to compute it. As was described in Godby (2002, the adjustment is more properly referred to as a Regional Cost Adjustment since district cost variations are not only due to variations in the local cost of living but other quantifiable factors as well.

[3] These other adjustments include a Small District and Small School Adjustment. Both allocate additional resources to districts based on district size and the number of small schools within a district.

districts with higher costs could not. Without a regional cost adjustment this advantage would violate the equity requirement the state funding model strives to achieve.

Nationally, there has been a growing demand for better methods of estimating regional differences in uncontrollable costs of education. A common question in the discussion of regional cost adjustment asks why cost variation cannot be accomplished by reimbursing directly for cost differences actually experienced. There are three reasons arguing against such a procedure: (i) the "market" for education inputs is not competitive.[4] If it were, actual district input expenditures would reflect the true costs of education and could be used to estimate underlying cost differences and reimbursement directly. Since input markets are not competitive, although expenditures may be influenced by actual cost differences, they may also reflect discretionary choices by school districts that do not reflect these costs. Resource allocation must differentiate between *uncontrollable cost differences* and discretionary choices or *controllable cost differences* to avoid this bias. (ii) Allowing education funding to be determined by actual expenditures would remove the incentive for districts to minimize their costs and deliver education services efficiently, thereby increasing the general cost of education to taxpayers. (iii) The principle of educational equity requires that given the potential existence of cost variation, estimation of these relative cost variations across districts must be carried out in an attempt to meet the equity goal. Without comparison of all district's costs and the use of an estimation method that accounts for controllable outcomes, it would be uncertain whether cost variations reflected actual cost differences, or differences in discretionary choices by districts. If variations occurred due to the latter reason they could violate the State's equity objective.

Historically, nine states including Wyoming have made some form of regional adjustment for differences in input costs in their school finance models. A summary of the methods used to estimate uncontrollable regional cost variations across these states is contained in Table 1. Of these nine states, four (Alaska, Colorado, Florida and Wyoming) have utilized or continue to utilize a price index to adjust district block grants. Three other states (Massachusetts, Ohio and Tennessee) have used use wage data from similar occupations to construct a wage index, which was then used to adjust district funding levels for district differences in personnel costs. Of the remaining two states, Virginia's adjustment is determined by legislation mandating district adjustments at discretionary levels, and Texas uses a statistically estimated adjustment based on a variety of factors in addition to price or wage costs. Of the four methods (use of price index, wage index, discretionary choice or statistical estimation using a variety of factors that affect regional cost), this report will recommend the use of a statistical adjustment.

[4] Markets for educational inputs such as teachers and school personnel are not competitive. For example, educational staff are specialized, and often highly unionized, while school districts are often the dominant or only consumer of this specialized labor in many areas. For these reasons, prices at any point in time may not reflect the true values underlying them and may differ across regions due to the market power suppliers or consumers have. For example, highly unionized areas may be able to win wage concessions other less organized areas cannot. Alternatively, in areas where school districts are the only consumer of teachers' services, they may be able to win wage concessions that lower the cost of education. In either case, a dollar spent in a district would not buy an equal level of services in exchange. Absent such market "imperfections", prices would tend to equalize across localities to the "competitive market price", the lowest price possible given costs.

Table 1: Survey of State Regional Adjustments for Input and Productivity Differences

State	Adjustment Methodology
Alaska	An input cost adjustment is made using a cost of living index for each of the 54 districts in the state.
Colorado	The Legislative Council of Colorado constructs a cost of goods index measuring differences in the costs of housing, goods and services across different regions of the State. Index values across the regions, which range from 1.007-1.630 are applied to each district's personnel portion of the statewide base allocation.
Florida	An input adjustment is made using a moving 3-year average of the Florida Price Level Index produced annually by the executive office of the Governor. This is applied in the state funding formula to each of the 67 districts. Index values are limited to a range of 1.000 and 1.2279.
Massachusetts	An input adjustment is made using a "wage adjustment" factor. This wage index is computed using all occupations in 25 regional areas and is used to adjust for differences in cost of living and salary expectations across the State. In 1998, the adjustment factor ranged between 0.834 and 1.073. Additionally, no district with a high incidence of poverty can be assigned an adjustment factor less than 1.00.
Ohio	An input adjustment is made using a "cost of doing business" factor constructed using wage data for all workers in the State. Since Ohio's counties are all rectangular in shape, an index value for each district is defined using the average weekly wages in the county in which each district is located and the average weekly wages in each of the four contiguous counties. Index values are then rescaled to values ranging from 1.00 to 1.089 and used to compute each district's school funding support. Ohio's funding model is currently under review.
Tennessee	An input adjustment is made using a comparison of average local non-governmental wages and average statewide non-governmental wages. This "costs of positions" adjustment is then used in the State's funding formula.
Texas	Using a comprehensive methodology that uses regional district data including geographic location, size, area, density, educational and teacher characteristics, economic conditions, teacher's salaries, enrollment growth and cost of living, a statistical estimation is performed to construct a Cost of Education Index, which is then used to adjust district funding.

Virginia	An input cost adjustment is made for the seven county and two city districts near Washington, DC to reflect the higher cost of living in those areas. Instructional salaries are increased by 9.83% while support salaries are increased by 19.07%.
Wyoming	Currently, the Wyoming Cost of Living Index (WCLI) is used to scale block grant amounts in an attempt to adjust for regional input cost differences.

Sources: Table derived from Godby (2002) based on information in Fowler and Monk (2001), Thompson and Silvernail (2001), Smith (2002).

Given the political implications of resource redistribution in school funding decisions, some states have ensured that districts may only benefit from such adjustments (Colorado, Florida, Ohio and Virginia) by allowing regional cost variations only to increase funding. Another (Massachusetts) ensures that such considerations cannot negatively impact disadvantaged areas. While framing regional cost adjustments positively would be politically less difficult, in Wyoming such an adjustment frame should not be defined unless it is the State's desire to increase the general level of education funding in the State. In the computation of base block grant levels, school prototype and district prototype models assume statewide average costs to achieve current education outcomes. Using a regional cost adjustment scaled such that it could not reduce any district's funding level would be inconsistent with the first stage of the district funding computation, as some districts have lower than average regional costs and therefore require less funding than average to achieve the educational goals all districts are responsible for. Further, the use of such an indexation method would serve to inflate funding across all districts beyond the levels estimated to be necessary to achieve current education outcomes.[5] The decision of how to scale a regional cost adjustment index (at the statewide average or such that no district's block-grant base can be reduced in this adjustment) is considered in more detail later in this report.

The differences in how states approach the problem of regional cost variation is illustrative of the problems faced in defining such adjustments. Some state adjustments, like that used in Texas, use complex statistical estimation to determine input cost variation across districts. Others use simpler adjustments based only on existing regional wage or price indexes, or direct legislation of a fixed adjustment. The choice of how to adjust for regional cost variations reflects a compromise between simplicity and accuracy. A more complex adjustment like that used in Texas, statistically estimated and considering many factors that affect cost variation, will be less transparent and intuitive. It will, however, be more accurate as it considers a wider set of factors that contribute to regional cost variations. A simpler adjustment based on a wage or price index that only considers one factor affecting regional cost variations and excluding all others, is less likely to reflect true cost differences and more likely to create funding biases across districts. It will, however, be easier to describe and compute. This report contends that Wyoming's responsibility to fund districts in an equitable manner requires that

[5] In fact, if the regional cost adjustment index were scaled such that no district's funding would be reduced after the first stage of computation, and one assumes that education outcomes are proportional to educational expenditures, this would be equivalent to a statewide decision to improve education outcomes beyond current levels in the State by increasing general levels of education funding.

accuracy be of primary concern, and therefore a statistical estimation of regional cost variation is recommended.[6] Given funding trends and court decisions across the country in the last two decades, the importance of identifying more accurate regional adjustment methodologies will grow as additional states adopt such adjustments in the future. Wyoming's efforts will influence also other state's decisions as the problems this state faces in defining such an adjustment are common to many regions just beginning to consider the issue.

II. The History of Regional Cost Adjustment in Wyoming

In response to a series of State Supreme Court judgments in the mid-1990s, the State of Wyoming and Management Analysis & Planning Associates, L.L.C. (MAP), a consulting firm with expertise in public school finance, embarked upon development of a cost-based education finance model. These efforts resulted in a comprehensive funding model that described instructional prototypes and a set of separate expense adjustments to define school district funding levels in the State.[7] To estimate required expenses, prototype models based on historic data were defined. MAP originally presumed that Albany and Laramie County personnel costs were likely the outcome of the most competitive labor market in the State due to their proximity to Colorado and the Denver metropolitan area and therefore used these to define the reference case for personnel expenses. To estimate a reasonable regional cost adjustment to account for the fact that personnel costs vary across the rest of the State, and since personnel costs determine the majority of a school district's operating costs (approximately 75%), MAP assumed local labor costs would be approximated by the Wyoming cost of Living Index.[8] It was further presumed that salary levels would be determined only by local cost of living considerations thus a regional cost adjustment utilizing a cost of living index was recommended.

To implement such an adjustment, MAP recommended that a modified version of the Wyoming Cost of Living Index (WCLI) be used.[9] At the time, the WCLI defined a cost of living index value for each of Wyoming's 23 counties (relative to the statewide average) by pricing 140 separate items representing housing, transportation, food, recreational and personal care, medical and apparel expenses for a hypothetical consumer in 15 sample sites.[10] In the intervening period, and partially in response to the needs of the school-finance model, the WCLI has been expanded to allow data collection in all 23 counties of the State. This change has increased the number of sample sites from 15 to 28, and county WCLI values are defined by outcomes in county sample

[6] It should be noted that Wyoming's educational equity provision in their State Constitution imposes a stricter standard for regional cost equalization than other states listed in Table 1 are required to achieve or have attempted to attain.

[7] This model is described in Guthrie, *et al.* (1997).

[8] Facility exists for other operating expenses, such as utility costs, to be adjusted for elsewhere in the model. MAP also considered the use of a labor-cost wage index, however, they determined that the data to construct such an index for Wyoming is unavailable, a finding also argued by Gerking (1999) when discussing how external or inflationary adjustments to the school finance model could be made.

[9] This index is constructed from data collected by the Economic Analysis Division of the Department of Administration and Information.

[10] Counties in which the sample site was located received an index value based on the cost of the basket of 140 goods at that sample site. The remaining eight counties received index values imputed from the costs at these 15 sites and based on an assessment of local similarities between unmeasured counties and those measured.

sites. This pricing survey is performed every six months, during the second and fourth quarters of the year.[11]

When constructing their suggested regional cost index for Wyoming, MAP noted that housing costs differ widely in the State and that higher housing prices, especially in the Jackson area, reflect an "amenity value" that is determined by beneficial local attributes that also influence salary decisions. MAP reasoned that because natural amenities in Teton County and to a lesser extent, other resort areas of the State, increase housing costs but also increase the attractiveness of employment positions, increasing personnel funding to compensate for housing cost variation would create a "double compensation" in these areas. Such an adjustment, they argued, would subsidize salaries for differences in goods prices *and* amenity benefits people enjoy when locating in such places, creating an unfair funding advantage for regions with more natural amenities. To overcome this problem, MAP recommended dropping the housing component from the WCLI when making geographic cost adjustments. MAP also recommended dropping the medical expense category when creating a regional cost index as they argued that teacher's health benefits are relatively uniform across the State and that the WCLI captured local medical cost disparities that were unlikely to affect the average education employee. To implement a regional cost adjustment, MAP recommended the following 3-step methodology:

- Define county goods price differences by using WCLI data after removal of housing and medical expenditure categories, and adjusting the weights of the remaining expense categories (transportation, food, recreational and personal care, and apparel expenses) to maintain total expenditure.
- Define new county WCLI values relative to the population-weighted average cost of surveyed items in Laramie and Albany Counties, which served as the index reference (this index value was assigned an index value of 1.0). Note that the WCLI is normally scaled with respect to the statewide average price of goods surveyed, which is approximately 4% less than the cost of goods in Laramie and Cheyenne.
- Adjust personnel costs for each of the 48 school districts in the State by multiplying their estimated base funding level by the revised WCLI value for the county the district is located in. Any index value greater than 1.0 would increase that district's funding, while values below this figure would reduce funding relative to prototype levels.

In 1997, the resulting index MAP developed had a 16.4% variation between districts in the lowest (Fremont) and highest (Teton) counties, with districts in Laramie and Albany counties realizing little or no regional cost adjustments as the prototype models in the funding formula used salaries in these areas to define reference salaries. In 1998, responding to comments and criticisms made regarding their proposed regional cost adjustment methodology, MAP revised their recommended regional cost adjustment procedure (MAP, 1998). Reports critical of the original adjustment proposal argued that the housing expense category of the WCLI included expenses that are not influenced by amenity values, such as heating and utility costs, and such items should remain in the index since geographic variations in these expenses may influence local salary decisions. MAP's revised index procedure allowed for these criticisms by recommending only exclusion of the actual shelter component from the WCLI, as well as

[11] Consideration of the WCLI, and potential improvements to the sampling process used to estimate it are described in Godby (2002).

medical expenses in a modified-WCLI used to determine regional cost adjustments.[12] To avoid sudden changes in the district funding due to survey variations, MAP also recommended using a 3-year rolling average of WCLI values (the average of the previous six WCLI survey outcomes) to define regional cost adjustment factors. Implementing these changes, the resulting regional variation between the lowest and highest cost counties (Fremont and Teton Counties respectively) in the index rose from 16.4% to 20.6%. MAP indicated concern that this was the maximum variation they deemed acceptable without additional empirical study.

In general, MAP's proposed funding model and its methodologies have been upheld as constitutional and acceptable as a means of defining education block grants, however, in a judgment written in 2001 some funding adjustments in the model were determined to be unconstitutional. Specifically, the Court ruled the following areas of the model required modification:

- Inflation adjustment
- Administrative and classified salaries
- Maintenance and operations
- At-risk students
- Vocational education
- Classified wages
- Small districts
- Small schools
- Regional cost adjustments.[13]

Smith (2002) describes suggested responses to these issues. Only discussion of the last adjustment is relevant to this report. The Court held that removal of the housing and medical components from the WCLI *"undermined its validity"*. In its ruling of February 23rd 2001, the Court ordered *"statewide average salaries must be adjusted for the full cost-of-living differences using either the entire WCLI or another reasonable formula which includes a full housing component, including the rental of shelter costs, and a medical component to cover costs not included in the benefits portion of the salary component."* As described in Wolkoff (2002), in accordance with this ruling, MAP recommended a revised regional cost adjustment mechanism utilizing all components of the WCLI. It should be noted that MAP and the State did not agree with the use of the full index. In previous documents MAP had found that actual teacher and other salaries paid in Teton County School District #1 did not exceed the level of adjustment they had previously recommended, and this was the basis for their contention that any increases greater than their recommended amount required additional empirical study. Given the Court ordered requirement that by July 1st, 2002 and without time to estimate an alternative formula, in accordance with the Court's ruling MAP recommended the full WCLI be used as the regional cost adjustment index. [14]

[12] This revision removed only rental costs of housing from the index with all other sub-components of the housing category retained, including heating and utility costs, and the costs of furnishings and housekeeping supplies, etc. The revised index maintained the relative importance of the all components included to reflect their relative costs in the actual WCLI survey.

[13] State of Wyoming et. al. v. Campbell County School District *et al.,* February 23, 2001. Text of this ruling is available online at http://legisweb.state.wy.us/2001/schoolFinance/01decision.htm.

[14] This report is the result of that disagreement, as the State has continued to investigate whether better methods exist with which to estimate regional cost.

Using the most recent WCLI surveys and the Laramie-Albany county average as the comparative base, MAP estimated that use of the complete WCLI index with housing and medical categories would increase Teton school district's funding by an additional $2 million and Laramie #1's by $70,000, while reducing all other districts' total funding by over $20 million (Wolkoff, 2002). The impact of including all items in the indexation procedure also had the effect of changing the relative order of index values as described in Table 2, thus creating an additional redistribution of total education funding across the remaining 46 school districts in the State. MAP attributed the extreme change in education funding levels due to the inclusion of housing and medical costs to two reasons:

1) Albany and Laramie Counties have higher housing prices than the statewide average, and the inclusion of housing prices increased the reference base to which all other county's goods costs were compared. This lowered most other county's index values and reduced the regional cost adjustment most districts received.

2) The 3-year WCLI average from the fourth quarter of 1997 through the second quarter of 2000 had a variation between its highest (Teton) and lowest (Weston) cost counties of 46.7% when all items were included. Since this increased variation in the index was primarily due to the very high cost of housing in Teton County relative to the rest of the State, including housing costs in the adjustment primarily benefited Teton County.

Table 2: WCLI Average Values 4Q1997 to 2Q-2000

County	Index value w/o Shelter and Medical	All Items WCLI Value	Change due to index redefinition
Albany	99.0	103.3	4.3
Big Horn	99.5	93.1	-6.4
Campbell	97.7	98.9	1.2
Carbon	103.5	97.6	-5.9
Converse	97.5	94.4	-3.1
Crook	98.7	95.5	-3.2
Fremont	97.7	95.7	-2.0
Goshen	95.8	92.9	-3.0
Hot Springs	100.8	95.3	-5.5
Johnson	103.0	101.2	-1.8
Laramie	97.5	102.4	4.9
Lincoln	101.3	95.6	-5.8
Natrona	99.8	98.3	-1.5
Niobrara	98.7	91.7	-7.0
Park	101.0	98.7	-2.3
Platte	98.2	95.1	-3.0
Sheridan	103.7	102.0	-1.7
Sublette	103.7	105.6	2.0
Sweetwater	102.2	100.4	-1.7
Teton	110.8	132.9	22.0

Uinta	102.5	100.7	-1.8
Washakie	97.5	93.9	-3.6
Weston	95.0	90.6	-4.4

Sources: Black (2001), Godby (2002).

To partially offset the decrease in total school funding across the State, MAP recommended that the reference base in their adjustment mechanism be changed from the average of the Laramie-Albany County WCLI values to the state-wide WCLI average value. Doing so increased statewide school funding by $9 million, as it lowered the regional cost adjustment index base and inflated the index values for all districts.

In 2002, the Wyoming Legislature authorized a study to determine if an alternative index could be defined to provide a "reasonable formula" to measure differences in costs that affect salaries across districts. Results of that study, described in Godby (2002) recommended that an alternative index should be defined, and that the most appropriate method of doing so was to use a statistical estimation method similar to one already employed in the Texas for regional adjustment. That is, a statistical estimation of regional cost adjustments was recommended based on actual teachers' salaries in the State, estimating the relationship of these salaries to a wide range of teacher characteristics, district characteristics including a district's remoteness, and cost of living

III. Recent Findings Regarding Regional Cost Adjustment in Wyoming

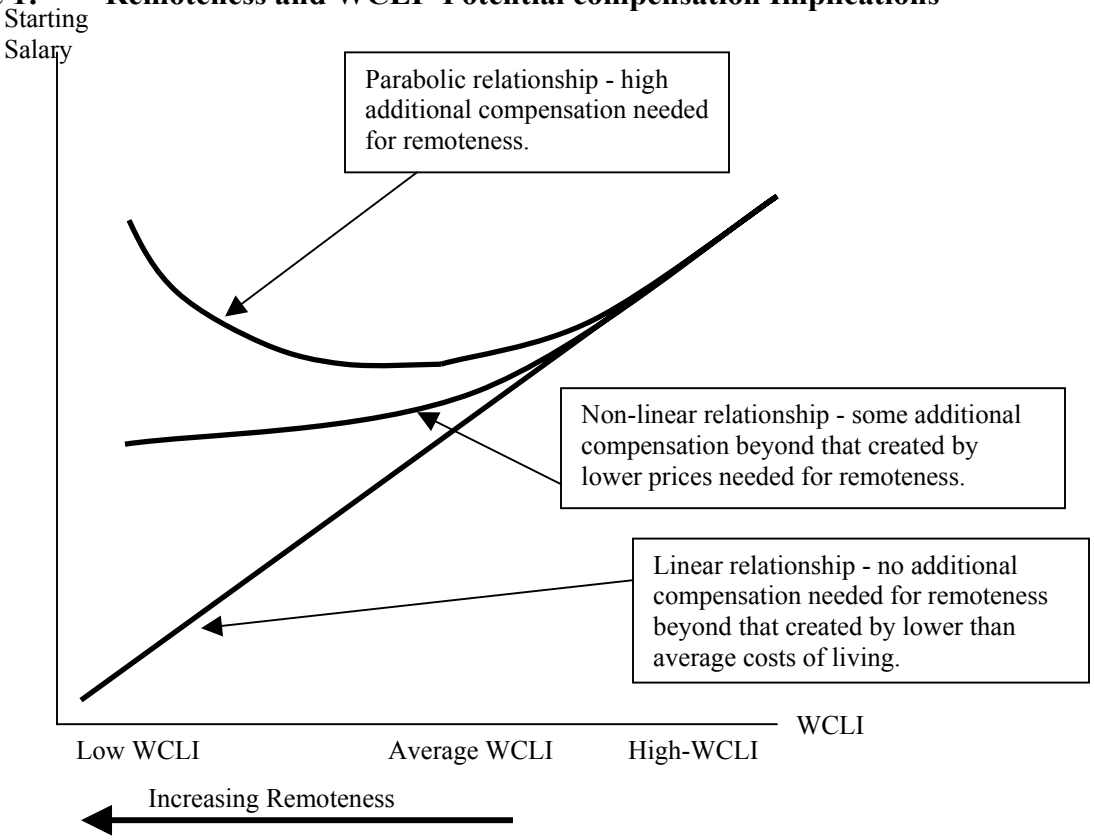
The primary argument made in Godby (2002) for the adoption of a statistical estimation of regional cost variations was based on the fact that the use of the WCLI as the mechanism of regional cost adjustment failed to account for other factors that affect labor costs in many districts. In particular, remoteness is also a key determinant of teacher salaries in many areas nationally, and additional compensation must be paid to teachers to work in such districts.[15] Use of only the full WCLI (including the cost of housing and medical) not only fails to account for this additional and important determinant of teacher salary variation, it actually exacerbates the problem by creating a regional cost adjustment that implies teachers in remote communities require *less* salary. In effect, the use of only a cost of living index that includes housing creates the opposite adjustment to what is required in remote districts. The reason for this is simple to understand: remoteness tends to reduce the demand for housing as there are fewer people in all occupations searching for shelter in such areas. Lower demand for housing results in reduced housing prices. Lower housing prices then result in a lower estimated cost of living in such remote areas. For teachers considering moving to remote communities, relatively lower housing costs do not provide adequate compensation for the reduced welfare they experience living in such a community. If in the past higher salaries and lower housing costs created additional compensation to attract teachers to these remote communities, reducing funding due to the impact lower housing prices have on the WCLI penalizes remote districts.

These ideas are illustrated in Figure 1. If no additional salary adjustment were required for a remote community because of the low cost of housing in such an area, a linear relationship would result between the WCLI and starting salaries. This is shown by the upward-sloped,

[15] Recently, Prince (2003) discusses how financial incentives should be used to alleviate problems with staffing in hard-to-staff schools, particularly those in low-income urban districts. The same arguments can be applied to remote districts.

straight-line in Figure 1. If some additional compensation beyond that created by the lower cost of living were required to attract teachers to more remote or smaller communities, the relationship between starting salaries and the cost of living would be non-linear, with the estimated relationship flattening out in more remote areas as additional compensation required for this characteristic would offset some compensation reduction created by the lower cost of living. This is shown by the second line in the Figure, which flattens out as remoteness is increased in the diagram. In the limit, if remoteness was an important enough cost to teachers, it could completely offset the impact that a lower cost of living has on the necessary salary to attract a teacher. Although the cost of living could be very low in a remote community, a teacher could instead demand a salary comparable to that needed in very high cost areas to accept a position in a more remote area. This would create the parabolic relationship shown by the third line in the Figure. This line indicates a very high sensitivity to salaries demanded to teach in remote communities. Use of the full-WCLI would only be appropriate if the actual relationship between starting salaries and the full WCLI in Wyoming resembled the straight-line. Additional compensation for remoteness would be indicated if the estimated relationship resembled either of the types of curved lines in the diagram.

Figure 1: Remoteness and WCLI- Potential compensation Implications



Godby (2002) attempted to determine whether the current use of the WCLI was appropriate for Wyoming by estimating the relationship between starting teacher salaries reported by districts and the WCLI in each county. Figure 2 updates this test using the starting salaries and measured WCLI values for the 2002-03 school-year. When a statistically fitted trend-line is used to estimate the relationship between starting salaries and the WCLI, the best fit

is not a linear relationship, but instead a parabolic one.[16] This indicates that the compensation implied by the lower costs of living in remote districts is not enough to overcome the impact remoteness or other unconsidered effects have on teachers' welfare and additional compensation appears needed to attract teachers. Further, the actual starting salary paid in Teton County is below that predicted if the full amount implied by the WCLI were needed to attract teachers. Since no general teacher shortage has been apparent in Teton County, a lower actual starting salary than that predicted by the full WCLI suggests new teachers in Teton appear willing to trade off some ability to purchase goods they could afford working elsewhere to live in Teton. To compensate for the welfare loss a reduced ability to purchase goods would create, new teachers in Teton likely consume a greater quantity of recreational and leisure opportunities than teachers elsewhere in the State, or consume other unpriced opportunities that are only available in Teton.[17] Such a relationship is not surprising, since labor market studies regularly indicate that people are willing to trade-off consumption of consumer goods for the additional opportunities areas that have significant recreational and leisure opportunities offer, especially when such opportunities are unavailable elsewhere.[18] Both the parabolic relationship between starting salaries and the WCLI, and the fact that Teton's starting salaries are below those implied by the WCLI replicate the results found previously in Godby (2002).

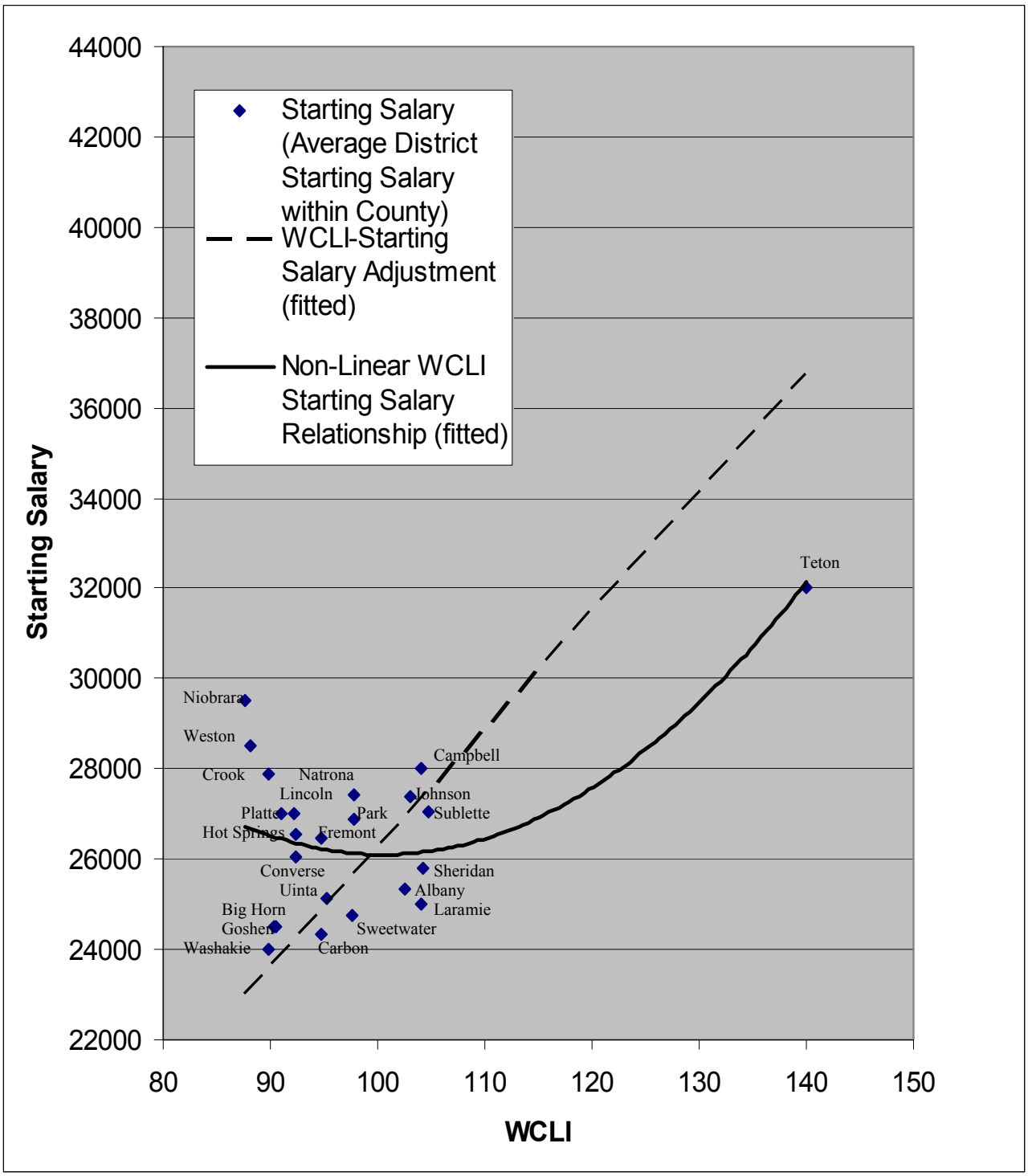
Further consideration of Figure 2 also reveals another pattern. Consider the implied adjustment under the current law represented by the dashed line. Districts in counties above this line receive an adjustment that is less than they actually pay in starting salaries. Consideration of which counties are included in this group reveals that these are the relatively small and more remote districts in the State. Districts below the line actually receive more than they pay in starting salaries, and these include districts in Teton, Laramie, Albany, Sheridan and Sweetwater Counties, among the largest and most developed in the State. If one considers the patterns apparent in the data shown in the figure, smaller districts often pay relatively higher starting salaries than not only the WCLI predicts, but relative to large centers in the State. For example, Weston and Niobrara starting salaries are only exceeded by those in Teton. This reveals further support of the hypothesis that small more remote districts face higher costs to attract teachers. Clearly, as indicated by the dashed line, the current law does not adjust appropriately for districts in such areas, and in fact *the current law appears to systematically over-fund larger districts while under-funding smaller or more remote ones*.

[16] The goodness of fit of a linear trend-line fitted to this data, as measured by its R^2 is 0.25, while a parabolic relationship results in a goodness of fit of 0.43.

[17] Clearly Teton County (Jackson in particular) possesses attributes that could increase a teacher's quality life even though the purchasing power of their salary is reduced due to the high costs of living there. In addition to being perennially rated as one of the top winter destinations in the country, Jackson regularly hosts arts and cultural events that are of national caliber, including for example, symphonies that are broadcast nationally. Other cultural and leisure choices exist in Teton to a degree unparalleled anywhere else in the State of Wyoming. In fact, a resident (teachers and others) in the area may accept a lower salary than the increased cost of living in the area would suggest they need, not because they regularly participate in such activities or events, but merely to have these choices, which are unavailable anywhere else in the State.

[18] Recently this empirical regularity has also been used to explain the wide income distribution gap observed in Teton County. State Senator and private economist Cale Case, commenting on the wide disparity in incomes and wealth observed in Teton in the 2000 Census, explained the findings in this way "People like skiing , they like the outdoors so they're willing to put up with the economic difficulties to be in that environment." (*Index Analyzes Rags to Riches Gap*, Casper Star Tribune, 11/27/03, pp. B1, B2.).

Figure 2: Starting Salaries-WCLI Relationship in Wyoming, 2002-03.



IV. Statistical Estimation of a Regional Cost Adjustment Index in Wyoming.

Academic research considering the estimation of regional cost adjustments suggests that a price index should be used only if such an index accurately proxies actual wage or input cost variations. Such an adjustment method is often most appropriate in highly developed urban centers where other influences affecting salary are more equivalent across places. When other factors beyond the cost of living, such as remoteness or the availability of recreational or other welfare enhancing opportunities differ across places, estimation of regional cost is more accurately accomplished by a statistical estimation that can quantify the impacts all these factors have on the salary demands.[19] This argument, combined with the empirical findings described in Figure 2 formed the basis for the recommendation in Godby (2002) that a statistical study of salary variation with respect to cost of living, remoteness and recreational opportunities be used to estimate a regional cost adjustment index in Wyoming.

It is the recommendation of this report that hedonic wage estimation be used to estimate a regional cost adjustment index. The greatest advantage of a statistical estimation of regional cost is that such a method uses actual cost data directly to estimate regional cost differences and any results can therefore be said to be "cost-based." Estimates will be based on actual salary outcomes and therefore will reflect them. The same cannot be said if a price or wage index is used. Currently, only Texas uses statistical estimates of education costs to determine regional cost adjustments (for a description, see Taylor et al. 2000). While more complicated to define than the use of a price or wage index, estimating a regional cost adjustment index statistically offers the ability to more accurately estimate the uncontrollable input cost variations districts face than an indirect proxy such as a cost of living index. To estimate salary variations statistically, actual cost data is used to define variations in regional costs. To avoid the incentive for administrators to use their expenses to influence future funding, estimating a regional cost adjustment is not conducted by comparing actual district expenditures, but instead by using a statistical technique called regression analysis. This is a well-accepted and powerful tool in identifying not only causal variables that affect outcomes, but also in quantifying the relative influence of these factors on such outcomes. In education finance, regression analysis can also be used to account for and estimate the impact of cost of living, remoteness recreational opportunities, climate and any other regional variations have on salary outcomes in a state. Additionally, once a statistical method estimating costs across districts is accepted and defined, no expertise by government or local administrators is needed to apply the results beyond what is needed to apply adjustment methods used traditionally.

While the advantages of using regression analysis to estimate regional cost differences are significant, there are still disadvantages to such an approach. First, the statistical technique of regression analysis is complex, and therefore the construction of an index to adjust for regional education input cost variations is not transparent. Consideration of this methodology and any interpretations of results may be too complex to debate in a public forum. Despite this, regression analysis is the cornerstone of much government policy work across the nation and it is a generally accepted methodology in many applications. Further, it has already been used in the Wyoming school-funding model to define the school prototypes used to determine baseline-funding levels for school districts, thus the methodology has been at least implicitly accepted

[19] This would also be true if one were estimating an appropriate regional cost adjustment across urban centers where salary demands could differ due to differences in the costs of living and crime rates for example.

elsewhere in the funding system. Secondly, while careful use of regression analysis can mitigate much of the ability local administrators might have in influencing future funding decisions, since the methodology uses actual cost data and not proxies of these costs, it is not immune to such influences. The likelihood that this weakness would actually be exploited, however, is remote. Although it could be possible to distort funding outcomes to a district's benefit through strategic salary decisions, given how data is used in a regression analysis, such efforts would almost certainly be futile considering the budgets administrators face and the degree of coordination and expenditure required across all districts to influence data to a district's advantage.[20] Further, statistical analysis can be carried out to determine the sensitivity of an estimated regional cost adjustment index to such attempts, and to identify methodologies to minimize the potential of such manipulation. In the proposed index described below, such a sensitivity analysis revealed no opportunity for any district to influence outcomes to their advantage without incurring higher costs than the gains created.

IV.1 Estimating a Regional Cost Adjustment Index using a Hedonic Wage Index.

The basic conceptual framework of a hedonic wage analysis identifies the factors that affect a teacher's willingness to accept a salary based on their own qualifications, characteristics of their work environment, characteristics of the district making the offer and characteristics of the community in which the district is located. It is important to recognize that such an estimation will not predict what a teacher *should* earn, but rather how teacher's salaries will vary when changes occur in personal qualifications or as the characteristics and conditions experienced in districts vary. Such and analysis will account for the fact that

- A worker cares about the benefits and monetary compensation they receive.
- A worker's own personal qualifications will influence the amount they are willing to accept in salary. Such qualifications include years of experience and educational attainment.
- A worker will care about the conditions in which they work. For a teacher, conditions that matter include characteristics of the classroom, including pupil/teacher ratio, and characteristics of the student population.
- A worker will care about the characteristics of the community in which they work. These characteristics can be measured directly by considering such community characteristics as local climate, distance to metropolitan centers, national parks, mountains or other natural features deemed potentially important to personnel, and population density characteristics, which allow one to proxy the presence of local services such as theaters, restaurants and retail outlets.

[20] If a statistical study of the determinants of salary across the State is performed, the resulting estimates describe the statewide average effect of a change in any explanatory variable on a predicted salary. Since no district includes more than one seventh of the teachers in the State, a discretionary salary change in the largest district could only influence one seventh of the observations in the dataset. If other districts did not modify their salaries similarly, the cost of influencing the predicted statistical relationship in one district's favor would cost seven times the benefit. Attempts to strategically influence a statistically estimated regional cost adjustment index therefore would not be worth the effort.

Collecting such data, and using regression techniques, an equation can be defined that predicts salary levels across the state. Inserting the characteristics specific to each district into the estimated equation, predicted salaries by district can be computed and used to estimate uncontrollable cost variations districts face locally. Using these results, it is then possible to construct a regional cost adjustment index. Such an index will have the ability to predict the increases in salaries required to attract teachers to more remote districts or to more expensive areas to live based on what current teachers have accepted in salary to compensate them for these challenges.

IV.2 Data Used in the Analysis.

A hedonic wage model uses actual salary data to estimate how changes in personal or district characteristics will impact the salary a teacher is willing to accept. Some personal and work environment characteristics that impact teacher salaries can be controlled by districts through their chosen hiring practices and management decisions. Such salary influences are referred to as *controllable* sources of salary variation. Those factors that a district's personnel or management decisions cannot impact but that influence salary are then referred to as *uncontrollable* sources of salary variation. Regional cost variations to be estimated for purposes of school finance arise due to uncontrollable sources of variation. Table 3 identifies the potential characteristics that could be used in the estimation of teacher salaries in Wyoming, and separates these variables into controllable and uncontrollable categories.

All data regarding teacher, work environment and district characteristics was collected for the most recent year available (2002-03 academic-year). Data was provided by the Wyoming Department of Education, with the exception of benefits information, which was provided by the Wyoming Education Association (WEA). 7410 individual teacher observations were used, representing all teachers in the State with a full-time equivalency (FTE) greater than or equal to 0.5.[21] Only teacher observations in the 48 school districts were included. District classifications were used to identify teachers, and administrators and other education personnel were not included in the salary analysis. Teacher and work environment characteristics, as well as student characteristics were collected by school where possible, as the dataset provided allowed analysis to associate school characteristics with each individual. Individual benefit levels were not available, and instead benefit premiums paid were collected based on the average levels paid per teacher by district. These mean premium payments were separated to describe the proportions and levels of total benefit premiums paid by districts on behalf of each employee and the direct employee contributions.

Community characteristics data was collected from a variety of sources. Population and information regarding income, housing values, and demographic information collected at the district level was provided by the Census Bureau from information collected in the 2000 Census. State Legislative Services Office staff computed population densities for areas surrounding each school in the State using census data at the block level. The Wyoming Cost of Living Index (WCLI) and raw data used to compute it (including original pricing data collected by sample

[21] Teachers with FTE< 0.5 were not considered in the analysis as salaries among this group often reflected salaries inconsistent with district salary schedules. In some cases it appeared that these teachers were primarily administrators or personnel whose primary duty was not teaching.

site) was provided by the Economic Analysis Division of the Wyoming Department of Administration and Information. Unemployment and aggregate labor market outcome data was provided by the Wyoming Department of Employment at the county level. Climate data was provided by the Wyoming State Climatologist's Office and was associated to teachers by school location within the State.[22] State Legislative Services Office staff and Professor Larry Ostresh, University of Wyoming Department of Geography and Recreation provided additional distance information. All distances were measured from each school to allow association with individual teacher assignments.[23]

Table 3: Teacher Characteristics and Environmental Factors used to Estimate the 2002-03 Salary Model.

Controllable Characteristics		***Uncontrollable Characteristics***
Teacher Characteristics	**Work Environment Characteristics**	**District/Community Characteristics**

• Full-time equivalency
• Total years of teaching experience
  o District
  o State
  o Total
• Educational attainment
• Ethnicity
• Gender
	• Teaching assignment
	• Non-contract assignments
	• Multiple campus assignments
	• Size of school
	• Type of school (elementary, junior high, high school, etc.)
	• WYCAS outcomes
	• Class size
		District
		• District enrollment
		• Benefits packages offered
		• Student characteristics
		  o LEP
		  o Free/reduced lunch
		  o Special Ed.
		
		Community Factors
		• Population
		  o Density
		  o District
		• Distance to major centers in State
		• Distance to recreational areas in/near State
		• Local cost of living
		• Unemployment Rate
		• Climate

The inclusion of benefits as an uncontrollable cost factor requires some explanation. While the benefits package teachers are paid could be considered a discretionary district decision, more recently benefits premiums have been rising sharply without any increase in coverage. Additionally, a significant component of total benefit premiums is the portion

[22] Climate data by weather station was provided, and each school in the state was then associated with the nearest weather station to estimate climate variation experienced locally by school.

[23] Road distances were computed by school to nearest major city centers over 50,000 people and nearest regional or major airport. Straight-line distances were computed by school to nearest National Park, Yellowstone National Park and nearest mountain ridgeline.

mandated by the State. For these reasons benefits premiums net of employee-paid premiums were treated as an uncontrollable factor.

To describe the cost of living in each of the 48 districts using the WCLI, which only defines a cost of living value in the State's 23 counties, a process was defined to map these county values to the 48 school districts. The following procedure was used:

(i) District locations that were actually sampled received their sample value.
   a. Those districts in counties with multiple sample sites no longer receive a county wide value and districts were assigned only the value defined in their sample site.

(ii) The remaining 20 school districts where sampling does not occur received a distance weighted value based on nearest sample sites using the following guidelines:
   a. Up to four sample sites may be used.
   b. Sample sites used in computation must be within 135 road miles (major road or highway) from the site whose value is being estimated.
   c. The set of sample sites used to estimate a particular district's cost of living is reduced if
      1. The second furthest site from the site being estimated is less than 50% as distant as the farthest site. In such cases the most distant site was not used.
      2. The shortest route to a sample site passes through a closer sample site. In this case the farther site is omitted.
      3. A regional geographic barrier exists between a district and sample site that makes travel between the sites impractical for parts of the year (as would be the case due to highway closures across the Big Horn Mountains in winter for example). In such cases, sites beyond the barrier were omitted.

Table 4 describes the WCLI values used in the analysis after mapping the 23 county values measured to the 48 school districts using the guidelines outlined above.[24] A geographical plot of cost of living patterns in the State using values defined by this procedure suggests a more accurate representation of costs of living experienced in the State than the WCLI currently does, as transitions in costs of living between region are now much smoother. Further, an analysis of correlation between the expanded WCLI series and median housing values by district also indicated a higher correlation than that found when each district was assigned the WCLI value of that county. This indicated that the adjusted series more accurately reflects movements in housing prices, the most important category in the WCLI, than the previously used county series.

[24] To distance weight a site using three sample sites nearby, the following computation was used. Assume a site is 25 miles from the nearest sample site, which has a sampled WCLI value of 100, 50 miles from the next closest site with a sample value of 105, and 75 miles from the most distant site, which has a WCLI value of 95. The distance weighting formula used to estimate the cost of living for the unsampled site is found as

distance-weighted site value = 75/(25+50+75)*100+50/(25+50+75)*105+25/(25+50+75)*95.

Table 4 Expanded WCLI Values Used

District_Name	Office City	WCLI Site 1	WCLI Site 2	WCLI Site 3	WCLI Site 4	Adjusted WCLI Value
Albany County School District #1	Laramie	Laramie				101.5
Big Horn County School District #1	Cowley	Lovell	Powell			89.6
Big Horn County School District #2	Lovell	Lovell				88.4
Big Horn County School District #3	Greybull	Greybull				90.6
Big Horn County School District #4	Basin	Greybull	Worland			90.3
Campbell County School District #1	Gillette	Gillette				104.6
Carbon County School District #1	Rawlins	Rawlins				94.0
Carbon County School District #2	Saratoga	Rawlins	Laramie			96.6
Converse County School District #1	Douglas	Douglas				93.0
Converse County School District #2	Glenrock	Casper	Douglas			96.2
Crook County School District # 1	Sundance	Sundance				88.8
Fremont County School District # 1	Lander	Lander				94.4
Fremont County School District # 2	Dubois	Jackson	Lander	Riverton	Thermopolis	103.2
Fremont County School District # 6	Pavillion	Riverton	Lander			94.0
Fremont County School District #14	Ethete	Lander	Riverton			94.2
Fremont County School District #21	Ft. Washakie	Lander	Riverton			94.2
Fremont County School District #24	Shoshoni	Thermopolis	Riverton			93.4
Fremont County School District #25	Riverton	Riverton				93.7
Fremont County School District #38	Arapahoe	Lander	Riverton			93.9
Goshen County School District #1	Torrington	Torrington				90.6
Hot Springs County School District #1	Thermopolis	Thermopolis				93.0
Johnson County School District #1	Buffalo	Buffalo				103.1
Laramie County School District #1	Cheyenne	Cheyenne				104.4
Laramie County School District #2	Pine Bluffs	Cheyenne	Torrington			99.4
Lincoln County School District #1	Kemmerer	Kemmerer				91.4
Lincoln County School District #2	Afton	Afton				99.3
Natrona County School District #1	Casper	Casper				98.7
Niobrara County School District #1	Lusk	Lusk				87.3
Park County School District # 1	Powell	Powell				94.2
Park County School District # 6	Cody	Cody				98.3
Park County School District #16	Meeteetse	Cody	Thermopolis	Powell	Worland	94.3
Platte County School District #1	Wheatland	Wheatland				90.8
Platte County School District #2	Guernsey	Wheatland	Torrington			90.4
Sheridan County School District #1	Ranchester	Sheridan				105.1
Sheridan County School District #2	Sheridan	Sheridan				105.1
Sheridan County School District #3	Clearmont	Sheridan	Buffalo			103.9
Sublette County School District #1	Pinedale	Pinedale				103.9
Sublette County School District #9	Big Piney	Pinedale	Kemmerer			99.8
Sweetwater County School District #1	Rock Springs	Rock Springs				99.1
Sweetwater County School District #2	Green River	Green River				94.9
Teton County School District #1	Jackson	Jackson				140.3
Uinta County School District #1	Evanston	Evanston				93.6
Uinta County School District #4	Mountain View	Evanston	Kemmerer	Green River		93.3
Uinta County School District #6	Lyman	Evanston	Kemmerer	Green River		93.3
Washakie County School District #1	Worland	Worland				88.9
Washakie County School District #2	Ten Sleep	Worland	Greybull			89.4
Weston County School District #1	Newcastle	Newcastle				87.1
Weston County School District #7	Upton	Newcastle	Sundance	Gillette		92.1

IV.3 Estimation of the Regional Cost Adjustment Index

To estimate the regional cost adjustment index, underlying regressions used a subset of the variables described in Table 3 to estimate the determinants of total salaries paid to individual teachers, including any remote pay. Individual total salary and remote pay data was provided by the State Department of Education. To use a regression analysis to construct a regional cost adjustment table index, a prior condition of the data must be met – that actual salaries paid in districts are high enough to attract teachers. Without this condition one cannot estimate the impact of various district characteristics on required teacher compensation as the required salary to attract a teacher will not be known. To test whether district salaries appear high enough to attract teachers, use was made of previous State reports and WEA data to determine whether any systematic teacher shortages, which would indicate that salaries are not high enough to attract teachers to some districts, are apparent in the State. No evidence of an aggregate teacher shortage or district specific teacher shortages was found.[25]

When a regression model is used to estimate a statistical relationship between an outcome and the variables that determine that outcome, the exercise of estimating the "fit" of the relationship is done in a specific fashion. The exercise is not to find a group of variables that find the highest explanatory power, but instead to proceed using a process akin to the scientific method. Standard economic theory will predict that specific variables determine salary outcomes in a predictable manner. Accordingly, a behavioral model is postulated, which suggests the specific types of variables to include in the analysis. These variables are then used in the regression estimation. The variables in Table 3 were selected in this manner. Not all variables selected this way may be found to have a relationship with the outcome a researcher is attempting predict, however, selecting variables to include in the regression in this manner ensures that variables with no behavioral basis for inclusion are used.

Regression results indicated that not all variables presented in Table 3 were significantly related to teacher's total compensation in Wyoming. Others could not be included for statistical reasons. Table 5 presents a streamlined set of variables found to have a significant relationship with salaries.[26] Among the controllable factors, no statistical relationship was found between salary and ethnicity, class size, WYCAS outcomes, whether a school assignment was an elementary or junior high school, or whether a teacher was assigned to multiple schools.[27] Of particular interest, no statistical relationship could be found between WYCAS outcomes and salaries, a finding that will have importance to those who believe increasing salaries will affect

[25] This assertion relies on evidence presented in Zax (2002), and data posted provided by the WEA. Both indicate there may be some difficulty in attracting teachers in particular disciplines, such as science, math, and in special education and support for limited English proficient and special needs students. These problems reflect national trends more than they describe problems specific to Wyoming that could attributable to insufficient teacher compensation.

[26] In the streamlined model, a number of variables are dropped. Several were dropped due to multicollinearity, a statistical problem that occurs when one or more variables are highly correlated. In such cases, the regression analysis is unable to estimate statistically meaningful coefficients that describe how changes in these variables affect salary outcomes. To avoid this problem, two of the three experience variables, which were highly correlated with one another, and population density measures and school size measures, which were highly correlated with one another and the district population variable were not included in the estimation.

[27] The insignificance of these variables was determined using individual and joint significance tests. They were dropped from the regression using mean squared error criteria.

student outcomes in a positive manner. Their also was no apparent relationship between salary outcomes and multiple teacher assignments. This result was likely due to the fact that many schools in the State are co-located, and although officially a teacher is assigned to two schools, in practice the other school is located within the same building or on the same property as their primary school assignment thus causing the teacher little or no inconvenience that would require additional compensation.

Table 5: Teacher Characteristics and Environmental Factors found to be statistically related to Salary - 2002-03 Salary Model.

Controllable Characteristics		***Uncontrollable Characteristics***
Teacher Characteristics	**Work Environment Characteristics**	**District/Community Characteristics**

• Full-time equivalency
• Total years of teaching experience
  o State
• Educational attainment
• Gender
	• Teaching assignment
	• Non-contract assignments
	• Type of school (high school or not)
		District
		• District enrollment
		• Average Benefits premiums paid by district (less employee-paid premiums)
		• Student characteristics
		  o LEP
		  o Free/reduced lunch
		  o Special Ed.
		Community Factors
		• Population
		  o District
		• Distance to nearest center with population over 50,000
		• Distance to recreational areas (proxied by distance to nearest National Park)
		• District cost of living
		• Climate
		• Indicator variable for Teton County

Of the uncontrollable district or community factors potentially affecting salaries, no statistical relationship could be verified between local unemployment rate outcomes and district salaries. This suggests that although local labor market outcomes may be expected to have an influence on teacher salaries, in Wyoming it may be the case that local labor markets are often too small to offer substitute occupations for teachers thus they have little impact on salary outcomes.

Among the uncontrollable variables, an indicator variable was included for Teton County School District observations as this district has a number of community characteristics that are significantly different from other districts in the State. The use of such a variable allows the

intercept of the estimated equation to be modified due to such influences. The use of such an indicator variable for Teton was supported by the high significance of its estimated coefficient.

The regression equation used to construct the regional cost adjustment index is described in Appendix A. This equation, which includes the benefits variable previously described, required special consideration for the simultaneity between benefits and salaries. Teachers will decide on an acceptable salary based on a benefits level offered them, and will accept an offered benefits package based on their salary compensation. Of the set of variables in Table 5, this is the only one that could be said to be determined simultaneously with the variable it explains, and in a regression analysis, this characteristic requires a special estimation method to avoid a bias in the estimated coefficients. Appendix A describes the results of regressions estimated normally and the regression outcomes when an instrumental variable technique was used to account for any simultaneity bias.[28] Resulting regional cost indexes computed using uncorrected equations, however, did not significantly differ from those using the instrumental variables estimation method.

An additional procedural change was made in the estimation method to account for the fact that school district sizes vary systematically. Those districts in the largest urban areas and therefore the least remote include the largest number of teachers in the sample. The number of teachers by district varied from 14 to 1004 teachers.[29] Of the 7410 observations, 3775 observations represent only 7 of the 48 districts.[30] The average number of teachers in these seven largest districts is 539. Of the remaining 41 districts, the average number of teachers representing each is 89. Many of these smaller districts are located in rural or relatively remote areas. This poses a problem when the purpose of a regression analysis is to determine how various factors, some of which vary due to remoteness, affect predicted salary levels. To correct for the difficulty this imposed to estimate such effects, observations were weighted to ensure that the effect of urban observations did not overwhelm those from smaller rural or more remote districts, with weights used by district inversely proportional to the size of that district.[31] Appendix A reports how resulting index values were affected by this regression correction. In general, the impact of this modification in the estimation method was to increase the sensitivity of district salary levels due to district specific factors such as the cost of living and remoteness factors, as observations in urban centers are not as sensitive to these differences as salaries in smaller or more remote districts. Overall, the estimated statistical fit of the regression is high and indicates that the estimated equation accounts for 78% of the variation observed in actual salary outcomes.

While specific economic models of salary formation suggest the types of variables to include in a regression analysis, the definition of these variables may affect regression estimates. For example, cost of living is expected to have a positive relationship with salary, with higher

[28] A Hausman test, used to determine if an instrumental variables correction is required in the presence of a potentially simultaneous variable, indicated that the use of an instrumental variables estimation method was appropriate.

[29] Laramie County School District #1 is represented by 1004 teachers in the dataset, while Sheridan School District #3 included only 14 teachers. On average, 419 teachers represented each district.

[30] These are the seven largest school districts in the set: Laramie County SD#1, Natrona SD#1, Albany County SD#1, Sweetwater County SD#1 and #2, Sheridan County SD#2 and Campbell County SD#1.

[31] Specifically, observations by district were weighted by the square root of the number of observations from that district. This correction also reduced the problem of heteroskedasticity, which appeared to arise due to differential district sizes.

cost communities requiring higher compensation. What is the appropriate measure of cost of living though? The WCLI is a wide cost measure, including a weighted price sample of 140 goods, including housing. Alternatively, one might argue the most important cost in an area is housing alone and that all other costs are minor in comparison given the proportion of a typical consumer's budget dedicated to that cost. Remoteness and distance from recreational opportunities also pose this problem. Remoteness implies a center is far from others, but far from where? Recreational opportunities will differ not only by type, but also by quality. Regression outcomes were tested to determine their sensitivity to definitional changes in variables. In general, regression and index outcomes varied little depending on the definition of cost and distance variables. Appendix A includes the index outcomes using housing values instead of the WCLI to demonstrate this characteristic. The reason for the low sensitivity of regression outcomes and therefore index outcomes to changes in variable definitions is easy to understand. Since the fundamental behavioral influence each variable imposes on salary does not change significantly when a variable definition changes, changes in definition had little impact on predicted salary outcomes (housing or WCLI both measure costs of living and therefore will be expected to affect salary similarly, and remoteness a teacher might subjectively believe to be present with respect to a particular community does not change depending on how it is measured).

When new variables were included in the regression to test the effect of a definitional change, these new variables were often highly correlated with those they replaced as they essentially measure the same influence. Regression estimates represent the *independent* impact a particular variable has on the variable. If two explanatory variables, each defined differently, but describing the same effect are highly correlated, they will move together, and therefore the associated change in the predicted variable their movements create will not differ greatly due to the definitional change. The high correlation present between the two variables measuring the same behavioral determinant also explains why both cannot be included in the regression analysis simultaneously. If they were, multicollinearity would result and the independent impact of either would be very difficult to determine since both variables move together most of the time.[32] In summary, more than one variable may be used to describe a behavioral relationship between salary, cost of living, remoteness or recreational opportunities. The fact that the sensitivity of index outcomes to changes in definitions was minimal implies that teacher's salary demands are influenced similarly by these broad characteristics regardless of how they are measured.[33]

One final comment should be made regarding the choice of recreational proxy to use in the regression relationship. Currently no data in the State exists with respect to the types of

[32] This high correlation among alternative definitions of various behavioral influences is clear when one compares the correlations of alternative variable specifications. The measured correlation between median owner-occupied housing values and the WCLI by district is 0.88, and it is 0.91 with the expanded WCLI set.

[33] This is particularly true for the definition of variables used to proxy recreational opportunities. Several were constructed and used, including distance to nearest National Park, and distance to nearest mountain ridgeline. It was reasoned that the first distance measure reasonably proxied recreational opportunities as National Parks are important recreational attractions and are often surrounded by other scenic and recreational attractions. The second measure assumed that mountains are an important scenic and recreational amenity that affects people's willingness to accept a salary offer. While the correlation between the two measures was only 0.18, resulting index outcomes using regressions using either variable or both were virtually identical. This is evidence that the impact of a teacher's subjective impression of the recreational opportunities an area offers on compensation required is not altered depending on how recreational opportunities are described.

recreation teachers prefer to enjoy on average or individually, and how such preferences vary across the State thus specific recreation locations cannot be easily identified to measure to. In such a situation, one must assume what the characteristics are of those places most highly valued as recreation destinations in or near the State. Given the importance of National Parks and mountains in this regard to Wyoming, and the fact that such areas are often surrounded by additional federal and state lands that offer even more recreational opportunities, the distance to the closest National Park from any school is one potential measure to be used in the salary estimation. Such a measure was used in the final analysis, computing the distance from one of the four National Parks nearest to any school in Wyoming (Rocky Mountain, Windy Cave, Teton and Yellowstone). Justification for this approximation is provided by Figure 3, which describes visitation volume to Parks in the State. National Park volume outweighs all others combined, and while a significant proportion of this volume is due to out-of-state tourists, the fact that these areas create such an attraction is further argument in favour of their importance in State recreational experiences.

Figure 3: Major Destinations in the State

Another measure considered as a recreational proxy was the distance of each school to the closest mountain ridgeline. Although this offered a wider set of potential recreation destinations in the State, it was not used for an important reason. First, National Parks allow some recreational quality control to be assumed. National Parks are required by Federal law to be maintained in pristine condition and are designated as National Parks as they represent a very

special environment. Mountain ridgelines, or distances to other recreational destinations suffer from a lack of such quality control. Mountain ridges are not all identical, and a wider variation may exist in the quality of such destinations relative to National Parks. While several measures could have been defined to proxy recreational opportunities, as previously described, none of the resulting salary indexes was sensitive to such variable changes. .

IV.4 The Estimated Regional Cost Adjustment Index

Based on the regression estimations reported in the last section and in Appendix A, a regional cost index was created. Construction of this index was accomplished using the following procedure:

1) Using economic theory, identification of the variables thought to influence salary compensation levels of teachers was made.

2) A regression analysis was conducted to quantify these behavioral relationships.

3) The resulting regression equation was then used to compute predicted salaries by district. To compute these predicted salaries, the statewide average value of controllable variables was used to estimate the predicted salary in each district. Uncontrollable factors in the estimated equation were assigned mean values by district to generate district salary predictions that vary only by the uncontrollable factors that influence compensation demands.

4) Once predicted salaries by district were computed, an average predicted salary was computed and used to create an index value using the following relationship:

$$Index\ Value_{district} = (Predicted\ District\ Salary)/(Avg.\ Predicted\ Salary\ \ by\ District)\ x\ 100$$

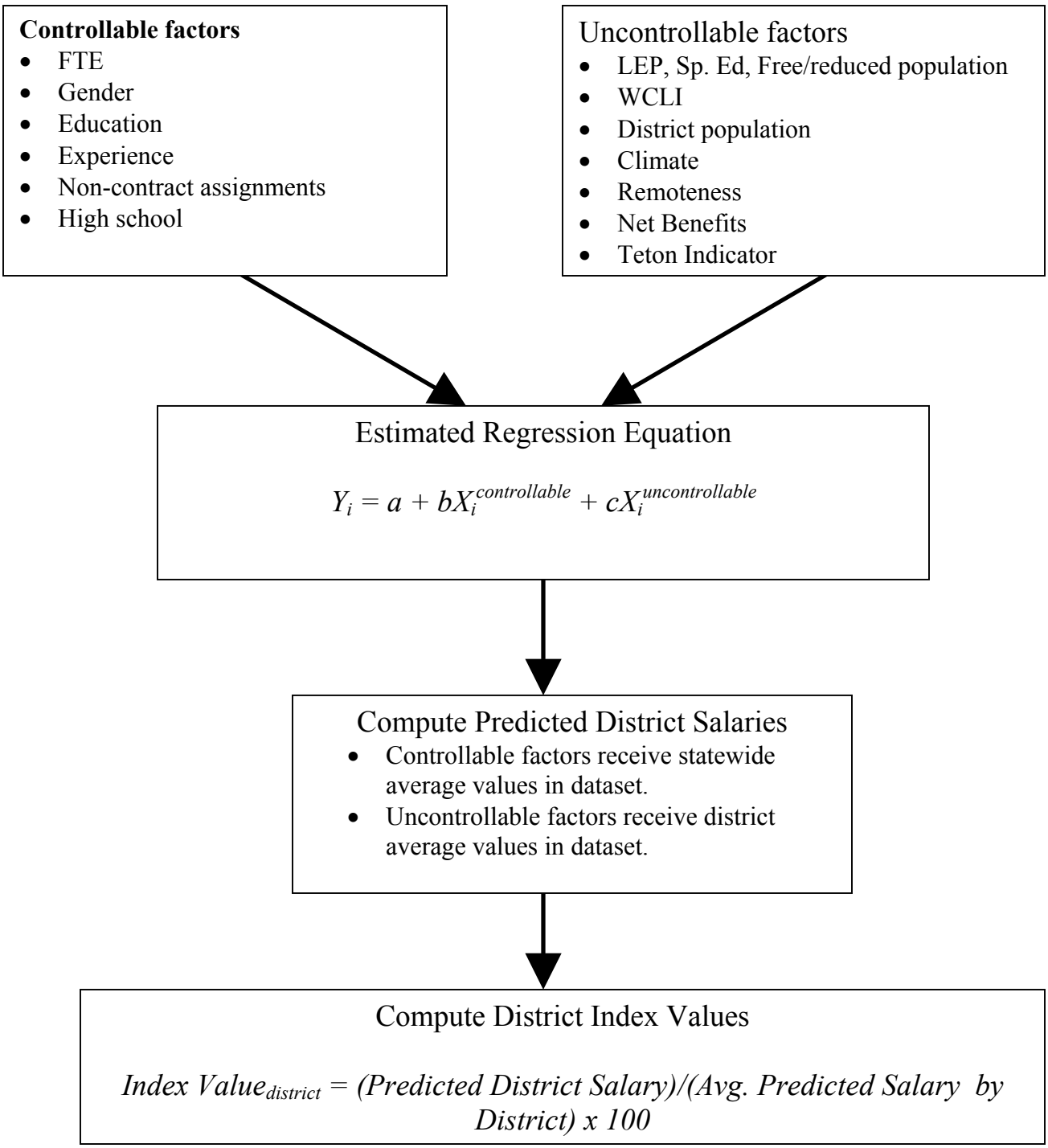
Figure 4 summarizes this procedure diagrammatically, and Table 6 describes the resulting regional cost adjustment index. The index computed is centered at the statewide average. This was deemed the appropriate base for consistency with the prototype models used to compute base funding levels by district and due to the statistical results. While it would have been politically more attractive to base the index at the minimum predicted salary in the State, resulting in a non-negative regional cost adjustment for all districts, the regression relationship *across all* teacher salaries indicated that the relationship between salary and its determinants resembled the middle curve in Figure 1. That is, salaries decline as cost of living falls, but this decrease is mitigated somewhat (but not completely) by the additional salary compensation required when a community differs due to other characteristics such as remoteness.[34]

[34] Had the estimated relationship been parabolic, districts with average WCLI values would have had the lowest predicted salaries in the State and basing the index at the minimum predicted salary would have been appropriate.

Table 6: Estimated Regional Cost Index.

District Name	WCLI (Current law)	Estimated Regional Cost Index Value	Change from Current Law
Albany County School District #1	**102.5**	**100.7**	**-1.8**
Big Horn County School District #1	**90.5**	**95.5**	**5.0**
Big Horn County School District #2	**90.5**	**96.9**	**6.4**
Big Horn County School District #3	**90.5**	**98.2**	**7.7**
Big Horn County School District #4	**90.5**	**98.1**	**7.6**
Campbell County School District #1	**104.0**	**106.0**	**2.0**
Carbon County School District #1	**94.8**	**99.9**	**5.1**
Carbon County School District #2	**94.8**	**97.9**	**3.1**
Converse County School District #1	**92.3**	**97.3**	**5.0**
Converse County School District #2	**92.3**	**96.3**	**4.0**
Crook County School District # 1	**89.8**	**94.9**	**5.1**
Fremont County School District # 1	**94.7**	**102.0**	**7.3**
Fremont County School District # 2	**94.7**	**96.9**	**2.2**
Fremont County School District # 6	**94.7**	**98.3**	**3.6**
Fremont County School District #14	**94.7**	**99.3**	**4.7**
Fremont County School District #21	**94.7**	**98.8**	**4.1**
Fremont County School District #24	**94.7**	**99.7**	**5.0**
Fremont County School District #25	**94.7**	**102.3**	**7.6**
Fremont County School District #38	**94.7**	**97.2**	**2.5**
Goshen County School District #1	**90.3**	**99.3**	**9.0**
Hot Springs County School District #1	**92.3**	**99.8**	**7.5**
Johnson County School District #1	**103.0**	**103.9**	**0.9**
Laramie County School District #1	**104.0**	**105.7**	**1.7**
Laramie County School District #2	**104.0**	**97.0**	**-7.0**
Lincoln County School District #1	**92.2**	**98.3**	**6.1**
Lincoln County School District #2	**92.2**	**97.3**	**5.1**
Natrona County School District #1	**97.8**	**108.2**	**10.4**
Niobrara County School District #1	**87.7**	**96.1**	**8.4**
Park County School District # 1	**97.8**	**97.7**	**-0.1**
Park County School District # 6	**97.8**	**98.7**	**0.9**
Park County School District #16	**97.8**	**96.4**	**-1.4**
Platte County School District #1	**91.0**	**96.5**	**5.5**
Platte County School District #2	**91.0**	**97.1**	**6.1**
Sheridan County School District #1	**104.2**	**104.1**	**-0.1**
Sheridan County School District #2	**104.2**	**106.0**	**1.8**
Sheridan County School District #3	**104.2**	**103.3**	**-0.9**
Sublette County School District #1	**104.8**	**97.0**	**-7.8**
Sublette County School District #9	**104.8**	**96.9**	**-7.9**
Sweetwater County School District #1	**97.7**	**107.9**	**10.2**
Sweetwater County School District #2	**97.7**	**105.0**	**7.3**
Teton County School District #1	**140.0**	**119.8**	**-20.2**
Uinta County School District #1	**95.2**	**101.9**	**6.7**
Uinta County School District #4	**95.2**	**102.2**	**7.0**
Uinta County School District #6	**95.2**	**101.3**	**6.1**
Washakie County School District #1	**89.8**	**99.0**	**9.2**
Washakie County School District #2	**89.8**	**98.0**	**8.2**
Weston County School District #1	**88.2**	**93.3**	**5.1**
Weston County School District #7	**88.2**	**96.1**	**7.9**
Average value:	96.4	100.0	3.6

Figure 4: Computation of the Regional Cost Index



Consider the proposed index outcomes in Table 6 relative to those occurring under the current regional adjustment. Across 48 districts, 39 districts find their index value is increased, and across all 48 districts, index values increase by an average 3.6% under the proposed index computed using the concepts and methodologies recommended in this report. Nine districts have an index value that is lower than previously. Of these though, the reduction in four districts was less than one-percent, or less than that which might be expected from random changes in the index from year to year currently. Of the remaining districts, five face an average reduction of approximately 5.2%, and Teton faces a cut of 14.4%. The minimum value in the new index is 93.3, while previously using only the WCLI it was 87.7. In general, smaller more remote communities gain under the new system, especially those whose WCLI values are nearest the minimum measured in the State. The data therefore indicates teachers in these communities enjoy salary outcomes higher than a cost of living adjustment only would suggest. This implies that an additional adjustment is apparently necessary to compensate teachers for working in these areas. Similarly, the maximum value of the index, which occurs in Teton County, is reduced from 140 to 119.8. Apparently benefits in the Teton area cause teachers to be willing to accept actual salary data outcomes less than a full cost of living adjustment would require. This finding verifies that found in Figure 2. Overall the total variation from lowest to highest index values is reduced from 59.6% to 28.4% in the proposed index relative to the current law. This amount of variation is almost identical to that found in Texas after defining a hedonically estimated index. The reduced variation is caused by the fact that the data outcomes suggest increased levels of pay are required for remote yet low-cost districts, while the highest cost district in set apparently offers benefits that teachers value highly enough to accept reduced salary outcomes relative to the cost of living in the area.

V. District Funding Implications and Simulations

Using the values in Table 6, the regional adjustment funding outcomes are described in Table 7 under the proposed index, along with funding levels under the current law. Recall that in the school finance model, district base allocations are computed using school prototype models and the regional cost adjustment then inflates that base funding if the district regional cost adjustment index value is greater than 100. Reductions from the base occur if the district regional cost adjustment index value is less than 100. As most districts have index values less than 100, most districts have their funding reduced relative to the base level computed using the prototype models when regional adjustment is applied. Under the proposed index, however, this occurs in fewer districts. Under the current law, only 11 districts have index values over 100 thus 37 receive funding reductions. Under the proposed adjustment the number of districts receiving funding increases over their base rises to 15 and only 33 districts experience reduced funding relative to the base level computed by the school finance model..

Table 7: Regional Cost Adjustment Outcomes – Change Relative to Base for SY 2004-05

		SY05 Base Funding	Current Law Regional Cost Adjustment	Proposed Regional Cost Adjustment	Change	% Change over Base
Albany	**#1**	$31,900,000	$513,813.96	$145,728.65	$(368,085.31)	-1.15
Big Horn	**#1**	$6,900,000	$(546,865.81)	$(222,644.05)	$324,221.76	4.70
Big Horn	**#2**	$5,540,000	$(415,644.39)	$(126,338.41)	$289,305.98	5.22
Big Horn	**#3**	$4,290,000	$(322,902.56)	$(54,895.43)	$268,007.13	6.25
Big Horn	**#4**	$3,650,000	$(290,993.60)	$(51,529.72)	$239,463.87	6.56
Campbell	**#1**	$60,200,000	$1,570,997.68	$2,343,495.14	$772,497.46	1.28
Carbon	**#1**	$14,030,000	$(545,372.57)	$(14,232.05)	$531,140.52	3.79
Carbon	**#2**	$8,880,000	$(349,011.25)	$(124,696.67)	$224,314.58	2.53
Converse	**#1**	$13,330,000	$(732,279.03)	$(256,509.06)	$475,769.97	3.57
Converse	**#2**	$6,840,000	$(394,869.91)	$(177,765.15)	$217,104.77	3.17
Crook	**#1**	$10,430,000	$(849,500.61)	$(379,151.53)	$470,349.08	4.51
Fremont	**#1**	$15,540,000	$(562,450.63)	$212,116.29	$774,566.92	4.98
Fremont	**#2**	$2,810,000	$(110,499.19)	$(58,663.18)	$51,836.01	1.84
Fremont	**#6**	$4,330,000	$(169,379.78)	$(47,027.31)	$122,352.47	2.83
Fremont	**#14**	$6,930,000	$(256,309.55)	$(33,314.57)	$222,994.98	3.22
Fremont	**#21**	$4,180,000	$(119,544.89)	$(26,537.73)	$93,007.16	2.23
Fremont	**#24**	$3,420,000	$(135,031.73)	$(7,542.43)	$127,489.30	3.73
Fremont	**#25**	$19,210,000	$(697,776.36)	$301,109.50	$998,885.86	5.20
Fremont	**#38**	$3,650,000	$(107,177.79)	$(58,554.87)	$48,622.92	1.33
Goshen	**#1**	$15,970,000	$(1,163,292.23)	$(83,339.16)	$1,079,953.08	6.76
Hot Springs	**#1**	$ 6,850,000	$(371,945.68)	$(10,827.22)	$361,118.46	5.27
Johnson	**#1**	$11,160,000	$242,953.00	$287,940.30	$44,987.30	0.40
Laramie	**#1**	$98,890,000	$2,658,492.99	$3,779,271.33	$1,120,778.34	1.13
Laramie	**#2**	$9,540,000	$278,778.68	$(182,395.44)	$(461,174.12)	-4.83
Lincoln	**#1**	$6,110,000	$(371,002.21)	$(72,306.24)	$298,695.97	4.89
Lincoln	**#2**	$17,810,000	$(1,001,571.02)	$(335,183.45)	$666,387.57	3.74
Natrona	**#1**	$89,420,000	$(1,336,621.55)	$5,022,387.16	$6,359,008.72	7.11
Niobrara	**#1**	$3,940,000	$(395,945.03)	$(110,573.95)	$285,371.08	7.24
Park	**#1**	$12,960,000	$(199,642.71)	$(206,576.04)	$(6,933.32)	-0.05
Park	**#6**	$17,520,000	$(259,343.38)	$(155,398.02)	$103,945.36	0.59
Park	**#16**	$1,920,000	$(34,623.72)	$(52,771.19)	$(18,147.47)	-0.95
Platte	**#1**	$10,830,000	$(767,891.10)	$(275,707.07)	$492,184.03	4.54
Platte	**#2**	$2,650,000	$(206,191.97)	$(59,231.23)	$146,960.74	5.55
Sheridan	**#1**	$8,030,000	$254,311.15	$222,543.97	$(31,767.18)	-0.40
Sheridan	**#2**	$25,600,000	$715,815.07	$1,026,889.51	$311,074.44	1.22
Sheridan	**#3**	$2,140,000	$65,522.08	$47,169.94	$(18,352.15)	-0.86
Sublette	**#1**	$6,110,000	$201,611.74	$(115,633.55)	$(317,245.29)	-5.19
Sublette	**#9**	$5,530,000	$195,836.90	$(112,277.59)	$(308,114.50)	-5.57
Sweetwater	**#1**	$37,110,000	$(572,439.69)	$1,914,941.87	$2,487,381.56	6.70
Sweetwater	**#2**	$22,180,000	$(340,401.37)	$731,187.61	$1,071,588.98	4.83
Teton	**#1**	$22,870,000	$4,802,365.48	$2,293,494.94	$(2,508,870.54)	-10.97
Uinta	**#1**	$23,400,000	$(792,846.44)	$315,821.05	$1,108,667.49	4.74
Uinta	**#4**	$6,330,000	$(222,369.05)	$91,525.30	$313,894.35	4.96
Uinta	**#6**	$6,580,000	$(237,573.83)	$60,475.54	$298,049.38	4.53
Washakie	**#1**	$10,690,000	$(786,973.84)	$(75,657.87)	$711,315.97	6.65
Washakie	**#2**	$1,620,000	$(147,616.50)	$(24,926.34)	$122,690.16	7.57
Weston	**#1**	$6,970,000	$(658,700.64)	$(346,293.59)	$312,407.05	4.48
Weston	**#7**	$2,860,000	$(284,544.72)	$(80,239.91)	$204,304.82	7.14
Total or Statewide Average		$719,650,000	$(5,256,647.61)	$14,857,358.10	$20,114,005.71	2.85

Note that under the current law adjustment occurs using the WCLI constructed as a moving average of WCLI values of the past 3 years. This index is not centered at a value of 100 and instead has an average value is 96.4. This is shown in Table 6 and occurs because the WCLI is expanded from 23 county measures to 48 districts, and this mapping is not mean-preserving. More districts with imputed WCLI values less than 100 than are included in the expanded set than those with values greater than 100, thus the average in the index drops.[35] If the current index were re-centered at 100, it would inflate funding levels in all districts by 3.73% relative to the current law and add an additional $26.8 million to the system. The proposed index, centered at the statewide average, has an average value of 100 and increases overall funding levels by $14.9 million relative to base values. It adds $20.1 million (2.85%) to the system relative to the current system after the WCLI index is applied as the current law reduces total education funding by $5.26 million (-0.73%) relative to the base outcomes. These outcomes are shown in Table 7.

The proposed index causes two changes to district funding incomes. In general, inflation of the index center causes district funding levels to rise as just described. Secondly, the proposed index is constructed after estimation of the impacts of remoteness, recreation, community size, cost of living and work environment on teacher salaries. The current index used is based only on the cost of living. Consideration of a wider set of influences on salary results in a redistribution of adjustments. 39 districts are assigned higher index values under the proposed index and receive higher funding than they would have otherwise. Districts facing more challenging circumstances in the recruitment of teachers are found to require higher salaries, and therefore have received relatively higher index values than if only the impact of cost of living on salary alone were considered. The opposite is true for districts with characteristics that are more attractive to teachers - recruiting is apparently less difficult and a lower salary is required than the consideration of cost of living alone would suggest. Such districts see their funding reduced using the new index.

Of the 9 districts that lose funding, five lose over 1.0% of their base funding level (Albany County #1 ($368,085, 1.15%), Laramie County #2 ($461,174, 4.83%), Sublette #1 ($317,245, 5.19%), Sublette #9 ($308,114, 5.57%) and Teton #1 ($2,508,871, 10.97%)). The remaining four districts lose $75,199 combined and well less than 1.0% of their base funding, which again is within the usual variation of the current law. Laramie #2 and Sublette #9 reductions appear to be due mainly to the fact that the WCLI used in the proposed adjustment is remapped to a value approximately 5% less than previously used. Reductions in other districts cannot be attributed to any one variable. Sublette #1 appears to have a lower index value because of the influence of recreation, district size and work environment proxies. Of the two remaining districts with losses greater than 1%, it appears that the primary influences reducing predicted salaries are relatively less challenging work environments, as proxied student population characteristics (language proficiency, free and reduced lunch and special education needs), and more importantly the fact that these districts are relatively close to other large urban centers in the case of Albany #1, or close to recreational areas in the case of Teton. The evidence from the statistical estimations indicates that these districts have been able to attract teachers with salaries lower than that suggested by local costs of living. These findings also

[35] Consider just the impact of mapping one WCLI value for Fremont County to the eight districts there. Fremont's WCLI value is 94.7, and because of the high number of districts in this county, this tends to lower the average of the index. This effect is compounded by the fact several other counties that also have low WCLI values but multiple school districts, which tends to reduce the simple index average.

reflect historical salary outcomes in these districts where salaries have been low relative to other areas in the State.

Historically, Albany #1 salaries have ranked lower than all other major centers with similar characteristics in the State. For the 2002-03 school year, using the WEA's annual salary and benefits report, Albany #1's average salary level ranks 30th in the State, and district salary scale benchmarks rank 30th or worse in 4 categories (out of nine), 24th or worse in 6 categories, and 17th or worse in 8 categories. Using WEA salary and benefits schedule surveys from 1980 and 1990, Albany #1 ranked 12th in 1980 and 14th overall in 1990. It appears that not only are the salaries required to attract and retain teachers in this district lower than all other urban centers, they have been falling relative to other districts' over the past 25 years. The cost of living measured in Laramie has varied in the last five years, but has been no lower than 7th highest and currently measures (as of July 2003) as the 5th most expensive location in the State. Relative to the cost of living there, salaries paid in Albany County have not reflected relative costs of living, and the proposed regional cost index value captures this effect, falling from the current WCLI-computed value of 102.5 to 100.7. Note that the district still receives an increase over its base funding level (an outcome that only occurs in 14 other districts), but the new adjustment is less than Albany #1 has previously received. Given the salary data cited above, this provides evidence that the proposed index captures uncontrollable cost variations in salary that the WCLI used previously could not.

Teton County outcomes are also indicative of historic salary patterns. In 1980, Teton salaries ranked 32nd in the State. In 1990, Teton salaries ranked 37th. While recently Teton salaries have been increased as the district has received much greater personnel funding in its block-grant, the fact remains that starting salaries, as shown in Figure 2 are still not reflective of the cost of living there, implying that teachers will work in the district (and have done so historically) for less than the measured cost of living implies. Average salaries in Teton according to WEA data, are the highest in the State, but only 10.9% higher than the statewide average salary.[36] The computed index value for Teton reflects that current salary costs there are higher than elsewhere, and the proposed index assigns the district the highest regional cost index value estimated (119.8) after controlling for experience, and education levels. Salary outcomes in the district though do not reflect current costs of living there, and given no aggregate teacher shortage exists in the district, this implies that personnel are willing to accept relatively lower purchasing power that teachers in the rest of the State enjoy in exchange for the opportunity to experience other benefits offered in the district. These findings are consistent with those presented regarding starting salaries in Figure 2.[37] Relative to current law, the proposed index more accurately captures the actual salary variation experienced in Teton relative to the rest of the State. The index also suggests Teton #1 is over-funded. Teachers are earning levels of compensation between 20% and 28% greater than the state average, but under the current law the district receives 40% more than the state average for personnel compensation.[38]

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[36] Note that this salary is not experience or education adjusted. WEA data for the 2002-03 school year indicates that the Teton County School District #1 salary schedule ranks highest in the State in eight of nine benchmarks, which include BA minimum, BA mid-salary, MA minimum, MA mid, MA max, non-doctoral max, average salary and schedule max. Teton ranks 6th in the remaining outcome (BA maximum).

[37] The regional cost adjustment index presented objectively describes current salary conditions comparatively, controlling for all controllable influences on salary. Whether these salary outcomes are reasonable to compare is considered in Section VI.

[38] Overall, teachers earn 20% more than the state average, while starting salaries are 28% higher than average.

The statistical evidence offers strong justification for a change in the regional adjustment formulation. Overall, if one considers salary estimations and the resulting index values presented in this report, it seems apparent that performing regional cost adjustment considering only costs of living does not accurately measure all sources of uncontrollable labor cost variation districts face in the State. A wider set of influences should be considered, including remoteness, recreational and leisure opportunities and district work environments. Consideration of these influences has the effect of increasing funding to smaller more remote districts, and reducing funding in districts that are less remote, and that offer other beneficial opportunities not available elsewhere. Additionally, the use of an index with an average value or "center" of 100 inflates overall funding levels. The current regional cost adjustment actually reduces funding relative to base levels as its average value is 96.4. The combination increasing the number of salary determinants considered and the re-centering of the index at 100 results in beneficial regional cost adjustment outcomes for the majority of districts in the State under the proposed index. For districts that do not receive funding increases, in Albany and Teton, actual labor costs are lower than would be indicated by local costs of living and therefore the analysis indicates that under the current adjustment law, these districts are over-funded relative to others in the State. The proposed adjustment index eliminates this problem.

VI. Are Predicted Salaries Comparable? Retention Patterns in Wyoming.

The basic assumption used to justify the statistical analysis supporting the regional cost index required that no aggregate teacher shortage existed in any district, thus salaries paid in the state are high enough to attract teachers. Two issues can be considered additional to this: first are all teachers of equivalent quality? Secondly, are salaries paid high enough to only attract teachers, or do they also allow teacher retention? With respect to the first question, the initial statistical regressions were computed using WYCAS scores as a predictor of salary. This use was intended to control for the fact that teachers may prefer to teach in schools achieving higher test scores, or require additional compensation to teach in those that perform relatively poorly. It also had the effect, however, of controlling the regression for measurable outcome differences that could be attributed to teacher quality.[39] No relationship could be identified at any reasonable statistical significance level between total compensation and test outcomes. Given this is the only outcome measure included in our dataset, the statistical results have been controlled for quality outcomes as much as can be claimed using the data available. Additional analysis of classroom outcomes will almost certainly be conducted in the future as Federal regulations link state education funding to student achievement, but additional consideration of this matter is outside of this report. The analysis presented is therefore is contingent on the reader's willingness to assume compensation levels are high enough to attract teachers of adequate quality and that these teachers are on average of similar quality across the State.

The problem of retention is more difficult. At issue is the State's responsibility to ensure teacher retention levels across districts are comparable.[40] If the State is required to ensure *input*

[39] One could presume that other measures used in the analysis, specifically the student population characteristics, also controlled for student quality effects on test scores. Had the WYCAS scores been included in the final model, additional consideration would be required for the simultaneous nature of these outcomes and student characteristics also used to predict teacher salaries.

[40] While legal definition of this responsibility was sought, nothing was provided that proved to be a definitive answer to this question.

equity across districts in the State, then retention equality may be required. Under this funding criterion, to measure uncontrollable district labor costs, as this report attempts to do, it is essential that the comparative basis used to measure these differences is properly identified. Because salaries are high enough to attract teachers does not imply compensation levels may also be high enough to retain them.[41] If one district pays only enough to attract teachers, but does not pay adequately to retain them, while another pays salaries that appear to attract and retain teachers, the cost comparison is false if it is assumed that the predicted salaries used to identify district cost differences only measure differences in the cost to attract teachers. If the district that can also retain has the higher salary, any inference regarding the relative costs to attract between the two districts is biased upward by the fact that the higher one also pays enough to retain its teachers. Similarly, any inference of the relative cost between the two districts to attract teachers for the less expensive district is biased downward. Under an *input equity* responsibility, if it is to be the case that the computed index presented in this report reflects *actual* uncontrollable teacher cost differences, it must be the case that all districts whose salary information was used to compute the index have similar retention patterns or else the type of bias just described may occur.[42] This bias is only of concern, however, when the State is obligated to provide for *input equity*.

Alternatively, the State may only be responsible for ensuring *outcome equity*. Under this funding criterion, the State would be responsible for ensuring district outcomes are equivalent, and that programs offered by district are equal. Funding to ensure retention outcomes would not be the State's responsibility unless it could be shown that student outcomes are negatively impacted by retention outcomes. Currently in Wyoming, no statistical support can be identified to show this is the case.[43] For example, as will be shown below, it may be the case that Teton County has a retention problem due to compensation levels among teachers. WYCAS outcomes, however, show that this district has student outcomes that are significantly higher statistically than the average outcomes across districts and in fact are among the highest in the State. While teacher retention may be a problem in Teton, this is apparently not impacting student outcomes in any negative way. If the State is only responsible for *outcome equity*, the currently proposed regional cost index is an appropriate estimate of uncontrollable cost differences. Retention would not be the State's concern, and funding should not be adjusted to impact it. If retention problems in Teton are due to compensation levels, it would be understood under an *outcome equity* criterion that in some districts, personnel outcomes will vary. In Teton this would imply that higher turnover occurs. This would be acceptable, however, and would minimize state taxpayer's responsibility for education funding, as long as student outcomes as indicated using assessment testing, remain acceptable.[44]

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[41] Since teachers may not have a full understanding of the work environment, district characteristics or other impacts affecting required compensation in an area when they take a position, it could be the case that once arrived, a teacher may require more (or less) compensation to remain in the district, depending on whether their initial impressions of a position and its challenges were underestimated (overestimated). This would imply that salaries required to attract a teacher may be differ from those required to retain. The working assumption in this report is that compensation required to retain a teacher in a district is at least as high as that required to attract.

[42] Or it will reflect actual values if the cost to retain is not different from the cost to attract teachers.

[43] An analysis of WYCAS outcomes and their relationship to Teacher characteristics and student characteristics was performed using the data provided to estimate regional cost differences. While student characteristics proved highly significant in predicting WYCAS outcomes, teacher experience and educational attainment did not predict test outcomes at any meaningful significance level.

[44] Appendix C includes a table that describes 2003 WYCAS outcomes by district.

It is unclear which funding criterion the State is responsible for, especially since there is no statistical relationship that can be identified using currently available data to relate teacher retention outcomes to student achievement. While the State has a responsibility to ensure educational equity, it also has an implied responsibility to ensure that taxpayer burden is minimized. An *outcome equity* approach would allow the State to avoid the responsibility to ensure retention outcomes are equivalent across the State, and in particular, in districts like Teton this would reduce required funding provided by the State. Under this funding obligation, using a regional cost adjustment index that presumes all salaries paid are high enough *only to attract* results in no funding bias that the State must concerned about.[45] In contrast, under an *input equity* criterion, the State may be responsible for retention outcomes, and use of the proposed index under this criteria must consider the bias that arises (and is only relevant when input equity is required) when retention outcomes differ. Under such a funding obligation retention considerations must be made when applying the regional cost index. The following analysis proceeds under this *input equity* funding assumption. If *outcome equity* is all that is required, the following analysis is irrelevant to the discussion, especially if all districts have acceptable assessment outcomes.[46]

Under an *input equity* funding obligation, retention outcomes matter. To determine retention patterns in Wyoming (using only available data used elsewhere in this report), the following uses an analysis of state experience within districts to explore potential turnover trends.[47] It should be noted at the outset that the purpose of this report was not to consider and identify potential turnover problems, nor to make recommendations in that regard. Further, causes of turnover and identification of whether turnover is abnormally high is very difficult to identify within a sample that covers only a short period of time. Apparent turnover problems may be the result of long term trends, or they may just be an outcome specific to the time period under consideration. Turnover may also be higher in a district due to difficult work conditions or other problems that cause teachers to leave (and that additional compensation could reverse), or it may be the product of a normal demographic shift in the teacher population and unrelated to compensation, work or district conditions. Given these caveats, without a much more detailed study, no firm conclusions can be made regarding turnover trends in the State, however, the following is presented to determine whether concerns regarding the comparability of salaries may exist.

Table 1 describes district averages of teacher's state experience from the 1998-1999. The table was constructed using data on all personnel identified as teachers with FTE >0.5. Districts with bolded values indicate that the average level of experience in the district was less than ten years in the period in question. Several trends can be identified. First, average levels of State experience have been increasing over the past five years. This is indicative of an aging teacher population. The State has undergone some turnover, however, and in the five year period,

[45] This is especially true when in most districts it appears the salary required to attract is equal to that required to retain teachers.

[46] As is shown in Appendix C, three of the five districts that have potential retention problems also appear to have significantly lower WYCAS assessment outcomes than the state average. These districts are Fremont #14, Fremont #21 and Park #16. Under an outcome equity approach, the State would be responsible for ensuring student performances in these districts improve. How this would be accomplished is outside the scope of this report.

[47] If such differences are identified, they would not necessarily imply the index is inaccurate as the regression used to analyze the data did include state experience, and therefore the impact of this variable has been controlled for. If significant differences do exist in turnover across districts and that turnover is best described using a richer definitional measure than experience, the index could be biased as described above.

average experience levels in districts across the State have only increased by 1.2 years. Average state experience levels across districts in the State therefore have tended to increase at a rate of 0.24 years of state experience per year. In the current year, average state experience level by district was 12.99 years. The highest state experience level in any district was recorded over the period in Weston School District #7 at 17.26 years (32.9% greater than the average) for academic year 2002-03, and the lowest experience in any district was 5.90 years (54.6% below the average state experience level) in Park #16, also recorded in 2002-03. From the table, it is apparent that relatively few districts (7 of 48 districts) have recorded average state experience levels of less than ten years over the five year sample. Among these, three exhibit a clear trend of increasing experience levels (Big Horn #1, Fremont #2 and Washakie #2), indicating that while a recent period of lower teacher retention may have negatively impacted teacher experience levels, retention may have improved enough to reverse this outcome. Currently, experience levels are rising in these districts. Of the remaining districts, it is much more difficult to discern whether a trend can be identified, with the exception of Park #16 where experience levels have fallen in almost every year of the sample.

Table 8: State Experience Outcomes by District 1998-99 to 2002-03

District Name	1998-99	1999-00	2000-01	2001-02	2002-03
Albany County School District #1	12.75	12.66	12.05	13.79	12.56
Big Horn County School District #1	**9.04**	**9.64**	**9.41**	10.07	10.51
Big Horn County School District #2	12.56	12.80	12.61	12.34	13.42
Big Horn County School District #3	14.12	14.68	14.40	15.25	15.09
Big Horn County School District #4	11.98	11.29	10.89	12.13	11.18
Campbell County School District #1	13.23	13.30	13.44	13.00	13.56
Carbon County School District #1	14.01	13.78	13.91	13.38	13.45
Carbon County School District #2	13.15	13.46	13.78	14.02	13.99
Converse County School District #1	12.89	14.24	14.36	15.33	15.32
Converse County School District #2	10.13	11.50	11.70	12.75	12.59
Crook County School District # 1	11.02	12.10	11.89	13.22	13.47
Fremont County School District # 1	14.52	13.64	12.90	13.59	14.28
Fremont County School District # 2	**7.78**	**9.39**	**9.44**	11.18	12.13
Fremont County School District # 6	14.43	15.19	15.49	16.52	16.03
Fremont County School District #14	**9.39**	**9.37**	**8.93**	**9.13**	10.19
Fremont County School District #21	**9.21**	**8.56**	**8.88**	**7.76**	**8.12**
Fremont County School District #24	13.49	14.10	14.77	14.55	15.05
Fremont County School District #25	13.23	14.17	14.43	14.82	15.02
Fremont County School District #38	12.08	12.07	11.17	12.94	12.58
Goshen County School District #1	13.80	13.20	13.00	13.11	13.61
Hot Springs County School District #1	10.99	12.70	12.59	13.77	14.97
Johnson County School District #1	13.68	13.59	13.00	13.74	14.13
Laramie County School District #1	12.86	12.84	12.95	12.97	12.71
Laramie County School District #2	10.86	10.94	11.32	10.17	10.35
Lincoln County School District #1	12.70	13.46	12.95	14.13	14.17
Lincoln County School District #2	11.64	11.97	13.05	11.51	11.46
Natrona County School District #1	12.00	12.11	12.22	11.78	12.57
Niobrara County School District #1	11.83	13.58	14.68	13.65	15.06
Park County School District # 1	12.12	12.16	11.06	12.59	12.97
Park County School District # 6	11.68	11.76	11.55	11.76	12.04
Park County School District #16	**8.70**	**6.92**	**5.95**	**6.48**	**5.90**
Platte County School District #1	11.81	13.16	12.89	13.87	15.20
Platte County School District #2	12.39	14.34	14.11	16.02	15.67
Sheridan County School District #1	10.65	10.78	10.62	11.06	11.71

Sheridan County School District #2	12.59	12.66	12.36	12.62	13.21
Sheridan County School District #3	10.00	10.48	11.32	9.89	10.54
Sublette County School District #1	10.66	10.79	11.25	11.05	11.14
Sublette County School District #9	10.97	11.10	11.24	11.16	11.69
Sweetwater County School District #1	13.13	13.78	13.91	14.17	14.80
Sweetwater County School District #2	14.11	14.66	15.02	14.73	15.37
Teton County School District #1	**9.85**	**9.74**	**9.92**	**9.86**	**9.32**
Uinta County School District #1	10.79	12.16	12.01	13.13	13.65
Uinta County School District #4	10.73	11.12	10.19	12.03	13.27
Uinta County School District #6	11.74	13.28	13.92	14.22	15.05
Washakie County School District #1	11.17	12.20	12.01	13.28	13.77
Washakie County School District #2	**8.00**	**8.86**	**8.89**	**9.40**	**9.72**
Weston County School District #1	11.11	12.63	12.88	14.13	13.75
Weston County School District #7	14.22	14.63	14.29	16.26	17.26
Average by District	11.79	12.24	12.20	12.67	12.99

How much experience deviation might the State deem acceptable? The amount of experience in districts across the State is not distributed uniformly, but resembles a bell-shaped distribution centered at the statewide average of 12.99 years. One common measure of dispersion in samples is the standard deviation, which measures the interval around the sample mean (or average value) in which approximately 68% of the sample would be expected to lie within if the sample were normally distributed. In a normally distributed sample, approximately 16% of the sample will lie below one standard deviation or more from the mean, implying in our sample of districts, approximately 7.5 districts would be expected to have experience levels one standard deviation below the state average. The standard deviation in the sample for 2002-03 is 2.2 years, thus any district with an average state experience levels of less than 10.79 years would be considered more than one standard deviation from the mean of the sample. In the current year, eight districts are found to have such levels of experience, thus one might presume that the experience sample in 2002-03 approaches a normal one.[48] While arbitrary, it has become common in statistical studies to consider that when a sample is normally distributed, those observations outside one standard deviation from the mean are abnormally high or low relative to the sample mean. With respect to teacher experience, this offers a simple rule for identifying when average state experience levels become abnormally low. In Table 8, over the most recent academic year Big Horn #1, Fremont #14 and #21, Laramie #2, Park #16, Sheridan #3, Teton #1 and Washakie #2 all have abnormally low levels of average state experience since these districts' average values are below 10.79 years. Notably, this set of districts includes those already identified as having potential problems with teacher retention in Table 8.

Within this set of districts, one might consider the proportions of teachers with various levels of experience, in five year increments for example. Table 9 presents such an analysis, describing the proportion of teachers in each district having the level of state level of experience described by each column, from less than 5 years to greater than 25 years in 2002-03. Average values of these proportions across districts are given below each column. Statewide, teachers with five years of experience or less on average account for 29.4% of the total teachers within a district. Average proportions are generally declining throughout the rest of the experience classes across districts. Overall, using these state average values, in a typical district

[48] Additionally, if the sample were normal, one would expect approximately 7.5 districts to over one standard deviation above the mean and 15 districts to be greater than one standard deviation above or below the mean (or simple average of the sample). Overall, 14 districts lie more than one standard deviation above or below the mean, thus the sample appears almost normal.

approximately 30% of teachers would have 5 years of state experience or less, and approximately 15% of teachers would have 5-10 years, another 15% would have 10-15 years, another 15% would have 15-20 years and another 15% would have 20-25 years state experience. The remaining 10% of teachers would have greater than 25 years state experience. One would expect that districts with abnormally high turnover levels would likely exhibit higher proportions of teachers with low levels of experience, particularly in the group with less than 5 years, as greater turnover would require greater levels of new teachers to replace those leaving. Districts with a proportion of teachers greater than one standard deviation (9.31%) above the statewide average district proportion of teachers with five years experience or less are bolded in the table and represent districts with abnormally high proportions of relatively inexperienced teachers using the standard deviation as our comparative criterion.[49]

Of the districts identified with abnormally high proportions of relatively inexperienced teachers (five years or less experience), six were previously identified with abnormally low levels of average state experience in Table 8. Only Washakie #2 and Big Horn #1 do not have abnormally high proportions of inexperienced teachers as defined under the criterion used here. For these two districts, results indicate that while the average level of experience is lower than one would expect, there is currently no indication of high turnover or retention problems in these districts based on the proportion of the least experienced teachers they employ, a fact reinforced by the previously identified trends in Table 1. Both districts' state experience levels are growing at a rate greater than the statewide average is growing, thus both districts' experience levels are currently "catching up" to those elsewhere. Low experience but not abnormally high levels of inexperienced teachers may therefore indicate a relatively recent retention problem in these areas that has since been overcome.

Table 9: Proportions of Teachers in Districts by Experience Level (2002-03)

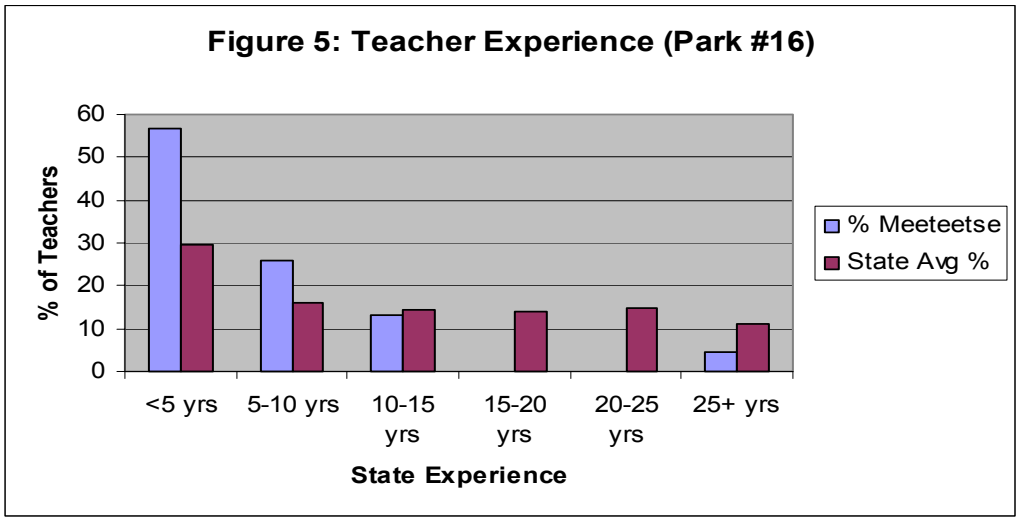
District Name	5 Yrs or less	5-10 Yrs.	10-15 Yrs.	15-20 Yrs.	20-25 Yrs.	25+ Yrs.
Albany County School District #1	34.2%	16.4%	11.1%	11.3%	14.6%	12.4%
Big Horn County School District #1	37.3%	21.7%	16.9%	9.6%	8.4%	6.0%
Big Horn County School District #2	30.6%	11.3%	21.0%	8.1%	12.9%	16.1%
Big Horn County School District #3	26.7%	8.9%	13.3%	11.1%	26.7%	13.3%
Big Horn County School District #4	**41.2%**	14.7%	11.8%	2.9%	17.6%	11.8%
Campbell County School District #1	27.0%	15.0%	12.4%	15.8%	19.8%	10.0%
Carbon County School District #1	29.4%	12.6%	14.0%	15.4%	18.9%	9.8%
Carbon County School District #2	28.0%	19.0%	12.0%	9.0%	14.0%	18.0%
Converse County School District #1	20.6%	16.3%	9.2%	18.4%	17.7%	17.7%
Converse County School District #2	26.0%	16.9%	23.4%	9.1%	15.6%	9.1%
Crook County School District # 1	25.5%	12.7%	19.1%	17.3%	13.6%	11.8%
Fremont County School District # 1	21.6%	15.0%	19.0%	13.1%	22.9%	8.5%
Fremont County School District # 2	28.6%	19.0%	19.0%	14.3%	14.3%	4.8%
Fremont County School District # 6	23.3%	9.3%	9.3%	18.6%	20.9%	18.6%
Fremont County School District #14	**39.8%**	16.9%	19.3%	10.8%	7.2%	6.0%
Fremont County School District #21	**56.1%**	9.8%	14.6%	7.3%	9.8%	2.4%
Fremont County School District #24	28.1%	12.5%	6.3%	12.5%	18.8%	21.9%
Fremont County School District #25	19.3%	15.0%	16.9%	15.5%	19.3%	14.0%
Fremont County School District #38	23.1%	19.2%	34.6%	7.7%	3.8%	11.5%
Goshen County School District #1	31.1%	14.8%	10.4%	10.9%	15.8%	16.9%
Hot Springs County School District #1	22.4%	13.4%	13.4%	17.9%	13.4%	19.4%

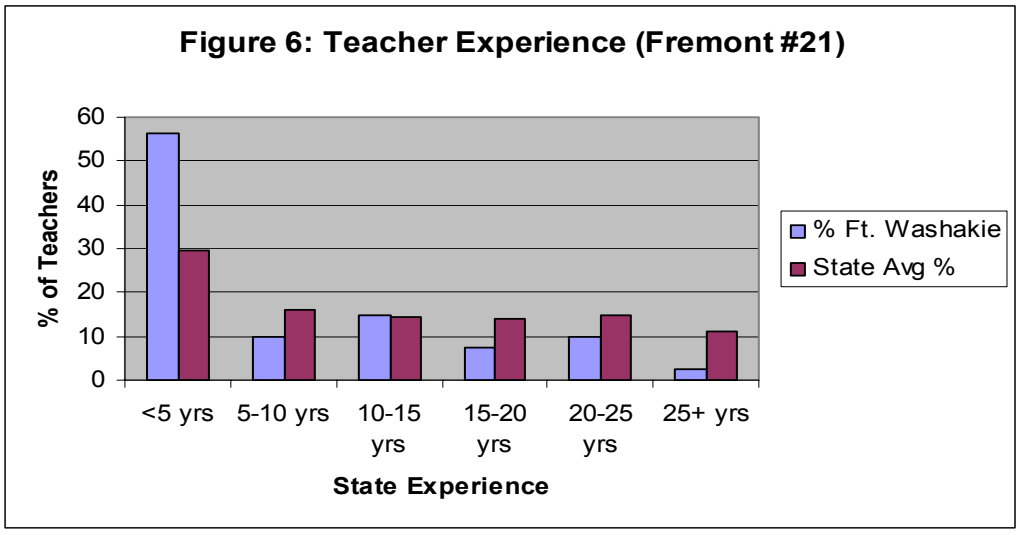
[49] This set of districts has a proportion greater than 38.71% of teachers with five years of experience or less.

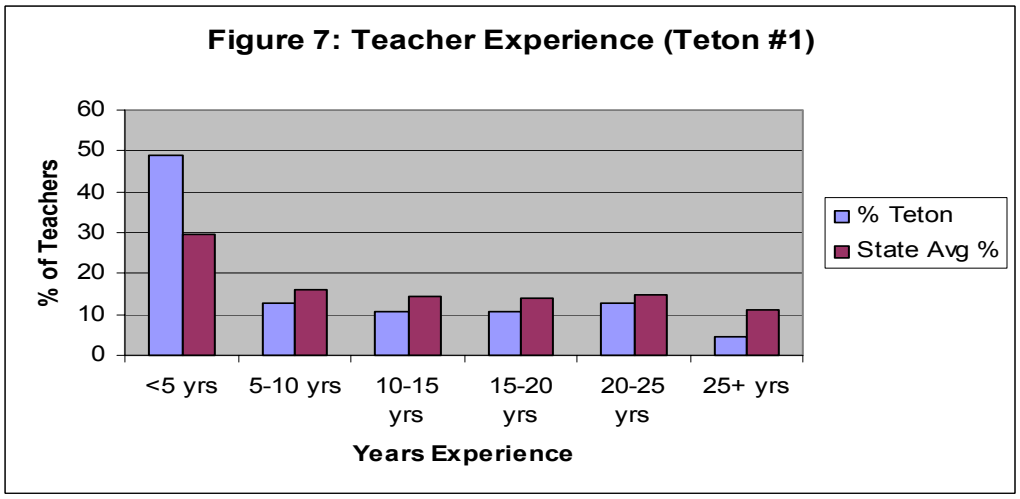
Johnson County School District #1	26.9%	13.4%	12.6%	12.6%	19.3%	15.1%
Laramie County School District #1	29.8%	16.1%	14.9%	14.4%	14.6%	10.1%
Laramie County School District #2	**42.7%**	15.6%	13.5%	9.4%	13.5%	5.2%
Lincoln County School District #1	33.3%	14.0%	7.0%	8.8%	21.1%	15.8%
Lincoln County School District #2	32.5%	18.3%	13.0%	17.2%	14.2%	4.7%
Natrona County School District #1	26.7%	19.3%	18.5%	12.9%	13.2%	9.4%
Niobrara County School District #1	15.0%	27.5%	17.5%	7.5%	15.0%	17.5%
Park County School District # 1	25.0%	16.4%	17.2%	20.7%	11.2%	9.5%
Park County School District # 6	29.6%	18.8%	16.7%	16.1%	9.1%	9.7%
Park County School District #16	**56.5%**	26.1%	13.0%	0.0%	0.0%	4.3%
Platte County School District #1	20.6%	17.5%	9.5%	18.3%	17.5%	16.7%
Platte County School District #2	28.6%	7.1%	0.0%	25.0%	21.4%	17.9%
Sheridan County School District #1	29.2%	19.8%	15.6%	17.7%	12.5%	5.2%
Sheridan County School District #2	30.6%	13.9%	14.3%	11.2%	17.0%	12.9%
Sheridan County School District #3	**42.9%**	7.1%	14.3%	28.6%	0.0%	7.1%
Sublette County School District #1	35.2%	24.1%	9.3%	11.1%	11.1%	9.3%
Sublette County School District #9	33.9%	21.4%	12.5%	14.3%	7.1%	10.7%
Sweetwater County School District #1	19.9%	15.6%	17.2%	14.1%	17.5%	15.6%
Sweetwater County School District #2	20.8%	11.0%	16.9%	16.5%	19.1%	15.7%
Teton County School District #1	**48.7%**	12.7%	10.7%	10.7%	12.7%	4.6%
Uinta County School District #1	27.1%	14.3%	13.2%	21.7%	14.3%	9.3%
Uinta County School District #4	19.6%	19.6%	16.1%	19.6%	21.4%	3.6%
Uinta County School District #6	15.4%	20.0%	7.7%	35.4%	7.7%	13.8%
Washakie County School District #1	21.9%	15.2%	20.0%	16.2%	17.1%	9.5%
Washakie County School District #2	33.3%	27.8%	16.7%	11.1%	11.1%	0.0%
Weston County School District #1	30.8%	12.8%	15.4%	9.0%	14.1%	17.9%
Weston County School District #7	14.8%	7.4%	11.1%	18.5%	37.0%	11.1%
Statewide Avg.	29.4%	15.9%	14.4%	14.1%	14.9%	11.3%

Source: Computed using data provided by the Wyoming Department of Education.

From the data presented in Table 9, in two districts (Park #16 and Fremont #21) over half the teachers employed have less than five years experience, while in Teton almost half of the teachers (48.7%) employed are similarly inexperienced. Figures 5 to 7 illustrate proportions of teachers by experience levels in these three districts in 2002-03, while the same information for the remaining districts with high proportions of inexperienced teachers are described in Appendix B. Washakie #2 and Big Horn #1 are also included for comparison.







Figures 5 to 7 show how high the proportion of relatively inexperienced teachers is in these districts relative to the rest of the State. Further, each district also has low proportions of more experienced teachers relative to state averages. In Fremont #21 and Teton #1, the data may further suggest that the least experienced teachers cannot be enticed to stay in these districts, as both districts have lower than average proportions of teachers in the 5-10 year state experience group.[50] Across all three districts the indicated experience patterns are potentially consistent with districts experiencing significant retention problems. Further, the patterns exhibited in some of the Figures described in the Appendix B are potentially suggestive of retention problems also, exhibiting the same pattern of experience outcomes as show in Figures 5 to 7.

Overall, this analysis has identified a criterion that could be used to determine when experience is low enough to be deemed abnormally low and potentially indicative of a retention problem. The suggested criterion is to compare the observed average level of state experience

[50] This may also indicate a relatively recent one-time event such as a large cohort of retiring teachers. Such an outcome, however, may be unlikely as Table 8 shows experience levels in these districts have been low for five years or more.

among teachers in a district with the statewide average level across districts. If this level is below one standard deviation of the average, the district is deemed to have abnormally low experience among its teachers. This criterion identifies Big Horn #1, Fremont #14 and #21, Laramie #2, Park #16, Sheridan #3, Teton #1 and Washakie #2 as having abnormally low experience levels. Additionally, the analysis has identified a second characteristic that could identify those districts experiencing teacher retention problems by considering the proportion of inexperienced teachers within a district relative to the statewide district average. Specifically, districts with proportions of least experienced teachers greater than one standard deviation or more above the statewide average proportion across districts are identified as having an abnormally high number of inexperienced teachers. This criterion identifies Big Horn #4, Fremont #14 and #21, Laramie #2, Park #16, Sheridan #3, and Teton #1 as districts with potential retention problems. Under both experience criteria (proportion of young teachers and average experience), a subset of districts emerges that may have retention rates outside of a level that would be considered "normal" in the State. These include Fremont #14 and #21, Park #16, Sheridan #3, and Teton #1. If these districts are actually experiencing retention rates below those in other districts across the State, the reason may be that compensation levels are too low to retain teachers.

Table 10: Funding Outcomes After Small School and Regional Cost Adjustments

District	SY05 Base Funding	Proposed Small School/Regional Cost Funding Change Relative to current Law	% Change
Fremont #14	$6,930,000	$500,000	7.2%
Fremont #21	$4,180,000	$210,000	5.0%
Park #16	$1,920,000	$140,000	7.3%
Sheridan #3	$2,140,000	$150,000	7.0%
Teton #1	$22,870,000	-$1,800,000	-7.9%

Source: State Legislative Services Office

The implications of such retention problems for the computed regional cost adjustment are important. Under a State obligation to *input equity* across districts, if it is the case that retention is not occurring in some districts at a rate comparable to other districts, the indicated cost values in the regional cost adjustment index may be underestimated. Consideration of the funding values implied by the proposed index presented in Table 7 indicate that two of these districts (Fremont #14 and #21) see current funding values improved relative to current law while the other three see values reduced with the introduction of the proposed regional cost index. Potential bias in the index arising from retention may result in these districts being under-funded. To see the funding outcomes overall due to consideration of other proposed funding changes in the school finance model, however, is necessary to determine how overall district funding levels are impacted by all changes in the school finance model. These are presented in Table 10. Using funding estimates provided by the Wyoming Legislative Services Office, the estimated impact of the combined small school and regional cost adjustments indicates four of the five districts with potential retention problems will see significant increases in funding if new funding adjustments are implemented. If some of these increases are applied to salaries, not only would retention outcomes potentially improve, future estimations of the regional cost adjustment would capitalize these compensation improvements in the estimated regional cost index,

increasing the future regional cost adjustments and funding these districts would receive.[51] New compensation levels would therefore be supported by future estimates of the regional cost index.[52]

Of the districts described in Table 10, only Teton #1 sees a significant decline in funding after all proposed adjustments are implemented. If a compensation-related retention problem really is present in this district, and the State is obligated to ensure *input equity*, a funding reduction would not improve the situation. As just described, this decrease in funding may be partially due to an underestimate in the regional cost index. The regional cost index value estimated in this report suggests that Teton County has an uncontrollable cost difference at least 20% higher than the State average, as the index value now identifies the lower bound of the cost difference to *attract and retain* teachers. How much higher would salary costs be if teachers were also being retained at normal rates in Teton? Unfortunately, if a district is not retaining teachers, there is no salary data available to answer this question. In Teton #1, the Court decision that resulted in use of the full WCLI for regional adjustment under the current law resulted in the district being compensated for labor costs at a rate 40% greater than the State average. While some of this increase has been used for increasing personnel compensation in the district, levels of salary compensation have not been increased to reflect current funding levels. Had they been, the estimated regional cost index value for the district would currently be 139, or almost the value received under the current regional cost law.[53] From 2000-01 to 2002-03, starting salaries in Teton #1 have risen from a level of $25,000 to $32,000. While this increase has resulted in Teton now paying the highest starting salary in the State, it represents only a 28% increase. Further, the proposed regional cost adjustment index presented here finds that current salaries in Teton County are only 20% greater than those paid at the statewide average controlling for differences in controllable characteristics.

In short, salaries in Teton have not risen to match the levels funded under the current regional cost adjustment law and recent increases do not represent the levels of funding Teton #1 is receiving for salary compensation. They also inform that while salaries have increased, retention outcomes as described in Tables 8 and 9 have not, thus more than a 20% premium may be required to improve (apparent) retention problems if they can be influenced by salary. Overall then, the required levels of compensation needed to slow turnover in the district may be between 20% and 40% greater than the State average, or they may even be more. Teton's failure to increase compensation proportionate to its compensation funding has resulted in no apparent improvements in retention, and the improvements in compensation that have been implemented do not inform of the adequacy of current funding levels to reverse retention problems. Until such time as the nature of retention outcomes in Teton and elsewhere in the State can be accurately ascertained by a study specifically commissioned to investigate retention, this report suggests that due to the potential retention problems in the district and the bias in estimated regional cost this could create, this district should be held harmless to current funding levels *if the State is obligated to provide input equity across districts*. Additionally, since potential retention problems are the reason for this recommendation, and Teton #1 has continually claimed its funding level must be protected to improve retention, this hold harmless funding should be

[51] This would occur because regional cost index values are computed using actual salary data.

[52] This assumes that compensation improvements in these districts are greater than the average level of those applied elsewhere in the State.

[53] This contention is based on a simulation in which all salaries in Teton#1 were increased by 16.4% over current values. The resulting index value for Teton #1 after re-estimating the regional cost index with these new salaries was 139.

made contingent on the condition that salaries are increased by approximately 16% to ensure compensation levels match those the State is currently funding for.[54] It is not in Teton's best interest to increase compensation levels to levels less than that funded for as such actions could be less effective in reversing retention outcomes. Additionally, any salary improvements made in Teton relative to the rest of the State will be capitalized in future estimations of the regional cost index as proposed.[55] The cost of this recommendation is the $1.8 million needed to hold Teton #1 harmless, and this increases the cost of the proposed regional cost adjustment from $20.1 to $21.9 million. This report also recommends that a retention study be conducted to determine (i) if such problems really do exist in the State and (ii) if identified, whether such problems are the result of a demographic shift in the districts as older faculty retire, or the result of insufficient compensation levels. This study would function to identify whether the hold harmless action as described is really necessary, and to identify the nature of the retention problem if it exists. Finally, the State must define its funding obligation to *input* or *outcome equity*.[56] Currently it is unclear what this obligation is.

VII. Report Recommendations

Recommendation 1: The State of Wyoming should replace the current regional cost adjustment index with a statistically estimated one as proposed in this report.

Estimated Cost: Estimated $20.114 million per funding cycle, not accounting for changes in student enrollment in the State, or other factors that could affect base level funding.

Justification:

The current WCLI-based regional cost adjustment index has several flaws, and these result in an index that fails to accurately estimate the uncontrollable cost variations districts face. Significant statistical evidence and standard economic theory suggests that basing the regional cost adjustment only on the cost of living in the State omits consideration of the effects that additional influences create on the uncontrollable costs districts face. In particular, the current law does not account for remoteness, recreational and community characteristics, and work environment characteristics that also affect the compensation required by teachers. Further, with respect to remoteness, the use of the WCLI creates an adjustment that is exactly opposite of what is necessary in small, remote districts. Overall, evidence has been presented in this report and in Godby (2002) that the use of the WCLI in the current regional cost adjustment law results in the following problems:

[54] This percentage is computed on the basis that the current regional cost index value for this district is 119.8 and a salary increase of 16.5% in all salaries would result in the predicted index value rising to 140, the regional cost value the district is funded to under current law.

[55] Again, this assumes that compensation improvements in Teton are greater than the average level of those applied elsewhere in the State.

[56] Note that the State cannot be expected to meet both requirements. If for example the State were required to ensure outcome equity and a district were underperforming in assessment tests, it would be required to take action to improve this outcome. Doing so may require more inputs to be provided to the district. This, however, would violate input equity unless the same increase in inputs was made available to every district.

1. Lack of consideration of other factors affecting uncontrollable costs. The statistical evidence strongly supports the contention that other factors also influence district's salary costs significantly.
2. A funding bias toward larger more urban districts. Evidence has been presented to show that larger more developed districts in the State receive funding beyond what actual salary outcomes suggest are required, while smaller remote districts receive funding reductions when actual salary outcomes indicate the need for funding increases. This result occurs because in larger urban areas, the cost of living predominates in the consideration of adequate compensation, while in remote or smaller areas other considerations become more important.
3. If actual uncontrollable costs are overestimated under the current law, the current regional cost law actually creates an incentive for districts to fund compensation at levels below those they are funded for. For example, a district with actual uncontrollable costs lower than the WCLI may not pass on all of the compensation adjustment given it to teachers, thereby capturing additional funding for other programs. The incentive would be to do so as increasing teacher pay does not result in any tangible benefit to the district, while funding additional programs materially would. Under the proposed model this incentive would be reduced, as the estimated regional cost in such an over-funded district would be estimated to be lower than the level they currently receive.
4. The total variation between lowest and highest cost districts in the State is grossly over-estimated under the current system based on current salary outcomes. The current system imposes a funding variation of 59.6% in adjustments allocated to districts. Evidence presented here suggests the appropriate variation based on current salary data is only 29.4% between highest and lowest cost districts. This problem exacerbates the problem in Point 2.
5. The use of the WCLI as implemented in the current law actually reduces total funding to the school finance system because an index is used with a base value of less than 100. The school finance model uses school prototypes to define the required funding for educational outcomes currently experienced in the State. The implementation of the current regional cost adjustment then reduces funding by approximately 0.73% because the index base is 3.6% below the level consistent with the statewide average levels used in the prototype models. Total funding is not reduced by the full 3.6% because of the funding bias in Point 2. Larger, more urban districts tend to receive larger funding increases relative to the funding reductions smaller or more remote districts receive.
6. Points 1-5, available statistical and economic evidence all indicate the current regional cost adjustment model over-funds districts in larger developed areas and under-funds those in less developed and more remote areas. Such a funding outcome implies a funding inequity is taking place between these two types of districts. This condition suggests the current regional cost adjustment is not adequately measuring regional cost variations in the cost of teachers across the State and that the equity requirement of the regional cost adjustment is intended to ensure is being undermined through the use of the current law.

Because of these problems, this report recommends that the current approach to regional cost adjustment be abandoned. In its place, it is recommended that an index based on a statistically estimated salary relationship that considers remoteness, recreational and community characteristics, and work environment characteristics, as well as the cost of living be used. The details regarding how such an index can be constructed are outlined in this report, as is a proposed index based on this approach. Such an index reflects the best estimate available regarding the true pattern of regional teacher cost variation in the State, and therefore avoids the biases and problems created under the current system to the best of our present ability to estimate teacher cost variation. Further, while the statistical methods required to compute the new index are more complex than those in the current law, they are still well within the abilities of those charged with administrating the school finance system. The analysis used to compute the regional cost adjustment relies on the same methods as those used to compute the school prototype models and other adjustments contained in the current school finance model. The data required to make this computation is readily available and regularly collected by State and Federal agencies. In summary, this report recommends that regional cost adjustment in the State be conducted as follows:

1. On an annual basis and as soon as data is available, the regression equation used to construct the regional cost adjustment index should be re-estimated using current data from the past school year only. This re-estimation would refit the same statistical relationship as described in the report with new data, and no re-specification of the data or the equation would be performed. Results of this estimation would be used to construct the regional cost adjustment for the next school year financing cycle. This will ensure the regional cost adjustment reflects current cost conditions, and reflects adjustments school districts may have to make with respect to teacher salaries.
2. Every five years or at the same time school finance prototype models are redefined, a study should be performed to determine if the statistical relationship between teacher salaries and the variables used to predict them has changed. If evidence is present to suggest this has occurred, a new statistical equation, including new variables and/or a new econometric specification shall be identified for the construction of the regional cost adjustment and to be used for the next five year cycle. This process will ensure that the underlying statistical relationship used to estimate salaries remains current and reflects actual conditions, and it will allow the regional cost adjustment index to be calibrated with respect to school prototype models to ensure that both steps in the school finance process remain consistent with one another.

Recommendation 2: If the State is responsible to ensure district funding provides *input equity,* regional cost adjustment with respect to Teton County should be held harmless to current levels described in the existing law.

Estimated Cost: $1.8 million.

Justification:

Under input equity criterion, the State must also ensure that retention outcomes are equivalent across districts. There is evidence that retention outcomes in Teton County #1 and four other districts are lower than what could be considered normal relative to districts in the rest

of the State. These retention differences may be due to normal demographic shifts in the teacher population that have resulted in a unique period of higher turnover, which does not affect how regional cost index values are interpreted. These retention differences could also be due to inadequate compensation levels that result in higher turnover rates than in other districts. When retention outcomes are not comparable, and these differences are due to compensation differences, this limits the comparability of computed index values in the regional cost adjustment index developed under the proposed methodology. Values in the index are computed under the assumption that actual salaries used for estimation of the index buy the *same* teacher services. It is possible to have salaries that attract teachers but do not provide adequate compensation to retain them at a rate comparable to the average retention rate in the State. If this occurs in some districts, the salaries paid in the district are not purchasing the same services that salary levels in other districts that pay enough to attract and retain are purchasing. In such cases, the estimated regional cost adjustment index values do not reflect percentage differences in uncontrollable costs across districts, as they do when districts have similar retention outcomes. Instead, these values describe the upper or lower bound of the cost difference. For example, in Teton County, the proposed regional cost index value is 119.8. If Teton had similar retention outcomes to average incomes in the State, this would imply uncontrollable costs are 20% higher in Teton County. Since Teton has lower retention outcomes than experienced in the State though, the index represents the lower bound of the possible estimate of the uncontrollable cost difference Teton and the State average level (assuming the reason retention problems in Teton are caused by inadequate compensation levels) *if and only if the State is required to ensure retention outcomes under an input equity responsibility*. To create retention outcomes in Teton that resemble those in the rest of the State, higher compensation may be required; therefore, the cost difference estimated (20%) is the lower bound of the level that would occur if Teton had the same turnover rate as experienced elsewhere in the State.

When retention levels are below those considered normal, one might ask what level of adjustment would be required to improve retention to average levels. Such an estimate cannot be made as information regarding what people need to be paid to remain in an area longer is unknown. Given that we can assume the required compensation level would be higher than current salary levels in Teton, this implies the necessary adjustment to improve retention outcomes is greater than the 119.8 value the regional cost index value assigned to Teton under the proposed index suggests. How much greater is unknown. Since reducing funding to the district would likely be detrimental to retention outcomes, to reduce Teton's funding below that described in the current law level would likely be counter-productive and therefore this report recommends that Teton be held harmless to previous funding levels (again only if the State is required to provide *input equity*). This would fulfill the State's obligation to fund Teton adequately, however, Teton School District #1, having complained that any reduced funding would further damage retention in their district, must ensure that the State provided funding is used for teacher compensation. This concern is the basis of Recommendation 4.

With respect to the four other districts with abnormally low experience outcomes, it is the recommendation of this report that they also be held harmless. Since under the new school finance proposals, all four districts experience increased funding levels under the new school finance adjustments proposed (regional cost and small school) of at least 5%, it is likely all four districts will see improved funding outcomes, thus assuming these proposals are accepted by the legislature and the courts, this report recommends additional compensation only be directed to these districts in the future if retention outcomes do not appear to improve after these funding

changes. If funding levels are correctly estimated in current LSO documents, these districts will not need to be held harmless to previous funding levels as newly proposed adjustments improve funding. **Note:** This funding recommendation is only made if it is determined the State is responsible to ensure retention outcomes are comparable across districts. If the State is not required to ensure this condition, funding to such levels increases the total education funding liability without any indication any improvement will occur in student outcomes. All that would improve would be the stability of the teaching pool in retention-challenged districts.

It is important to recognize that under outcome equity, the State would not have a responsibility to support retention thus this recommendation would not be required.

Recommendation 3: The State of Wyoming should commission a retention study to determine (i) whether significant differences are apparent in retention outcomes in the State, (ii) the cause of these retention differences, (iii) whether improved compensation could improve these outcomes, (iv) the best guidelines to use to identify retention problems as they occur in the State.

Estimated Cost: Such a study could cost as much as $150,000 due to the level of detail required.

Justification:

Retention outcomes are important when determining how to interpret the regional cost index values computed under the proposed methodology. Retention rates for teachers in an area may be affected by the specific demographics of the teacher population (e.g. are teachers approaching retirement age) or they may be due to affected by compensation levels. If district retention is comparable, the index values describe the uncontrollable cost differences between districts. If these outcomes are not comparable, *and the reason for this difference can be traced to compensation levels*, then the index values in those districts where retention is lower than normal describe the lower bound of that district's uncontrollable cost level relative to other districts. (This, as outlined in the last recommendation, is true only if the State is obligated to provide input equity.) Identification of districts with retention problems is therefore critical to understanding how to interpret the regional cost index. A study to determine whether retention problems exist and their causes in particular districts would allow proper interpretation of the regional cost index. Understanding whether retention outcomes exist and what their causes are is also necessary when considering the question of State funding responsibility. Without a set of criteria regarding the definition of retention and turnover problems, it is unclear that the question of retention can be resolved and defined to anyone's satisfaction, particularly the Legislature's or the Court's.

Recommendation 4: The State shall ensure that districts are accountable such that any monies directed toward a district to improve retention outcomes (e.g. additional funding to hold a district harmless) are used to improve retention outcomes only. Districts should not be allowed to redirect such funding to uses other than staff compensation.

Estimated Cost: $0

Justification:

As described in the report, while Teton County District #1 is funded at a level that would allow salaries to be 40% above the statewide average, current salary outcomes reflect salary levels that are only 20% above those levels. Further, starting salaries have only been increased to levels 28% above the statewide average level. The State is funding Teton in a way the Courts have deemed acceptable, but Teton County has complained publicly it cannot retain teachers and the data suggests that retention rates are abnormally low in this district. The problem appears to be that the district, while increasing salaries somewhat, has also apparently diverted at least some funds meant to ensure teachers are adequately compensated to other uses. This has not created a positive effect on retention outcomes in Teton County. If the state makes an exception to normal funding rules to improve retention rates in Teton, they should have a reasonable expectation these additional funds will be put to the use intended. For this reason, Teton County School District #1, and any other district held harmless under the regional cost adjustment should be held accountable to ensure that resources meant to improve retention outcomes are put to this use. If they are, these salary increases will be reflected in future estimations of the regional cost adjustment index, and therefore salary increases will be capitalized under the proposed regional cost adjustment methodology.

It is important to recognize that under outcome equity, the State would not have a responsibility to support retention thus this recommendation would not be required.

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Appendix A

Instrumental Variable Regression (Used for Index 9-IV Weighted)

Instrumental variables (2SLS) regression, observations weighted by inverse of square root of teacher population in a district. Net Benefits have been instrumented using all variables, mean average temperature and distance to nearest ridgeline.

Number of obs = 7410
F(19, 7390) = 1339.45
Prob > F = 0.0000
R-squared = 0.7747
Adj R-squared = 0.7741
Root MSE = 4522.8

total and remote pay	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
net benefits	-.1880064	.0772796	-2.43	0.015	-.3394964	-.0365163
fte	37195.45	603.1701	61.67	0.000	36013.06	38377.83
male	1342.518	132.9294	10.10	0.000	1081.938	1603.098
prior state exp.	585.5065	6.023986	97.20	0.000	573.6978	597.3152
has bachelors	2442.687	572.7248	4.27	0.000	1319.983	3565.391
has masters	6359.771	116.2675	54.70	0.000	6131.854	6587.689
has doctorate	10037.83	818.7283	12.26	0.000	8432.89	11642.77
high school teacher	395.4263	134.0924	2.95	0.003	132.5669	658.2856
adminstrative	4397.018	259.7422	16.93	0.000	3887.849	4906.187
other	1588.849	124.8648	12.72	0.000	1344.078	1833.619
pe/coaching	2401.161	167.8583	14.30	0.000	2072.111	2730.211
% limited English	4.424521	9.204739	0.48	0.631	-13.61939	22.46843
% free-reduced lunch	-7.006588	3.93574	-1.78	0.075	-14.72176	.708584
% special. ed students	14.43794	10.94878	1.32	0.187	-7.024782	35.90066
wcli adjusted	47.11996	24.21946	1.95	0.052	-.3570885	94.59701
district pop 2000	.0678198	.0062715	10.81	0.000	.0555258	.0801138
dist to 50k city	12.83388	2.35524	5.45	0.000	8.21694	17.45083
dist to nearest NP	20.47234	1.95273	10.48	0.000	16.64443	24.30025
Teton Dummy Var.	7940.799	1216.315	6.53	0.000	5556.475	10325.12
constant	-19374.88	2536.873	-7.64	0.000	-24347.87	-14401.88

OLS Regression (Used for Index 8- OLS weighted)

OLS regression, observations weighted by inverse of square root of teacher population in a district.

Number of obs = 7410
F(19, 7390) = 1346.99
Prob > F = 0.0000
R-squared = 0.7759
Adj R-squared = 0.7754
Root MSE = 4509.9

total and remote pay	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
fte	37135.68	601.2152	61.77	0.000	35957.12	38314.23
male	1305.579	132.1693	9.88	0.000	1046.489	1564.668
prior state exp.	585.3	6.006419	97.45	0.000	573.5257	597.0743
has bachelors	2353.871	570.5599	4.13	0.000	1235.411	3472.331
has masters	6344.266	115.8582	54.76	0.000	6117.151	6571.381
has doctorate	10016.13	816.3588	12.27	0.000	8415.833	11616.43
high school teacher	349.8454	133.1225	2.63	0.009	88.88732	610.8035
administrative	4458.997	258.4497	17.25	0.000	3952.362	4965.632
other	1712.81	119.8744	14.29	0.000	1477.822	1947.798
pe/coaching	2420.57	167.2966	14.47	0.000	2092.621	2748.519
% limited English	2.159747	9.156956	0.24	0.814	-15.7905	20.10999
% free-reduced lunch	-8.193383	3.910917	-2.10	0.036	-15.85989	-.526872
% special. ed students	13.87298	10.91647	1.27	0.204	-7.526415	35.27237
wcli adjusted	50.71149	24.23811	2.09	0.036	3.197877	98.2251
net benefits	.0583733	.0378892	1.54	0.123	-.0159004	.1326469
district pop 2000	.063718	.0061834	10.30	0.000	.0515968	.0758393
dist to50k city	12.88753	2.352907	5.48	0.000	8.275159	17.4999
dist to nearest NP	23.35889	1.791456	13.04	0.000	19.84712	26.87065
Teton Dummy Var.	6231.523	1130.347	5.51	0.000	4015.72	8447.325
constant	-21718.36	2465.866	-8.81	0.000	-26552.16	-16884.56

Table A1: Indexes Based on Alternative Regression Equations

district_name	WCLI - Current Law	Index 5a (base= avg)	Index 7 IV version of 5a	Index 6a	Index 6a IV version	Index 8 OLS Weighted	Index 9- IV Weighted
Albany #1 (Laramie)	**102.5**	99.7	99.0	99.5	98.2	98.7	100.8
Big Horn #1 (Byron)	**90.5**	96.0	96.1	96.7	97.0	95.7	95.5
Big Horn #2 (Lovell)	**90.5**	94.3	93.5	95.1	93.7	95.0	96.9
Big Horn #3 (Greybull)	**90.5**	97.7	97.8	98.2	98.6	98.3	98.2
Big Horn #4 (Basin)	**90.5**	98.1	98.4	98.7	99.4	98.7	98.1
Campbell #1 (Gillette)	**104.0**	104.6	104.4	104.7	104.2	105.2	106.0
Carbon #1 (Rawlins)	**94.8**	101.0	101.3	101.9	102.3	100.8	99.9
Carbon #2 (Saratoga)	**94.8**	98.9	99.0	99.4	99.3	98.2	98.0
Converse #1 (Douglas)	**92.3**	95.6	95.6	95.4	95.6	97.1	97.4
Converse #2 (Glenrock)	**92.3**	95.8	96.0	95.7	95.8	96.9	96.4
Crook #1 (Sundance)	**89.8**	97.7	98.3	98.2	99.8	96.2	94.9
Fremont #1 (Lander)	**94.7**	100.3	99.7	100.3	99.5	100.7	102.1
Fremont #2 (Dubois)	**94.7**	99.1	99.4	98.4	99.1	97.2	96.9
Fremont #6 (Pavillion)	**94.7**	99.0	99.1	98.8	99.4	98.6	98.4
Fremont #14 (Ethete)	**94.7**	102.1	101.7	102.1	101.4	98.6	99.3
Fremont #21 (Ft. Washakie)	**94.7**	103.7	103.7	101.4	101.7	99.3	98.8
Fremont #24 (Shoshoni)	**94.7**	97.2	96.5	97.7	96.4	98.4	99.7
Fremont #25 (Riverton)	**94.7**	101.2	100.5	99.9	99.0	101.0	102.4
Fremont #38 (Arapahoe)	**94.7**	101.9	102.6	102.1	103.4	99.2	97.2
Goshen #1 (Torrington)	**90.3**	96.5	96.4	96.7	96.7	98.6	99.3
Hot Springs #1 (Thermopolis)	**92.3**	98.6	98.7	98.7	99.2	100.0	99.8
Johnson #1 (Buffalo)	**103.0**	100.1	100.0	98.8	98.4	103.4	104.0
Laramie #1 (Cheyenne)	**104.0**	106.1	106.3	106.1	106.6	105.4	105.8
Laramie #2 (Pine Bluffs)	**104.0**	93.0	92.8	92.2	91.2	95.6	97.1
Lincoln #1 (Kemmerer)	**92.2**	100.3	100.5	101.3	101.7	99.6	98.3
Lincoln #2 (Afton)	**92.2**	99.8	100.0	99.5	100.1	98.0	97.4
Natrona #1 (Casper)	**97.8**	105.7	105.7	106.0	106.0	107.9	108.2
Niobrara #1 (Lusk)	**87.7**	94.9	94.3	96.0	95.0	94.6	96.1
Park #1 (Powell)	**97.8**	95.9	95.5	95.8	95.4	96.4	97.7
Park #6 (Cody)	**97.8**	98.0	97.6	97.6	97.2	97.4	98.8
Park #16 (Meeteetse)	**97.8**	97.1	96.7	97.2	96.5	95.6	96.4
Platte #1 (Wheatland)	**91.0**	98.2	99.4	97.8	100.5	98.9	96.5
Platte #2 (Guernsey)	**91.0**	97.7	98.4	95.8	97.3	98.4	97.1
Sheridan #1 (Ranchester)	**104.2**	100.5	99.4	99.4	97.4	102.1	104.2
Sheridan #2 (Sheridan)	**104.2**	104.8	105.3	104.1	104.9	107.2	106.1
Sheridan #3 (Clearmont)	**104.2**	100.5	100.5	100.3	99.7	103.2	103.4
Sublette #1 (Pinedale)	**104.8**	103.5	104.4	102.8	104.9	99.7	97.1
Sublette #9 (Big Piney)	**104.8**	103.1	103.9	103.8	105.3	99.6	96.9
Sweetwater #1 (Rock Springs)	**97.7**	106.8	106.7	107.1	107.1	108.2	108.0
Sweetwater #2 (Green River)	**97.7**	104.4	104.4	104.5	104.9	105.6	105.0
Teton #1 (Jackson)	**140.0**	116.9	116.4	117.1	116.2	118.2	119.8
Uinta #1 (Evanston)	**95.2**	101.4	101.2	101.7	101.6	102.5	102.0
Uinta #4 (Mt. View)	**95.2**	100.8	100.5	101.0	100.6	102.3	102.3
Uinta #6 (Lyman)	**95.2**	101.8	102.0	102.1	102.6	102.6	101.4
Washakie #1 (Worland)	**89.8**	101.2	101.8	101.9	103.5	100.6	99.0
Washakie #2 (Ten Sleep)	**89.8**	100.8	101.6	99.1	101.5	100.5	98.1
Weston #1 (Newcastle)	**88.2**	93.7	93.5	94.8	94.7	92.3	93.3
Weston #7 (Upton)	**88.2**	94.4	93.6	95.5	93.7	93.9	96.2

Legend:

Index 5a: Index based on OLS regression of variables used in Index 8.

Index 7: This index was computed from regression outcomes using same variables as in Equation 5a, with net benefits instrumented for with all other variables.

Index 6a: Index based on OLS regression using all variables in Index 5a equation, however, the WCLI variable has been replaced by the value of median owner occupied housing.

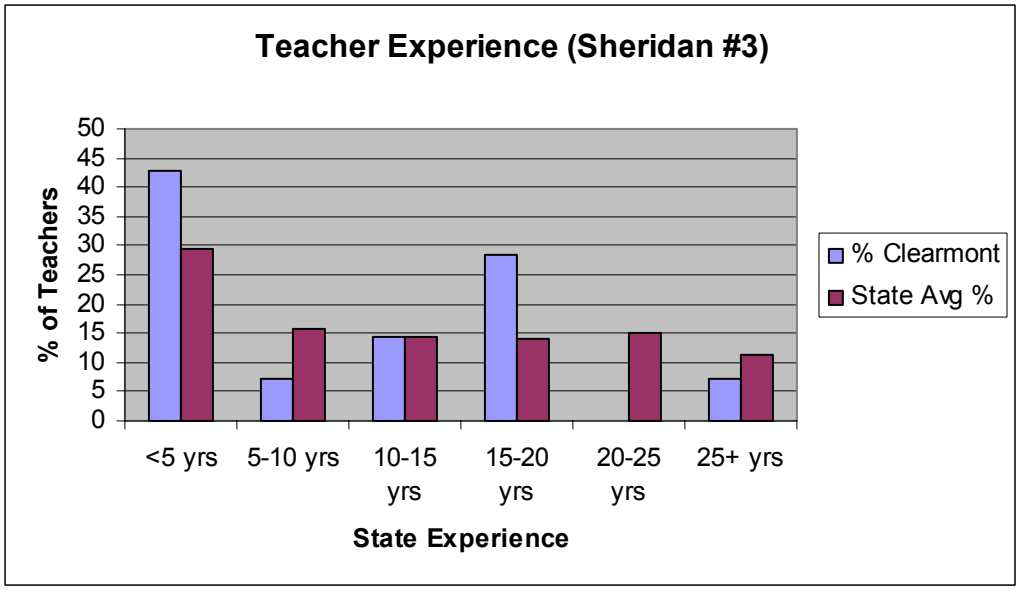
Index 6a IV: This index is constructed based on a regression using the variables in Index 6a regression, with the net benefits variable instrumented using other variables in the equation as instruments.

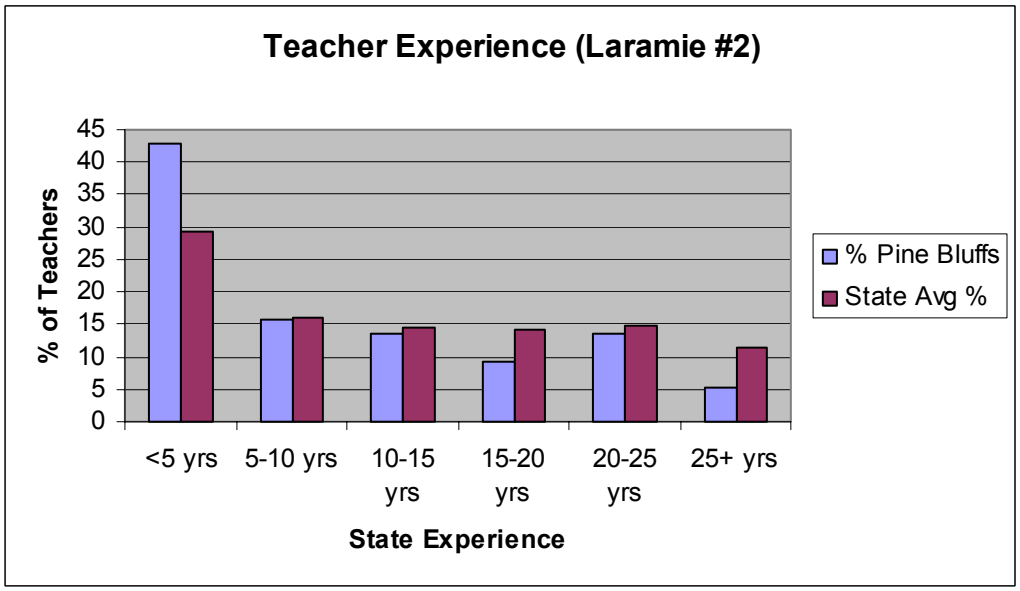
Index 8: Index constructed from Index 8 OLS weighted equation.

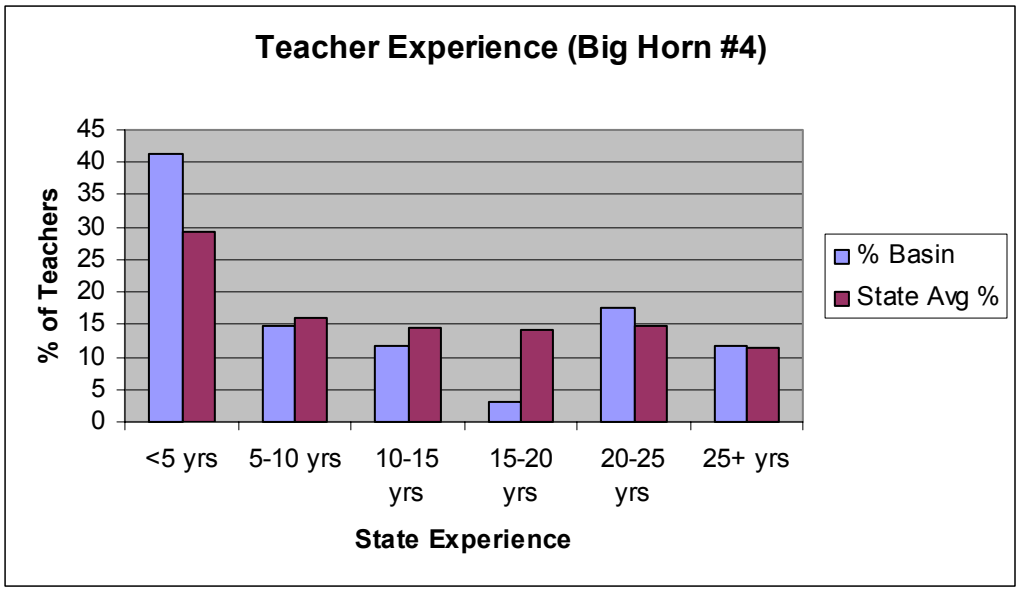
Index 9: Index constructed from Index 9 IV weighted equation.

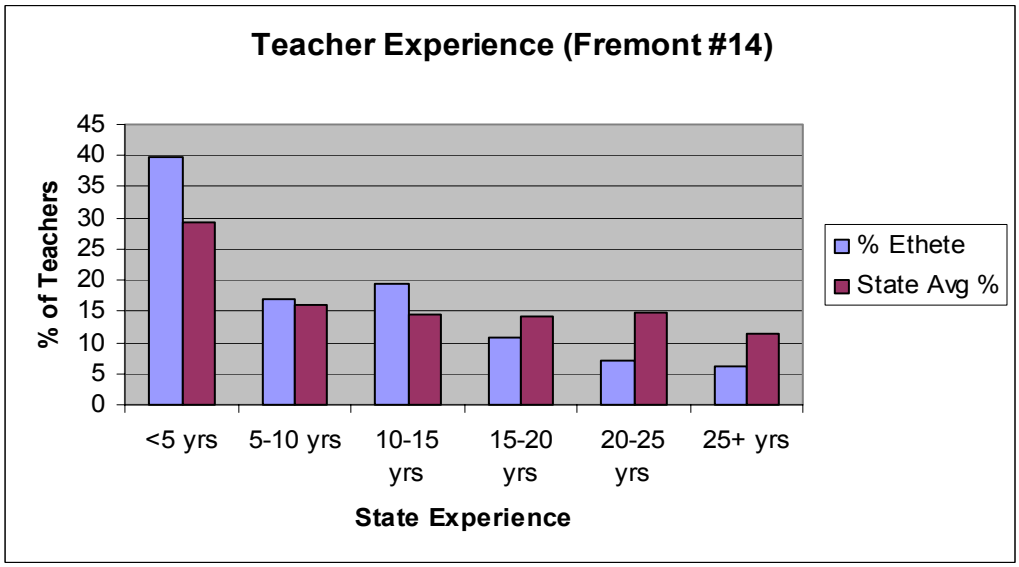
Appendix B

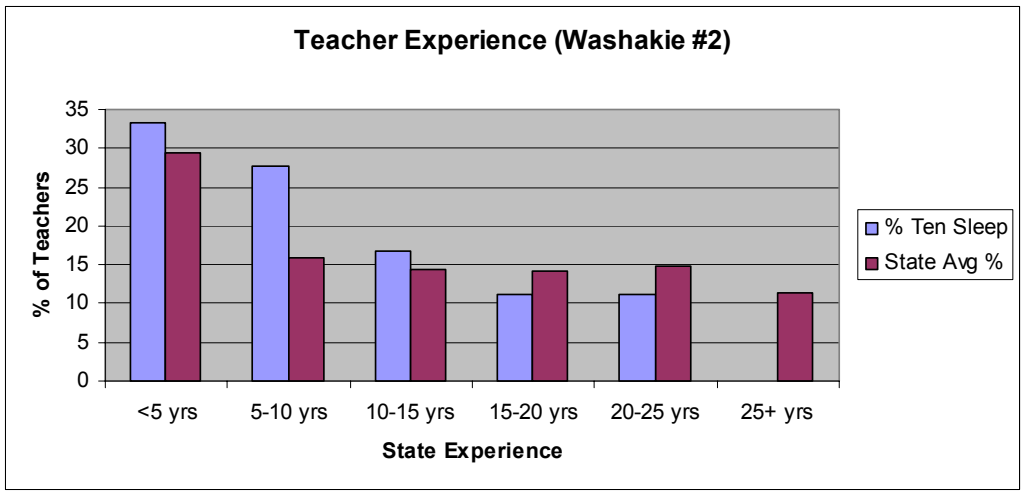
The following figures illustrate experience patterns in selected districts with proportions of least experienced teachers greater than one standard deviation of the statewide average proportion across districts (Big Horn #4, Fremont #14, Laramie #2, and Sheridan #3). Also included are two districts that exhibit average state experience levels one standard deviation or more below the state average level across districts (Big Horn #1, Washakie #2), but in which the proportion of inexperienced teachers is not greater than one standard deviation from the statewide average proportion across districts.

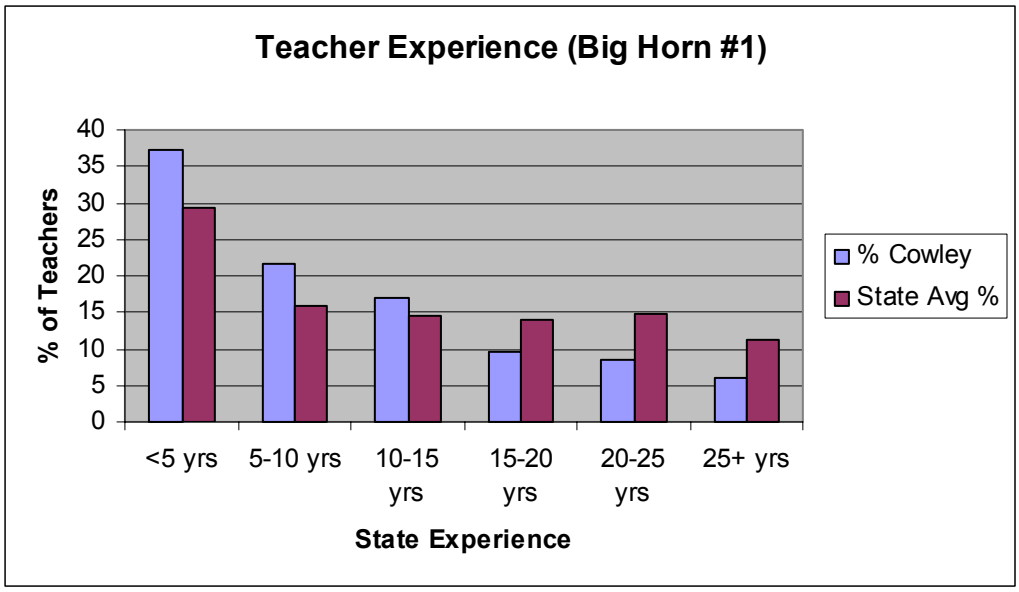





Teacher Experience (Big Horn #4)
% of Teachers
45
40
35
30
25
20
15
10
5
0
<5 yrs
5-10 yrs
10-15 yrs
15-20 yrs
20-25 yrs
25+ yrs
State Experience
% Basin
State Avg %


Teacher Experience (Fremont #14)
% of Teachers
45
40
35
30
25
20
15
10
5
0
<5 yrs
5-10 yrs
10-15 yrs
15-20 yrs
20-25 yrs
25+ yrs
State Experience
% Ethete
State Avg %


Teacher Experience (Washakie #2)
% of Teachers
35
30
25
20
15
10
5
0
<5 yrs
5-10 yrs
10-15 yrs
15-20 yrs
20-25 yrs
25+ yrs
State Experience
% Ten Sleep
State Avg %


Teacher Experience (Big Horn #1)
% of Teachers
40
35
30
25
20
15
10
5
0
<5 yrs
5-10 yrs
10-15 yrs
15-20 yrs
20-25 yrs
25+ yrs
State Experience
% Cowley
State Avg %

Appendix C:

The following tables present summary statistics for data used in the analysis presented.

Table C1: Total and Remote Pay, and Net Benefits

		Total and Remote Pay			Net Benefits		
district_id	N	mean	min	max	mean	min	max
101000	371	37285.49	7000	61860	6790.89	6790.9	6790.89
201000	82	37202.88	14500	60950	7827.58	7827.6	7827.58
202000	62	35416.17	21475	63102	4212.79	4212.8	4212.79
203000	45	41138.76	26014	56619	7388.38	7388.4	7388.38
204000	34	36918.38	24148	50654	9351.67	9351.7	9351.67
301000	612	40618.1	14491	73555	6531.76	6531.8	6531.76
401000	143	37969.6	13353	62702	9794.46	9794.5	9794.46
402000	100	37296.45	14700	52719	9946.06	9946.1	9946.06
501000	141	40312.41	17306	57432	5707.5	5707.5	5707.5
502000	77	35918.82	14450	47613	9576.31	9576.3	9576.31
601000	110	39541.98	14900	57700	10133.5	10134	10133.5
701000	153	38454.44	13275	56602	5909.54	5909.5	5909.54
702000	21	36628.06	27164	48891	9889.4	9889.4	9889.4
706000	43	38348.51	15415	49559	9061.9	9061.9	9061.9
714000	83	38473.37	15000	57718	9518.87	9518.9	9518.87
721000	41	38205.41	24320	67900	9738.53	9738.5	9738.53
724000	32	41211.01	28860	55640	6262.07	6262.1	6262.07
725000	207	36539.52	14000	50999	6567.14	6567.1	6567.14
738000	26	37987.69	28007	48235	11371.9	11372	11371.9
801000	183	38290.66	15925	60172	6511.42	6511.4	6511.42
901000	67	39350.08	26950	57839	7255.28	7255.3	7255.28
1001000	119	39523.33	14473	59194	5619.69	5619.7	5619.69
1101000	1004	41042.66	12636	74786	10045.6	10046	10045.6
1102000	96	35298.56	18520	54958	4817.36	4817.4	4817.36
1201000	57	40262.35	16875	55998	11824.9	11825	11824.9
1202000	169	39261.96	12100	57376	11306.8	11307	11306.8
1301000	932	41893.96	13987	67307	7317.21	7317.2	7317.21
1401000	40	40716.28	24090	52752	4792.47	4792.5	4792.47
1501000	117	39708.91	6020	51622	5203.65	5203.7	5203.65
1506000	186	41362.08	13963	60380	6745.08	6745.1	6745.08
1516000	23	33661.84	16045	50000	6881.93	6881.9	6881.93
1601000	126	37373.92	14200	54480	11550.4	11550	11550.4
1602000	28	37427.68	24300	49500	10321.6	10322	10321.6
1701000	96	35526.1	13418	52791	5248.87	5248.9	5248.87
1702000	294	41354.37	9936	58940	9063.9	9063.9	9063.9
1703000	14	35382.86	18300	43000	7060.71	7060.7	7060.71
1801000	54	41193.86	16663	66829	14282.5	14283	14282.5
1809000	56	42648.56	16225	60789	14383.9	14384	14383.9
1901000	326	41284.87	13619	59476	8409.41	8409.4	8409.41
1902000	236	43139.6	11530	63000	9315.09	9315.1	9315.09
2001000	197	42392.92	16500	70360	15012.8	15013	15012.8
2101000	258	39127.91	14000	59338	10220.1	10220	10220.1
2104000	56	40386.54	27900	54280	8315.89	8315.9	8315.89
2106000	65	39893.49	13700	59605	10355.7	10356	10355.7
2201000	105	39682.34	26631	55647	10926.2	10926	10926.2
2202000	18	28561.56	13275	49300	13059.3	10926	13184.8
2301000	78	38564.61	29200	52528	6519.97	6520	6519.97
2307000	27	39505.41	30747	50451	4210.3	4210.3	4210.3
Total	7410		6020	74786		4210.3	15012.8

Table C2: Teacher FTE and Total State Experience

		FTE			State Experience		
district_id	N	mean	min	max	Mean	min	max
101000	371	0.97593	0.5	1.31	12.55642	0	38
201000	82	0.988781	0.5	1	10.51317	0	34
202000	62	0.993065	0.63	1	13.42097	1	35
203000	45	1	1	1	15.09111	0	31
204000	34	0.992647	0.75	1	11.17647	0	28
301000	612	0.97299	0.5	1	13.55874	0	34
401000	143	1	1	1	13.44685	0	35
402000	100	0.962	0.5	1	13.9854	0	34
501000	141	0.990922	0.5	1	15.32333	0	35
502000	77	0.976364	0.5	1	12.59403	0	30
601000	110	0.990909	0.5	1	13.47409	0	41
701000	153	0.990196	0.5	1	14.28105	0	32
702000	21	1.015238	1	1.29	12.13286	0	28.25
706000	43	0.97907	0.5	1	16.03256	0	35
714000	83	0.981928	0.5	1	10.18675	0	30
721000	41	1	1	1	8.121951	0	34
724000	32	1	1	1	15.05469	0	29
725000	207	0.981304	0.5	1.12	15.01812	0	36
738000	26	1	1	1	12.57692	1	28
801000	183	0.993607	0.5	1.17	13.60549	0	36
901000	67	1	1	1	14.96567	0	39
1001000	119	0.982185	0.5	1	14.13403	0	32
1101000	1004	0.985379	0.5	1.2	12.71182	0	41
1102000	96	0.984375	0.5	1	10.34552	0	29.4
1201000	57	0.982456	0.5	1	14.16649	0	34
1202000	169	0.976154	0.5	1	11.45621	0	36
1301000	932	0.990816	0.5	1.28	12.57045	0	38
1401000	40	0.98	0.6	1	15.06075	0.6	37
1501000	117	0.982906	0.5	1	12.9694	0	39
1506000	186	0.994624	0.5	1	12.04495	0	37
1516000	23	0.956522	0.57	1	5.899565	0	30
1601000	126	0.98246	0.5	1	15.2031	0	34
1602000	28	0.989643	0.71	1	15.67429	0	28
1701000	96	0.981042	0.5	1	11.70531	0	30
1702000	294	0.983333	0.5	1	13.2117	0	37
1703000	14	0.964286	0.5	1	10.53571	0	34
1801000	54	0.972222	0.5	1	11.14481	0	32
1809000	56	0.982143	0.5	1	11.6875	0	34
1901000	326	0.99089	0.5	1	14.80074	0	36
1902000	236	0.993348	0.5	1.31	15.37004	0	35
2001000	197	0.958071	0.5	1	9.315279	0	36
2101000	258	0.998062	0.5	1	13.6462	0	41
2104000	56	1	1	1	13.26875	0	33
2106000	65	0.965077	0.5	1	15.05015	0.5	34
2201000	105	1	1	1	13.77343	0	40
2202000	18	0.919444	0.5	1	9.715556	0	24
2301000	78	0.996795	0.75	1	13.75385	0	37.5
2307000	27	1	1	1	17.25926	1	31
Total	7410		0.5	1.31		0	41

Table C3: Teacher Education Levels By District

	Has Bachelors Degree (1=Yes)			Has Masters Degree (1=Yes)			Has Doctorate (1=Yes)		
district_id	mean	min	max	mean	min	max	mean	min	max
101000	0.938005	0	1	0.350404	0	1	0.005391	0	1
201000	1	1	1	0.292683	0	1	0	0	0
202000	1	1	1	0.225807	0	1	0	0	0
203000	1	1	1	0.222222	0	1	0	0	0
204000	0.970588	0	1	0.294118	0	1	0	0	0
301000	0.995098	0	1	0.308824	0	1	0	0	0
401000	0.993007	0	1	0.188811	0	1	0	0	0
402000	0.99	0	1	0.23	0	1	0	0	0
501000	1	1	1	0.524823	0	1	0	0	0
502000	1	1	1	0.285714	0	1	0	0	0
601000	1	1	1	0.227273	0	1	0	0	0
701000	1	1	1	0.313726	0	1	0.006536	0	1
702000	0.952381	0	1	0.333333	0	1	0	0	0
706000	1	1	1	0.069767	0	1	0	0	0
714000	1	1	1	0.240964	0	1	0.012048	0	1
721000	0.95122	0	1	0.292683	0	1	0	0	0
724000	1	1	1	0.1875	0	1	0	0	0
725000	0.956522	0	1	0.227053	0	1	0	0	0
738000	0.961539	0	1	0.115385	0	1	0	0	0
801000	0.994536	0	1	0.163934	0	1	0	0	0
901000	1	1	1	0.373134	0	1	0.014925	0	1
1001000	0.983193	0	1	0.428571	0	1	0	0	0
1101000	0.991036	0	1	0.472112	0	1	0.002988	0	1
1102000	0.916667	0	1	0.375	0	1	0	0	0
1201000	0.982456	0	1	0.175439	0	1	0	0	0
1202000	0.988166	0	1	0.189349	0	1	0	0	0
1301000	0.998927	0	1	0.314378	0	1	0.007511	0	1
1401000	1	1	1	0.375	0	1	0	0	0
1501000	1	1	1	0.538462	0	1	0.008547	0	1
1506000	1	1	1	0.537634	0	1	0.016129	0	1
1516000	1	1	1	0.217391	0	1	0	0	0
1601000	1	1	1	0.468254	0	1	0	0	0
1602000	1	1	1	0.25	0	1	0	0	0
1701000	1	1	1	0.34375	0	1	0	0	0
1702000	0.993197	0	1	0.251701	0	1	0	0	0
1703000	0.928571	0	1	0.071429	0	1	0	0	0
1801000	0.962963	0	1	0.222222	0	1	0	0	0
1809000	0.928571	0	1	0.125	0	1	0	0	0
1901000	1	1	1	0.196319	0	1	0	0	0
1902000	1	1	1	0.207627	0	1	0.004237	0	1
2001000	0.964467	0	1	0.324873	0	1	0	0	0
2101000	1	1	1	0.290698	0	1	0.01938	0	1
2104000	1	1	1	0.267857	0	1	0	0	0
2106000	1	1	1	0.153846	0	1	0	0	0
2201000	0.990476	0	1	0.419048	0	1	0.019048	0	1
2202000	1	1	1	0.166667	0	1	0	0	0
2301000	0.961539	0	1	0.307692	0	1	0	0	0
2307000	0.925926	0	1	0.222222	0	1	0	0	0
Total		0	1		0	1		0	1

Table C4: Teacher Gender and Multiple School Assignments

	Teacher Gender (male = 1)				Multiple School Assignment (1=Yes)		
district_id	N	mean	min	max	mean	min	max
101000	371	0.266846	0	1	0.204852	0	1
201000	82	0.365854	0	1	0.329268	0	1
202000	62	0.322581	0	1	0.096774	0	1
203000	45	0.377778	0	1	0.377778	0	1
204000	34	0.382353	0	1	0.294118	0	1
301000	612	0.248366	0	1	0.161765	0	1
401000	143	0.237762	0	1	0.06993	0	1
402000	100	0.36	0	1	0.53	0	1
501000	141	0.333333	0	1	0.106383	0	1
502000	77	0.311688	0	1	0.272727	0	1
601000	110	0.263636	0	1	0.472727	0	1
701000	153	0.339869	0	1	0.202614	0	1
702000	21	0.190476	0	1	0.285714	0	1
706000	43	0.209302	0	1	0.162791	0	1
714000	83	0.216868	0	1	0.084337	0	1
721000	41	0.268293	0	1	0.439024	0	1
724000	32	0.46875	0	1	0.6875	0	1
725000	207	0.256039	0	1	0.130435	0	1
738000	26	0.153846	0	1	0	0	0
801000	183	0.311475	0	1	0.284153	0	1
901000	67	0.328358	0	1	0.38806	0	1
1001000	119	0.336135	0	1	0.168067	0	1
1101000	1004	0.279881	0	1	0.174303	0	1
1102000	96	0.333333	0	1	0.25	0	1
1201000	57	0.280702	0	1	0.245614	0	1
1202000	169	0.485207	0	1	0.147929	0	1
1301000	932	0.256438	0	1	0.166309	0	1
1401000	40	0.35	0	1	0.25	0	1
1501000	117	0.358974	0	1	0.128205	0	1
1506000	186	0.33871	0	1	0.091398	0	1
1516000	23	0.347826	0	1	0	0	0
1601000	126	0.31746	0	1	0.253968	0	1
1602000	28	0.428571	0	1	0.642857	0	1
1701000	96	0.28125	0	1	0.395833	0	1
1702000	294	0.268708	0	1	0.180272	0	1
1703000	14	0.142857	0	1	0.5	0	1
1801000	54	0.333333	0	1	0.314815	0	1
1809000	56	0.392857	0	1	0.303571	0	1
1901000	326	0.300614	0	1	0.144172	0	1
1902000	236	0.271186	0	1	0.169492	0	1
2001000	197	0.28934	0	1	0.116751	0	1
2101000	258	0.360465	0	1	0.081395	0	1
2104000	56	0.321429	0	1	0.321429	0	1
2106000	65	0.384615	0	1	0.261539	0	1
2201000	105	0.333333	0	1	0.171429	0	1
2202000	18	0.277778	0	1	0.666667	0	1
2301000	78	0.307692	0	1	0.089744	0	1
2307000	27	0.222222	0	1	0.444444	0	1
Total	7410		0	1		0	1

Table C5: Student Characteristics by District

	% LEP Students			% Free&Reduced Lunch			% Special Ed		
district_id	mean	min	max	mean	min	max	mean	min	max
101000	0.45	0.00	2.56	26.47	0.00	58.33	15.99	0.00	38.60
201000	2.57	0.00	10.64	51.52	33.33	81.97	16.99	10.47	32.79
202000	1.36	0.00	3.01	42.99	32.72	50.84	13.00	11.06	16.00
203000	5.71	0.63	11.06	28.60	15.72	37.33	12.75	11.95	13.82
204000	1.13	0.00	4.27	39.54	0.00	52.38	13.96	0.00	18.80
301000	2.20	0.00	16.73	20.89	8.90	50.18	10.14	0.00	14.33
401000	1.03	0.00	7.88	27.50	0.00	62.42	14.30	0.00	20.18
402000	0.31	0.00	2.17	35.82	11.63	70.00	18.23	3.45	36.59
501000	1.11	0.00	2.01	28.53	9.09	71.43	10.59	0.00	16.09
502000	0.36	0.00	0.78	29.29	0.00	34.17	12.62	0.00	14.17
601000	0.17	0.00	0.87	29.36	15.20	45.83	15.11	3.05	50.00
701000	17.05	0.00	74.29	31.24	0.00	72.22	14.50	8.33	37.14
702000	0.00	0.00	0.00	44.00	32.00	50.00	8.06	6.00	9.09
706000	25.43	0.00	27.80	43.33	33.33	48.44	12.58	0.00	17.19
714000	99.55	98.97	100.00	87.54	87.13	87.97	22.24	19.30	24.86
721000	111.02	100.00	100.00	82.31	81.13	82.47	0.27	0.19	0.29
724000	3.74	0.00	6.04	31.82	22.88	42.22	13.70	11.86	15.56
725000	15.95	7.57	20.90	40.41	26.07	54.84	0.19	0.16	0.25
738000	82.25	82.25	82.25	94.93	94.93	94.93	16.67	16.67	16.67
801000	3.50	0.00	12.50	46.28	0.00	68.75	14.48	0.00	21.30
901000	1.90	1.03	2.63	34.45	22.61	45.36	14.07	9.58	16.88
1001000	0.07	0.00	0.28	24.19	0.00	44.94	17.43	0.00	24.72
1101000	1.83	0.00	7.19	30.88	0.00	73.28	11.52	0.00	18.70
1102000	1.96	0.00	18.31	32.94	11.76	56.34	12.96	8.24	16.89
1201000	0.45	0.00	1.54	27.87	16.23	37.69	9.45	7.46	14.88
1202000	0.64	0.00	2.73	31.47	21.67	40.26	10.64	6.86	42.86
1301000	0.31	0.00	8.40	33.93	0.00	89.92	14.66	0.00	33.61
1401000	0.00	0.00	0.00	33.08	0.00	42.86	16.24	9.03	21.77
1501000	0.97	0.00	2.31	30.88	16.67	48.75	10.22	0.00	25.00
1506000	0.13	0.00	0.37	18.16	0.00	29.38	9.95	0.00	15.15
1516000	1.41	1.41	1.41	45.77	45.77	45.77	0.09	0.09	0.09
1601000	6.13	0.00	12.02	24.68	0.00	51.85	14.71	5.88	19.14
1602000	0.00	0.00	0.00	39.07	25.97	55.30	0.25	0.09	0.34
1701000	4.80	0.00	9.92	28.11	0.00	49.72	12.19	0.00	20.61
1702000	0.30	0.00	0.61	32.17	0.00	66.67	12.82	0.00	19.27
1703000	0.00	0.00	0.00	28.02	14.71	51.72	11.56	0.00	24.14
1801000	0.23	0.00	12.50	20.68	0.00	23.67	11.98	5.94	25.00
1809000	0.00	0.00	0.00	27.21	17.39	38.60	10.46	8.70	12.58
1901000	1.56	0.00	12.01	24.56	4.26	50.68	15.88	0.00	38.30
1902000	1.47	0.00	23.08	19.65	0.00	53.85	15.53	0.00	24.39
2001000	8.87	0.00	19.47	12.57	0.00	29.17	11.53	4.76	27.59
2101000	1.78	0.00	9.17	39.61	27.05	51.75	14.65	10.98	19.06
2104000	0.00	0.00	0.00	19.78	10.04	30.51	17.08	13.56	22.29
2106000	0.13	0.00	0.40	19.20	10.89	23.33	19.41	12.50	35.64
2201000	4.69	0.00	10.94	34.22	22.99	55.21	16.37	13.33	20.83
2202000	4.31	2.33	6.98	37.47	32.56	72.22	0.16	0.06	0.19
2301000	0.00	0.00	0.00	24.02	15.18	66.67	14.99	13.20	18.07
2307000	0.00	0.00	0.00	17.28	13.33	22.09	14.40	9.52	20.00
Total		0.00	100.00		0.00	94.93		0.00	50.00

Table C6: District Population, Distance to National Parks (straight-line) and Nearest 50k City (road distance) by School in District

		Dist. Population (2000)			Dist. to Nat. Park			Dist. to 50K City		
district_id	N	mean	min	max	mean	min	max	mean	min	max
101000	371	32015	32015	32015	65.8302	57	118	53.0885	47.94	102.38
201000	82	3070	3070	3070	92.3781	89	95	92.305	67.95	110.85
202000	62	3280	3280	3280	98	98	98	85.0815	84.68	85.35
203000	45	2985	2985	2985	114	114	114	116.426	116.2	116.61
204000	34	2250	2250	2250	117.441	115	138	129.302	124.4	155.7
301000	612	33700	33700	33700	107.394	11	134	138.755	122.4	172.46
401000	143	10800	10800	10800	128.664	119	164	115.003	85.07	183.77
402000	100	4925	4925	4925	100.05	85	114	111.481	80.74	131.84
501000	141	8175	8175	8175	113.05	90	126	51.0211	47.09	74.07
502000	77	3880	3880	3880	129.104	129	137	25.0377	24.42	38.15
601000	110	5885	5885	5885	82.1818	72	94	95.1202	80.29	109.42
701000	153	10260	10260	10260	121.379	121	174	138.254	93.57	138.98
702000	21	1835	1835	1835	58	58	58	165.637	165.2	165.87
706000	43	1785	1785	1785	109.395	84	110	131.182	130.5	161.51
714000	83	2160	2160	2160	114.169	113	115	137.029	136.4	137.73
721000	41	1955	1955	1955	111	111	111	142.67	142.7	142.67
724000	32	1410	1410	1410	137	137	137	98.75	98.75	98.75
725000	207	14780	14780	14780	130	130	130	121.491	120.9	122.2
738000	26	1615	1615	1615	128	128	128	121.85	121.9	121.85
801000	183	12335	12335	12335	119.541	90	122	79.0554	57.13	110.59
901000	67	4880	4880	4880	124.119	124	125	128.086	127.6	129.35
1001000	119	7075	7075	7075	164.403	155	166	106.361	67.56	113.11
1101000	1004	77205	77205	77205	67.9651	54	94	0.2066	0	34.06
1102000	96	4400	4400	4400	92.7813	78	107	34.6232	24.25	49.39
1201000	57	3810	3810	3810	151.211	151	152	101.596	101.3	101.95
1202000	169	10150	10150	10150	92.7633	70	134	96.0029	80.91	103.35
1301000	932	66535	66535	66535	150.883	137	179	1.5104	0	63.97
1401000	40	2445	2445	2445	78.65	72	79	100.587	100.1	102.78
1501000	117	10330	10330	10330	79.7778	62	90	86.1802	76.96	95.99
1506000	186	14160	14160	14160	64.3979	46	65	105.636	104.5	141.77
1516000	23	810	810	810	79	79	79	135.49	135.5	135.49
1601000	126	7460	7460	7460	115.651	102	118	72.9727	49.4	75.88
1602000	28	1510	1510	1510	116	116	116	99.9	98.3	101.1
1701000	96	3970	3970	3970	161.188	152	166	125.9	106.6	138.58
1702000	294	22185	22185	22185	168.99	160	172	130.633	127.4	148.5
1703000	14	400	400	400	156.429	147	158	153.579	151	169.29
1801000	54	3910	3910	3910	83.463	55	84	156.124	117.3	157
1809000	56	2625	2625	2625	103.929	102	120	149.153	146.7	149.54
1901000	326	24605	24605	24605	174.687	140	178	169.64	146.1	182.4
1902000	236	12925	12925	12925	178.818	140	206	154.532	131.1	156.34
2001000	197	18070	18070	18070	34.7767	10	37	85.1342	72.86	110.52
2101000	258	13790	13790	13790	189	189	189	69.033	68.26	70.26
2104000	56	3000	3000	3000	186.518	184	187	104.996	101.4	106.05
2106000	65	2950	2950	2950	183.308	183	184	106.399	104.2	108.05
2201000	105	7520	7520	7520	126	126	126	141.2	140.8	141.5
2202000	18	1145	770	7520	149	149	149	123.25	123.3	123.25
2301000	78	5345	5345	5345	37.9487	37	51	75.6486	74.49	87.46
2307000	27	1295	1295	1295	64	64	64	92.13	92.09	92.18
Total	7410		400	77205		10	206		0	183.77

Table C7: District WYCAS Outcomes

district_id	% students above or proficient- Reading	% students above or proficient- Writing	% students above or proficient- Math	Average Across Three Tests
101000	49.7%	48.2%	47.0%	48.3%
201000	46.3%	57.2%	46.1%	49.8%
202000	36.6%	42.9%	30.7%	36.7%
203000	44.1%	42.7%	28.0%	38.3%
204000	42.3%	53.4%	36.9%	44.2%
301000	43.5%	43.3%	39.9%	42.3%
401000	34.7%	40.0%	26.1%	33.6%
402000	40.5%	46.1%	24.9%	37.2%
501000	33.9%	40.2%	31.8%	35.3%
502000	44.6%	55.0%	39.7%	46.4%
601000	48.3%	55.1%	47.9%	50.4%
701000	51.8%	50.1%	43.7%	48.5%
702000	46.5%	36.9%	30.5%	38.0%
706000	42.6%	44.4%	36.5%	41.2%
714000	7.7%	17.4%	2.7%	9.3%
721000	12.8%	8.7%	6.0%	9.2%
724000	52.6%	29.8%	43.0%	41.8%
725000	47.3%	55.7%	31.7%	44.9%
738000	4.5%	13.5%	5.6%	7.9%
801000	42.8%	54.5%	45.3%	47.6%
901000	46.8%	62.1%	49.6%	52.8%
1001000	46.2%	54.6%	46.9%	49.2%
1101000	40.3%	45.7%	34.7%	40.2%
1102000	48.3%	44.5%	45.7%	46.2%
1201000	34.2%	37.4%	30.3%	34.0%
1202000	63.0%	62.3%	47.4%	57.5%
1301000	37.6%	39.3%	33.3%	36.7%
1401000	39.1%	45.1%	37.3%	40.5%
1501000	55.2%	68.9%	49.1%	57.7%
1506000	55.8%	63.2%	46.8%	55.3%
1516000	36.1%	30.2%	39.6%	35.3%
1601000	46.4%	49.6%	41.5%	45.8%
1602000	45.7%	31.8%	46.8%	41.4%
1701000	57.2%	64.3%	56.4%	59.3%
1702000	53.8%	58.3%	52.0%	54.7%
1703000	56.0%	63.1%	46.4%	55.2%
1801000	60.1%	68.7%	47.1%	58.6%
1809000	46.2%	51.5%	35.8%	44.5%
1901000	35.2%	37.9%	37.5%	36.9%
1902000	44.3%	45.7%	33.5%	41.2%
2001000	54.2%	57.0%	48.6%	53.3%
2101000	39.6%	41.6%	31.2%	37.4%
2104000	37.9%	41.3%	40.5%	39.9%
2106000	52.0%	51.3%	44.6%	49.3%
2201000	44.3%	58.7%	38.8%	47.3%
2202000	61.3%	31.3%	45.4%	46.0%
2301000	35.2%	45.0%	34.0%	38.1%
2307000	42.7%	51.3%	35.5%	43.1%
District Average	**43.5%**	**46.6%**	**37.9%**	**42.7%**

Table C8: District ID and District Name Legend

district_id	district_name	office_city
101000	Albany County School District #1	Laramie
201000	Big Horn County School District #1	Cowley
202000	Big Horn County School District #2	Lovell
203000	Big Horn County School District #3	Greybull
204000	Big Horn County School District #4	Basin
301000	Campbell County School District #1	Gillette
401000	Carbon County School District #1	Rawlins
402000	Carbon County School District #2	Saratoga
501000	Converse County School District #1	Douglas
502000	Converse County School District #2	Glenrock
601000	Crook County School District # 1	Sundance
701000	Fremont County School District # 1	Lander
702000	Fremont County School District # 2	Dubois
706000	Fremont County School District # 6	Pavillion
714000	Fremont County School District #14	Ethete
721000	Fremont County School District #21	Ft. Washakie
724000	Fremont County School District #24	Shoshoni
725000	Fremont County School District #25	Riverton
738000	Fremont County School District #38	Arapahoe
801000	Goshen County School District #1	Torrington
901000	Hot Springs County School District #1	Thermopolis
1001000	Johnson County School District #1	Buffalo
1101000	Laramie County School District #1	Cheyenne
1102000	Laramie County School District #2	Pine Bluffs
1201000	Lincoln County School District #1	Kemmerer
1202000	Lincoln County School District #2	Afton
1301000	Natrona County School District #1	Casper
1401000	Niobrara County School District #1	Lusk
1501000	Park County School District # 1	Powell
1506000	Park County School District # 6	Cody
1516000	Park County School District #16	Meeteetse
1601000	Platte County School District #1	Wheatland
1602000	Platte County School District #2	Guernsey
1701000	Sheridan County School District #1	Ranchester
1702000	Sheridan County School District #2	Sheridan
1703000	Sheridan County School District #3	Clearmont
1801000	Sublette County School District #1	Pinedale
1809000	Sublette County School District #9	Big Piney
1901000	Sweetwater County School District #1	Rock Springs
1902000	Sweetwater County School District #2	Green River
2001000	Teton County School District #1	Jackson
2101000	Uinta County School District #1	Evanston
2104000	Uinta County School District #4	Mountain View
2106000	Uinta County School District #6	Lyman
2201000	Washakie County School District #1	Worland
2202000	Washakie County School District #2	Ten Sleep
2301000	Weston County School District #1	Newcastle
2307000	Weston County School District #7	Upton