Alaska School District
Cost Study Update

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Prepared for
Alaska Legislative Budget and Audit Committee

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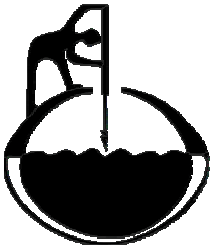

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EXECUTIVE SUMMARY

The Legislative Budget and Audit Committee of the Alaska Legislature has asked The Institute of Social and Economic Research (ISER) at the University of Alaska Anchorage to make certain changes and adjustments to the Geographic Cost of Education Index (GCEI) that the American Institutes for Research (AIR) constructed and reported on in *Alaska School District Cost Study* (January 2003). The requested changes address a number of the questions and criticisms that were raised by ISER in its review of the AIR study (*A Review of Alaska School District Cost Study,* January 29, 2004). The specific tasks included updating data sets, adjusting the index for actual energy costs, and reviewing travel and budget share assumptions. The most significant task was to address deficiencies in AIR's certificated personnel compensation component that had been identified in ISER's initial review. ISER was also asked to re-estimate the overall cost index, once other tasks were accomplished.

1. Data sets from the Alaska Department of Education and Early Development (DEED) used in the AIR study have been updated for us by DEED. In addition, we have incorporated community level data from the 2000 census, conducted a survey on the difficulty of filling teaching positions, and added data on travel costs from off-highway locations. These data are central to the estimation of certified personnel compensation used in the index computation. The documentation of data variables is included in the appendix.

2. We have reviewed the measurement and calculation of budget weights used in the calculation of the GCEI. Our earlier review had questioned the omission of special revenue funds in the calculation of budget weights. We agree that this omission is appropriate given the uncertainty surrounding the availability of these funds and the fact that the measurement of these funds is not subject to the same quality controls as the operating fund. We do think that using an average of fiscal years provides some additional stability to the budget weights and we use the average of FY2000 – FY2003 district operating revenue funds in the computation of revised indexes.

3. We were critical of AIR's estimation of the energy component of the GCEI and indicated that actual energy costs would be a better choice. We have made this change. This results in an average increase of 34 percent in the relative cost of energy and a 2.8 percent average increase in the GCEI.

4. In the course of our analysis we have identified a number of areas in which more information would lead to more precise estimates of regional educational cost differences. These include data relative to teacher training and qualifications (teacher quality measures), improved compensation measures, especially regarding benefits, market supply and demand conditions related to teacher and administrator recruitment, and information relating to teacher (and administrator) choices about employment opportunities. Some of these data should be captured on a regular basis, while other data may be appropriately captured on a project specific basis.

5. The travel component of the index was also reviewed. No specific changes were recommended at this time. We would note that the travel weight in the index is about five percent of the total weighting and that it would take fairly large changes in the relative cost of travel to make much difference in the GCEI. The EXCEL version of the index model that we have constructed does allow for variation of several travel assumptions, including per diem rates.

6. The most significant and challenging task was the estimation of teacher, or teacher/administrator compensation. Our review of AIR's estimates had raised a number of criticisms. Most of these related to technical issues of measurement error, model misspecification, and estimation error. Our concerns focused on turnover rates and the potential for significant qualitative differences in teachers across districts. We have attempted to address these concerns and have developed two sets of relative cost estimates for certificated personnel. One set deals with certified teachers only. The second looks at all certificated personnel (teachers and administrators). We then used these cost relatives to calculate two versions of the overall (GCEI) index. Our estimate for the GCEI using the "teachers only" estimate results in an average index about fifteen percent higher than the current index used in Alaska. The teacher/administrator version of the GCEI results in an index that averages about nineteen percent more than the current state index.

7. We were asked to convert AIR's index model written in Microsoft ACCESS to one written in Microsoft EXCEL. We have done this.

I. INTRODUCTION

The Legislative Budget and Audit Committee of the Alaska Legislature has asked The Institute of Social and Economic Research (ISER) at the University of Alaska Anchorage to make certain changes and adjustments to the Geographic Cost of Education Index (GCEI) that the American Institutes for Research (AIR) constructed and reported on in *Alaska School District Cost Study* (January 2003). The requested changes address a number of the questions and criticisms that were raised by ISER in its review of the AIR study (*A Review of Alaska School District Cost Study,* January 29, 2004). The specific tasks are contained in the scope of work and are shown here.

I-1. SCOPE OF WORK

1. Update Data Sets.

Update the "certified" data base of administrators and teachers for the years 2003, and 2004 if available. Also obtain DEED FY Budget Matrix Audits for years since the AIR study. These updates would need to be provided with DEED cooperation.

2. Revise Estimation of Certified Teacher Compensation Component Of Index.

Modify and update the teacher compensation model to address concerns addressed in the review, including turnover, income/experience interdependence, and measurement errors in market prices for teachers.

3. Adjust Index To Use Actual Energy Costs Rather Than Estimated Costs.

Update and re-compute the energy index and overall index using actual energy costs.

4. Review of Travel Cost Index Components.

Review per diem travel cost allowances and service call travel time computation, and re-compute the index components and overall index if per diem costs or service travel costs are modified.

5. Review Definition and Measurement of Budget Categories.

Review the definition and measurement of budget categories used in the construction of the overall index. Determine if budget categories as presently defined accurately reflect full costs of providing educational services. Incorporate any changes into the re-computation of index components and the overall index.

6. Suggestions Regarding Collection of New or Additional Data for Future Index Estimation.

Make recommendations regarding modifications to, or additions to, data that are either presently collected or need to be collected to facilitate periodic updating of the index.

7. Provide Results In Spread Sheet Format.

Provide data sets and index computations in spread sheet (Excel) format.

I-2. SUMMARY OF NOTATION

Before turning to the specific tasks we restate the index number formula that is used in the calculation of the index, and explain the notation and variable names, etc. We attempt to use the same notation that was used by AIR where possible. The index employed is referred to as a Törnqvist index number. In general terms, it is an index of cost relatives between two places, exponentially weighted by the average of budget shares in the two places. The formula for the index, as used in this study, is as follows. Elements of the equation are explained below.

$$(1) \qquad NDXj = \prod_{i}^{12} \frac{(Pij)}{(PiAnch)}^{\left(BSij + BSiAnch\right)/2}$$

NDX_j = overall index of relative costs of District j compared to Anchorage. This is the estimate of the geographic cost difference between the "j^{th}" district and Anchorage. The index is based on twelve sub-components of overall costs, as shown below (administration, classified employees, teachers, energy costs, etc.). NDX_j is what AIR referred to as the "Superlative" index for a given district.

$\prod$ = a multiplication operator that says multiply each of the 12 components (e.g., sub-component 1 X sub-component 2 X - - - - X sub-component 12).

The "cost" relatives are (P_{ij}/P_{iAnch}). In other words, the cost relative is the cost of a specific component (the i^{th} component, e.g., a "comparable" teacher) in the j^{th} district (P_{ij}), divided by the cost of the same component in the Anchorage district (P_{iAnch}). Anchorage is the reference district. The choice of reference district is arbitrary and does not affect the relative regional differences.

BS_{ij} = budget share accounted for by the i^{th} item in the total budget of district j. This can also be stated as BS_{ij}/BS_j, where BS_j is the total budget for the j^{th} district. BS_{iAnch} = the comparable budget share for Anchorage.

j = the j^{th} school district, j = 2, . . ,56 (Note: there are no districts 26 or 41; Anchorage = 5).

i = the i^{th} expenditure category in the overall index (i = 1, . . . ,12). The categories and shorthand (variable) name for each category are provided here. We have retained the index component definitions and variable names used in the AIR study (*Alaska School District Cost Study: Updating the SGCEI in Access Handbook,* p. 11.)

Category Number	Expenditure Category	Variable Name
i = 1	Administrators	ADMIN
i = 2	Certified teachers	TCHR
i = 3	Classified employees	CLASS
i = 4	Travel, teacher from school to district office	PD1
i = 5	Travel, teacher from district office to Anchorage	PD2
i = 6	Travel, school admin from schools to dist. office	PD3
i = 7	Travel, superintendent, dist. off to Anchorage	PD5
i = 8	Travel, district admin. to schools	SO1
i = 9	Travel, Maintenance from district off or center of commerce	MT1
i = 10	Energy, actual costs	ENERGY
i = 11	Goods: Paper, cost plus shipping	PAPER
i = 12	Goods: Window, cost plus shipping	WINDOWS

The budget shares are the weights used in the index. As can be seen from the index equation, the average of the reference district and the Anchorage district is used to weight the relative importance of each cost relative in the computation of the index.

In summary, the overall index is simply the product of the twelve sub-component indexes. Each sub-component index is the expenditure category "cost relative" raised to the exponent (average of budget shares for Anchorage and the given district).

Our criticisms and observations regarding the AIR index addressed both measures of the cost relatives and computation of budget shares. The tasks addressed in ISER's work attempt to address the most serious flaws.

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II. REPORT ON THE SPECIFIC TASKS.

We could not have done what we did without the thorough and timely assistance of many individuals. Heidi Gosho, of the Alaska Department of Education and Early Development's (DEED) Assessment and Accountability division ran the data set on certificated personnel and provided assistance in interpreting it. Eddy Jeans and Elizabeth Sweeney in DEED's School Finance and Facilities unit provided the audited district budget data and revenue source data used in our analysis, as well as extremely helpful insights into school funding. Patricia DeRoche of ISER contacted all school districts to conduct our survey on hiring issues faced by districts.

In section II, we describe and discuss what we have done with respect to each of the seven tasks shown in the scope of work.

II-1. UPDATE DATA SETS.

We have obtained, from the DEED, the audited district budget reports for each of the fifty-three districts for the fiscal years FY2000 through FY 2003. These are used in the computation of the budget shares that serve as the weights in the index referenced above. These are discussed more fully below. We have also been provided with files containing certified personnel data for FY1999 through FY2004. These data provide a significant portion of the data used in the estimation of teacher compensation "cost relatives" used in the calculation of the geographic cost index. The data include information regarding compensation, qualifications, experience, teaching assignment, gender, ethnicity, longevity, and other characteristics. We have also collected additional information from school districts regarding the degree of difficulty in filling vacant positions. These data are described more fully in Section II-2 and Appendix III. We have also supplemented data on travel costs from off-highway community schools. Data from the 2000 U.S. Decennial Census regarding community and school district characteristics have also been incorporated. The documentation of data variables is also included in the appendix.

II-2. REVISE ESTIMATION OF CERTIFIED TEACHER COMPENSATION COMPONENT OF INDEX

Our analysis of AIR's estimation of teacher compensation raised a number of concerns. First, we were critical of the construction of the comparative wage index and its use in estimating personnel cost relatives, particularly in the teacher compensation equation. The estimates of teacher and administrator-teacher compensation that we have developed do not make use of such an index. Secondly, we raised a number of questions regarding the specification and estimation of the equation used to estimate teacher compensation. At least some of those concerns also applied to the administrator compensation equation as well. Our concerns related to turnover rates,

and longevity and experience levels. Also, the fact that observed salaries do not necessarily reflect market clearing wages introduced additional errors in the AIR estimates, including the possibility of qualitative differences in personnel.

In the present analysis, the objective is to estimate the amount of funds that a district needs, relative to Anchorage, to recruit and retain certificated personnel of equivalent quality to Anchorage. Alaska school districts compete with each other for the same pool of individuals with the qualifications to serve as teachers and administrators. They also compete for these individuals to some extent with employers outside school districts and with school districts in other states. Since our concern is with the *relative* success of different Alaska districts compared to each other, however, the primary focus of the analysis is on competition among school districts within the state. Consequently, accurate estimates of the required personnel differentials involve modeling how this competition plays out in job markets for teachers and administrators.

Economists conceptualize markets in terms of supply and demand. The demand relationship models decisions of buyers; supply models decisions of sellers. The equilibrium market price is the price that balances supply and demand. If conditions change so that buyers have more purchasing power, competition among them will tend to bid up the market price until a new equilibrium is reached. The market price could also go up if conditions change so that fewer sellers want to supply that particular market. Identifying the influence of any factor on observed market prices requires an ability to distinguish effects of supply from effects of demand.

For teacher job markets, buyers are school districts seeking to employ teachers, while sellers are individuals seeking employment in these districts. Prices are salaries offered to and accepted by personnel. Teachers may have similar qualifications, but not identical. Each teacher has some unique qualities that make him or her relatively more or less suited to a given job. A job may be similar to another with the same description but located in a different place, but is likewise not identical. These differences provide for a market outcome that matches individuals to districts at somewhat different salaries, even though all districts are competing for the same personnel pool.

Although observed market prices balance supply and demand in most markets, this does not occur in all markets at all times. In particular, observed teacher salaries in a given district may not always balance supply and demand for that district. Some districts may have difficulty filling all positions, while others may find themselves with many qualified applicants for each job opening (queuing). If this is the case, then estimating cost differentials based on the assumption that observed salaries are market equilibrium prices will produce erroneous results.

If districts differ significantly in the degree of queuing or the percentage of hard-to-fill positions, then it is likely that districts with queues will be able to hire and retain better-quality teachers than districts that have difficulty filling positions. The ability of districts with job queues to select for quality results in overall disparities in instructional quality between districts with job queues and those without them. This interaction of quality and queuing exacerbates the errors produced by calculating cost differentials based on market prices. Whether differences among districts in the degree of queuing are

significant is an empirical question that needs to be answered before one can determine that it is necessary to adjust the analysis.

The AIR study estimated salary differentials for districts based on the assumption that the observed salary for a teacher, after controlling for individual demographic characteristics, education, experience, and job type, depended on variables measuring the desirability of working and living in the district. Since it modeled teacher preferences, and included no information on district purchasing power, they estimated a supply equation for the teacher job market. Our method corrects for three critical errors embedded in the AIR approach.

First, unlike the AIR study, we account for the influence of demand factors on the market. Districts that have more purchasing power from the current foundation funding formula and from local financial resources can afford to pay teachers more than districts with fewer resources. Ignoring the effect on salaries of differences in purchasing power confounds demand factors with district characteristics supposedly measuring the desirability of working and living in the district.

Second, unlike the AIR study, we address explicitly the possibility of supply-demand imbalances among districts that result in queuing for jobs and in difficult-to-fill positions. We conducted a survey of district personnel officers in order to ascertain differences in their perception of the difficulty of filling teaching positions and of obtaining their preferred choice of job applicants. The survey results indeed show significant disparities across districts. We add variables derived from the survey to adjust the market supply equation for discrepancies between observed market salaries and those that would balance supply and demand.

Third, we address the potential for quality disparities introduced by observed queuing in some districts. These quality differences are not observed in measured teacher characteristics such as degrees earned, age, and experience. Nevertheless, the existence of significant queues in some districts, but not others, results in a situation where observed salary differentials among districts do not measure the cost differential of hiring teachers of equivalent qualifications. The salary differentials of teachers in high-queue districts may in fact be unrelated to cost differentials needed to give districts without queues equivalent purchasing power in the marketplace. Instead of trying to estimate a supply equation based on the effect of district characteristics on salaries, we instead estimate the effect of district characteristics on teacher decisions to stay or move from a current job. Since the supply equation models individual teacher job choices rather than salaries, it is less subject to confounding of salary differences with teacher quality differences.

In addition to these three methodological improvements, our method improves on the AIR approach in an additional important way by analyzing the effect of community differences on teacher supply decisions. The AIR study used only district-level data on population and geographic characteristics of work sites around the state. This may make sense superficially, because salary decisions are often made at the district level. However, teachers decide to accept jobs offered in schools in particular communities within districts. The variation in community characteristics is much greater than that of districts as a whole. For example, a district like the Kenai Peninsula Borough School

District has remote rural villages like Tyonek as well as urbanized areas like Kenai and Soldotna. Many rural districts have headquarters in regional centers that offer substantially different working environments from the districts' small villages. Using community level data within a model of individual job choice allows us to estimate much more precisely how teacher preferences influence the ability of districts to retain and hire staff. District differentials are easily constructed by taking weighted averages of estimated community differentials for the communities that each district serves.

Finally, we note that our methodology allows us to estimate cost relatives for either teachers or all certificated personnel (teachers and certificated administrators). Our review of AIR's personnel estimates focused on teachers, and to a lesser extent, on administrators. Our analysis of the certificated personnel data set in the current study indicated that administrator cost relatives in the AIR study may also have been in error. Since the supply side of the model that we have developed is conceptually applicable to administrators as well as teachers (we observe that a significant proportion of administrators in the data set are former teachers in the data set), we have developed two sets of cost relatives. The first is limited to teachers only. The second combines teachers and administrators. Appendix II-2 describes the technical details of the estimation of cost differentials for certificated personnel.

Table II-1 (page 9) shows the estimated cost relatives. As discussed above and in Appendix II-2, two alternative estimating methodologies have been used.

The first (survival equation approach) focuses on the ability of the district to retain teachers that are already employed. The second ("move" equation approach) concentrates on the ability of the district to attract or hire new people. Thus, the two approaches address separate aspects of the staffing task. It is our judgment that the average of the two cost relatives is more representative of the overall figure than either one separately. Alternatively stated, both equations bring information to bear on the staffing problem and the combined information is preferable to either approach alone.

Table II-1 shows cost relatives for both teachers and teachers plus administrators (all persons). Again, combining the information from the two equation approaches is preferable to choosing one or the other. Note that Table II-1 shows the cost relatives for teachers (or teachers/administrators) and not the overall cost index. These cost relatives are incorporated into the computation of the overall index in Section III.

Table II-1. Estimated Certificated Personnel Cost Relatives

DISTRICT NAME	DISTRICT NUMBER	(1) APX II-2-4 TEACHER SURVIVAL EQUATION	(2) APX II-2-7 TEACHER, LAST 2 MOVES EQUATION	(3) AVERAGE OF (1)+(2)	(4) APX II-2-3 ALL PERSONS SURVIVAL EQUATION	(5) APX II-2-6 ALL PERSONS LAST TWO MOVES	(6) AVERAGE OF (4)+(5)
DENALI BOROUGH SCHOOL DISTRICT	2	1.292	1.129	1.211	1.299	1.146	1.222
ALASKA GATEWAY SCHOOL DISTRICT	3	1.485	1.235	1.360	1.476	1.248	1.362
ALEUTIAN REGION SCHOOL DIST	4	1.620	1.326	1.473	1.576	1.374	1.475
ANCHORAGE SCHOOL DISTRICT	5	1.000	1.000	1.000	1.000	1.000	1.000
ANNETTE ISLAND SCHOOL DISTRICT	6	1.514	1.210	1.362	1.505	1.286	1.396
BERING STRAIT SCHOOL DISTRICT	7	1.830	1.521	1.676	1.803	1.543	1.673
BRISTOL BAY BOROUGH SCH DIST	8	1.485	1.344	1.415	1.463	1.312	1.388
CHATHAM REGION SCHOOLS	9	1.491	1.257	1.374	1.495	1.298	1.397
CHUGACH SCHOOL DISTRICT	10	1.263	1.097	1.180	1.258	1.103	1.180
COPPER RIVER SCHOOL DISTRICT	11	1.393	1.197	1.295	1.390	1.222	1.306
CORDOVA CITY SCHOOL DISTRICT	12	1.244	1.177	1.210	1.258	1.239	1.249
CRAIG CITY SCHOOL DISTRICT	13	1.226	1.140	1.183	1.225	1.177	1.201
DELTA GREELY SCHOOL DISTRICT	14	1.337	1.137	1.237	1.336	1.151	1.244
DILLINGHAM CITY SCHOOL DIST	15	1.475	1.230	1.352	1.474	1.258	1.366
FAIRBANKS NORTH STAR BORO S/D	16	1.047	1.019	1.033	1.074	1.029	1.051
GALENA CITY SCHOOL DISTRICT	17	1.527	1.277	1.402	1.513	1.284	1.398
HAINES BOROUGH SCHOOL DISTRICT	18	1.282	1.053	1.167	1.283	1.106	1.194
HOONAH CITY SCHOOL DISTRICT	19	1.541	1.238	1.389	1.518	1.276	1.397
HYDABURG CITY SCHOOL DISTRICT	20	1.693	1.268	1.480	1.665	1.330	1.498
IDITAROD AREA SCHOOL DISTRICT	21	1.768	1.407	1.588	1.699	1.414	1.557
JUNEAU BOROUGH SCHOOLS	22	1.158	1.171	1.165	1.171	1.188	1.180
KAKE CITY SCHOOL DISTRICT	23	1.564	1.251	1.407	1.550	1.337	1.443
KENAI PENINSULA BOROUGH SCHS	24	1.173	1.121	1.147	1.177	1.141	1.159
KETCHIKAN GATEWAY BOROUGH S.D.	25	1.198	1.152	1.175	1.213	1.196	1.204
KLAWOCK CITY SCHOOL DISTRICT	27	1.465	1.203	1.334	1.446	1.236	1.341
KODIAK ISLAND BOROUGH SCH DIST	28	1.299	1.191	1.245	1.297	1.232	1.264
KUSPUK SCHOOL DISTRICT	29	1.747	1.437	1.592	1.709	1.456	1.583
LAKE AND PENINSULA SCHOOL DIST	30	1.652	1.357	1.505	1.608	1.380	1.494
LOWER KUSKOKWIM SCHOOL DIST	31	1.639	1.456	1.548	1.615	1.459	1.537
LOWER YUKON SCHOOL DISTRICT	32	1.796	1.529	1.663	1.770	1.541	1.655
MATANUSKA-SUSITNA BOROUGH SCHS	33	1.123	1.037	1.080	1.122	1.046	1.084
NENANA CITY SCHOOL DISTRICT	34	1.543	1.197	1.370	1.534	1.220	1.377
NOME CITY SCHOOL DISTRICT	35	1.511	1.366	1.438	1.500	1.365	1.432
NORTH SLOPE BOROUGH SCH DIST	36	1.764	1.507	1.636	1.761	1.558	1.660
NORTHWEST ARCTIC SCHOOL DIST	37	1.753	1.462	1.607	1.734	1.468	1.601
PELICAN CITY SCHOOL DISTRICT	38	1.344	1.171	1.257	1.344	1.224	1.284
PETERSBURG CITY SCHOOL DIST	39	1.248	1.186	1.217	1.259	1.241	1.250
PRIBILOF ISLAND SCHOOL DIST	40	1.771	1.356	1.563	1.751	1.404	1.578
SITKA BOROUGH SCHOOL DISTRICT	42	1.268	1.188	1.228	1.269	1.203	1.236
SKAGWAY CITY SCHOOL DISTRICT	43	1.241	1.037	1.139	1.246	1.097	1.171
SOUTHEAST ISLAND SCHOOL DIST	44	1.335	1.191	1.263	1.334	1.246	1.290
SOUTHWEST REGION SCHOOL DIST	45	1.775	1.388	1.582	1.720	1.416	1.568
SAINT MARYS CITY SCHOOL DIST	46	1.651	1.409	1.530	1.644	1.425	1.535
UNALASKA CITY SCHOOL DISTRICT	47	1.503	1.347	1.425	1.495	1.422	1.458
VALDEZ CITY SCHOOL DISTRICT	48	1.233	1.037	1.135	1.246	1.078	1.162
WRANGELL CITY SCHOOL DISTRICT	49	1.250	1.156	1.203	1.251	1.162	1.206
YAKUTAT CITY SCHOOL DISTRICT	50	1.320	1.164	1.242	1.332	1.200	1.266
YUKON FLATS SCHOOL DISTRICT	51	1.863	1.427	1.645	1.832	1.469	1.651
YUKON KOYUKUK SCHOOL DISTRICT	52	1.756	1.331	1.543	1.689	1.312	1.501
TANANA CITY SCHOOL DISTRICT	53	1.823	1.376	1.599	1.783	1.393	1.588
YUPIIT SCHOOL DISTRICT	54	1.827	1.530	1.679	1.799	1.539	1.669
KASHUNAMIUT SCHOOL DISTRICT	55	1.766	1.505	1.636	1.750	1.537	1.643
ALEUTIANS EAST BOROUGH SCH DIS	56	1.785	1.342	1.564	1.747	1.375	1.561

SOURCE: COMPUTED BY ISER, BASED ON THE APPENDIX EQUATION IDENTIFIED IN THE COLUMN HEADING.

II-3. ADJUST INDEX TO USE ACTUAL ENERGY COSTS RATHER THAN ESTIMATED COSTS.

Our review of the AIR study was critical of the methodology used to estimate energy costs and the application of the methodology. These problems led to energy cost estimates that were often substantially in error when compared to actual energy costs. As a consequence of these problems ISER suggested that the energy cost component of the index be computed using actual cost data rather than the flawed estimated cost data.

To do this, we have computed, for each district, energy cost per student. The measure of energy costs that we have used is the sum of "energy" cells described in the AIR budget matrix (Vol. II, Appendix I, pp. 111-113). In essence, the cells in the matrix labeled "energy" have been summed to provide a measure of total energy cost. We have done this for the four fiscal years for which we have data (FY2000 - FY2003).

The total energy cost for a given district is then divided by the district's Average Daily Membership (ADM) figure for the same fiscal year. This results in a figure that represents the "dollars per student" spent on energy. This figure, divided by the comparable Anchorage figure, is the energy cost relative, or relative cost of energy per student, between the district in question and Anchorage, i.e., $(P_{energyj})/(P_{energyAnchorage})$.

The actual cost relatives for energy for each fiscal year are shown in Appendix Table II-3-1 in Appendix II-3 (page 37). The table also includes AIR's cost relatives based on their energy forecasting model. As can be seen, there are substantial differences in most instances, and in general the AIR figure underestimates the actual cost.

We have also calculated the superlative (or overall) index using AIR's original data, and then AIR's data except for actual energy cost relatives. These results are shown in Appendix Table II-3-2 (page 38). For most districts, the overall index increases when actual energy costs are used. The largest increase was about thirteen percent. In a few instances the index decreased, with the largest drop being a little over four percent. These comparisons give a general idea of the impact of including actual energy costs.

II-4. REVIEW OF TRAVEL COST INDEX COMPONENTS.

Our criticism of the travel cost component of the index related primarily to lack of transparency in how the index was calculated. We noted that per diem rates varied depending on the type of travel, but that this was not documented. It appears that these rates were determined in consultation with the Technical Working Group and we do not have any reason to question their decision. However, the spreadsheet version of the model that we have constructed easily allows for substitution of other values if deemed appropriate. There was also a question regarding computation of maintenance travel, related to whether or not round-trip or one-way travel time was the appropriate measure. We have talked to a few firms that make service calls to remote areas of the state. Most indicate that round-trip, rather than one-way travel time would be used in computing service call costs. However, this practice may be dependent on who the customer is. At this point we have not made any adjustment to the model.

II-5. REVIEW DEFINITION AND MEASUREMENT OF BUDGET CATEGORIES.

The computation of budget shares is an important issue since the budget shares determine the relative weight applied to specific components of the overall index. AIR included both the operating fund and special revenue funds matrixes in their report, but did not use the special revenues fund matrix in their computations. Our review also was unable to replicate the budget shares calculated by AIR, although the differences were small. After re-reviewing the computations provided to us by AIR, we found a minor programming error in their calculations. When this was corrected, the expected results were obtained.

The FY 2000 – FY2003 budget reports from DEED, for each of the fifty-three districts, have been reviewed. We have calculated the operating fund budget shares for each year and compared shares on a year by year basis. It is clear that there is year to year variation, but in almost all instances the variation, within a given district, is quite small. Generally, the larger the district, the smaller is the annual variation in budget shares. Also, the greater the importance of an item in the overall budget, the smaller the annual variation. Inspection of the data also indicates, as expected, substantial variation between districts. Budget share data were also reviewed for trends within specific components. Relatively few trends, either within specific components or between components were observed and these did not appear to be significant.

Our review of AIR's report also questioned the exclusion of special revenue funds in the calculation of budget share weights. Special revenue funds include a wide array of revenue sources including federal funds, grants from public and private sources, and more. We have re-calculated the budget shares for FY 2000 using the combined Operating Fund and Special Revenue Funds data. Comparing operating fund shares with the combined shares suggests that inclusion of the special revenue funds does make some difference. The average share accounted for by classified employees increases by about ten percent, instructional and office supplies (the "paper" variable), by about 11.2 percent, maintenance supplies (the "window" variable) by 15.4 percent, and PD3 (travel between schools and district offices, except teachers) increases about five-fold (from a very small base, however). On the other hand, administration and teacher compensation shares (and total personnel expenditures) decline, as do some components of travel. Also, almost no energy costs are met from special fund revenues. Overall, it appears that special revenue funds supplement non-personnel budget components to a greater extent than the certified personnel and energy components.

We have also looked at the share of total funds (operating plus special revenue funds) accounted for by special revenue funds. See Appendix Table II-5-1 (page 39). In FY2000 (based on the average of all districts) special revenue funds were 17.3 percent of total funds. This figure has increased slightly to 21.7 percent in FY2003. The average hides a high degree of variability among districts. One district had about over sixty percent of its combined revenue from special revenue funds, while another was at about six percent. These were extreme cases, with a more typical range between ten and thirty percent. In many instances there was also substantial year to year variation within districts.

After reviewing these data and observations, and after discussing our findings with DEED, it is our judgment that it is appropriate to leave special revenue funds out of the budget share calculations. We can summarize our opinion as follows. First, the receipt of special revenue funds is not automatic, or guaranteed. Second, the role of special revenue funds (or share of total budget) varies significantly across districts and may vary with respect to intended use. Third, the level of special revenue funds within a district may vary substantially from year to year. Finally, it should be noted that at this time special revenue funds reporting is not audited by DEED, in contrast to operating revenue fund reporting. Thus, there is a significant difference in the reliability of the data.

A further issue relates to which of the fiscal years to include in the computations of budget weights. We have elected to use an average of the four fiscal years of the operating revenue fund to measure budget shares. Our reasons for this choice were as follows. First, averaging over the four years smoothes out year to years variation, and should provide a more representative picture of actual expenditure patterns. Secondly, we have four years of energy cost data, which allows us to use an average of energy costs over a multi-year period. This reduces the effects of any one year's weather or fuel price variations. Third, the data used to estimate the teacher cost relative span five years of certified teacher data. Again, this has an averaging effect on comparative district costs for teachers. It should be noted that we have not updated the AIR data on the paper, window, or travel variables, nor the non-teacher personnel variables, all of which were based on FY2002 data. In effect, the teacher and energy components represent, on average, fifty-six percent of total budget outlays.

For purposes of comparison, we have estimated the overall index, using AIR's cost data, for the FY2000 and the four-year (FY2000 – FY 2003) average budget shares set (Appendix Table II-5-2, page 40). The two indexes are quite similar. However, the index computed with four-year average budget weights is lower for 32 districts, and roughly the same for most of the rest. The average of the index values for the 53 districts is about 0.6 percent lower using four-year weights and the variance of the index values is also slightly less. Overall, the four-year average weights do seem to stabilize the index values somewhat.

II-6. SUGGESTIONS REGARDING COLLECTION OF NEW OR ADDITIONAL DATA FOR FUTURE INDEX ESTIMATION

The ability to accurately measure relative costs between districts depends on the availability of information relating to the provision of educational services. Some of these data are currently available, but there are important gaps remaining. In general, there are four areas where better data would contribute to greater understanding of the provision of educational services. The first relates to teacher training and qualifications (teacher quality measures). Second is detail on the value of benefits received by individual teachers (teacher compensation). A third area is more systematic information regarding market supply and demand conditions for teachers (and administrators), including information about differences among school districts' abilities to fill teaching positions. Lastly, information from teachers about what choices of jobs they face and how they make those choices would be extremely valuable. In the first two categories,

data exist that the state already collects or could collect on an on-going basis. The latter two categories are more suited for collection as needed for analysis.

1. **Teacher training and qualifications**: Teacher quality is difficult to measure, especially in ways that can be summarized into simple quantitative measures. However, it would be useful to have the location and date of initial teacher training, any endorsements/specialty areas that a teacher holds, and scores from PRAXIS or other teacher exams. DEED collects these data, and much of it is included in the certification database, but connecting that data with the certified staff accounting database that we used would be time-consuming and expensive. There may be additional variables that are also collected, but not captured, such as data on the college, major, academic performance, courses taken, etc., available from transcripts that are submitted as part of the certification process. Variables such as these have been significant in studies nationally relating to the measurement of instructional and student performance.

2. **Benefits**: We discussed the need to include benefit data in estimating teacher compensation differentials in our review of AIR's study; however, available data were not sufficient to accomplish that in the current analysis. Currently districts report aggregate expenditures for benefits in several categories; however, to be useful for modeling teacher supply issues, we need to know what districts spend on each individual's benefits. Also, because districts may differ in their buying power for their health insurance, it would be useful to know what health benefits teachers receive.

3. **Districts' abilities to fill positions**: We conducted a brief survey to address this question; however, answers to our questions highlighted some of the areas with inadequate data. For example, some districts are able to fill most positions from unsolicited applications; others "don't really have any applicants; we go out and recruit". Our survey did not address differences in districts' recruiting strategies. In response to the question, "how many qualified applicants do you have", a few districts were able to define "qualified" as the three applicants chosen to move forward to interview, while others considered all applicants with the relevant certifications. One possible source of useful data is the Alaska Teacher Placement web site, which could potentially provide data for many (but not all) districts about how long jobs are posted before they are filled; how many applicants jobs attract through ATP; and how many positions are vacant during the year. Annual standardized reporting of recruiting practices, efforts, and success, by districts, could also be fruitful.

4. **Teacher Choices**: Currently available data can tell us what jobs teachers actually chose. When teachers move from one job to another, we can assume that their new job was preferable to their old one, although we may not know why. We have no information about other jobs that they might have preferred (but not been offered) or that they were offered, but chose not to take, or that they chose not to apply for at all. Those data would greatly improve our insight into why teachers make the choices they do (and what policies districts might use to reduce turnover or extend longevity). These data would need to be collected directly from teachers. Job fairs provide a promising venue in which to collect this sort of data from new teachers; experienced teachers who move could potentially be identified through the same certified staff data we used in the current analysis.

II-7. PROVIDE RESULTS IN SPREAD SHEET FORMAT.

The computation of the overall index has been converted from ACCESS to EXCEL. The overall index can be recalculated using new survey data on travel, office and instructional supplies (“paper”) and maintenance supplies (“window”). Revisions to the personnel components of the index continue to require separate estimation of personnel index components. These index components are not subject to routine or automatic updating. We are providing, under separate cover, two copies of the index model (the model used by ISER) used to generate the index values discussed below.

III. ISER COMPUTED INDEX VALUES

The ISER estimates of teacher and teacher/administrator cost relatives developed in Section II-2 have been used to compute new values of the overall (GCEI) index. Note that the overall index reflects a combination of AIR estimates for some components and ISER estimates for others. Important distinctions include the following. First, we use actual energy costs instead of AIR estimates. Second, we are using the average of FY2000 – FY2003 budget weights rather than FY2000 (used by AIR). We do use the AIR cost relatives for the "paper", "window" and travel components. We also use AIR's classified employee estimates. We have computed two sets of overall index values and these are shown in Table III-1 (page 16).

The first shows the overall index computed using ISER's estimate of teacher cost relatives (the average of teacher survival and move equations). This means that the index is calculated using AIR values for administrators. The second overall index uses ISER's combined teacher/administrator cost relatives (the average of the teacher/administrator survival and move equations). Hence, this second estimate does not make use of AIR's administrator cost relatives.

The table values also include the current index (AS14.17.460) values and the ratios of the new indexes relative to the current index. It is clear that both new indexes tend to be higher than the current index. The "teacher only" version averages about fifteen percent above the current index and the combined index average is about nineteen percent higher. There is a high degree of correlation between the existing and new indexes. The two columns showing the ratios of the ISER estimates to the current index give an indication of the degree to which the ISER index exceeds the current index. This information is also shown graphically in Figure III-1 (page 17).

It is our judgment that the certificated personnel cost relative based on the combined teacher/administrator estimate provides a more accurate measure of certificated personnel cost differences and should be the cost relative used in the calculation of the overall index (GCEI). For clarity, we include Table III-2 (page 18), which shows the current (AS14.17.460) index in column (1), the ISER computed overall (GCEI) index based on the teacher/administrator cost relatives (the column headed PROPOSED GEOG DIF INDEX) in column(2), and the arithmetic difference between the proposed index and the current index in column(3).

TABLE III-1. Comparison of Current Index with *Teachers Only* and *All Certificated Personnel* Indexes

DISTRICT	DIST ID	CURRENT GEOG DIF AS14.17.460	AVERAGE, TEACHER EQUATIONS	AVERAGE, ALL PERSONS EQUATIONS	RATIO, TEACHER/ CURRENT INDEX	RATIO, ALL PERSONS/ CURRENT INDEX
ANCHORAGE SCHOOL DISTRICT	5	1.000	1.000	1.000	1.000	1.000
MATANUSKA-SUSITNA BOROUGH SCHS	33	1.010	1.059	1.070	1.049	1.059
FAIRBANKS NORTH STAR BORO S/D	16	1.039	1.054	1.070	1.014	1.030
JUNEAU BOROUGH SCHOOLS	22	1.005	1.124	1.145	1.119	1.139
WRANGELL CITY SCHOOL DISTRICT	49	1.000	1.134	1.159	1.134	1.159
KETCHIKAN GATEWAY BOROUGH S.D.	25	1.000	1.139	1.170	1.139	1.170
VALDEZ CITY SCHOOL DISTRICT	48	1.095	1.142	1.170	1.043	1.069
KENAI PENINSULA BOROUGH SCHS	24	1.004	1.151	1.171	1.147	1.166
SKAGWAY CITY SCHOOL DISTRICT	43	1.143	1.145	1.174	1.002	1.027
SITKA BOROUGH SCHOOL DISTRICT	42	1.000	1.170	1.195	1.170	1.195
HAINES BOROUGH SCHOOL DISTRICT	18	1.008	1.161	1.200	1.152	1.191
CRAIG CITY SCHOOL DISTRICT	13	1.010	1.172	1.206	1.160	1.194
CORDOVA CITY SCHOOL DISTRICT	12	1.096	1.191	1.234	1.086	1.126
DELTA GREELY SCHOOL DISTRICT	14	1.106	1.208	1.241	1.092	1.122
PETERSBURG CITY SCHOOL DIST	39	1.000	1.202	1.244	1.202	1.244
KODIAK ISLAND BOROUGH SCH DIST	28	1.093	1.254	1.289	1.147	1.180
KLAWOCK CITY SCHOOL DISTRICT	27	1.017	1.266	1.302	1.244	1.280
COPPER RIVER SCHOOL DISTRICT	11	1.176	1.282	1.316	1.090	1.119
DENALI BOROUGH SCHOOL DISTRICT	2	1.313	1.299	1.332	0.990	1.015
NENANA CITY SCHOOL DISTRICT	34	1.270	1.287	1.338	1.014	1.054
ANNETTE ISLAND SCHOOL DISTRICT	6	1.011	1.275	1.338	1.261	1.324
DILLINGHAM CITY SCHOOL DIST	15	1.254	1.311	1.346	1.045	1.074
GALENA CITY SCHOOL DISTRICT	17	1.348	1.359	1.391	1.008	1.032
HOONAH CITY SCHOOL DISTRICT	19	1.055	1.363	1.399	1.292	1.326
SOUTHEAST ISLAND SCHOOL DIST	44	1.124	1.364	1.403	1.214	1.248
YAKUTAT CITY SCHOOL DISTRICT	50	1.046	1.380	1.412	1.319	1.350
UNALASKA CITY SCHOOL DISTRICT	47	1.245	1.382	1.441	1.110	1.157
NOME CITY SCHOOL DISTRICT	35	1.319	1.419	1.450	1.076	1.099
KAKE CITY SCHOOL DISTRICT	23	1.025	1.406	1.459	1.372	1.423
PELICAN CITY SCHOOL DISTRICT	38	1.290	1.423	1.477	1.103	1.145
BRISTOL BAY BOROUGH SCH DIST	8	1.262	1.453	1.478	1.152	1.171
CHUGACH SCHOOL DISTRICT	10	1.294	1.490	1.496	1.151	1.156
HYDABURG CITY SCHOOL DISTRICT	20	1.085	1.425	1.504	1.314	1.386
CHATHAM REGION SCHOOLS	9	1.120	1.517	1.576	1.354	1.407
ALASKA GATEWAY SCHOOL DISTRICT	3	1.291	1.547	1.594	1.198	1.235
KASHUNAMIUT SCHOOL DISTRICT	55	1.389	1.543	1.619	1.111	1.166
SAINT MARYS CITY SCHOOL DIST	46	1.351	1.573	1.624	1.164	1.202
LOWER KUSKOKWIM SCHOOL DIST	31	1.491	1.621	1.663	1.087	1.115
SOUTHWEST REGION SCHOOL DIST	45	1.423	1.632	1.685	1.147	1.184
PRIBILOF ISLAND SCHOOL DIST	40	1.419	1.649	1.691	1.162	1.192
YUPIIT SCHOOL DISTRICT	54	1.469	1.647	1.723	1.121	1.173
KUSPUK SCHOOL DISTRICT	29	1.434	1.675	1.734	1.168	1.209
TANANA CITY SCHOOL DISTRICT	53	1.496	1.707	1.786	1.141	1.194
NORTH SLOPE BOROUGH SCH DIST	36	1.504	1.742	1.791	1.158	1.191
NORTHWEST ARCTIC SCHOOL DIST	37	1.549	1.774	1.823	1.145	1.177
YUKON KOYUKUK SCHOOL DISTRICT	52	1.502	1.782	1.835	1.186	1.222
IDITAROD AREA SCHOOL DISTRICT	21	1.470	1.802	1.846	1.226	1.256
LOWER YUKON SCHOOL DISTRICT	32	1.438	1.797	1.861	1.250	1.294
ALEUTIAN REGION SCHOOL DIST	4	1.736	1.890	1.939	1.089	1.117
ALEUTIANS EAST BOROUGH SCH DIS	56	1.423	1.938	1.991	1.362	1.399
LAKE AND PENINSULA SCHOOL DIST	30	1.558	1.940	1.994	1.245	1.280
BERING STRAIT SCHOOL DISTRICT	7	1.525	1.938	1.998	1.271	1.310
YUKON FLATS SCHOOL DISTRICT	51	1.668	2.002	2.116	1.200	1.268
AVERAGE		1.245	1.438	1.481	1.155	1.189
RATIO TO CURRENT INDEX AVERAGE			1.155	1.190		

SOURCE: COMPUTED BY ISER

	CURRENT INDEX	AVEAVERAGE, TEACHERS	AVERAGE, ALL PERSONS
	Column 1	*Column 2*	*Column 3*
Column 1	1		
Column 2	0.904424423	1	
Column 3	0.900052557	0.998599748	1

FIGURE III-1. Comparison of Current and ISER-Calculated Cost Differentials

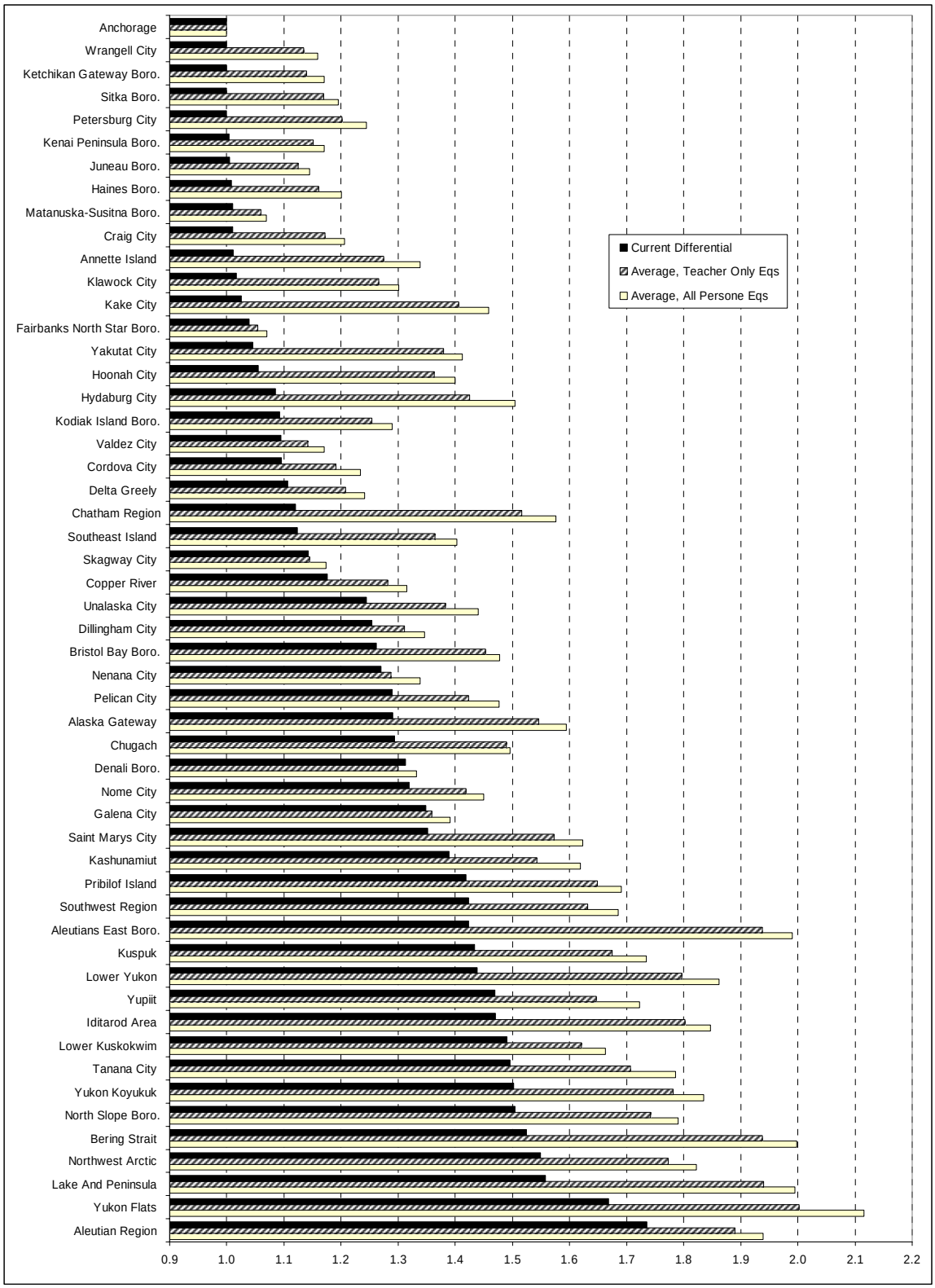

TABLE III-2. Current Geographic Cost Differential Index and Proposed New Index

DISTRICT	DIST ID	(1) CURRENT GEOG DIF INDEX AS14.17.460	(2) PROPOSED GEOG DIF INDEX	(3) ARITHMETIC DIFFERENCE, PROPOSED - CURRENT
ANCHORAGE SCHOOL DISTRICT	5	1.000	1.000	0.000
MATANUSKA-SUSITNA BOROUGH SCHS	33	1.010	1.070	0.060
FAIRBANKS NORTH STAR BORO S/D	16	1.039	1.070	0.031
JUNEAU BOROUGH SCHOOLS	22	1.005	1.145	0.140
WRANGELL CITY SCHOOL DISTRICT	49	1.000	1.159	0.159
KETCHIKAN GATEWAY BOROUGH S.D.	25	1.000	1.170	0.170
VALDEZ CITY SCHOOL DISTRICT	48	1.095	1.170	0.075
KENAI PENINSULA BOROUGH SCHS	24	1.004	1.171	0.167
SKAGWAY CITY SCHOOL DISTRICT	43	1.143	1.174	0.031
SITKA BOROUGH SCHOOL DISTRICT	42	1.000	1.195	0.195
HAINES BOROUGH SCHOOL DISTRICT	18	1.008	1.200	0.192
CRAIG CITY SCHOOL DISTRICT	13	1.010	1.206	0.196
CORDOVA CITY SCHOOL DISTRICT	12	1.096	1.234	0.138
DELTA GREELY SCHOOL DISTRICT	14	1.106	1.241	0.135
PETERSBURG CITY SCHOOL DIST	39	1.000	1.244	0.244
KODIAK ISLAND BOROUGH SCH DIST	28	1.093	1.289	0.196
KLAWOCK CITY SCHOOL DISTRICT	27	1.017	1.302	0.285
COPPER RIVER SCHOOL DISTRICT	11	1.176	1.316	0.140
DENALI BOROUGH SCHOOL DISTRICT	2	1.313	1.332	0.019
NENANA CITY SCHOOL DISTRICT	34	1.270	1.338	0.068
ANNETTE ISLAND SCHOOL DISTRICT	6	1.011	1.338	0.327
DILLINGHAM CITY SCHOOL DIST	15	1.254	1.346	0.092
GALENA CITY SCHOOL DISTRICT	17	1.348	1.391	0.043
HOONAH CITY SCHOOL DISTRICT	19	1.055	1.399	0.344
SOUTHEAST ISLAND SCHOOL DIST	44	1.124	1.403	0.279
YAKUTAT CITY SCHOOL DISTRICT	50	1.046	1.412	0.366
UNALASKA CITY SCHOOL DISTRICT	47	1.245	1.441	0.196
NOME CITY SCHOOL DISTRICT	35	1.319	1.450	0.131
KAKE CITY SCHOOL DISTRICT	23	1.025	1.459	0.434
PELICAN CITY SCHOOL DISTRICT	38	1.290	1.477	0.187
BRISTOL BAY BOROUGH SCH DIST	8	1.262	1.478	0.216
CHUGACH SCHOOL DISTRICT	10	1.294	1.496	0.202
HYDABURG CITY SCHOOL DISTRICT	20	1.085	1.504	0.419
CHATHAM REGION SCHOOLS	9	1.120	1.576	0.456
ALASKA GATEWAY SCHOOL DISTRICT	3	1.291	1.594	0.303
KASHUNAMIUT SCHOOL DISTRICT	55	1.389	1.619	0.230
SAINT MARYS CITY SCHOOL DIST	46	1.351	1.624	0.273
LOWER KUSKOKWIM SCHOOL DIST	31	1.491	1.663	0.172
SOUTHWEST REGION SCHOOL DIST	45	1.423	1.685	0.262
PRIBILOF ISLAND SCHOOL DIST	40	1.419	1.691	0.272
YUPIIT SCHOOL DISTRICT	54	1.469	1.723	0.254
KUSPUK SCHOOL DISTRICT	29	1.434	1.734	0.300
TANANA CITY SCHOOL DISTRICT	53	1.496	1.786	0.290
NORTH SLOPE BOROUGH SCH DIST	36	1.504	1.791	0.287
NORTHWEST ARCTIC SCHOOL DIST	37	1.549	1.823	0.274
YUKON KOYUKUK SCHOOL DISTRICT	52	1.502	1.835	0.333
IDITAROD AREA SCHOOL DISTRICT	21	1.470	1.846	0.376
LOWER YUKON SCHOOL DISTRICT	32	1.438	1.861	0.423
ALEUTIAN REGION SCHOOL DIST	4	1.736	1.939	0.203
ALEUTIANS EAST BOROUGH SCH DIS	56	1.423	1.991	0.568
LAKE AND PENINSULA SCHOOL DIST	30	1.558	1.994	0.436
BERING STRAIT SCHOOL DISTRICT	7	1.525	1.998	0.473
YUKON FLATS SCHOOL DISTRICT	51	1.668	2.116	0.448
AVERAGE		1.245	1.481	0.236

SOURCE: COMPUTED BY ISER USING TEACHER/ADMINISTRATOR MODEL.

APPENDIX MATERIAL

NOTE

There is no Appendix I.

Appendix II section numbers refer to the corresponding section numbers in the body of Section II of the report. If there is no appendix material related to a particular section, there will be no corresponding appendix section.

Appendix III provides detailed coverage of the survey measuring differences among school districts in their ability to fill teaching positions.

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Appendix II. Estimation of Cost Differentials for Certificated Personnel

This appendix provides the technical description of the procedures used to estimate proposed cost differentials for certificated personnel. First, we outline the relationships that describe the market for teachers and administrators. Second, we discuss the identification of parameters in these simultaneous relationships. Next, we describe the specific variables that work through the relationships to determine market outcomes, and provide the data sources for each variable. Then, we discuss specification and statistical estimation of the parameters of the relationships. Finally, we describe how we used the coefficients estimated from the equations to generate cost differentials for communities and school districts.

Relationships

School districts hire teachers and administrators in markets characterized, like all markets, by supply and demand relationships. The market demand relationship models the decisions of a school district to hire personnel and their ability and willingness to pay to recruit and retain staff. The demand price represents this willingness to pay. We model the demand price, P, as a function of the number of personnel needed, N^D, the quality of staff hired, Q, and vectors of individual characteristics (other than quality), I, characteristics of the job, J, exogenous demand-shift characteristics, X. That is,

$$P = D^{-1}(N^D, Q, I, J, X) \quad (1)$$

Equation (1) implies a tradeoff between quantity and quality, limited by the district's budget. Since the district is competing with other districts to fill similar positions, the relevant price, P, can be expressed as the relative price offered by the district compared to the average offer for a similar job across all Alaska districts.

The supply relationship models the decisions of individuals to apply for and accept offers of employment at that particular district. The market supply, expressed as the number of teachers or administrators, N^S, depends on the salary offer, P, as well as I, J, and a vector Z of place and district characteristics measuring working conditions and the perceived quality of life in the community. That is,

$$N^S = S(P, I, J, Z) \quad (2)$$

Teachers and administrators prefer jobs that pay more and are located in communities that offer a better quality of life. We assume that it is possible to observe a tradeoff of pay for certain desirable community characteristics.

Ordinarily, market equilibrium occurs at the price P^* that equates N^S to N^D. In this case, however, the ability of districts to choose different quality thresholds allows the existence of multiple equilibria. Districts possessing a combination of financial resources and community quality of life can pay more than P^* in order to attract staff of higher than average quality. Districts with less money and poor perceived community quality of life may have difficulty filling positions and may have to accept staff of lesser quality. The following equation summarizes this relationship.

$$Q = f(P - P^*) \quad (3)$$

Identification

Equations (1), (2), and (3) define a simultaneous system of equations, with three jointly determined variables, P, N, and Q, and vectors of predetermined variables, I, J, X, and Z. The parameters of a simultaneous equation can only be estimated if the equation is identified. In general, identification is possible if it excludes at least one variable for each equation in the

system. In the system defined above, the supply equation is identified, but the demand equation is not identified. In practice, this means that it is not possible to determine empirically a school district's preferences for the tradeoff between quantity and quality of personnel without additional information. For example, we might hypothesize that the district has preferences *U* for the number of staff, staff quality, and quality of facilities, *F*:

$$U = U(N, Q, F) \quad (4)$$

The amount paid to operate facilities plus the amount paid to staff is limited by a budget, B:

$$P*N + R*F \leq B \quad (5)$$

where R represents the unit cost of operating facilities. If the district maximizes equation (4) subject to equation (5) and the labor market relationships (1), (2), and (3), then a unique equilibrium solution emerges for *N*, P, *Q*, and *F*. With observations on an exogenous indicator for the unit cost of facilities -- for example, the price of fuel -- then all relationships are identified and can be estimated empirically.

Determining the equilibrium quality, *Q*, in each district as an outcome of the budget constraints of districts would allow us to estimate the implications of the current Alaska school foundation funding formula for differences in staff quality among Alaska districts. However, such a determination is not necessary in order to complete our task of estimating personnel cost differentials among districts. For this it is only necessary to estimate the supply relationship in equation (2), which is identified. This equation provides the empirical basis for determining how much teachers and administrators would need to be compensated in different districts to provide each district with a supply of job candidates of equivalent quality.

Data definition and sources

Alaska DEED certification files provide data on individual characteristics, *I*, for teachers and administrators filling certificated positions for the years 1999 through 2004. Individual characteristics include age, sex, ethnicity, college degrees awarded, and years of experience. The same source provides the job title for the position, which we summarized into six categories of job types, *J*, for teachers and six categories for administrators, as well as salary information.

Exogenous demand-shift factors, *X*, represent factors that explain differences in the demand for personnel at any given salary. These factors include indicators of the financial resources of the district and changes in student enrollment (ADM). We measure the state's existing defined entitlement, which we define as the sum of state and non-deductible federal impact aid plus required local effort per adjusted ADM, growth in ADM between 1999-2004, and dummy variables for districts with high industrial (petroleum) tax base (NSB, Valdez), and for one district (Galena) that has generated exceptionally large revenue from correspondence programs. Spreadsheets generated for the school foundation annual reports provide the source of these data. Eddy Jeans of the DEED kindly provided us with these spreadsheets.

The set of place and district variables, Z, include a variety of community data drawn from the 2000 US census and data series generated and used by AIR in their study. Census 2000 place variables include district and community total and school-age population size and distribution by ethnicity, percent of population 16 and older in the community who were employed in 1999, and the percent of families in the community living in poverty in 1999. We include the set of regional (district) climate indicators used by AIR. In addition, we constructed a number of indicators of community remoteness, including dummy variables for whether the community was located on the road system, whether the community has direct air service to Anchorage or requires an additional small plane flight to a hub with direct air service, and the air fare of the flight from the nearest hub to Anchorage. Finally, we include a variable indicating whether the community

prohibits sale and importation of alcohol, based on records obtained from the Alaska Alcoholic Beverage Control Board. Appendix Table II-2-1 shows relevant variables, their definitions and sources.

Specification of the equations to estimated

To control for quality, we examine labor supply decisions by individual teachers. We examine two specific decisions: (1) duration of employment in schools in a given community (survival analysis), and (2) moving from a job in schools in one community to a job in schools in another community (discrete-choice revealed preference). The survival analysis estimates the tradeoff between compensation and community and district characteristics that determine how long an individual remains in a community. The discrete-choice analysis estimates the tradeoff between compensation and community and district characteristics that determine which communities and districts are relatively more attractive to teachers and administrators with at least one prior job working in Alaska public schools. It assumes that all moves are voluntary, so a move always results in an increase in welfare.

The survival model assumes and exponential hazard function of the form,

$$e^{-\lambda t}, \tag{6}$$

where t equals time, which is measured in years, and

$$-\log(\lambda) = \lambda_0 + \alpha \log P + \beta I + \gamma J + \delta Z + u \tag{7}$$

In equation (7), λ_0, α, β, γ, and δ are parameters to be estimated, and u is a random error.

The discrete choice equations are specified as a rank-order logit, where the probability of moving from district A to district B equals

$$e^{\mu A}/e^{\mu B} \tag{8}$$

The exponents in equation (8), μ^A and μ^B are given by the linear equation:

$$\mu^i = \alpha \log P + \gamma P^J + \delta Z + u \tag{9}$$

where P^J represents the average salary difference between the job type held by the individual and the average salary for a regular classroom teacher job. Equation (9) is similar to equation (7), except that the vector of job characteristics J is represented by a single variable. Since equation (8) represents only relative preference between two communities for the same individual, individual characteristics, I, are not relevant in equation (9) (β=0), and there is no constant term (λ_0=0).

The community cost index represents the amount that the salary would have to be adjusted to exactly offset the difference in community quality of life compared to Anchorage. For both models, this is calculated as

$$\exp[-\delta(Z_k - Z_a)/\alpha], \tag{10}$$

where α represents the coefficient on the relative price, and δ represents the vector of coefficients multiplied by the respective difference between the characteristics of the community (k) and Anchorage (a). For the survival model, equation (10) calculates the compensation that would equalize survival rates among all communities. For the discrete-choice model, equation (10) calculates the compensation that would make teachers equally likely to move to or from all communities.

To obtain school district indexes from community indexes, we calculate the weighted average of the indexes of the communities served by that school district, with the weights equal to the number of teachers (or administrators) employed in each community.

Estimation of equations

Since the supply equations represent part of a simultaneous system of equations, the first step is to estimate an instrumental variable for the jointly determined salary variable, *P*. Appendix Table II-2-2 shows the results of estimating the reduced-form equation for the natural logarithm of the salary as a function of a constant, a trend, and the full set of predetermined variables included in the system of equations (1), (2), and (3). These predetermined variables include *I*, *J*, *X*, and *Z*. This equation is somewhat similar to the salary equations estimated in the AIR study. The two primary differences are that they include the *Z* (demand-shift) variables, and that they include community as well as district characteristics. Including the set of Z variables corrects an error in the AIR study methodology. The results in Appendix Table II-2-2 show that the variables representing ability to pay (entitlement funding, and dummy variables for districts with a significantly enhanced local revenue base) are indeed positive and significant.

The coefficients in Appendix Table II-2-2 are used to construct two salary variables. The salary relative to the average salary for that job type is constructed by subtracting the means for the job type from the predicted values of the salary equation. The average salary differential for different job types is constructed by taking the linear combination of dummy variables for each job type times its estimated coefficient. Since the constant term represents regular classroom teacher, the result automatically produces a differential relative to regular classroom teacher.

Appendix Tables II-2-3, II-2-4, and II-2-5 show the results of estimating equations for the survival model for three different populations: all certificated personnel, teachers, and administrators. Estimation is by maximum likelihood. The equations all show significant positive coefficients on the logarithm of the relative salary (instrumental variable), as well as significant coefficients for individual characteristics, job characteristics, and a number of community and district variables.

Appendix Tables II-2-6, II-2-7, II-2-8, and II-2-9 show the maximum likelihood estimates of the discrete-choice move equations for four specifications. These are, respectively, (1) the most recent two moves for all personnel, (2) the most recent two moves of teachers to other teaching positions, (3) the most recent two moves of administrators to other administrative positions, and (4) all moves by certificated personnel, ranked in order. Note that many administrators moved into a district or school from a teaching position elsewhere, while some moved back to teaching positions from administrative positions. Consequently, the first and fourth specification includes all these job moves, while the second and third include only a subset of job moves. The coefficient on the logarithm of the salary differential (instrumental variable) is positive and statistically significant except for the administrator moves, which includes a relatively small number of observations. Coefficients on the logarithm of the average salary difference between the observed job and a regular classroom teacher job are positive and significant as well, and generally smaller than the coefficients on the within-job-category salary differentials. This suggests that people who move from one job type to another -- for example, from a teacher to a principal -- are generally willing to make the change with a smaller change in salary than would be required to induce them to make a lateral move to the same community. The equations all show significant coefficients for a number of community and district variables.

Community and District Cost Indexes

The equations above include many variables specific to the teacher and job. Controlling for those factors in the model allows us to isolate the effects of community and district characteristics. Accordingly, we use *only* those community and district characteristics to estimate the relative attractiveness of different communities.

To construct the community cost differentials, we

1) multiply the community characteristic coefficients by the relevant values for each community. This produces a "sumproduct" value for each community.
2) Again for each community, subtract its sumproduct from the sumproduct calculated for Anchorage. Although this numerical difference has no simple meaning, it is the amount that the wage difference (times its coefficient) would have to equal in order to compensate for community and district characteristics, holding all teacher and job characteristics constant.
3) Divide the difference by the coefficient of LWAGEDIF, (the log of the wage differential) giving the log of the necessary wage differential to compensate.
4) Take the antilog to calculate the wage differential for each community

Community cost differentials need to be aggregated into district cost differentials. We did this by taking the weighted average of the community differentials for all the communities in each district, with the weights being chosen to match the equation. For the "All certificated Personnel" equations, the weights were the average number of certificated personnel (1999-2004) reported in each community. For the teachers only equations, the weights were the average number of teachers, and for the administrator equations, the average number of administrators in each community.

Appendix Table II-2-1. Data Definitions and Sources

Variable Name	Variable Definition	Source
FEMALE	Gender	DEED certified Staff Accounting Database
AGE	Age in years	DEED certified Staff Accounting Database
AGESQ	Age squared	Calculated from AGE
EXPERIENCE	Years Experience in current job type (i.e. as a teacher, principal, or superintendent)	DEED certified Staff Accounting Database
STARTEXP	Experience, first yr in community	Calculated from EXPERIENCE
ENDEXP	Experience, last yr in community	Calculated from EXPERIENCE
DATAYEAR	Fiscal Year the data was collected; FY 1999 data was collected in Oct 98, FY04 in Oct 03, etc	DEED certified Staff Accounting Database
TREND	Data year –1988: this controls for wage inflation from 1999 to 2004	Calculated from DATAYEAR
BA	Highest ed is BA	DEED certified Staff Accounting Database
MA	Highest ed is MA	DEED certified Staff Accounting Database
SP	Highest ed is Education Specialist	DEED certified Staff Accounting Database
DD	Highest ed is Doctorate	DEED certified Staff Accounting Database
BLACK	Black ethnicity	DEED certified Staff Accounting Database
NATIVE	Alaska Native ethnicity	DEED certified Staff Accounting Database
OTHER	Not black, not native, not white	DEED certified Staff Accounting Database
SUPER	Job=superintendent	DEED certified Staff Accounting Database
ASUPER	Job=assistant superintendent	DEED certified Staff Accounting Database
PRINC	Job= principal	DEED certified Staff Accounting Database
APRINC	Job=assistant principal	DEED certified Staff Accounting Database
DISTINST	District-level instructional professionals; DEED job codes 5, 6, 7, 10,32, 34, 36–38, 42, 46, 71	DEED certified Staff Accounting Database
DISTPROF	Other district-level professionals; DEED job codes 8, 9, 17–19, 22, 23, 47, 50, 51, 53, 70	DEED certified Staff Accounting Database
HEAD	Job=head teacher	DEED certified Staff Accounting Database
OTHPROF	Other school-level professionals DEED job codes 11, 12, 20, 24	DEED certified Staff Accounting Database
SPECED	Job=special education classroom teacher; DEED job code 11 with job detail codes 49, 56 – 59, 179 – 188, 196	DEED certified Staff Accounting Database
SPECRES	Job= other special education teacher; DEED job codes 13, 26–30, 45	DEED certified Staff Accounting Database
MATHSCI	Job=secondary math or science; DEED job code 11 with job detail codes 5, 7, 11, 20,22,23, 36, 38, 201 and higher	DEED certified Staff Accounting Database
ENTITLE	(State Foundation Aid +non-deductible federal aid + required local contribution) /ADJADM	DEED, School Finance and Facilities Section
ADJADM	Adjusted ADM: actual ADM adjusted for school size, special education and intensive needs, but NOT for district cost differentials	ISER calculated from DEED's Foundation Aid spreadsheet, setting all district cost factors to 1
GROWTH	Percent growth in district enrollment, 1999 to 2004	DEED website, www.eed.state.ak.us/stats/QuickFacts/ADM.pdf
NSB	North Slop Borough dummy variable	ISER constructed
VALDEZ	Valdez dummy variable	ISER constructed
ANC	Anchorage dummy variable	ISER constructed
D17	Galena City Schools Dummy variable	ISER constructed
HEATDD	Heating degree days	AIR data set

Appendix Table II-2-1. Data Definitions and Sources

Variable Name	Variable Definition	Source
COOLDD	Cooling degree days	AIR data set
LOWRAIN	Low rainfall (AIR definition)	AIR data set
HIGHRAIN	High rainfall (AIR definition)	AIR data set
TOTPOP	Community population	2000 U.S. Census
PCTAIAN	Percent of TOTPOP that is American Indian or Alaska Native alone	2000 U.S. Census
PCTOTH	Percent of TOTPOP that is neither white nor AIAN	2000 U.S. Census
SCHLPOP	School aged population; i.e. community population aged 5 through 19	2000 U.S. Census
SCHPAIAN	Percent of SCHLPOP that is American Indian or Alaska Native	2000 U.S. Census
SCHPOTH	Percent of SCHLPOP that is neither white nor American Indian / AK Native	2000 U.S. Census
PCTEMPL	Percent of community aged 16 and over that is employed (1999)	2000 U.S. Census
PCTPOV	Percent of community's families that are in poverty (1999)	2000 U.S. Census
ROADED	1=community is connected by road to Anchorage	ISER constructed
AIRTOHUB	1= no road access between community and hub	ISER constructed
HUBTOANC	Cost of travel from hub to Anchorage (or community to Anchorage, if Anchorage is hub)	ISER constructed from Alaska Airlines, PenAir, and Frontier Air Web sites
DISTTOT	Total district enrollment	
DISTANAI	Percent of DISTTOT that is American Indian or Alaska Native	www.eed.state.ak.us/stats/DistrictEthnicity/ 2004_District_Ethnicity_Report.pdf
DISTPBL	Percent of DISTTOT that is Black	
DISTPOTH	Percent of DISTTOT that is neither white nor American Indian / Alaska Native, nor black	
LASTDRY	Alcohol status of community, teacher's last yr in community	Alcoholic Beverage Control Board web site http://www.dps.state.ak.us/abc/LocalOption.htm and historical data from ISER[1] http://www.iser.uaa.alaska.edu/projects/alcohol/elections.htm

[1] A Historical Sketch of the Elections for Local Option Control of Alcoholic Beverages in Communities in Alaska, by Teresa Hull. July 1999.

Appendix Table II-2-2. Equation to Estimate Expected Teacher Salary

Variable Name	Var Description	Coeff.	Std Error	T-Ratio	Prob
Constant		9.5731	3.56E-02	268.912	0
FEMALE	Gender	-6.59E-03	2.56E-03	-2.572	0.0101
AGE	Age in years	2.75E-02	9.59E-04	28.695	0
AGESQ	Age squared	-2.58E-04	1.08E-05	-23.851	0
ENDEXP	Experience, last yr in community	1.36E-02	1.70E-04	79.739	0
TREND	To account for wage inflation, 99 to 04	2.17E-02	7.12E-04	30.448	0
BA	Highest ed is BA	0.14035	1.75E-02	8.027	0
MA	Highest ed is MA	0.20631	1.76E-02	11.754	0
SP	Highest ed is Education Specialist	0.19735	2.70E-02	7.306	0
DD	Highest ed is Doctorate	0.21984	2.18E-02	10.098	0
BLACK	Black ethnicity	-1.93E-02	9.80E-03	-1.966	0.0493
NATIVE	Alaska Native ethnicity	-2.29E-02	5.75E-03	-3.981	0.0001
OTHER	Not black, not native, not white	-0.11238	2.38E-02	-4.718	0
SUPER	Job=superintendent	0.48658	1.43E-02	34.154	0
ASUPER	Job=assistant superintendent	0.44583	2.20E-02	20.274	0
PRINC	Job= principal	0.3409	6.45E-03	52.82	0
APRINC	Job=assistant principal	0.27263	1.19E-02	22.898	0
DISTINST	District-level instructional professionals	0.21024	8.28E-03	25.384	0
DISTPROF	Other district-level professionals	0.18054	1.01E-02	17.945	0
HEAD	Job=head teacher	0.10688	1.07E-02	10.029	0
OTHPROF	Other school-level professionals	-6.50E-03	4.83E-03	-1.346	0.1782
SPECED	Job=special education classroom teacher	-4.09E-03	3.95E-03	-1.036	0.3001
SPECRES	Job= other special education teacher	3.28E-02	7.28E-03	4.501	0
MATHSCI	Job=secondary math or science	7.49E-03	5.25E-03	1.425	0.1541
ENTITLE	State+fed+local aid entitlement/ADM	6.93E-06	2.35E-06	2.951	0.0032
GROWTH	% growth in district enrollment, 99–04	6.18E-03	6.09E-03	1.015	0.3103
NSB	North Slop Borough dummy variable	6.15E-02	1.29E-02	4.771	0
VALDEZ	Valdez dummy variable	0.1808	1.60E-02	11.332	0
ANC	Anchorage dummy variable	-1.67E-02	3.46E-02	-0.482	0.6297
D17	Galena District Dummy Variable	6.83E-02	1.55E-02	4.402	0
HEATDD	Heating degree days	6.64E-06	1.53E-06	4.332	0
COOLDD	Cooling degree days	7.98E-05	1.88E-04	0.425	0.6706
LOWRAIN	Low rainfall (AIR definition)	4.25E-03	6.29E-03	0.675	0.4994
HIGHRAIN	High rainfall (AIR definition)	-2.80E-03	7.67E-03	-0.364	0.7155
TOTPOP	Community population	-8.78E-06	1.13E-06	-7.803	0
PCTAIAN	% of cmty that is AIAN alone	0.40955	5.10E-02	8.037	0
PCTOTH	% of cmty that is neither white nor AIAN	0.34028	5.37E-02	6.335	0
SCHLPOP	School age pop, 2000	3.58E-05	4.41E-06	8.132	0
SCHPAIAN	% of SCHLPOP that is AIAN	-0.35063	4.77E-02	-7.347	0
SCHPOTH	% of SCHLPOP not white or AIAN	-0.1401	5.83E-02	-2.403	0.0162
PCTEMPL	% of cmty aged 16+ that is employed	8.66E-03	2.32E-02	0.373	0.7089
PCTPOV	% of cmty's families in poverty (1999)	-6.50E-02	2.48E-02	-2.622	0.0087
ROADED	1=cmty connected by road to Anchorage	-4.57E-02	8.21E-03	-5.567	0

Appendix Table II-2-2. Equation to Estimate Expected Teacher Salary

Variable Name	Var Description	Coeff.	Std Error	T-Ratio	Prob
AIRTOHUB	1=cmty not road-connected to hub	-4.21E-02	6.42E-03	-6.565	0
HUBTOANC	Cost of travel from hub to Anchorage	1.08E-04	1.97E-05	5.483	0
DISTTOT	Total district enrollment	7.16E-07	7.05E-07	1.016	0.3096
LASTDRY	Alcohol status of community, teacher's last yr in cmty	3.47E-02	5.96E-03	5.826	0

Observations	=	16387	Weights	=	ONE
Mean of LHS	=	10.82160	Std.Dev of LHS	=	0.2547960D+00
StdDev of residuals	=	0.1476158	Sum of squares	=	0.3560556D+03
R-squared	=	0.6652970	Adjusted R-squared	=	0.6643548D+00
F[46, 16340]	=	706.074	Prob value	=	0.3217295D-13
Log-likelihood	=	8122.05	Restr.(b=0) Log-l	=	-0.8458321D+03
Amemiya Pr. Criter.	=	0.02185293	Akaike Info.Crit.	=	-0.9855434D+00

Appendix Table II-2-3. Survival Equation, All Certificated Personnel

Variable Name	Var Description	Coeff.	Std Error	T-Ratio	Prob
Constant		-1.558	0.375	-4.154	0
LWAGEDIF	Log of ratio between actual and predicted wage	3.0111	0.8524	3.533	0.0004
AGE	Age, last year in cmty	0.15147	1.05E-02	14.392	0
AGESQ	Age squared	-1.43E-03	1.18E-04	-12.043	0
FEMALE	Gender	7.31E-02	2.74E-02	2.67	0.0076
NATIVE	Alaska Native ethnicity	0.41758	5.90E-02	7.081	0
BLACK	Black ethnicity	-0.31398	0.1058	-2.968	0.003
OTHER	Not black, not native, not white	1.7292	1.328	1.302	0.1928
BA	Highest ed is BA	9.33E-02	0.1848	0.505	0.6135
MA	Highest ed is MA	-0.15309	0.1855	-0.825	0.4092
SP	Highest ed is Education Specialist	-0.44068	0.2847	-1.548	0.1217
DD	Highest ed is Doctorate	-0.46506	0.2193	-2.121	0.0339
STARTEXP	Experience, first year in community	-2.16E-02	2.14E-03	-10.093	0
NOEXPER	Dummy variable if startexp=0	-0.18369	3.78E-02	-4.855	0
ANC	Anchorage dummy variable	-1.471	0.3294	-4.466	0
HEATDD	Heating degree days	-4.84E-05	1.45E-05	-3.345	0.0008
COOLDD	Cooling degree days	1.68E-03	1.61E-03	1.043	0.2969
LOWRAIN	Low rainfall (AIR definition)	4.40E-02	5.92E-02	0.744	0.457
HIGHRAIN	High rainfall (AIR definition)	8.77E-02	7.20E-02	1.218	0.2231
TOTPOP	Community population	2.26E-05	1.53E-05	1.474	0.1405
PCTAIAN	Percent of community that is AIAN alone	-1.84	0.5962	-3.086	0.002
PCTOTH	Percent of community neither white nor AIAN	-2.7472	0.5962	-4.608	0
SCHLPOP	School Age Population, 2000	-8.96E-05	6.05E-05	-1.48	0.1389
SCHPAIAN	Percent of SCHLPOP that is AIAN	1.0957	0.542	2.022	0.0432
SCHPOTH	Percent of SCHLPOP neither white nor AIAN	2.8636	0.577	4.963	0
PCTEMPL	Percent of cmty 16 and over that is employed	0.45893	0.2232	2.056	0.0398
PCTPOV	Percent of cmty's families in poverty (1999)	-0.17117	0.2401	-0.713	0.4758
ROADED	1=community is connected by road to Anchorage	0.14004	8.46E-02	1.656	0.0977
AIRTOHUB	1=cmty not road-connected to hub	-6.37E-02	6.45E-02	-0.987	0.3236
HUBTOANC	Cost of travel from hub to Anchorage	-1.06E-04	2.01E-04	-0.53	0.5959
DISTTOT	Total district enrollment	3.68E-05	6.79E-06	5.416	0
LASTDRY	Alcohol status of cmty, teacher's last yr in cmty	0.144	6.20E-02	2.323	0.0202
SUPER	Job=superintendent	4.44E-03	0.1483	0.03	0.9761
ASUPER	Job=assistant superintendent	4.13E-02	0.2097	0.197	0.8438
PRINC	Job= principal	-9.15E-02	6.31E-02	-1.449	0.1473
APRINC	Job=assistant principal	0.1574	0.1302	1.209	0.2267
DISTINST	District-level instructional professionals	8.13E-02	8.12E-02	1.002	0.3165
DISTPROF	Other district-level professionals	-0.16926	0.1092	-1.55	0.1211
HEAD	Job=head teacher	-0.10185	9.04E-02	-1.127	0.2598
OTHPROF	Job=other school-level professionals	-5.86E-02	5.56E-02	-1.054	0.2921
SPECED	Job=special education classroom teacher	-0.13211	4.23E-02	-3.121	0.0018
SPECRES	Job= other special education teacher	4.65E-02	8.70E-02	0.535	0.5924
MATHSCI	Job=secondary math or science	0.90373	8.22E-02	11.001	0

Log-likelihood = -15286.9 Wald Chi-Squared (42) = 3976.2 Prob=0

Appendix Table II-2-4. Survival Equation, Teachers Only

Variable Name	Var Description	Coeff.	Std Error	T-Ratio	Prob
Constant		-1.3651	0.4404	-3.1	0.0019
LWAGEDIF	Log of ratio between actual and predicted wage	2.8789	0.9105	3.162	0.0016
AGE	Age, last year in cmty	0.16006	1.10E-02	14.533	0
AGESQ	Age squared	-1.51E-03	1.25E-04	-12.097	0
FEMALE	Gender	6.16E-02	2.90E-02	2.121	0.0339
NATIVE	Alaska Native ethnicity	0.44455	6.25E-02	7.117	0
BLACK	Black ethnicity	-0.3441	0.109	-3.157	0.0016
OTHER	Not black, not native, not white	1.7457	1.313	1.33	0.1836
BA	Highest ed is BA	-0.38088	0.2721	-1.4	0.1615
MA	Highest ed is MA	-0.59522	0.2727	-2.183	0.029
SP	Highest ed is Education Specialist	-0.66016	0.4493	-1.469	0.1418
DD	Highest ed is Doctorate	-1.0751	0.3337	-3.222	0.0013
STARTEXP	Experience, first year in community	-2.33E-02	2.33E-03	-10.009	0
NOEXPER	Dummy variable if startexp=0	-0.15848	3.98E-02	-3.981	0.0001
ANC	Anchorage dummy variable	-1.6338	0.364	-4.488	0
HEATDD	Heating degree days	-4.21E-05	1.55E-05	-2.712	0.0067
COOLDD	Cooling degree days	1.85E-03	1.79E-03	1.032	0.3021
LOWRAIN	Low rainfall (AIR definition)	1.02E-02	6.33E-02	0.161	0.8718
HIGHRAIN	High rainfall (AIR definition)	0.11734	7.70E-02	1.524	0.1276
TOTPOP	Community population	2.77E-05	1.68E-05	1.651	0.0988
PCTAIAN	Percent of community that is AIAN alone	-1.8587	0.6379	-2.914	0.0036
PCTOTH	Percent of community neither white nor AIAN	-2.843	0.6361	-4.469	0
SCHLPOP	School Age Population, 2000	-1.09E-04	6.57E-05	-1.652	0.0986
SCHPAIAN	Percent of SCHLPOP that is AIAN	1.1146	0.5818	1.916	0.0554
SCHPOTH	Percent of SCHLPOP neither white nor AIAN	2.9835	0.6111	4.882	0
PCTEMPL	% of community age 16+ that is employed (1999)	0.48894	0.2363	2.069	0.0386
PCTPOV	% of community's families in poverty (1999)	-0.19255	0.2592	-0.743	0.4576
ROADED	1=community is connected by road to Anchorage	0.15959	8.98E-02	1.777	0.0756
AIRTOHUB	1=cmty not road-connected to hub	-7.64E-02	6.92E-02	-1.104	0.2695
HUBTOANC	Cost of travel from hub to Anchorage	-1.02E-04	2.14E-04	-0.478	0.6327
DISTTOT	Total district enrollment	3.67E-05	7.52E-06	4.886	0
LASTDRY	Alcohol status of cmty, teacher's last yr	0.18827	6.73E-02	2.799	0.0051
HEAD	Job=head teacher	-0.10183	9.01E-02	-1.13	0.2584
OTHPROF	Job=other school-level professionals	-7.26E-02	5.59E-02	-1.299	0.1941
SPECED	Job=special education classroom teacher	-0.13349	4.24E-02	-3.146	0.0017
SPECRES	Job= other special education teacher	4.25E-02	8.72E-02	0.487	0.626
MATHSCI	Job=secondary math or science	0.89539	8.22E-02	10.889	0

Log-Likelihood..... -13992. Wald ChiSquared (37)=3018 Prob=0

Appendix Table II-2-5. Survival Equation, Administrators Only

Variable Name	Var Description	Coeff.	Std Error	T-Ratio	Prob
Constant		1.819	1.319	1.379	0.1678
LWAGEDIF	Log of ratio between actual and predicted wage	4.5926	1.881	2.442	0.0146
AGE	Age, last year in cmty	7.09E-03	4.66E-02	0.152	0.8791
AGESQ	Age squared	3.84E-05	4.81E-04	0.08	0.9364
FEMALE	Gender	0.10953	8.66E-02	1.265	0.2059
NATIVE	Alaska Native ethnicity	0.28888	0.1843	1.567	0.1171
BLACK	Black ethnicity	-0.34022	0.4047	-0.841	0.4006
BA	Highest ed is BA	0.93345	0.3057	3.054	0.0023
MA	Highest ed is MA	0.52495	0.3132	1.676	0.0937
SP	Highest ed is Education Specialist	0.36786	0.4158	0.885	0.3763
DD	Highest ed is Doctorate	0.34219	0.3487	0.981	0.3264
STARTEXP	Experience, first year in community	-1.49E-02	6.01E-03	-2.481	0.0131
NOEXPER	Dummy variable if startexp=0	-0.33991	0.1297	-2.621	0.0088
ANC	Anchorage dummy variable	0.30366	0.7726	0.393	0.6943
HEATDD	Heating degree days	-8.87E-05	3.66E-05	-2.421	0.0155
COOLDD	Cooling degree days	5.70E-03	6.23E-03	0.915	0.3601
LOWRAIN	Low rainfall (AIR definition)	0.21368	0.1629	1.312	0.1896
HIGHRAIN	High rainfall (AIR definition)	-0.13043	0.2101	-0.621	0.5347
TOTPOP	Community population	2.31E-06	2.47E-06	0.935	0.35
PCTAIAN	Percent of community that is AIAN alone	-0.70076	0.5469	-1.281	0.2
PCTOTH	Percent of community neither white nor AIAN	-0.55622	1.138	-0.489	0.6251
DISTANAI	Percent of DISTRICT enrollment that is AIAN	-0.14633	0.4111	-0.356	0.7219
DISTPBL	Percent of DISTRICT enrollment that is Black	-8.3202	5.495	-1.514	0.13
DISTPOTH	% DISTRICT enrollment not white, AIAN, or black	-0.19988	1.49	-0.134	0.8933
PCTEMPL	% of cmty aged 16+ that is employed (1999)	0.41716	0.6898	0.605	0.5453
PCTPOV	% of community's families in poverty (1999)	2.97E-02	0.6785	0.044	0.9651
ROADED	1=community is connected by road to Anchorage	-3.39E-02	0.2638	-0.129	0.8977
AIRTOHUB	1=cmty not road-connected to hub	-6.00E-02	0.1787	-0.336	0.7372
HUBTOANC	Cost of travel from hub to Anchorage	-3.53E-04	5.66E-04	-0.624	0.5328
DISTTOT	Total district enrollment	3.60E-05	1.75E-05	2.06	0.0394
LASTDRY	Alcohol status of community, teacher's last yr	-0.14081	0.166	-0.848	0.3962
SUPER	Job=superintendent	9.62E-02	0.1684	0.571	0.5678
ASUPER	Job=assistant superintendent	0.12649	0.2262	0.559	0.5759
DISTINST	District-level instructional professionals	0.10162	0.1144	0.888	0.3745
DISTPROF	Other district-level professionals	-0.29185	0.1528	-1.91	0.0562
APRINC	Job=assistant principal	0.15562	0.1473	1.056	0.2909

Log-Likelihood..... -1552.6 Wald ChiSquared (36) = 377 Prob =0

Appendix Table II-2-6. Discrete Choice Equation, All Certificated Personnel, Last Two Moves Only

Variable Name	Var Description	Coeff.	Std Error	T-Ration	Prob
LWAGEDIF	Log of ratio between actual and predicted wage	6.8266	1.752	3.898	0.0001
LOGTYPE	Log of ratio between average wage for a regular classroom teacher and average wage for job held after the move	1.8732	0.9351	2.003	0.0452
ADMIN	Administrator Job	0.5633	0.3054	1.845	0.0651
HEATDD	Heating degree days	-9.02E-05	2.83E-05	-3.188	0.0014
COOLDD	Cooling degree days	1.39E-02	4.11E-03	3.388	0.0007
LOWRAIN	Low rainfall	-0.31392	0.1396	-2.249	0.0245
HIGHRAIN	High rainfall	-0.14964	0.2003	-0.747	0.4549
TOTPOP	Community population	-5.37E-05	2.78E-05	-1.934	0.0532
PCTAIAN	Percent of community that is AIAN alone	-3.0336	1.201	-2.527	0.0115
PCTOTH	Percent of community neither white nor AIAN	-3.1506	1.319	-2.388	0.0169
SCHLPOP	School Age Population, 2000	2.33E-04	1.15E-04	2.03	0.0423
SCHPAIAN	Percent of SCHLPOP that is AIAN	2.6492	1.132	2.341	0.0192
SCHPOTH	Percent of SCHLPOP neither white nor AIAN	2.8094	1.287	2.183	0.029
PCTEMPL	% of community aged 16+ employed (1999)	0.4895	0.3936	1.244	0.2136
PCTPOV	Percent of community's families in poverty (1999)	-0.73407	0.5927	-1.238	0.2155
ROADED	1=community is connected by road to Anchorage	0.71252	0.2193	3.248	0.0012
AIRTOHUB	1=cmty not road-connected to hub	-0.18633	0.1563	-1.192	0.2332
HUBTOANC	Cost of travel from hub to Anchorage	-8.63E-04	4.42E-04	-1.955	0.0506
DISTTOT	Total district enrollment	5.26E-07	1.29E-05	0.041	0.9674
LASTDRY	Alcohol status of community, teacher's last yr	-9.69E-02	0.1473	-0.658	0.5107

Log-Likelihood..... -1007.1
Restricted (Slopes=0) Log-L. -1165.5
Chi-Squared (20)..... 316.86
Significance Level..... 0.000

Appendix Table II-2-7. Discrete Choice Equation, Teachers Moving to Other Teaching Jobs

Variable Name	Var Description	Coeff.	Std Error	T-Ratio	Prob
LWAGEDIF	Log of ratio between actual and predicted wage	7.7936	2.036	3.828	0.0001
LOGTYPE	Log of ratio between average wage for a regular classroom teacher and average wage for job held after the move	6.9791	2.194	3.182	0.0015
HEATDD	Heating degree days	-6.71E-05	3.23E-05	-2.076	0.0379
COOLDD	Cooling degree days	1.34E-02	4.67E-03	2.867	0.0041
LOWRAIN	Low rainfall	-0.62799	0.1588	-3.955	0.0001
HIGHRAIN	High rainfall	8.20E-02	0.2336	0.351	0.7257
TOTPOP	Community population	-6.65E-05	3.09E-05	-2.157	0.031
PCTAIAN	Percent of community that is AIAN alone	-2.4088	1.38	-1.746	0.0808
PCTOTH	Percent of community neither white nor AIAN	-2.8916	1.51	-1.915	0.0555
SCHLPOP	School Age Population, 2000	2.84E-04	1.27E-04	2.228	0.0259
SCHPAIAN	Percent of SCHLPOP that is AIAN	2.004	1.3	1.541	0.1233
SCHPOTH	Percent of SCHLPOP neither white nor AIAN	3.0199	1.45	2.082	0.0373
PCTEMPL	% of community aged 16+ employed (1999)	0.8036	0.453	1.774	0.0761
PCTPOV	Percent of community's families in poverty (1999)	-0.57223	0.6828	-0.838	0.402
ROADED	1=community is connected by road to Anchorage	1.0051	0.2521	3.988	0.0001
AIRTOHUB	1=cmty not road-connected to hub	-3.20E-02	0.1816	-0.176	0.8603
HUBTOANC	Cost of travel from hub to Anchorage	-7.76E-04	5.11E-04	-1.517	0.1293
DISTTOT	Total district enrollment	2.91E-06	1.44E-05	0.202	0.8401
LASTDRY	Alcohol status of community, teacher's last yr	-0.22181	0.1726	-1.285	0.1987

Log-Likelihood..... -771.73
Restricted (Slopes=0) Log-L. -912.02
Chi-Squared (19)..... 280.59
Significance Level..... 0.000

Appendix Table II-2-8. Discrete Choice Equation, Administrators Moving to Other Administration Jobs

Variable Name	Var Description	Coeff.	Std Error	T-Ratio	Prob
LWAGEDIF	Log of ratio between actual and predicted wage	4.8094	3.631	1.324	0.1854
LOGTYPE	Log of ratio between average wage for a regular classroom teacher and average wage for job held after the move	3.148	0.5904	5.332	0
HEATDD	Heating degree days	-2.09E-04	6.36E-05	-3.292	0.001
COOLDD	Cooling degree days	1.33E-02	9.47E-03	1.41	0.1587
LOWRAIN	Low rainfall	0.64915	0.3218	2.018	0.0436
HIGHRAIN	High rainfall	-0.93015	0.4159	-2.237	0.0253
TOTPOP	Community population	1.19E-05	7.05E-05	0.168	0.8663
PCTAIAN	Percent of community that is AIAN alone	-3.7896	2.719	-1.394	0.1634
PCTOTH	Percent of community neither white nor AIAN	-1.8738	3.028	-0.619	0.536
SCHLPOP	School Age Population, 2000	-2.27E-05	2.90E-04	-0.078	0.9375
SCHPAIAN	Percent of SCHLPOP that is AIAN	4.2975	2.566	1.675	0.0939
SCHPOTH	Percent of SCHLPOP neither white nor AIAN	1.608	3.224	0.499	0.618
PCTEMPL	% of community aged 16+ employed (1999)	0.54682	0.8919	0.613	0.5398
PCTPOV	Percent of community's families in poverty (1999)	-0.22867	1.323	-0.173	0.8628
ROADED	1=community is connected by road to Anchorage	5.25E-03	0.4857	0.011	0.9914
AIRTOHUB	1=cmty not road-connected to hub	-0.76238	0.3337	-2.285	0.0223
HUBTOANC	Cost of travel from hub to Anchorage	-1.78E-03	9.81E-04	-1.812	0.0699
DISTTOT	Total district enrollment	-1.94E-05	3.07E-05	-0.632	0.5276
LASTDRY	Alcohol status of community, teacher's last yr	0.16049	0.3112	0.516	0.6061

Log-Likelihood..... -217.86
Restricted (Slopes=0) Log-L. -253.50
Chi-Squared (19)..... 71.290
Significance Level..... 0.0000

Appendix Table II-2-9. Discrete Choice Equation, All Certificated Personnel, All Moves

Variable Name	Var Description	Coeff.	Std Error	T-Ratio	Prob
LWAGEDIF	Log of ratio between actual and predicted wage	6.3568	1.439	4.418	0
LOGTYPE	Log of ratio between average wage for a regular classroom teacher and average wage for job held after the move	2.7902	0.7889	3.537	0.0004
ADMIN	Administrator Job	0.29382	0.2548	1.153	0.2489
HEATDD	Heating degree days	-7.24E-05	2.28E-05	-3.171	0.0015
COOLDD	Cooling degree days	1.23E-02	3.32E-03	3.711	0.0002
LOWRAIN	Low rainfall	-0.24601	0.1095	-2.247	0.0247
HIGHRAIN	High rainfall	-0.19035	0.1664	-1.144	0.2527
TOTPOP	Community population	-4.98E-05	2.29E-05	-2.175	0.0296
PCTAIAN	Percent of community that is AIAN alone	-3.406	0.9823	-3.467	0.0005
PCTOTH	Percent of community neither white nor AIAN	-3.3649	1.101	-3.057	0.0022
SCHLPOP	School Age Population, 2000	2.08E-04	9.47E-05	2.198	0.0279
SCHPAIAN	Percent of SCHLPOP that is AIAN	2.9415	0.9311	3.159	0.0016
SCHPOTH	Percent of SCHLPOP neither white nor AIAN	3.043	1.072	2.84	0.0045
PCTEMPL	% of community aged 16+ employed (1999)	0.11639	0.3218	0.362	0.7176
PCTPOV	Percent of community's families in poverty (1999)	-0.53238	0.4588	-1.16	0.2459
ROADED	1=community is connected by road to Anchorage	0.55355	0.1804	3.069	0.0022
AIRTOHUB	1=cmty not road-connected to hub	-6.82E-02	0.1263	-0.54	0.5891
HUBTOANC	Cost of travel from hub to Anchorage	-5.59E-04	3.59E-04	-1.556	0.1196
DISTTOT	Total district enrollment	6.00E-06	9.68E-06	0.619	0.5358
LASTDRY	Alcohol status of community, teacher's last yr	-0.15568	0.1148	-1.356	0.175

Log-Likelihood..... -1607.4
Restricted (Slopes=0) Log-L. -1764.8
Chi-Squared (20)..... 314.87
Significance Level..... 0.0000

APPENDIX TABLE II-3-1. Energy Cost Relatives

DISTRICT	DISTID	FY2000	FY2001	FY2002	FY2003	AVE 00-03	AIR ESTIMATE
DENALI BOROUGH SCHOOL DISTRICT	2	4.798	5.026	5.297	4.722	4.961	1.659
ALASKA GATEWAY SCHOOL DISTRICT	3	6.845	7.293	6.754	7.172	7.016	3.797
ALEUTIAN REGION SCHOOL DIST	4	2.848	6.507	6.096	5.949	5.350	4.980
ANCHORAGE SCHOOL DISTRICT	5	1.000	1.000	1.000	1.000	1.000	1.000
ANNETTE ISLAND SCHOOL DISTRICT	6	2.663	3.549	2.467	3.187	2.966	0.752
BERING STRAIT SCHOOL DISTRICT	7	5.552	5.860	5.794	9.591	6.699	4.099
BRISTOL BAY BOROUGH SCH DIST	8	3.820	4.796	4.485	4.753	4.463	2.962
CHATHAM REGION SCHOOLS	9	4.040	4.060	4.247	7.692	5.010	3.721
CHUGACH SCHOOL DISTRICT	10	3.866	3.530	3.329	3.156	3.470	1.436
COPPER RIVER SCHOOL DISTRICT	11	2.304	2.656	2.419	2.580	2.490	2.388
CORDOVA CITY SCHOOL DISTRICT	12	2.206	2.419	2.026	2.355	2.251	1.647
CRAIG CITY SCHOOL DISTRICT	13	1.230	1.630	1.676	1.575	1.528	1.875
DELTA GREELY SCHOOL DISTRICT	14	2.137	1.793	1.717	1.421	1.767	2.333
DILLINGHAM CITY SCHOOL DIST	15	2.137	2.219	2.643	3.139	2.534	2.162
FAIRBANKS NORTH STAR BORO S/D	16	1.178	1.287	1.213	1.328	1.251	1.617
GALENA CITY SCHOOL DISTRICT	17	1.485	1.537	2.109	2.002	1.783	2.872
HAINES BOROUGH SCHOOL DISTRICT	18	2.386	2.722	2.809	3.175	2.773	1.806
HOONAH CITY SCHOOL DISTRICT	19	4.925	5.536	4.935	5.302	5.174	4.625
HYDABURG CITY SCHOOL DISTRICT	20	3.776	5.597	6.301	5.766	5.360	1.232
IDITAROD AREA SCHOOL DISTRICT	21	7.206	5.940	6.766	8.292	7.051	5.130
JUNEAU BOROUGH SCHOOLS	22	0.853	0.989	0.911	1.032	0.946	0.743
KAKE CITY SCHOOL DISTRICT	23	4.078	5.124	5.164	6.022	5.097	2.387
KENAI PENINSULA BOROUGH SCHS	24	1.558	1.598	1.642	1.519	1.579	1.343
KETCHIKAN GATEWAY BOROUGH S.D.	25	1.701	1.963	1.761	1.789	1.803	0.755
KLAWOCK CITY SCHOOL DISTRICT	27	2.739	3.684	2.854	3.250	3.132	1.876
KODIAK ISLAND BOROUGH SCH DIST	28	2.326	2.654	2.384	2.500	2.466	1.958
KUSPUK SCHOOL DISTRICT	29	5.626	7.204	7.810	7.909	7.137	1.672
LAKE AND PENINSULA SCHOOL DIST	30	11.333	12.512	14.190	14.935	13.242	4.631
LOWER KUSKOKWIM SCHOOL DIST	31	4.297	4.992	3.989	4.771	4.512	3.436
LOWER YUKON SCHOOL DISTRICT	32	3.700	4.335	5.645	4.067	4.437	3.179
MATANUSKA-SUSITNA BOROUGH SCHS	33	1.160	1.187	1.202	1.170	1.180	1.059
NENANA CITY SCHOOL DISTRICT	34	0.852	2.187	0.956	1.149	1.286	1.808
NOME CITY SCHOOL DISTRICT	35	3.029	3.200	3.378	3.817	3.356	2.405
NORTH SLOPE BOROUGH SCH DIST	36	6.395	5.464	5.160	5.384	5.601	9.329
NORTHWEST ARCTIC SCHOOL DIST	37	6.346	6.669	7.203	7.890	7.027	4.937
PELICAN CITY SCHOOL DISTRICT	38	5.086	8.387	10.017	9.586	8.269	1.282
PETERSBURG CITY SCHOOL DIST	39	2.728	2.984	3.062	3.342	3.029	1.246
PRIBILOF ISLAND SCHOOL DIST	40	4.735	4.961	4.970	4.966	4.908	1.316
SITKA BOROUGH SCHOOL DISTRICT	42	1.187	1.438	1.229	1.475	1.332	0.914
SKAGWAY CITY SCHOOL DISTRICT	43	3.489	3.943	3.020	3.328	3.445	1.656
SOUTHEAST ISLAND SCHOOL DIST	44	2.992	3.736	3.861	4.668	3.814	1.124
SOUTHWEST REGION SCHOOL DIST	45	4.385	4.296	7.432	8.839	6.238	3.410
SAINT MARYS CITY SCHOOL DIST	46	3.825	5.629	5.268	4.694	4.854	3.942
UNALASKA CITY SCHOOL DISTRICT	47	3.756	3.659	2.351	2.819	3.146	1.895
VALDEZ CITY SCHOOL DISTRICT	48	2.168	1.988	1.868	2.542	2.142	1.617
WRANGELL CITY SCHOOL DISTRICT	49	1.748	1.690	1.870	2.019	1.831	1.051
YAKUTAT CITY SCHOOL DISTRICT	50	4.497	5.060	5.556	5.912	5.256	3.397
YUKON FLATS SCHOOL DISTRICT	51	14.100	14.988	15.312	14.682	14.770	5.443
YUKON KOYUKUK SCHOOL DISTRICT	52	9.322	9.953	9.651	5.807	8.683	4.738
TANANA CITY SCHOOL DISTRICT	53	8.329	9.500	9.484	8.582	8.974	4.680
YUPIIT SCHOOL DISTRICT	54	3.132	4.807	4.967	6.113	4.754	3.587
KASHUNAMIUT SCHOOL DISTRICT	55	2.969	3.221	2.942	4.528	3.415	2.762
ALEUTIANS EAST BOROUGH SCH DIS	56	5.727	9.329	9.874	16.371	10.325	3.233
AVERAGE						3.564	2.659

SOURCE: COMPUTED BY ISER FROM THE SUPERLATIVE INDEX MODEL

APPENDIX TABLE II-3-2. Comparison of AIR Predicted and Actual Energy Superlative Indexes

DISTRICT	DISTID	AIR ENERGY	ACTUAL ENERGY	act/air
DENALI BOROUGH SCHOOL DISTRICT	2	1.090	1.181	1.083013
ALASKA GATEWAY SCHOOL DISTRICT	3	1.278	1.359	1.063124
ALEUTIAN REGION SCHOOL DIST	4	1.651	1.611	0.975615
ANCHORAGE SCHOOL DISTRICT	5	1.000	1.000	1
ANNETTE ISLAND SCHOOL DISTRICT	6	1.036	1.113	1.074159
BERING STRAIT SCHOOL DISTRICT	7	1.535	1.572	1.023729
BRISTOL BAY BOROUGH SCH DIST	8	1.187	1.208	1.017968
CHATHAM REGION SCHOOLS	9	1.207	1.215	1.005974
CHUGACH SCHOOL DISTRICT	10	1.313	1.405	1.07017
COPPER RIVER SCHOOL DISTRICT	11	1.137	1.135	0.997864
CORDOVA CITY SCHOOL DISTRICT	12	1.074	1.093	1.01728
CRAIG CITY SCHOOL DISTRICT	13	1.087	1.068	0.982215
DELTA GREELY SCHOOL DISTRICT	14	1.093	1.087	0.994662
DILLINGHAM CITY SCHOOL DIST	15	1.136	1.135	0.999406
FAIRBANKS NORTH STAR BORO S/D	16	1.085	1.070	0.986195
GALENA CITY SCHOOL DISTRICT	17	1.258	1.202	0.955504
HAINES BOROUGH SCHOOL DISTRICT	18	1.025	1.042	1.01632
HOONAH CITY SCHOOL DISTRICT	19	1.125	1.130	1.004539
HYDABURG CITY SCHOOL DISTRICT	20	1.099	1.172	1.066055
IDITAROD AREA SCHOOL DISTRICT	21	1.373	1.424	1.037633
JUNEAU BOROUGH SCHOOLS	22	1.027	1.033	1.005357
KAKE CITY SCHOOL DISTRICT	23	1.090	1.131	1.037413
KENAI PENINSULA BOROUGH SCHS	24	1.026	1.033	1.007336
KETCHIKAN GATEWAY BOROUGH S.D.	25	1.011	1.057	1.045449
KLAWOCK CITY SCHOOL DISTRICT	27	1.034	1.056	1.021627
KODIAK ISLAND BOROUGH SCH DIST	28	1.114	1.126	1.010369
KUSPUK SCHOOL DISTRICT	29	1.195	1.312	1.098083
LAKE AND PENINSULA SCHOOL DIST	30	1.462	1.603	1.096635
LOWER KUSKOKWIM SCHOOL DIST	31	1.358	1.379	1.015328
LOWER YUKON SCHOOL DISTRICT	32	1.388	1.403	1.011085
MATANUSKA-SUSITNA BOROUGH SCHS	33	0.993	0.997	1.004126
NENANA CITY SCHOOL DISTRICT	34	1.169	1.126	0.963564
NOME CITY SCHOOL DISTRICT	35	1.160	1.178	1.016117
NORTH SLOPE BOROUGH SCH DIST	36	1.554	1.518	0.97642
NORTHWEST ARCTIC SCHOOL DIST	37	1.467	1.501	1.023312
PELICAN CITY SCHOOL DISTRICT	38	1.144	1.242	1.08509
PETERSBURG CITY SCHOOL DIST	39	1.010	1.068	1.058131
PRIBILOF ISLAND SCHOOL DIST	40	1.290	1.417	1.098499
SITKA BOROUGH SCHOOL DISTRICT	42	1.033	1.045	1.011607
SKAGWAY CITY SCHOOL DISTRICT	43	1.000	1.044	1.044284
SOUTHEAST ISLAND SCHOOL DIST	44	1.067	1.129	1.058066
SOUTHWEST REGION SCHOOL DIST	45	1.256	1.277	1.01668
SAINT MARYS CITY SCHOOL DIST	46	1.257	1.255	0.998031
UNALASKA CITY SCHOOL DISTRICT	47	1.193	1.247	1.045965
VALDEZ CITY SCHOOL DISTRICT	48	1.053	1.070	1.015387
WRANGELL CITY SCHOOL DISTRICT	49	1.002	1.027	1.025795
YAKUTAT CITY SCHOOL DISTRICT	50	1.171	1.194	1.019398
YUKON FLATS SCHOOL DISTRICT	51	1.457	1.645	1.129388
YUKON KOYUKUK SCHOOL DISTRICT	52	1.451	1.556	1.072065
TANANA CITY SCHOOL DISTRICT	53	1.261	1.343	1.064821
YUPIIT SCHOOL DISTRICT	54	1.312	1.303	0.992873
KASHUNAMIUT SCHOOL DISTRICT	55	1.246	1.251	1.004175
ALEUTIANS EAST BOROUGH SCH DIS	56	1.491	1.546	1.036652
AVERAGE		1.199	1.233	

SOURCE: COMPUTED FROM THE SUPERLATIVE INDEX MODEL.

MIN	0.955504
MAX	1.129388

APPENDIX TABLE II-5-1. Special Revenue Funds as a Proportion of Total Revenues

DISTRICT	DISTID	FY2003 SP REV/ TOT REV	FY2002 SP REV/ TOT REV	FY2001 SP REV/ TOT REV	FY2000 SP REV/ TOT REV	FOUR YR AVERAGE
DENALI BOROUGH SCHOOL DISTRICT	2	0.134	0.141	0.154	0.152	0.145
ALASKA GATEWAY SCHOOL DISTRICT	3	0.317	0.270	0.192	0.194	0.247
ALEUTIAN REGION SCHOOL DIST	4	0.089	0.046	0.080	0.062	0.069
ANCHORAGE SCHOOL DISTRICT	5	0.164	0.142	0.138	0.134	0.145
ANNETTE ISLAND SCHOOL DISTRICT	6	0.180	0.148	0.151	0.108	0.147
BERING STRAIT SCHOOL DISTRICT	7	0.233	0.195	0.157	0.161	0.189
BRISTOL BAY BOROUGH SCH DIST	8	0.206	0.188	0.183	0.179	0.189
CHATHAM REGION SCHOOLS	9	0.202	0.231	0.170	0.141	0.187
CHUGACH SCHOOL DISTRICT	10	0.643	0.654	0.517	0.539	0.596
COPPER RIVER SCHOOL DISTRICT	11	0.237	0.219	0.193	0.182	0.208
CORDOVA CITY SCHOOL DISTRICT	12	0.150	0.155	0.115	0.141	0.140
CRAIG CITY SCHOOL DISTRICT	13	0.199	0.257	0.282	0.158	0.228
DELTA GREELY SCHOOL DISTRICT	14	0.327	0.352	0.345	0.307	0.332
DILLINGHAM CITY SCHOOL DIST	15	0.245	0.228	0.220	0.216	0.228
FAIRBANKS NORTH STAR BORO S/D	16	0.174	0.183	0.189	0.161	0.177
GALENA CITY SCHOOL DISTRICT	17	0.198	0.182	0.105	0.132	0.159
HAINES BOROUGH SCHOOL DISTRICT	18	0.221	0.163	0.180	0.174	0.184
HOONAH CITY SCHOOL DISTRICT	19	0.337	0.299	0.238	0.184	0.267
HYDABURG CITY SCHOOL DISTRICT	20	0.134	0.175	0.195	0.268	0.196
IDITAROD AREA SCHOOL DISTRICT	21	0.248	0.253	0.230	0.220	0.238
JUNEAU BOROUGH SCHOOLS	22	0.175	0.170	0.154	0.149	0.162
KAKE CITY SCHOOL DISTRICT	23	0.205	0.149	0.143	0.138	0.160
KENAI PENINSULA BOROUGH SCHS	24	0.162	0.145	0.152	0.142	0.151
KETCHIKAN GATEWAY BOROUGH S.D.	25	0.177	0.172	0.165	0.131	0.161
KLAWOCK CITY SCHOOL DISTRICT	27	0.171	0.140	0.101	0.090	0.126
KODIAK ISLAND BOROUGH SCH DIST	28	0.157	0.153	0.147	0.135	0.148
KUSPUK SCHOOL DISTRICT	29	0.255	0.161	0.157	0.158	0.185
LAKE AND PENINSULA SCHOOL DIST	30	0.161	0.160	0.138	0.156	0.154
LOWER KUSKOKWIM SCHOOL DIST	31	0.233	0.224	0.234	0.195	0.222
LOWER YUKON SCHOOL DISTRICT	32	0.242	0.200	0.208	0.207	0.215
MATANUSKA-SUSITNA BOROUGH SCHS	33	0.200	0.188	0.186	0.175	0.188
NENANA CITY SCHOOL DISTRICT	34	0.239	0.095	0.068	0.088	0.125
NOME CITY SCHOOL DISTRICT	35	0.244	0.249	0.179	0.171	0.212
NORTH SLOPE BOROUGH SCH DIST	36	0.192	0.165	0.158	0.144	0.165
NORTHWEST ARCTIC SCHOOL DIST	37	0.215	0.200	0.210	0.176	0.201
PELICAN CITY SCHOOL DISTRICT	38	0.155	0.146	0.139	0.100	0.133
PETERSBURG CITY SCHOOL DIST	39	0.133	0.152	0.109	0.150	0.136
PRIBILOF ISLAND SCHOOL DIST	40	0.193	0.159	0.241	0.222	0.205
SITKA BOROUGH SCHOOL DISTRICT	42	0.211	0.229	0.189	0.184	0.204
SKAGWAY CITY SCHOOL DISTRICT	43	0.210	0.119	0.057	0.072	0.117
SOUTHEAST ISLAND SCHOOL DIST	44	0.323	0.331	0.253	0.179	0.274
SOUTHWEST REGION SCHOOL DIST	45	0.256	0.216	0.217	0.219	0.228
SAINT MARYS CITY SCHOOL DIST	46	0.187	0.212	0.314	0.193	0.228
UNALASKA CITY SCHOOL DISTRICT	47	0.244	0.235	0.179	0.192	0.214
VALDEZ CITY SCHOOL DISTRICT	48	0.182	0.165	0.168	0.164	0.170
WRANGELL CITY SCHOOL DISTRICT	49	0.209	0.153	0.130	0.148	0.161
YAKUTAT CITY SCHOOL DISTRICT	50	0.193	0.183	0.187	0.164	0.182
YUKON FLATS SCHOOL DISTRICT	51	0.140	0.159	0.123	0.116	0.135
YUKON KOYUKUK SCHOOL DISTRICT	52	0.211	0.206	0.225	0.146	0.199
TANANA CITY SCHOOL DISTRICT	53	0.232	0.274	0.294	0.227	0.258
YUPIIT SCHOOL DISTRICT	54	0.378	0.355	0.338	0.302	0.346
KASHUNAMIUT SCHOOL DISTRICT	55	0.275	0.300	0.254	0.233	0.267
ALEUTIANS EAST BOROUGH SCH DIS	56	0.104	0.133	0.107	0.097	0.110
AVERAGE		0.217	0.203	0.188	0.173	0.196

SOURCE: COMPUTED BY ISER FROM ANNUAL DISTRICT REPORTS.

APPENDIX TABLE II-5-2. Comparison of FY2000 With Four Year Average Weights

DISTRICT NAME	DISTID	AIR WITH FY2000	AIR WITH 4 YEAR WEIGHTS	RATIO FOUR YR/ FY2000 WTS
DENALI BOROUGH SCHOOL DISTRICT	2	1.090	1.086	0.996
ALASKA GATEWAY SCHOOL DISTRICT	3	1.278	1.271	0.994
ALEUTIAN REGION SCHOOL DIST	4	1.651	1.697	1.028
ANCHORAGE SCHOOL DISTRICT	5	1.000	1.000	1.000
ANNETTE ISLAND SCHOOL DISTRICT	6	1.036	1.033	0.997
BERING STRAIT SCHOOL DISTRICT	7	1.535	1.508	0.982
BRISTOL BAY BOROUGH SCH DIST	8	1.187	1.190	1.003
CHATHAM REGION SCHOOLS	9	1.207	1.219	1.009
CHUGACH SCHOOL DISTRICT	10	1.313	1.267	0.966
COPPER RIVER SCHOOL DISTRICT	11	1.137	1.110	0.976
CORDOVA CITY SCHOOL DISTRICT	12	1.074	1.071	0.997
CRAIG CITY SCHOOL DISTRICT	13	1.087	1.096	1.008
DELTA GREELY SCHOOL DISTRICT	14	1.093	1.093	1.000
DILLINGHAM CITY SCHOOL DIST	15	1.136	1.145	1.008
FAIRBANKS NORTH STAR BORO S/D	16	1.085	1.085	1.000
GALENA CITY SCHOOL DISTRICT	17	1.258	1.243	0.988
HAINES BOROUGH SCHOOL DISTRICT	18	1.025	1.025	0.999
HOONAH CITY SCHOOL DISTRICT	19	1.125	1.113	0.989
HYDABURG CITY SCHOOL DISTRICT	20	1.099	1.067	0.971
IDITAROD AREA SCHOOL DISTRICT	21	1.373	1.383	1.008
JUNEAU BOROUGH SCHOOLS	22	1.027	1.024	0.997
KAKE CITY SCHOOL DISTRICT	23	1.090	1.096	1.005
KENAI PENINSULA BOROUGH SCHS	24	1.026	1.030	1.004
KETCHIKAN GATEWAY BOROUGH S.D.	25	1.011	1.012	1.001
KLAWOCK CITY SCHOOL DISTRICT	27	1.034	1.032	0.999
KODIAK ISLAND BOROUGH SCH DIST	28	1.114	1.112	0.998
KUSPUK SCHOOL DISTRICT	29	1.195	1.194	0.999
LAKE AND PENINSULA SCHOOL DIST	30	1.462	1.434	0.981
LOWER KUSKOKWIM SCHOOL DIST	31	1.358	1.330	0.979
LOWER YUKON SCHOOL DISTRICT	32	1.388	1.392	1.003
MATANUSKA-SUSITNA BOROUGH SCHS	33	0.993	0.994	1.001
NENANA CITY SCHOOL DISTRICT	34	1.169	1.141	0.976
NOME CITY SCHOOL DISTRICT	35	1.160	1.160	1.000
NORTH SLOPE BOROUGH SCH DIST	36	1.554	1.527	0.983
NORTHWEST ARCTIC SCHOOL DIST	37	1.467	1.450	0.988
PELICAN CITY SCHOOL DISTRICT	38	1.144	1.097	0.959
PETERSBURG CITY SCHOOL DIST	39	1.010	1.010	1.000
PRIBILOF ISLAND SCHOOL DIST	40	1.290	1.274	0.987
SITKA BOROUGH SCHOOL DISTRICT	42	1.033	1.028	0.996
SKAGWAY CITY SCHOOL DISTRICT	43	1.000	0.995	0.995
SOUTHEAST ISLAND SCHOOL DIST	44	1.067	1.080	1.012
SOUTHWEST REGION SCHOOL DIST	45	1.256	1.264	1.006
SAINT MARYS CITY SCHOOL DIST	46	1.257	1.243	0.989
UNALASKA CITY SCHOOL DISTRICT	47	1.193	1.185	0.994
VALDEZ CITY SCHOOL DISTRICT	48	1.053	1.056	1.002
WRANGELL CITY SCHOOL DISTRICT	49	1.002	1.000	0.998
YAKUTAT CITY SCHOOL DISTRICT	50	1.171	1.174	1.003
YUKON FLATS SCHOOL DISTRICT	51	1.457	1.414	0.971
YUKON KOYUKUK SCHOOL DISTRICT	52	1.451	1.411	0.972
TANANA CITY SCHOOL DISTRICT	53	1.261	1.264	1.002
YUPIIT SCHOOL DISTRICT	54	1.312	1.286	0.980
KASHUNAMIUT SCHOOL DISTRICT	55	1.246	1.231	0.988
ALEUTIANS EAST BOROUGH SCH DIS	56	1.491	1.473	0.988

SOURCE: COMPUTED USING THE SUPERLATIVE INDEX MODEL.

Appendix III. Evidence of Differences Among School Districts in Ability to Fill Teaching Positions

We conducted a brief survey to address the different conditions districts face as they try to fill positions. We were especially interested in distinguishing between districts who had many more applicants than positions, and those who struggled to find enough applicants to fill their open positions. We called all 54 Alaska school districts and asked them a brief series of questions about what positions were hard to fill, how many applicants they typically have for both hard to fill and other positions; what percent of the time they can fill their openings with their top choice of candidates, and how they fill openings that occur during the school year. The instrument, with a summary of the answers, is included in this appendix.

The results should be interpreted with caution; answers to our questions highlighted some of the areas of concern. In some districts, the respondent had many years of experience, and could estimate the openings and applicants for a "typical" year; in others, the respondent was new and had only one year's hiring cycle to draw on. Also, districts varied widely in how they recruit applications; some districts rely heavily on information posted on their web site; others add to that attendance at numerous job fairs both in and outside of Alaska, as well as working with UA's Alaska Teacher Placement service. Finally, although our teacher data covered the school years 1998/99 through 2003/04, this district information is a one-time collection. Several districts noted that it has been getting steadily more difficult to fill their positions, and the market conditions that they face now may be different from those they faced in 1998.

We analyzed the results to produce two variables. The percent of hires for which the district obtains its first choice (Q 4c) became the variable *topchoic*. The answers to four questions– "What are your hard-to-fill positions?" (Q1); "What percent of your district's openings are for hard to fill positions?" (Q2); "How many qualified applicants do you typically have for hard-to-fill positions?" (Q3a); and "What percent of these applicants have **more than** the minimum job qualifications?" (Q3b) – were combined to create a three-level (-1, 0, 1) variable (*hardfill*) to describe how difficult it is for the district to fill its vacancies. In order to test whether the queue variables are systematically correlated with the purchasing power and characteristics that measure quality of life in the district, we estimated equations explaining *topchoic* and *hardfill* as a function of the set of Z variables as defined in equation (1). Appendix Table III-1 shows the results of estimating an equation for *topchoic*. The equation is a censored regression, taking into account the fact that *topchoic* falls between zero and 100 percent. Appendix Table III-2 shows the results of estimating an equation for *hardfill*. Since *hardfill* takes on three ordered values, the equation is estimated as an ordered logit. Variable names are defined in Appendix Table II-2-1.

Appendix Table III-1. Estimating the Percent of New Hires that are Districts' First Choice Candidates

Variable Name	Coeff.	Std Error	T-Ratio	Prob.
ENTITLE	-1.02E-03	2.01E-04	-5.083	0
GROWTH	21.832	0.5176	42.183	0
NSB	14.556	1.102	13.21	0
VALDEZ	-9.7976	1.378	-7.112	0
ANC	91.978	2.965	31.018	0
D17	35.223	1.331	26.465	0
HEATDD	1.74E-03	1.32E-04	13.204	0
COOLDD	-0.17177	1.60E-02	-10.739	0
LOWRAIN	-8.103	0.5398	-15.012	0
HIGHRAIN	19.47	0.6649	29.283	0
TOTPOP	-3.14E-03	9.64E-05	-32.56	0
PCTAIAN	-53.727	4.346	-12.361	0
PCTOTH	-160.65	4.593	-34.979	0
SCHLPOP	1.31E-02	3.78E-04	34.797	0
SCHPAIAN	10.158	4.053	2.506	0.0122
SCHPOTH	44.819	4.946	9.061	0
PCTEMPL	-66.982	1.973	-33.95	0
PCTPOV	-46.464	2.105	-22.071	0
ROADED	-4.3006	0.6975	-6.166	0
AIRTOHUB	-7.3893	0.5475	-13.496	0
HUBTOANC	5.69E-02	1.69E-03	33.578	0
DISTTOT	-1.19E-03	6.06E-05	-19.591	0
LASTDRY	6.6561	0.5029	13.236	0

Appendix Table III-2. Estimating whether Districts have Low(-1), Medium (0) or High (+1) Difficulty in Filling Vacant Positions

Variable Name	Coeff.	Std Error	T-Ratio	Prob.
ENTITLE	-5.79E-04	2.31E-05	-25.02	0
GROWTH	-0.78088	5.17E-02	-15.113	0
NSB	-5.4377	0.1864	-29.167	0
VALDEZ	2.2627	0.4682	4.833	0
ANC	-8.1337	0.449	-18.113	0
D17	1.3035	0.436	2.989	0.0028
HEATDD	2.78E-04	1.49E-05	18.618	0
COOLDD	-2.74E-02	2.00E-03	-13.705	0
LOWRAIN	0.1665	8.35E-02	1.994	0.0461
HIGHRAIN	-0.65824	5.80E-02	-11.358	0
TOTPOP	3.07E-04	1.74E-05	17.664	0
PCTAIAN	-7.8954	0.4334	-18.219	0
PCTOTH	-10.651	0.4327	-24.614	0
SCHLPOP	-1.13E-03	6.80E-05	-16.599	0
SCHPAIAN	7.3311	0.3841	19.089	0
SCHPOTH	11.136	0.4265	26.11	0
PCTEMPL	-2.053	0.1939	-10.586	0
PCTPOV	0.11586	0.2364	0.49	0.6241
ROADED	0.5615	6.72E-02	8.36	0
AIRTOHUB	1.7463	4.59E-02	38.06	0
HUBTOANC	3.89E-03	1.90E-04	20.516	0
DISTTOT	3.54E-05	8.54E-06	4.15	0
LASTDRY	-0.16486	5.56E-02	-2.965	0.003

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Alaska School District Cost Revision Survey December 2004

Responses from 54 Districts; where numbers do not add to 54, some respondents did not answer question.

1. What are your district's hard-to-fill positions? (multiple answers from each district)

Position Type	# of Districts citing type as hard-to-fill
Special Education	41
Math	30
Science	22
Positions in remote locations	10
Music	8
Guidance	7
Principal/Administration	7
Foreign Language	7
No positions are hard to fill	5
Secondary	5
Vocational Ed	4
All positions are hard to fill	3
Language Arts	3
Alaska Native Languages	3
Positions in communities with poor housing	2
Pre-School	2
Nurses	1
ROTC	1
Technology	1
Drama	1
History	1
Positions requiring multiple qualifications	1
Health/P.E.	1

2. What percent of your district's openings are for hard-to-fill positions?

Percent of Positions that are Hard-to-fill	Number of Districts
None	4
1%-9%	6
10%-39%	21
40%-80%	18
81%-100%	5

3a. How many qualified applicants do you typically have for hard-to-fill positions?

Number of Applicants for each position	Number of Districts
Less than one	5
1-1.5	15
1.6-3	15
3.1-6.9	9
7 or more	7

3b. What percent of these applicants have **more than** the minimum job qualifications?

% Applicants with >minimum qualifications	Number of Districts
1% or fewer	18
2%-20%	10
21%-49%	6
50%-74%	11
75%-100%	4

4a. How many qualified applicants do you typically have for other positions?

Number of Applicants for each position	Number of Districts
Five or fewer	13
6-10	15
11-15	11
16-25	10
26 or more	4

4b. What percent of these applicants have **more than** the minimum job qualifications?

% Applicants with >minimum qualifications	Number of Districts
1% or fewer	4
2%-20%	10
21%-49%	9
50%-74%	18
75%-100%	8

4c. Considering all the positions you fill during the course of a school year, what percent of new hires are your "first choice" candidates?

Percent of new hires who are First Choice Candidates	Number of Districts
24% or less	6
25%-49%	10
50%-74%	19
75%-100%	19

4d. What percent are **not** your first choice, but also not your last?

Percent of new hires who are Neither First nor Last Choice Candidates	Number of Districts
24% or less	19
25%-49%	18
50%-74%	11
75%-100%	4

5a. How does your district cover positions when a qualified applicant cannot be hired by the start of the school year?
(Multiple answers from each district)

Method	Number of Districts Citing Method
Long Term Substitute	54
Combining Classes	30
Using a teacher who is out of their field	12
Retired teachers	10
Teacher Aide	8
Emergency Certification	8
REPP Interns	4
Outsourcing	3
Administration	3

5b. Do you follow the same strategy for teaching positions that become vacant during the school year? (If not, what do you do?)

Same strategy	
Yes	46
No	8

6a. Over the course of a typical school year, how many teaching positions in your district become vacant for an extended period?

Number of Vacant Positions During Year	Number of Districts
Less than 1	20
1-4	24
5-8	5
More than 8	3

6b. What percent of these are your "hard to fill" positions?

Percent of Vacant–during–year positions that are hard to fill	Number of Districts
0%-5%	12
6%-24%	0
25%-75%	14
76%-94%	0
95%-100%	14

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