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School size and educational performance: an analysis of ITBS scores across Iowa school districts

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School size and educational performance: An analysis of ITBS scores across Iowa school districts

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ABSTRACT

There were two main goals this paper set out to accomplish. The first was to set up an econometric model that analyzed and predicted average ITBS test scores for school districts across Iowa. The ITBS test is a test which is mandated by the No Child Left Behind Act. It is used to judge how well schools are performing. The econometric model designed in this study predicted student achievement as a function of daily attendance rates, per pupil expenditures, dropout rates, student-to-teacher ratios, number of pupils per computer, average number of years experience for full-time teachers, average salary for full-time teachers, percentage of full-time teachers who have obtained a Master's degree or above for their educational level, percentage of district students who are either Hispanic, American Indian, African American, or Asian, and the percentage of children ages five to seventeen in families living in poverty for any particular school district.

The econometric model used to predict ITBS scores had five coefficients significantly different from zero at the 5% level. These coefficients were for the variables Minority, Attendance, Poverty, Experience, and Enrollment. Additionally, the coefficient for the PPExpenditure variable was statistically significant at the 10% level. The coefficient for the Dropout variable was significant at the 11% level. The Enrollment variable's coefficient was found to be upwardly biased, because some of the lower performing high enrollment school districts were left out of the study because of participation rate problems.

This study found the most important predictors of student achievement (as measured by ITBS scores) were the socio economic status of the students and the students' attendance rates. Socio economic status was measured by a combination of poverty and minority rates in this study. The coefficients for the Attendance, Poverty, and Minority variables were

significantly different from zero at the .1% level. The coefficients for the Minority and Poverty variables were negative. The coefficient for the Attendance variable was positive.

The second objective of this study was to analyze how different enrollment ranges affect various characteristics for school districts. The statistical averages were computed for these characteristics and put into a table to be more easily analyzed. A special note of emphasis was put into how average ITBS scores were affected by different enrollment ranges.

1. INTRODUCTION

In the 1950's Iowa had over 4,000 school districts. Today, there are only 370 school districts statewide with several more consolidations pending.[1] Together with state tax revenue tightening and larger districts costing less per pupil, it seems consolidation will continue to expand, at least in the near future. With all of these ongoing consolidation efforts, analyses must be done to see how different school district enrollment levels affect various characteristics throughout these school districts. This is especially true considering school districts at the lower enrollment levels, which typically are the ones consolidated. This study will be paying particular attention to how enrollment rates effect student achievement in Iowa's school districts. Student achievement will be gauged by using average ITBS (Iowa Test of Basic Skills) scores across Iowa school districts. Additionally, an econometric model will be set up to predict student achievement as a function of daily attendance rates, per pupil expenditures, dropout rates, student-to-teacher ratios, number of pupils per computer, average number of years experience for full-time teachers, average salary for full-time teachers, percentage of full-time teachers who have obtained a Master's degree or above for their educational level, percentage of school district students who are considered to be a minority (Hispanic, American Indian, African American, or Asian), and the percentage of children ages five to seventeen in families living in poverty for any particular school district.

There have been a wide variety of studies conducted over the years looking into how enrollment levels affect student achievement. Research results as to whether smaller

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[1] Iowa Association of School Boards. *Data Claims and Answers*, 2005. Available at: http://www.ia-sb.org/legislativeadvocacy/educationfundingmyths.pdf
(accessed: 13 April 2005)

enrollment levels increase student achievement have been somewhat vague. Some studies (Hoagland 1995, Walberg 1989) show dramatic increases in student achievement with smaller enrollment levels. Still others (Stekelenburg 1991, Stevenson 2001) show larger school enrollment levels more desirable. The problem with much of the literature has been that the authors involved often try to promote a certain policy perspective. Thus, their results tend to show evidence supporting their cause. In contrast to much of the literature, studies conducted independently of supporting a certain viewpoint (Howley 1996, McCathern 2004) find results showing no connection between enrollment levels, positive or negative, with student achievement.

A study by Hoagland in 1995 tried to determine the relationship between comprehensive high school size and student achievement in mathematics, reading, and written expression as measured by the 1990 California Assessment Program. Hoagland found very large schools (500+ seniors) performed significantly below other size categories. Additionally, he found low socioeconomic schools were particularly vulnerable to the negative effects of being larger schools.[2] Another study by McIntire and Marion studied data from a national sample of high school students for the years 1980 to 1986. This study found that in all cases except the mathematics measure, students from small schools had higher mean scores on the dependent measures than other students, and students from moderately-sized schools had higher mean scores than those from large schools. Additionally, McIntire

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[2] Hoagland, J. P. (1995). The effect of high school size on student achievement as measured by the California Assessment Program (Doctoral dissertation, University of La Verne, California, 1995). *UMI Dissertation Services*, 9606388.

and Marion found that in rural schools, socioeconomic status explained between 10-20% of the variability in all of the dependent measures except two.[3]

In sharp contrast to these previous studies, a study by Stevenson (2001) of South Carolina public schools found students in larger schools scored higher on standardized achievement tests than students in smaller schools. However, it should be noted that he found overcrowding to hinder achievement levels. Thus, while larger schools increased standardized achievement test scores, overcrowded larger schools obstructed achievement. Stevenson also found socioeconomic status as measured by free or reduced lunch to be a major predictor of achievement on standardized tests. Additionally, he found newer schools and higher student attendance rates increased standardized testing scores for school districts in South Carolina.[4]

A study by McCathern (2004) tried to determine whether a relationship existed between school size and student achievement in reading and mathematics. Pupil-teacher ratio, percentage of students on the free and reduced lunch program, amount of teacher experience, level of teacher education, gender, racial composition of the school, school operating costs, and community setting (rural, suburban, or urban) were some of the factors controlled in the study. McCathern found no significant relationship between school size and reading or mathematics achievement. McCathern found the most significant predictor of

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[3] McIntire, W. G., & Marion, S. F. (1989). Academic Achievement in America's Small Schools: Data from High School and Beyond. (ERIC Document Reproduction Service No. ED 315 250)

[4] Stevenson, K. R. (2001). *The relationship of school facilities conditions to selected student academic outcomes: A study of South Carolina public school.* Columbia, SC: Education Oversight Committee [online]. Available: http://www.state.sc.us/eoc/PDF/FacilityStudyReport.pdf

student achievement was socioeconomic status which had a strong negative correlation with achievement.[5]

The evidence relating school district size to student achievement is very ambiguous. However, it seems to be apparent in academic research that other variables show strong predictive power for student achievement. The evidence is overwhelming that socioeconomic status is a major predictor of student achievement. Socioeconomic status is often measured by a number of different variables such as the number of minorities, poverty rates, income levels, free and reduced lunch programs, etc. Whatever the measure used, socioeconomic status is by-in-large the most important predictor variable for student achievement across the plethora of academic research on the subject. This research project reviewed 17 major studies that had socioeconomic status used as a variable in either multiple regression analysis or bivariate correlations. Socioeconomic status was found to be a significant predictor of student achievement in every one of these major studies.

Other variables also seem to have predictive power for student achievement as stated by various studies. Some variables such as attendance and dropout rates indicate how students feel about the overall atmosphere at a particular school district. In general, high attendance and low dropout rates show a positive atmosphere at an institution. On the contrary, low attendance and high dropout rates show an atmosphere not as receptive to students. The majority of studies on attendance and dropout rates have shown these variables to be statistically significant predictors of student achievement. For example, a research project by Fetler (1989) studied school dropout rates for two consecutive years (1985-1986

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[5] McCathern, D. A., Jr. (2004) The Relationship between PreK--5 and K--5 elementary school size and student achievement of grade 5 students on the MAT7 in South Carolina for the school years 1996--1997 and 1997—1998 (Doctoral dissertation, University of South Carolina, 2004). *UMI Dissertation Services*, 3130469.

and 1986-1987) for all California public high schools in conjunction with student achievement. Fetler found higher achievement was associated with lower dropout rates.[6] Additionally, a study by the New York City Board of Education (2000) examined the extent to which student attendance, teacher certification, and teacher absence explained the differences in reading and mathematics achievement among elementary and middle schools in New York City. Multiple regression analysis indicated that student attendance and teacher certification rates were positively and significantly related to student outcomes on mathematics and reading achievement tests, even after factoring out the effects of student demographics. In fact, after controlling for student demographics, teacher certification explained as much as 2.1 percent of variation in students' reading and mathematics test scores, while student attendance explained as much as 13.9 percent of the variation.[7]

A study by Gieselmann (2004) focused on 180 Kentucky elementary school principals and 799 teachers. Gieselmann used multiple regression analysis with elementary scores on the CATS as the dependent variable and principal gender, years of principal experience, years of principal experience at present site, free/reduced lunch population, years of teaching experience, highest level of education, and leadership skills as the independent

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[6] Felter, M. (1989). School Dropout Rates, Academic Performance, Size, and Poverty: Correlates of Educational Reform. (ERIC Document Reproduction Service No. EJ 409 725)

[7] N/A. (2000). Impact of Student Attendance, Teacher Certification and Teacher Absence on Reading and Mathematics Performance in Elementary and Middle Schools in New York City. Flash Research Report #3. *New York City Board of Education, Brooklyn. Div. of Assessment and Accountability.* (ERIC Document Reproduction Service No. ED 451 316)

variables. Gieselmann found that free/reduced lunch, gender, and teaching experience were statistically significant predictors of student achievement.[8]

The teacher-pupil ratio debate has been the source of much controversy in recent years. Politicians, school teachers, and the general public have sparred over what is best for society's children. A comprehensive study by Hanushek (1998) analyzed 23 of the best available studies which looked at teacher-student ratios. Hanushek found only 1 out of the 23 studies (4%) showed smaller classes to have a statistically significant positive effect on student performance. Although it should be noted that he was quick to point out many of the econometric studies simply may not have had adequate data to distinguish between "small effect" and "no effect", leading to the pattern of statistically insignificant results reported.[9]

The most expansive research study on teacher-to-pupil ratios ever orchestrated was conducted by the department of education in the state of Tennessee. Project STAR (Student Teacher Achievement Ratio) studied over 7,000 students in 79 different school districts beginning in 1985. A group of kindergarteners through third graders were randomly assigned to regular class sizes in the 22 to 24 range or small class sizes in the 14 to 16 range. All of the schools involved in the study were large enough to hold at least one class size of each group. The project then followed the development of these students by tracking their standardized test scores in reading and mathematics across grade levels. Project STAR found that students in small class sizes have significantly greater average achievement at the end of kindergarten. Thus, the results showed smaller class sizes at the kindergarten and possibly

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[8] Gieselmann, S. R. (2004). Predicting elementary school student achievement: The impact of principal gender and principal leadership skills. (Doctoral dissertation, University of Louisville, 2004). *UMI Dissertation Services*, 3134183.

[9] Hanushek, E. A. (1998). The Evidence on Class Size. W. Allen Wallis Institute of Political Economy.

the first grade levels having positive effects on student achievement. However, Project STAR did not show support for a reduction in class sizes in subsequent grade levels after kindergarten (and possibly first grade). There was found to be no significant difference in student achievement when class sizes were reduced for these levels. The results from Project STAR can be interpreted by policy makers to justify reductions in class sizes at the kindergarten and first grade levels, but not subsequent grade levels if improvements in achievement scores are the aim of class size reductions.

All of these studies highlighted above are in someway connected with student achievement. Most of the literature published has used bivariate correlations trying to relate socioeconomic status, dropout rates, attendance rates, etc., to student achievement. Instead of using bivariate correlations to analyze individual characteristic's effects on student achievement, a multiple regression analysis will be used in the first part of this study in order to analyze and predict ITBS scores for Iowa school districts. The second half of this study will be analyzing how average ITBS scores change across enrollment ranges for Iowa school districts. Additionally, an investigative look into how changes in enrollment ranges affect other characteristics for school districts will be reviewed in the second half of this paper.

2. THE DATA

This segment describes all of the data compiled in order to set up the econometric model used in this study. The econometric model developed in this study was used to analyze certain variables causing variation in the ITBS scores for school districts across Iowa. The eventual econometric model constructed looked at previous attempts to model standardized testing scores as a function of other variables. This study used a combination of Gieselmann (2004), Haag (2004), Knudsen (1989), McCathern (2004), Roberts (2002), as well as some other studies highlighted in the bibliography section of this paper as a basis for the variables selected in the econometric model.

There are currently 370 school districts in the state of Iowa. This study endeavored to model each school district's average combined ITBS scores for fourth, eighth, and eleventh graders as a function of their average daily attendance rate, per pupil expenditures, dropout rate, student-to-teacher ratio, number of pupils per computer, average number of years experience for full-time teachers, average salary for full-time teachers, percentage of full-time teachers who have obtained a Master's degree or above for their educational level, percentage of school district students who are either Hispanic, American Indian, African American, or Asian, and the percentage of children ages five to seventeen in families living in poverty for any particular school district. Table 1 outlines the abbreviations for the variables used in the model.

To estimate the average combined ITBS scores for a particular district, this study used data for all of the variables that ranged from the years 2000 to 2004. The data for the dependent variable ITBS was found on the Iowa Department of Education's website. The proficiency scores for mathematics and reading were combined into a single score by taking an average of the two proficiency scores for any of the three individual grades tested. These scores for the fourth, eighth, and eleventh graders were then averaged across the board in order to have a single score to use as the dependent variable.

It should be noted that because of the nature of how small many of the school districts are in Iowa, there is often grade sharing across Iowa school districts. Effective July 1, 2004, the school districts Fredericksburg and Sumner, Allison-Bristol and Greene, Graettinger and Terril, and Alden and Iowa Falls were added to the list of schools participating in the practice of grade sharing.[10] Grade sharing occurs when different school districts decide to combine some of their classes together. For instance, there may be two very small school districts adjacent to each other (each having 200 students). These school districts might decide they each want their own elementary and middle schools to support their own children. However, they decide it would be best to combine their student populations at the high school level. For this reason, some of the school districts in the data set had only one or two of the combined ITBS scores for either the fourth, eighth, and eleventh graders. It turns out there were 29 school districts (out of the 370) that did not have all of the scores for the fourth, eighth, and eleventh graders. Additionally, out of these 29 school districts, two of them had absolutely no record for their ITBS scores at all. The school districts which did not have any data on the ITBS scores were subsequently dropped out of the study. However, suppose one of the 29 school districts had only the scores for the fourth and eleventh graders or only the scores for the eighth graders. They then they were allowed to stay in the study.

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[10] Bureau of Administration and School Improvement Services. *School Leaders of America*, 2004. Available at: http://www.state.ia.us/educate/ecese/asis/sli/doc/sl0405.html
(accessed: 13 April 2005)

It was also found that several of the school districts had some very low participation rates. Participation rates indicate how many students have taken the ITBS in a particular school district in a given year. For instance, if a school district has 200 students and only 180 students ended up taking the ITBS, then that school district would have a participation rate of 90% (180/200). The main problem stemming from low participation rates is that it is possible some of the school districts are "hiding" their poorly performing students by having them not take the ITBS. For this reason, it was decided only school districts having participation rates above 95% were allowed to remain in the study (95% is the standard outlined in the No Child Left Behind Act).[11] Of the 370 school districts across Iowa, it was found that 27 did not have participation rates above 95% for their various grade levels. The combination of dropping the 27 school districts for low participation rates and having two school districts with no ITBS scores results in a combined subset of 341 schools out of the original 370 for analysis.

The data for the dependent variable ITBS was obtained by averaging the proficiency scores for the two school years 2001-2002 and 2002-2003. The only data taken from the year 2000 was for the Poverty variable. The reason for this is that the year 2000 was the most current year the census bureau had for describing poverty rates on a school district by school district basis. Attendance (2001-2002), Computers (2002-2003), Dropout (2002-2003), and PPExpenditures (2002-2003) were the other variables in which current data was not able to be obtained.

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[11] No Child Left Behind Act. *Website for the NCLB*, 2005. Available at: http://www.ed.gov/nclb/landing.jhtml?src=pb (accessed: 13 April 2005)

It should be noted that a problem arose when working with the PPExpenditure data. The problem occurred because the school districts George and Little Rock were consolidated during this particular year. For this reason, a weighted average for these two school districts had to be taken for the PPExpenditure variable. This was the only instance in which a problem arose from the consolidation of school districts. The data for STRatio, Experience, Minority, and Salary, and Enrollment were all taken from the most recent school year (2003-2004).

Some of the variables' data was not taken from the most current school year because of access restrictions on current data. All of the variables were in a relatively close timeframe and included in the overall econometric model. A detailed account of where all of the data came from is listed in the Bibliography section at the end of this paper.

3. ESTIMATION METHODS

OLS was the estimation method used for this study. SPSS was the statistical computer program used to run the regressions and for tabulating the statistics throughout this paper. One of the main purposes of this study was to come up with an overall econometric model to predict ITBS scores. The econometric model this study used to predict average ITBS test scores for Iowa school districts is listed below.

$$ITBS = \beta_0 + \beta_1 Attendance + \beta_2 PPExpend + \beta_3 Enrollment + \beta_4 STRatio + \beta_5\ Poverty + \beta_6 Computers + \beta_7 Experience + \beta_8 Salary + \beta_9 Teacherdegree + \beta_{10} Minority + \beta_{11} Dropout + €$$

Where: € = error term

Table 2 shows the output for the OLS regression when using the statistical computer software SPSS. The SPSS output shows there were five statistically significant independent coefficients (that were different from zero) at the 5% level and six if the constant is included in the regression analysis. These coefficients were from the variables Minority, Attendance, Poverty, Experience, and Enrollment. Additionally, the coefficient for the PPxpenditure variable was statistically significant at the 10% level. It should also be noted that the coefficient for the Dropout variable was significant at the 11% level.

The coefficients for the variables for STRatio, Salary, Teacherdegree, Dropout, and Computers were all statistically insignificant from zero at the 5% and 10% levels. Both of the coefficients for the Teacherdegree and STRatio variables had the opposite sign than what this study expected. The Teacherdegree variable turned out to have a negative coefficient and the STRatio variable had a positive coefficient. With this said, it should be noted that both of the coefficients for these variables turned out to be insignificantly different from zero. The unexpected signs for the coefficients were more than likely due to some type of missing variable bias. Missing a relevant variable could have caused correlation between these coefficients and the error term. This in turn could have caused the unexpected signs for the coefficients.

The R-Squared for the model in Table 2 was .304 and the adjusted R-Squared turned out to be .281. An adjustment for the model was considered that would have dropped the Teacherdegree and STRatio variables. This was mainly considered because of the unexpected signs and the statistical insignificance of their coefficients. It was decided that the Teacherdegree and STRatio variables would stay in the regression, because they were still considered relevant to the study even though the results from their coefficients seem to be counterintuitive.

The three independent variables for Poverty, Minority, and Attendance had the most dramatic effect on average ITBS scores. This was especially true when their t-values and standardized coefficients were taken into consideration (these variables had the highest t-values and standardized coefficients out of all of the variables). The predictive power for the Attendance variable intuitively makes sense when looking at school districts in general. Most students who regularly attend and do not skip class will tend to do better in school, and thus should have higher scores on the ITBS. This study finds high attendance rates (followed closely by poverty and minority rates) for children are the most important predictive variables when trying to foretell average ITBS scores.

Minority and Poverty were two variables this study used to control for socioeconomic status. Past research on standardized test scores has shown there is a significant difference in scores between poor and minority children in comparison to other students on standardized tests. In fact, one major example of this is on the SAT test. While this paper did not specifically analyze the SAT, the SAT does somewhat resemble the ITBS. In 2002, the mean combined math/verbal SAT score for Blacks was 857 in comparison to the mean combined math/verbal SAT score of 1060 for Whites. Also, the mean combined math/verbal SAT score for children from a family that made under $10,000/year was 859 in comparison to the mean combined math/verbal score of 1123 for children from a family that made over $100,000/year.[12] The SAT, ACT, ITBS, and many other standardized tests have long had documented statistics which show lower scores on average for minorities. Additionally, studies have consistently shown students living in poverty-stricken areas are more likely to have troubled backgrounds in comparison to students who come from more affluent families. In the long run this affects their educational attainment and thus their average ITBS scores in a negative way. The negative and significant coefficient for the Poverty variable is a strong indication this is taking place. This study finds empirical evidence showing a strong connection between socioeconomic status as shown by poverty and minority rates with average ITBS scores.

The other variables showing strong predictive power for average ITBS scores were Enrollment, PPExpenditure, and Experience. These variables all had positive coefficients. Intuitively, it makes sense that the coefficient for the PPExpenditure variable would be positive. If more funds are being used to upgrade schools, hire staff, and provide

[12] College Board, *College-Board Seniors Nat'l. Report*, 2002

extracurricular activities, then standardized testing scores should go up accordingly. The positive coefficient for the Experience variable was to be expected because it should cause an increase in the "quality" of teachers in a particular school district. The more experience teachers gain, the more skillful they become at their job, just as in any other profession. This will improve standardized tests scores through better teaching techniques.

Interestingly, the Enrollment variable was positive and significant. However, a number of the high enrollment school districts were left out of the econometric model due to participation rate problems. In fact, seven school districts having enrollment levels above 7500 students were left out of the econometric model. Historically these seven school districts have been known to include lesser quality schools than the high enrollment school districts used in the econometric model. Thus, these seven school districts would be expected to have lower ITBS test scores than the ones used in the econometric model. This problem more than likely caused bias in the model, particularly in the case of the Enrollment variable's coefficient.

Further evidence of bias in the Enrollment variable's coefficient is shown when a second econometric model is analyzed. This second econometric model includes the school districts whose low participation rates left them out of the main econometric model of this study. The low participation rate school districts left out of the main model do not have an entirely accurate measure of their schools' ITBS scores for reasons highlighted in previous sections. However, leaving the low participation rate school districts in this second model provided some insight as to how they might have changed the main econometric model.

This second econometric model can be viewed in Table 3. This model looks very similar to the main econometric model, except when looking at the Enrollment variable's coefficient. The Enrollment variable's coefficient in this model turns out to be negative and insignificant. This is in direct contrast to the main model's findings. The main model found the Enrollment variable's coefficient to be positive and significant. The ITBS scores for the children in school districts with high enrollment levels and low participation rates were lower than their counterparts used in the main model which had high enrollment levels and participation rates above 95%. This is further evidence that the coefficient for the Enrollment variable is probably higher in the main econometric model than it should be in reality. A deeper analysis of how enrollment ranges affect average ITBS scores detailing this problem will take place in the Descriptive Statistics section of this paper.

High dropout rates for students show an overall aversion towards the advancement of education for many students in a particular school district. As was stated previously, the coefficient for the Dropout variable was significant at the 11% level. Thus, dropout rates are not as strong of a predictive variable as some of the other variables highlighted above. However, it should definitely be considered a relevant variable in the overall modeling process for predicting average ITBS scores. Previous studies, particularly Fetler (1989), have found lower dropout rates associated with higher achievement. This is consistent with what this study finds.

The STRatio, Salary, Teacherdegree, and Computers variables have the least effect on the average ITBS scores in the model. Very few research studies have found student achievement strongly associated with any of these four variables. Thus, the insignificance of their coefficients hardly came as a surprise to this study. While these variables were not strong predictors for average ITBS test scores, they were none-the-less allowed to stay in the model to control for the chance of an omitted variable bias.

4. DESCRIPTIVE STATISTICS

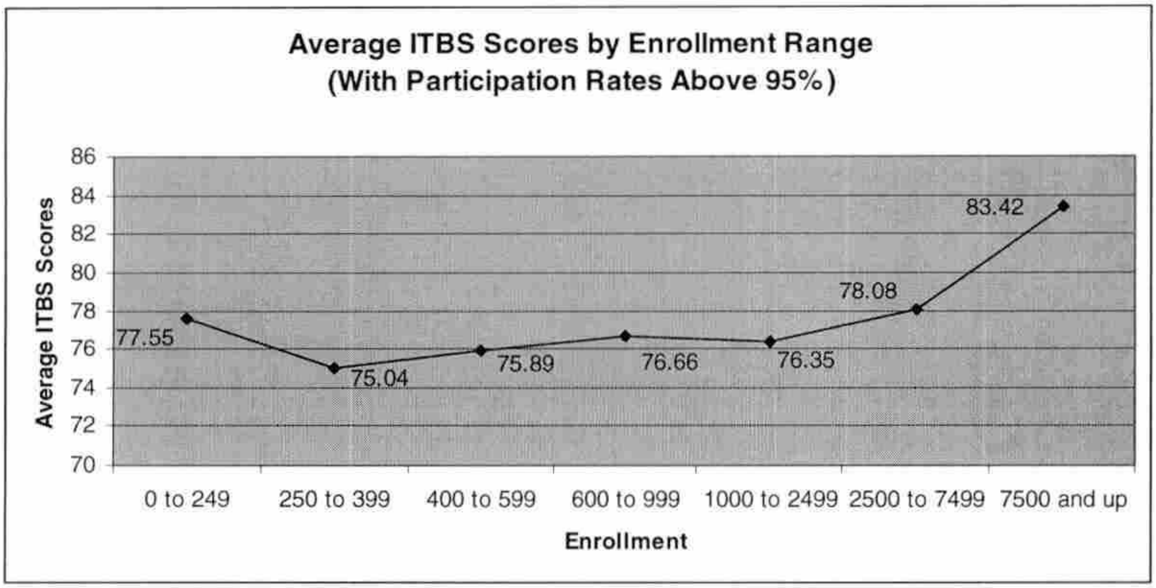
The second area of focus for this paper evaluated how enrollment ranges affect school districts as a whole. In particular, an investigative look into how various enrollment sizes affect average ITBS scores will be one of the main areas analyzed in this section. Secondly, an empirical study of how the ranges for enrollment sizes affect other characteristics in school districts across Iowa will be the other focus of this segment. Table 4 outlines averages for all of the original independent variables across school districts ranging in sizes from 0 to 249, 250 to 399, 400 to 599, 600 to 999, 1000 to 2499, 2500 to 7499, and 7500 and up.[13] These ranges were used because they were the ranges mapped out in the Finance section on the Iowa Department of Education's website. Additionally, Knudson (1989) used these same ranges in his dissertation based on the consolidation of Iowa school districts.

Of the 370 school districts across Iowa, a subset of 341 was used, because of the problem with participation rates outlined in previous sections. It should be noted that the last category (7500 and up) had only two school districts available out of the possible nine used in this study because of the low participation rate problem. These two school districts were West Des Moines and Iowa City. Historically these school districts have been known to include some very high quality schools. Thus, they were expected to have higher ITBS test scores in comparison to other districts. The analyses of these higher enrollment districts should not be seen as conclusive, because the seven school districts left out of the study would probably not have comparable scores to West Des Moines and Iowa City even if their participation rates were above 95%. The other six categories for enrollment levels lost only a small percentage of the total amount of school districts in their categories. The inclusion of

[13] These enrollment ranges do not include special education students.

the majority of school districts at these levels makes the interpretation of their statistics more justified.

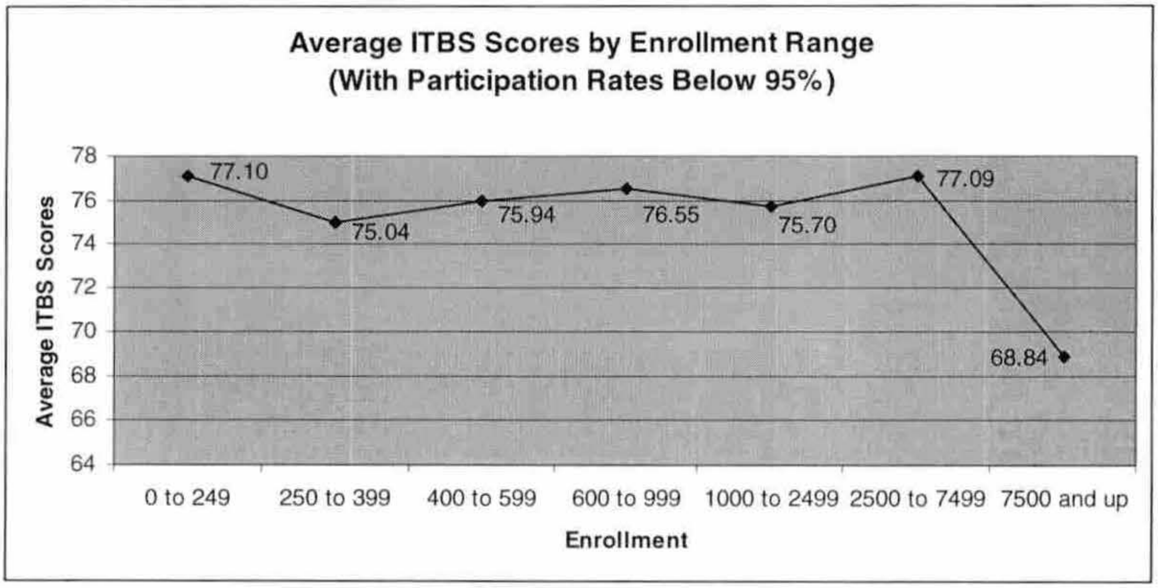
A U-shaped curve materializes when average ITBS scores are graphed as a function of enrollment. An overall display of this can be viewed in Graph A. Very low enrollment levels (0 to 249) have relatively high rates for average ITBS scores in general. After the initial surge in average ITBS scores, the next level (250 to 399) reports the lowest average ITBS scores out of all the available levels for enrollment. Following this level, the average ITBS scores slowly rise until the highest level possible (7500 and up) where it reaches its maximum value. It should be noted that there is a slight dip for average ITBS scores at the 1000 to 2499 level, but this is relatively inconsequential in the overall scheme of things. Additionally, the 7500 and up enrollment level cannot be seen as the "best" level, because there are not enough school districts at this level to validate its high average ITBS score.



Graph A. Average ITBS Scores by Enrollment Range (above 95%)

A pair-wise Bonferroni test was used to see if there were significant differences in average ITBS scores across the enrollment levels listed. The results of the pair-wise Bonferroni test can be viewed in Table 5. The Bonferroni test results showed no significant differences between any of the levels in enrollment. Thus, even though a U-shaped curve materializes when average ITBS test scores are graphed as a function of Enrollment levels, it does not warrant the conclusion that any of the enrollment levels are better or worse off than any of the others. The pair-wise comparison of enrollment levels can be interpreted to mean there is no relation between enrollment levels and average ITBS scores.

A second analysis of enrollment level effects on average ITBS test scores was used which included the school districts that had participation rates below 95%. The average ITBS scores by different enrollment levels including these school districts can be viewed in Graph B.



Graph B. Average ITBS Scores by Enrollment Range (below 95%)

The average ITBS test scores for these enrollment levels are very similar to those displayed in Graph A, except for the 7500 and up enrollment level. In fact, all of the mean scores are within one point of their counterparts in Graph A, except for the 7500 and up enrollment level. Surprisingly, instead of the 7500 and up enrollment level having the highest average ITBS scores, this level now has the lowest average ITBS scores. Additionally, pair-wise comparisons were run on the school districts which had participation rates below 95%. The results of these pair-wise comparisons can be viewed in Table 6. The pair-wise Bonferroni test including the school districts having low participation rates had very similar results to those presented in Table 5. The only pair-wise comparison which showed a difference between average ITBS test scores in Table 5 and Table 6 were those involving the 7500 and up enrollment level. In fact, every single enrollment level except the 250 to 399 range showed a significant difference in ITBS scores between themselves and the 7500 and up range.

The pair-wise comparisons of ITBS test scores for the 7500 and up level, whether including all of the schools or just West Des Moines and Iowa City, were hard to substantiate because of the number of school districts at this level to begin with. Thus, the results from the 7500 and up level should not be interpreted as a completely accurate. The rest of the levels consistently showed there was no difference in average ITBS scores across different school district enrollment levels. The pair-wise comparisons of ITBS test scores across enrollment levels imply there is no relation between enrollment levels and average ITBS scores.

Another one of the things this study analyzed were changes in the characteristics of teachers when enrollment levels increased. The Teacherdegree and Salary variables' values appear to have a very positive relationship when enrollment levels are increased for school districts in Table 4. Many of the larger school districts are in highly populated areas like Des Moines and Cedar Rapids. These areas often have higher standards of living and higher on average per capita income than many of the smaller districts in Iowa. Thus, a higher average salary is to be expected in these types of cities or districts. Additionally, many more of the teachers in these school districts have Master's degrees or Ph.D.'s which can cause an increase in salary for many of them. The reason many of these teachers have more advanced degrees in these school districts is not apparently obvious. It could be speculated that these school districts either have more funds available to them to hire these teachers, they place a premium on hiring them, or it could be possible that many of these high enrollment districts are adjacent to more populated cities with higher educational systems. This would allow teachers to more easily access advanced degree opportunities. Pair-wise comparisons in average teacher salaries across different enrollment levels found significant increases in average salaries as enrollment increased across all enrollment levels except between the 2500 to 7499 and 7500 and up levels. Thus, as enrollment levels increase in school districts, average salaries for teachers increase in concurrence. Additionally, pair-wise comparisons in the Teacherdegree variable across different enrollment levels found significant increases in the percentages of teachers with advanced degrees as enrollment levels increased. Thus, as enrollment levels increased, the percentage of teachers with advanced degrees also increased.

Another variable which is used to explain teacher characteristics is the Experience variable. The mean for this variable across all school districts is 15.01. Pair-wise comparisons in the Experience variable across different school district enrollment levels showed significant differences in the 0 to 249 and 250 to 399 levels in comparison to the other school district levels. The small enrollment school districts (0 to 249) and (250 to 399) had teachers with less experience than those in the more populated school districts. The other enrollment levels, besides the 0 to 249 and 250 to 399 levels, had no significant differences in the number of years experience in comparison to each other.

The variables pertaining to socio-economic status were the next values this study looked at pertaining to the different school district sizes. The variables used to describe socio-economic status in this study were the Poverty and Minority variables. Again, as was highlighted in the previous paragraph, many of the larger school districts are located in larger cities. Thus, it should come as no surprise to anyone that a positive relationship develops between larger school districts and the average percentage of students who are a minority in these school districts. Many smaller, more rural towns across Iowa have smaller minority populations in comparison to more urban areas which might help explain the deviations in these statistics across enrollment levels. Besides a slightly higher minority percentage in the first category (0 to 249), there is an increase in minority percentages across every enrollment category all the way up to the highest enrollments (7500 and up). The 7500 and up category had significantly higher percentages of minorities across all enrollment levels. The 1000 to 2499 enrollment level had significantly higher percentages of minorities than the 250 to 399 and 400 to 599 enrollment levels. The 2500 to 7499 enrollment level had significantly higher percentages of minorities in comparison to all of the other levels except for the 1000 to 2499 and 7500 and up enrollment levels. Thus, the higher enrollment level a school district has, the more likely that school district will have higher rates of minorities.

The average percentage of students living in poverty decreases as the enrollment levels increase. This occurs across all levels of enrollment except the slight increase in poverty rates at the 1000 to 2400 range. The poverty rates for the 0 to 249 and 400 to 599 enrollment levels were significantly higher than all of the other levels except the 7500 and up level. The rest of the poverty rates across school districts showed no significant differences from each other. Thus, many of the smaller school districts have higher rates of poverty than the larger school districts in Iowa.

The average dropout rate percentage steadily rose for every category except the 250 to 399 category. However, there were no significant differences for dropout rates across enrollment levels when pair-wise comparisons were made. The pair-wise comparisons of dropout rates imply there is no relation between enrollment levels and dropout rates.

The average attendance rate had a slightly downward trend as enrollment levels were increased. There were two instances at the 600 to 999 and 7500 and up levels that saw slight increases in their averages from previous enrollment categories. Additionally, attendance rates across all enrollment levels were not significantly different from each other. The overall average attendance rate for all enrollment levels was 95.80%.

The number of pupils-per-computer ratio tended to increase as the enrollment levels increased. It should be noted there was a slight decrease after the initial enrollment level of 0 to 249. After the 400 to 599 enrollment level, there were consistent increases in the pupils-per-computer ratio all the way up to the highest level 7500 and up which had a 5.40 ratio. The pupils-per-computer ratio for the 0 to 249 enrollment level was significantly lower than the 2500 to 7499 enrollment level. This stated, the only enrollment level showing significant differences in ratios across multiple enrollment levels was the 250 to 399 enrollment level. The pupils per computer ratio for the 250 to 399 enrollment level was significantly lower than all of the other levels except the 0 to 249 and 7500 and up enrollment levels. Thus, the only ratio across enrollment levels which could be justified to be quite different from any of the other levels was the 250 to 399 level. The 250 to 399 level had the lowest ratio across all school district enrollment levels with a 2.96 average pupils per computer ratio.

The average student to teacher ratio gradually increased as enrollment levels increased. However, there was a slight dip at the 250 to 399 and 400 to 599 enrollment levels in comparison to the averages at the other enrollment levels. The 7500 and up level had the highest average student to teacher ratio at 16.99. Nonetheless, the 7500 and up student-to-teacher ratio was only significantly higher than the 250 to 399 enrollment level, because of the small number of schools at its level. The major differences across enrollment levels occurred at the 250 to 399 and 400 to 599 enrollment levels. Both of the student-to-teacher ratios for these levels were significantly lower than the 1000 to 2499 and 2500 to 7499 enrollment levels. Additionally, the 250 to 399 student-to-teacher ratio was also significantly lower than the 600 to 999 and 7500 and up levels. The pair-wise comparisons of student to teacher ratios across enrollment levels showed significant differences occurred at the 250 to 399 and 400 to 599 enrollment levels in comparison to many of the other enrollment levels. The evidence is clear from this study that there are smaller class sizes at the lower school district enrollment levels. These findings are consistent with what previous research has shown.

A second analysis was conducted on student-to-teacher ratios to evaluate how they are related to average ITBS scores at different levels. Student to teacher ratios were divided into the levels (0 to 10], (10.00 to 12], (12.00 to 14], (14.00 to 16], (16.00 to 18], (18.00 to 20], and (20 and up). Once the various school districts were divided into these levels, pair-wise comparisons were able to be made to see if there were significant differences in average

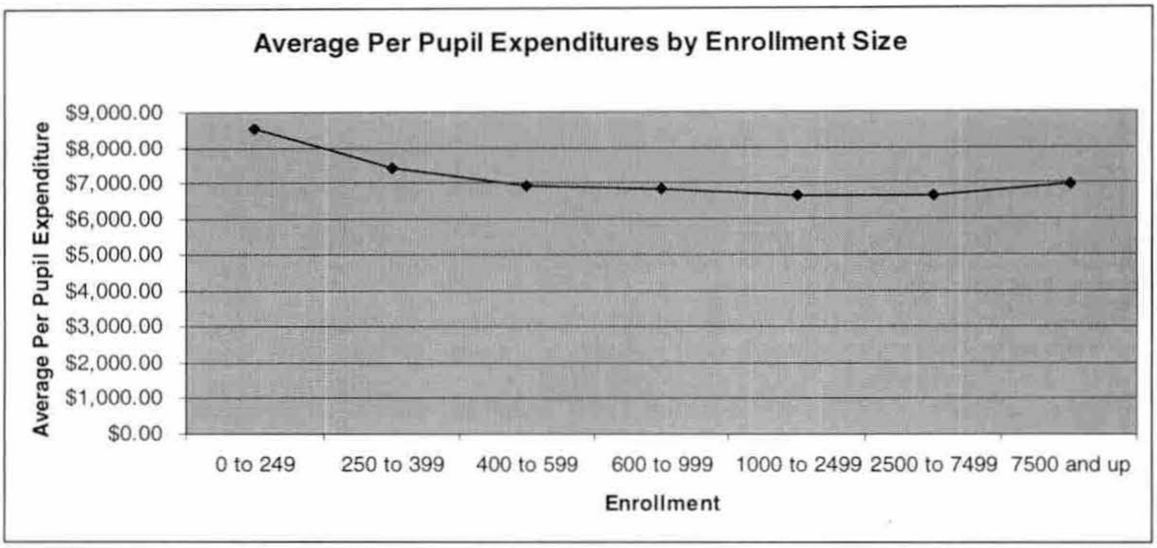
ITBS scores across these levels. Table 9 shows average ITBS scores across the student to teacher ratio levels highlighted above.

The 16 to 18 category was the only level which was significantly different from any of the other levels. The 16 to 18 category had significantly higher student-to-teacher ratios than the (10 to 12] and (12 to 14] levels. The main reason the higher levels (18 to 20] and (20 and up) were not significantly different from any of the other categories was because they had such a small number of school districts in their categories. Other than the significant differences at the 16 to 18 category, there were no significant differences in student to teacher ratios across levels. The pair-wise comparisons of ITBS test scores at different student-to-teacher ratios imply there is not a strong relation between student-to-teacher ratios and average ITBS scores.

Lastly, this study examined how the various school district enrollment sizes are related to per pupil expenditures for each district. Previous studies, in particular Andrew, Duncombe, and Yinger, (2002) and Dodson III and Garrett, (2004) have found optimal sizes for school districts in individual states for minimizing costs. What these and many other authors have found is that a U shaped cost curve materializes when graphing per pupil expenditures as a function of enrollment sizes. For instance, these previous studies have found very high per pupil expenditure rates at very small schools. These per pupil expenditure rates seem to slowly fall until they reach a bottom. This is mainly due to sizable economies of scale taking place because of reduced administrative costs. Once this bottom is reached, the per pupil expenditure rates slowly rise again because of diseconomies of scale taking place at large school districts. This study found consistently decreasing per pupil expenditures when enrollment rates were increased while studying the subset of 341 schools.

However, if all of the 370 Iowa school districts are analyzed, this study finds similar results in accordance with these other authors' findings when looking at the overall data for Iowa. Table 10 outlines the average per pupil expenditure rates for districts ranging in sizes from 0 to 249, 250 to 399, 400 to 599, 600 to 999, 1000 to 2499, 2500 to 7499, and 7500 and up when all of the school districts across Iowa are included in the study.

There was one school district in the data spreadsheet which did not have information on average per pupil expenditure. Thus, that school district was left out of this analysis and is the reason why there are only 369 school districts listed instead of the 370 total. The small school districts (0 to 249) clearly have the most expensive expenditures per pupil with an average per pupil expenditure at $8513.28. It also would seem there is an optimal school district size, (if you are trying to minimize costs) that lies somewhere in the 1000 to 7499 range. In fact most of the economies of scale seem to have taken place once a 1000 student population has materialized. A more detailed analysis of cost functions for Iowa school districts can be read in a paper written by Brandon Repp entitled "Economies of size and implications for consolidation: a case study of Iowa school districts" (2004). Repp found a per pupil cost minimization at the 2700 enrollment level for school districts in Iowa. If the average ITBS scores are graphed as a function of enrollment rates, a U shaped curve materializes as is found in other studies. A graphical analysis of these averages can be viewed in Graph C.



Graph C. Average Per Pupil Expenditures by Enrollment Size

Clearly, there are higher per pupil expenditures at the lower enrollment levels. Pair-wise comparisons show the two lowest enrollment levels 0 to 249 and 250 to 399 have significantly higher per pupil expenditures than practically all of the other enrollment ranges. The only comparison that does not show a significant difference in per pupil expenditures is when the 250 to 399 level is compared to the 7500 and up level. All of the other enrollment levels have significantly lower per pupil expenditures than the 0 to 249 and 250 to 399 enrollment levels. Additionally, the other enrollment levels show no significant differences in per pupil expenditures when compared to one another. This study finds conclusive evidence that lower enrollment ranges have higher per pupil expenditures.

5. CONCLUSION

The recent increased interest in school district consolidation has in part been motivated by the belief that higher school enrollment levels would increase educational opportunities and thereby improve educational quality. Using ITBS scores as the measure of educational outcomes, the first objective of this study was to design an econometric model which would be used to predict average ITBS scores across Iowa school districts. The econometric model used in this study predicted student achievement as a function of daily attendance rates, per pupil expenditures, dropout rates, student-to-teacher ratios, number of pupils per computer, average number of years experience for full-time teachers, average salary for full-time teachers, percentage of full-time teachers who have obtained a Master's degree or above for their educational level, percentage of district students who are either Hispanic, American Indian, African American, or Asian, and the percentage of children ages five to seventeen in families living in poverty for any particular school district. The second objective of this study was to analyze how different enrollment ranges affect various characteristics for school districts.

The econometric model used to predict ITBS scores had five coefficients significantly different from zero at the 5% level. These coefficients were for the variables Minority, Attendance, Poverty, Experience, and Enrollment. Additionally, the coefficient for the PPExpenditure variable was statistically significant at the 10% level. The coefficient for the Dropout variable was significant at the 11% level.

This study found that the most important predictors of student achievement (as measured by ITBS scores) were the socio economic status of the students and the students' attendance rates. Socio economic status was measured by a combination of poverty and minority rates in this study. All three of these variables were significantly different from zero at the .1% level. Iowa school districts having students with high minority and poverty rates have drastically lower scores on the ITBS test. It is not apparent if this is because of the home lives of the students, innate ability, the school districts themselves, or some combination of the three. The coefficients for the Minority and Poverty variables were negative. The coefficient for the Attendance variable was positive. All three of these outcomes' results are consistent with the results of previous research.

The other variables in the econometric model with good predictive power for ITBS scores were Experience, Enrollment, PPExpenditure, and Dropout. The coefficients for the variables Experience, Enrollment, and PPExpenditure were all positive. However, it should be noted that the econometric model used in this study is probably biased, particularly with respect to the Enrollment variable's coefficient. This bias was caused by some of the lower performing, high enrollment school districts being omitted from the econometric model due to low participation rates. Further evidence of the bias in the Enrollment variable's coefficient was shown when a second econometric model was analyzed which included the school districts having participation rates below 95%. This second model looked very similar to the main econometric model, except in the case of the Enrollment variable's coefficient. The Enrollment variable's coefficient in this second model turned out to be negative and insignificant. This was in direct contrast to the main model's findings. The main model found the Enrollment variable's coefficient to be positive and significant. The ITBS scores for the children in school districts with high enrollment levels and low participation rates were lower than their counterparts in the main model which had high enrollment levels and participation rates above 95%. Schools with low participation rates in the ITBS tests apparently have dramatically lower test results. Further research on the reasons for this result would be useful. The coefficient for the Dropout variable was negative. Although the predictive power for these variables were not as strong as Poverty, Minority, or Attendance, they were all still significant at some level or another.

The second half of this paper analyzed how various characteristics in Iowa school districts changed when enrollment levels were increased. Of particular concern was how ITBS scores changed when enrollment levels increased. This study found no significant differences in ITBS scores across different enrollment levels.[14] This implies that at least with respect to ITBS scores as a measure of quality, school performance is not significantly affected by school enrollment levels in Iowa school districts.

Of the other characteristics analyzed in the second segment, it was found that drop out rates, percent of minority students, average full-time teacher salaries, percent of full-time teachers with advanced degrees, student-to-teacher ratio, teachers' number of years experience, and pupils per computer all saw consistent increases in their rates when enrollment ranges went up.[15] It should also be noted that poverty rates consistently decreased as enrollment levels increased. Pair-wise comparisons found significant increases in the values for percent of minority students, average full-time teacher salary, percent of full-time teachers with advanced degrees, and teachers' number of years experience as enrollment levels increased.[16] This study found no significant differences in the values for

[14] There were some discrepancies with this statement at the 7500 and up enrollment level. They were discussed in the Descriptive Statistics section of this paper.

[15] It should be noted that there were some slight decreases in some areas for these categories which was described in the Descriptive Statistics section of this paper.

[16] The significant differences talked about in this paragraph are not across all enrollment levels for each of the variables, but rather a majority of the enrollment levels.

the variables Attendance, Dropout, and Computers across enrollment levels.[17] The 250 to 399 and 400 to 599 enrollment levels had significantly higher poverty rates than the other enrollment levels.

The pair-wise comparisons of student-to-teacher ratios across enrollment levels showed significant differences occurred at the 250 to 399 and 400 to 599 enrollment levels in comparison to many of the other enrollment levels. This study finds conclusive evidence that there are smaller class sizes at the lower school district enrollment levels. However, it should be noted that the lower class sizes in these school districts did not improve average ITBS scores versus the more populated classrooms. In fact, pair-wise comparisons across student-to-teacher ratio levels found only the (16 , 18] level had significantly different ITBS scores than any of the other levels. The pair-wise comparisons of ITBS test scores at different student-to-teacher ratios imply there is not a strong relation between student to teacher ratios and average ITBS scores.

Per pupil expenditures were analyzed at different enrollment levels. A U-shaped curve materialized when per pupil expenditures were graphed against enrollment levels. Very high average per pupil expenditures are seen at the very low enrollment levels. For the 0 to 249 level an average per pupil expenditure of $8513.28 is seen. This decreases somewhat to $7425.87 at the next enrollment range of 250 to 399. There are consistent decreases in average per pupil expenditure from the 0 to 249 enrollment level all the way up to the 1000 to 2499 enrollment level which has an average per pupil expenditure of $6619.03. At this point there was a slight increase in the average per pupil expenditures to

[17] There was a significant difference at the 250 to 399 enrollment level compared to other enrollment levels for the pupils per computer variable.

$6622.29 for the next level of 2500 to 7499. The last increase takes place for the next enrollment level of 7500 and up which has an average per pupil expenditure level of $6959.39. Pair-wise comparisons showed the two lowest enrollment levels 0 to 249 and 250 to 399 had significantly higher per pupil expenditures than the other enrollment ranges.[18] Additionally, the other enrollment levels showed no significant differences in per pupil expenditures when compared to one another. This study indicates that lower enrollment ranges have higher per pupil expenditures.

This paper has taken an in depth look at how various social and demographic factors along with enrollment levels affect ITBS scores for school districts across the state of Iowa. The main emphasis of this paper looked at how enrollment levels affect ITBS test scores across Iowa school districts. The Enrollment variable's coefficient in the econometric model was positive and significantly different from zero at the 5% level. However, because seven of the nine school districts in the largest category were dropped because of low participation rates, the econometric results may be bias. This point was further perpetuated by the fact that the coefficient for the Enrollment variable in the second econometric model was negative and insignificantly different from zero at the 5% level. Because of these discrepancies, pair-wise comparisons were used instead to better gauge how enrollment levels affected ITBS scores. The Bonferroni pair-wise comparison test found no significant differences in ITBS scores across different enrollment levels. Suggesting, no relation between school district size and ITBS scores in Iowa school districts.

[18] It should be noted that he only comparison that did not show a significant difference in per pupil expenditures was when the 250 to 399 level was compared to the 7500 and up level.

Hopefully, the analysis presented in this study can be used to improve policy decisions related to school districts in the state of Iowa. The first segment of this paper can be used to more accurately assess why certain school districts have lower or higher ITBS scores for their students. The second segment of this paper can be used to assess potential impacts to different characteristics in cases of school district consolidations. A special note of thanks goes to Dr. Daniel Otto, Dr. Thomas Alsbury, Dr. Brent Kreider, and Brandon Repp for their help in writing this paper.

Table 1. Definitions for Variables

Abbreviated Name	Definition
ITBS	The score which describes the average of the ITBS proficiency scores across the board for the fourth, eighth, and eleventh graders at a particular school district in the state of Iowa.
Attendance	The average daily attendance rate for students at a particular school district in the state of Iowa.
PPExpenditure	Per pupil expenditures for a particular school district in the state of Iowa.
STRatio	The student to full time teacher ratio for a particular school district in the state of Iowa.
Poverty	The percentage of children ages 5 to 17 living in families that are in poverty for a particular school district in the state of Iowa.
Computers	The pupil per computer ratio for a particular school district in the state of Iowa.
Experience	The average number of years experience for full time teachers for a particular school district in the state of Iowa.
Salary	The average annual salary for a full time teacher in a particular school district in the state of Iowa.
Teacherdegree	The percentage of full time teachers in a particular school district who have obtained a master's degree or above for their educational level.
Minority	The percentage of district students who are either Hispanic, American Indian, African American, or Asian.
Dropout	The dropout rate as a percentage of seventh through twelfth graders.
Enrollment	The total number of students enrolled at a particular school district in the state of Iowa.

Table 2. Econometric Model with participation rates above 95%

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-151.500	36.979		-4.097	.000
	Total K-12 Enrollment	.001	.000	.172	2.612	.009
	K-12 Attendance Rate	2.252	.388	.281	5.799	.000
	Dropout Rate as % of 7-12 Enrollment	-14.840	9.039	-.077	-1.642	.102
	% Minority	-17.185	4.781	-.183	-3.594	.000
	% of Students ages 5 to 17 in poverty	-.390	.075	-.270	-5.216	.000
	Student-to-Teacher Ratio	.179	.178	.062	1.004	.316
	Average Full Time Teacher Salary	.000	.000	.070	.846	.398
	Average Full Time Teacher Total Experience	.393	.144	.168	2.732	.007
	Percent of Full Time Teachers with Advanced Degrees	-.037	.036	-.061	-1.028	.305
	Pupils per Computer	-.263	.202	-.063	-1.299	.195
	Per Pupil Expenditure	.001	.000	.099	1.731	.084

[a] Dependent Variable: ITBS.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.552(a)	.304	.281	4.94452

[a] Predictors: (Constant), Per Pupil Expenditure, K-12 Attendance Rate, Dropout Rate as % of 7-12 Enrollment, % Minority, Pupils per Computer, Percent of Full Time Teachers with Advanced Degrees, % of Students ages 5 to 17 in poverty, Average Full Time Teacher Total Experience, Student-to-Teacher Ratio, Total K-12 Enrollment, Average Full Time Teacher Salary

Table 3. Econometric Model with participation rates below 95%

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-147.226	35.371		-4.162	.000
	Total K-12 Enrollment	-8.430E-05	.000	-.034	-.601	.548
	K-12 Attendance Rate	2.189	.371	.279	5.900	.000
	Dropout Rate as % of 7-12 Enrollment	-14.938	9.081	-.073	-1.645	.101
	% Minority	-18.537	4.171	-.233	-4.445	.000
	% of Students ages 5 to 17 in poverty	-.388	.075	-.255	-5.187	.000
	Student-to-Teacher Ratio	.207	.173	.071	1.198	.232
	Average Full Time Teacher Salary	.000	.000	.170	2.183	.030
	Average Full Time Teacher Total Experience	.201	.139	.084	1.443	.150
	Percent of Full Time Teachers with Advanced Degrees	-.023	.034	-.039	-.685	.494
	Pupils per Computer	-.236	.241	-.047	-.981	.327
	Per Pupil Expenditure	.000	.000	.073	1.383	.168

Dependent Variable: ITBS

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.585(a)	.342	.321	5.01606

[a] Predictors: (Constant), Per Pupil Expenditure, Dropout Rate as % of 7-12 Enrollment, K-12 Attendance Rate, Average Full Time Teacher Total Experience, Total K-12 Enrollment, % of Students ages 5 to 17 in poverty, Pupils per Computer, % Minority, Percent of Full Time Teachers with Advanced Degrees, Student-to-Teacher Ratio, Average Full Time Teacher Salary

Table 4. Enrollment

	0-249	250-399	400-599	600-999	1000-2499	2500-4999	7500 and up	Totals
Number of School Districts	29	55	73	89	74	19	2	341
Average ITBS Score	77.55	75.04	75.89	76.66	76.35	78.08	83.42	76.36
Average Per Pupil Expenditure	$8707	$7426	$6855	$6824	$6625	$6653	$6621	$7034
Average Student to Teacher Ratio	13.63	12.27	13.24	13.92	14.42	15.47	16.99	13.70
Average Attendance Rate as a %	95.87%	95.87%	95.79%	95.91%	95.70%	95.45%	95.64%	95.80%
Average Drop Out Rate %	.35%	1.65%	.60%	.61%	.78%	1.21%	1.50%	.84%
Average % of Students living in Poverty	10.48%	10.06%	8.96%	7.69%	7.84%	6.42%	5.59%	8.53%
Average % of Students who are a Minority	3.55%	2.94%	2.98%	3.90%	6.12%	8.68%	18.83%	4.35%
Average Full Time Teacher Salary	$31460	$33351	$35445	$37160	$39080	$41159	$45047	$36380
Average Full Time Teacher Experience	12.71	14.26	14.92	15.65	15.83	14.73	15.34	15.01
Average # of Pupils per Computer Ratio	3.02	2.96	3.67	3.54	3.75	4.28	5.40	3.53
Average % of Teachers who have Advanced Degrees	7.85	13.95	15.04	17.52	23.13	35.06	37.18	17.90

Table 5. Multiple Comparisons, Dependent Variable: ITBS. (Bonferroni Test with participation rates above 95%)

Enrollment (I)	Enrollment (J)	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
0 to 249	250 to 399	2.5110	1.36506	1.000	-1.6682	6.6901
	400 to 599	1.6599	1.30567	1.000	-2.3374	5.6572
	600 to 999	.8904	1.27186	1.000	-3.0034	4.7842
	1000 to 2499	1.2017	1.30316	1.000	-2.7880	5.1913
	2500 to 7499	-.5316	1.75565	1.000	-5.9065	4.8433
	7500 and up	-5.8679	4.34871	1.000	-19.1815	7.4457
250 to 399	0 to 249	-2.5110	1.36506	1.000	-6.6901	1.6682
	400 to 599	-.8511	1.06208	1.000	-4.1026	2.4004
	600 to 999	-1.6206	1.02023	1.000	-4.7440	1.5028
	1000 to 2499	-1.3093	1.05899	1.000	-4.5514	1.9328
	2500 to 7499	-3.0426	1.58289	1.000	-7.8886	1.8034
	7500 and up	-8.3789	4.28188	1.000	-21.4879	4.7301
400 to 599	0 to 249	-1.6599	1.30567	1.000	-5.6572	2.3374
	250 to 399	.8511	1.06208	1.000	-2.4004	4.1026
	600 to 999	-.7695	.93928	1.000	-3.6451	2.1061
	1000 to 2499	-.4582	.98124	1.000	-3.4623	2.5459
	2500 to 7499	-2.1915	1.53197	1.000	-6.8816	2.4986
	7500 and up	-7.5278	4.26332	1.000	-20.5800	5.5243
600 to 999	0 to 249	-.8904	1.27186	1.000	-4.7842	3.0034
	250 to 399	1.6206	1.02023	1.000	-1.5028	4.7440
	400 to 599	.7695	.93928	1.000	-2.1061	3.6451
	1000 to 2499	.3113	.93579	1.000	-2.5536	3.1762
	2500 to 7499	-1.4220	1.50326	1.000	-6.0242	3.1802
	7500 and up	-6.7583	4.25309	1.000	-19.7791	6.2625
1000 to 2499	0 to 249	-1.2017	1.30316	1.000	-5.1913	2.7880
	250 to 399	1.3093	1.05899	1.000	-1.9328	4.5514
	400 to 599	.4582	.98124	1.000	-2.5459	3.4623
	600 to 999	-.3113	.93579	1.000	-3.1762	2.5536
	2500 to 7499	-1.7333	1.52983	1.000	-6.4168	2.9503
	7500 and up	-7.0696	4.26255	1.000	-20.1194	5.9802
2500 to 7499	0 to 249	.5316	1.75565	1.000	-4.8433	5.9065
	250 to 399	3.0426	1.58289	1.000	-1.8034	7.8886
	400 to 599	2.1915	1.53197	1.000	-2.4986	6.8816
	600 to 999	1.4220	1.50326	1.000	-3.1802	6.0242
	1000 to 2499	1.7333	1.52983	1.000	-2.9503	6.4168
	7500 and up	-5.3363	4.42193	1.000	-18.8740	8.2014

Table 5. (continued)

Enrollment (I)	Enrollment (J)	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
7500 and up	0 to 249	5.8679	4.34871	1.000	-7.4457	19.1815
	250 to 399	8.3789	4.28188	1.000	-4.7301	21.4879
	400 to 599	7.5278	4.26332	1.000	-5.5243	20.5800
	600 to 999	6.7583	4.25309	1.000	-6.2625	19.7791
	1000 to 2499	7.0696	4.26255	1.000	-5.9802	20.1194
	2500 to 7499	5.3363	4.42193	1.000	-8.2014	18.8740

Table 6. Multiple Comparisons, Dependent Variable: ITBS. (Bonferroni Test with participation rates below 95%)

Enrollment (I)	Enrollment (J)	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
0 to 249	250 to 399	2.0614	1.38642	1.000	-2.1807	6.3035
	400 to 599	1.1628	1.31408	1.000	-2.8580	5.1835
	600 to 999	.5514	1.27800	1.000	-3.3589	4.4618
	1000 to 2499	1.4044	1.30431	1.000	-2.5865	5.3952
	2500 to 7499	.0112	1.70465	1.000	-5.2046	5.2270
	7500 and up	8.2592(*)	2.35282	.011	1.0602	15.4582
250 to 399	0 to 249	-2.0614	1.38642	1.000	-6.3035	2.1807
	400 to 599	-.8986	1.10393	1.000	-4.2764	2.4791
	600 to 999	-1.5100	1.06072	1.000	-4.7555	1.7355
	1000 to 2499	-.6570	1.09228	1.000	-3.9991	2.6851
	2500 to 7499	-2.0502	1.54844	1.000	-6.7880	2.6876
	7500 and up	6.1978	2.24223	.126	-.6629	13.0584
400 to 599	0 to 249	-1.1628	1.31408	1.000	-5.1835	2.8580
	250 to 399	.8986	1.10393	1.000	-2.4791	4.2764
	600 to 999	-.6113	.96425	1.000	-3.5617	2.3390
	1000 to 2499	.2416	.99886	1.000	-2.8146	3.2979
	2500 to 7499	-1.1516	1.48402	1.000	-5.6923	3.3891
	7500 and up	7.0964(*)	2.19824	.029	.3704	13.8224
600 to 999	0 to 249	-.5514	1.27800	1.000	-4.4618	3.3589
	250 to 399	1.5100	1.06072	1.000	-1.7355	4.7555
	400 to 599	.6113	.96425	1.000	-2.3390	3.5617
	1000 to 2499	.8530	.95089	1.000	-2.0565	3.7624
	2500 to 7499	-.5402	1.45217	1.000	-4.9835	3.9030
	7500 and up	7.7077(*)	2.17686	.009	1.0471	14.3684
1000 to 2499	0 to 249	-1.4044	1.30431	1.000	-5.3952	2.5865
	250 to 399	.6570	1.09228	1.000	-2.6851	3.9991
	400 to 599	-.2416	.99886	1.000	-3.2979	2.8146
	600 to 999	-.8530	.95089	1.000	-3.7624	2.0565
	2500 to 7499	-1.3932	1.47538	1.000	-5.9074	3.1211
	7500 and up	6.8548(*)	2.19241	.040	.1466	13.5630
2500 to 7499	0 to 249	-.0112	1.70465	1.000	-5.2270	5.2046
	250 to 399	2.0502	1.54844	1.000	-2.6876	6.7880
	400 to 599	1.1516	1.48402	1.000	-3.3891	5.6923
	600 to 999	.5402	1.45217	1.000	-3.9030	4.9835
	1000 to 2499	1.3932	1.47538	1.000	-3.1211	5.9074
	7500 and up	8.2480(*)	2.45179	.018	.7461	15.7498

Table 6. (continued)

Enrollment (I)	Enrollment (J)	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
7500 and up	0 to 249	-8.2592(*)	2.35282	.011	-15.4582	-1.0602
	250 to 399	-6.1978	2.24223	.126	-13.0584	.6629
	400 to 599	-7.0964(*)	2.19824	.029	-13.8224	-.3704
	600 to 999	-7.7077(*)	2.17686	.009	-14.3684	-1.0471
	1000 to 2499	-6.8548(*)	2.19241	.040	-13.5630	-.1466
	2500 to 7499	-8.2480(*)	2.45179	.018	-15.7498	-.7461

* The mean difference is significant at the .05 level.

Table 7. Average ITBS Score by Enrollment Size (with participation rates above 95%)

Enrollment	Average ITBS Score	Number of School Districts	Std. Deviation
0 to 249	77.5521	29	7.53835
250 to 399	75.0411	55	6.29390
400 to 599	75.8922	73	5.97508
600 to 999	76.6617	89	4.99962
1000 to 2499	76.3504	74	5.69453
2500 to 7499	78.0837	19	7.25346
7500 an up	83.4200	2	1.73948
Total	76.3626	341	5.97416

Table 8. Average ITBS Score by Enrollment Size (with participation rates below 95%)

Enrollment	Average ITBS Score	Number of School Districts	Std. Deviation
0 to 249	77.1025	32	7.85525
250 to 399	75.0411	55	6.29390
400 to 599	75.9397	76	6.14039
600 to 999	76.5511	93	5.04725
1000 to 2499	75.6981	80	6.00599
2500 to 7499	77.0913	23	7.43503
7500 an up	68.8433	9	9.67152
Total	75.9069	368	6.31767

Table 9. Average ITBS Score by Student to Teacher Ratio

Student to Teacher Ratio	Average ITBS Score	Number of Schools	Standard Deviation
(0 to 10]	74.58	11	5.74
(10.00 to 12]	74.77	52	6.65
(12.00 to 14]	75.81	134	5.66
(14.00 to 16]	76.54	107	5.65
(16.00 to 18]	80.09	25	5.01
(18.00 to 20]	80.96	7	6.25
(20 and up)	82.90	5	6.03
Totals	76.36	341	5.97

Table 10. Average Per Pupil Expenditure by Enrollment

Enrollment	Average Per Pupil Expenditure	Number of schools
0 – 249	$8513.28	33
250-399	$7425.87	55
400-599	$6905.62	76
600 – 999	$6835.54	93
1000 – 2499	$6619.03	80
2500 – 7499	$6622.29	23
7500 and up	$6959.39	9
Total	$7030.79	369

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