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Abstract

This paper attempts to determine: What affects the graduation rates of Illinois public high schools? This question will be answered based on explanatory variables deemed important by previous research. The relationship between Illinois public high school graduation rates and the percentage of low income students in the high school, the percentage of parental involvement within the school, instructional expenditures per pupil, and the number of students enrolled in the school will be examined. The data was gathered from various sources including the Interactive Illinois Report Card and the Illinois State Board of Education. The results of the study show that schools with a higher percentage of students from low income families have lower high school graduation rates. The district's instructional expenditures per pupil have positive correlation with graduation rates, holding all else constant. Parental contact proved statistically insignificant in determining high school graduation rates in the state of Illinois. The regression model suggests that schools with student enrollment of 0-500 have higher graduation rates than large schools with over 1,000 students, but schools with student enrollment of 501-1,000 have lower graduation rates than schools with over 1,000 students.

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By

Jazmen Rose*

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This paper attempts to determine: What affects the graduation rates of Illinois public high schools? This question will be answered based on explanatory variables deemed important by previous research. The relationship between Illinois public high school graduation rates and the percentage of low income students in the high school, the percentage of parental involvement within the school, instructional expenditures per pupil, and the number of students enrolled in the school will be examined. The data was gathered from various sources including the Interactive Illinois Report Card and the Illinois State Board of Education. The results of the study show that schools with a higher percentage of students from low income families have lower high school graduation rates. The district's instructional expenditures per pupil have positive correlation with graduation rates, holding all else constant. Parental contact proved statistically insignificant in determining high school graduation rates in the state of Illinois. The regression model suggests that schools with student enrollment of 0-500 have higher graduation rates than large schools with over 1,000 students, but schools with student enrollment of 501-1,000 have lower graduation rates than schools with over 1,000 students.

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1. Introduction

An increasing trend in national high school graduation rates has been shown over time due to the innovations associated with more educational resources, technological advancements, and national recognition of the overall importance of a high school diploma. According to the 2001 *No Child Left Behind Act,* the U.S. Department of Education defines the graduation rate as percentage of students, measured from the start of the school year, who graduate from public high school with a regular diploma (not including a GED or any other diploma not fully aligned with the state's academic standards) in the standard number of years.[1] This latest legislation in education indicates that the high school state departments must maintain target graduation rates in order for the high school state departments to be successfully making adequate yearly progress (AYP).[2] Illinois is one of the many states that have set a target rate for high school graduates. The statewide target high school graduation rate in Illinois was 69% for 2005-2006.[3] There are schools that contribute greatly to pulling the statewide graduation rate upward, but of course there are schools that have low graduation rates which pull statewide average graduation rates in the negative direction. This may be due to various reasons such as the school, family, and social environments of the students.

The purpose of my research is to look at the effects of certain family, school, and social environment factors on the graduation rates of public high school in Illinois. I have gathered information in areas such as the percentage of pupils that are from low income backgrounds, the number of students enrolled at each institution, percentage of students who have had a parent make contact with the school, and district expenditures per pupil on teaching and extracurricular activities. This project is of importance because it might be able to provide greater insight into varying graduation rates among high schools in Illinois. By knowing the factors that have

affects on graduation rates, the state can have a better idea of what factors need to be addressed in communities and schools in order to raise graduation rates throughout the state of Illinois.

2. Literature Review

In the article Do Neighborhood Conditions Affects High School Dropout and College Graduation Rates?, an empirical model is designed by the authors, Thomas Vartanian and Philip Gleason, that attempts to give insight into whether poverty, income levels, the percentage of household with only a female parent present, and the percentage of students with parents in professional or managerial employment affect whether a student will dropout of high school or successfully complete college.[4] The study uses data from the Panel Study on Income Dynamics and the U.S. Census Bureau.[5]

High school dropout rates and college graduation rates are the dependent variables of interest. The study uses a neighborhood quality index as the main independent variable of interest.[6] This index is comprised of four variables; poverty rates, income level, percentage of households where there was only a female parent present, and the percentage of students who are from families with a parent in professional or managerial employment.[7] Additional control variables relate to family characteristics and demographics were also included.. Separate models are estimated for both Caucasian American and African American youth.

The results reveal that neighborhood conditions do in fact have an impact on high school dropout rates and college graduation rates for African Americans and Caucasian Americans, but the results for each group are different.[8] The probability that an African American student will drop out of high school is six percentage points lower for African Americans from quality neighborhoods versus those from low quality neighborhoods.[9] However, neighborhood

conditions prove insignificant in determining college graduation rates for African Americans.[10] Among Caucasian American youth, college graduation rates increase by seven percentage points when going from low quality to high quality neighborhoods.[11] However, the neighborhood conditions are found to be insignificant in predicting high school dropout rates among Caucasian Americans.[12] The results therefore suggest a direct relationship between neighborhood quality and high school and college graduation rates.

A report created by the Bank Street School of Education called Small Schools: Great Strides examines the effects of small school size on the performance of schools in Chicago, IL. Performance measures include commonly used variables such as dropout rates, absenteeism, and standardized test scores.[13] The Consortium on Chicago School Research is the main source of data gathered for the purposes of the research conducted.[14] The independent variables used fall in the categories of student/demographic characteristics, school characteristics, and building characteristics.[15] Based on the conducted research, students in small high schools have attendance rates that are higher than those of large host schools, which are large schools that have a smaller school within a large school.[16] In addition, smaller schools have attendance rates above those of the average high school in the Chicago area school system.[17] When comparing dropout rates among schools, smaller schools-within-schools, which are those small schools that are located within host schools, are by far lower than those of the large host schools and other Chicago Public Schools.[18] This is still the case after demographic differences among the school's student body were accounted for. Research shows that the grade point averages and standardized test scores of high school students attending small schools are significantly higher than those students attending large host schools.[19]

As one would expect, there are a number of benefits to both students and teachers that might be attributed to the better academic environment of small schools. Within smaller schools, teachers enjoy enhanced relationships with students, have stronger sense of commitment to the school and students, and feel a heightened level of responsibility to pupils.[20] Also, there is more flexibility in tending to the needs of students, such as more time to provide individualized attention and increased creation of programs designed to aid with educational success, just to name a few.[21]

Other empirical papers have looked into other factors, such as family involvement, that may affect how well students perform in schools. One such study is found in the article, *Family Involvement in Middle and High School Students' Education*, a Harvard Family Research Project. A longitudinal study is performed among middle and high school students that varied across race, family structure, and demographics.[22] The study suggests that increased family involvement in a child's education does result in increased academic performance and college enrollment.[23]

The study further delves into research that finds three family involvement processes to be important in foretelling academic performance of students. The three processes are parenting, family-and-educational facility relationships, and parental responsibilities for academic success.[24] Parenting encompasses the parenting style and levels of supportiveness, involvement, monitoring, and communication that takes place between parents and their children.[25] Supportiveness, involvement, monitoring, and communication are found to have a direct relationship with academic success.[26] The family-and-educational facility relationships include communication with schools, and attendance and involvement in school activities.[27] As one would expect, these relationships have a positive relationship with academic success and desires

to continue to postsecondary education.[28] Parental responsibilities for academic success, which is the emphasis that parents place on homework completion, education expectations, and parental encouragement of their children to attend postsecondary education, is found to have a positive relationship with academic success.[29]

This study shows that it is important for a child's parents to be involved in their life and academics.[30] Schools alone are not enough to prepare students for academic success; high levels of family participation in the education process also play a role in academic success versus academic failure.

3. Econometric Model

The population model is as follows:

$$\textbf{\textit{GradRate}} = \beta_0 + \beta_1 \textbf{\textit{lowincrt}} + \beta_2 \textbf{\textit{parcontctRt}} + \beta_3 \textbf{\textit{instrexpd}} + \beta_4 \textbf{\textit{lowstuenroll}} + \beta_5 \textbf{\textit{midstuenroll}} + \textbf{\textit{u}},$$

where *GradRate* is the high school's graduation rate, *lowincrt* is the percentage of low income students enrolled in the high school, *parcontctrt* is a measure of parental involvement within the high school, *instrexpd* is the amount of instructional expenditures per pupil in thousands of dollars, *lowstuenroll (0-500),* and *midstuenroll (501-1,000)* refer to the number of students enrolled and whether it is in the low or middle range. The variable, *lowstuenroll,* takes on a value of one if the school has an enrollment size of 0-500 students and zero otherwise. The variable, *midstuenroll,* will take on the value of one when a school has an enrollment size of 501-1,000 students and zero otherwise. High enrollment schools (1,000+ pupils) will be used as the base group.

It is hypothesized that each variable used in the model will have a significant effect on high school graduation rates. Parental involvement could have a positive relationship with high school graduation rates because parents are assumed to have a positive influence on their child's performance. On the other hand, parental involvement could have a negative relationship with graduation rate rates if high parental contact is the result of poor behavior or truancy among students. It is anticipated that the percentage of low income students will have a negative effect on the high school graduation rates given that the low income status of the students tells us that the financial environment of the schools is subsistent, and the district may be unable to afford quality educational resources and staff. One would expect the total amount of districts' expenditures per pupil to have a positive relationship with the high school graduation rates because the instructional expenditures go towards more educational resources and support for the students. The effect that the number of students enrolled will have on the dependent variable may vary. It might be the case that the number of students provides information on the quality of education in the school and the reputation of the school, which infers a positive relationship between increased student enrollment and graduation rates. On the other hand, it could be assumed that schools with smaller student enrollment can better provide the resources necessary for students to graduate, thus causing increased student enrollment to have a negative affect on graduation rates. It the case of the public school systems, families are generally not allowed to chose the school a child attends, areas are usually zoned.

It is suspected that multicollinearity may exist among variables. It is possible that a negative relationship exists between parental contract rates and low income levels. At higher percentages of students from low income backgrounds, one would expect the parental contact rate to decline. However, perfect collinearity is not expected to be an issue. There are many

factors that could have an impact on the graduation rates at public high school in Illinois, so it is expected that this model does not account for all of the factors that have an impact on public high school graduation rates. Omitted variable bias may be present in the proposed model. The model does not account for attendance rates, which would have a positive effect on graduation rates. Because low income rates and attendance rates have a negative correlation, the result could be negative bias. Thus, the OLS estimates from the regression model may be on average too small. Also, in order to eliminate any potential problems resulting from heteroskedasticity, the robust standard errors are used when estimating the equations.

4. Data Description

The dependent variable is public high school graduation rates in the state of Illinois, so data were from state government education agencies. The Illinois State Board of Education website reports annual report cards for all public schools in Illinois, which includes data on most of the variables in the model. All data used are from the 2004-2005 school year, which is the 2006 fiscal year. The high school graduation rates are measured according to the national *No Child Left Behind Act of 2001*. The five independent variables are described in further detail below. The first explanatory variable, the percentage of students that come from a low income background, is measured as a percentage of the students who were eligible and participated in a free lunch program during 2006. Figure 1 in Appendix II shows a graphical representation of the relationship between low income status and graduation rates, where percentage of students in the school that are from low income backgrounds is measured on the y axis, and the percentage graduation rate is measured on the x axis. The graph indicates that as the percentage of low income status students decreases, a school's graduation rate increases. The parental contact rate

is the percentage of students who have had a parent make contact with the school at least once during the 2006 fiscal school year. Parental contact is considered parent-teacher conferences, the school visiting the home, parental visits to the school, telephone conversations, and written correspondences. This information is gathered from students' records held at the high school. The instructional expenditures are a measure of the school district's expenditures toward teaching students, such as the salaries paid to faculty and classroom material. Instructional expenditures are includes expenditures toward extracurricular activities, such as high school coaching staff. Figure 3 in Appendix II is a graphical representation of the relationship between district's instructional expenditures and graduation rates, where district's expenditures per student is measured on the y axis, and the percentage graduation rate is measured on the x axis. The graph indicates that as the district's instructional expenditures increases, a school's graduation rate increases. The last two variables were chosen to determine if the number of students enrolled at a public school has an effect on graduation rates. The number of students enrolled at a school is separated into three categories. The three categories are low student enrollment (0-500 students enrolled), middle student enrollment (501-1,000 students), and high student enrollment (1,000+ students). A dummy variable for schools with low enrollment is established for enrollment of 0-500 students. The other dummy variable, medium student enrollment, measures the effects on graduation rates when student enrollment is 501-1,000 students. If the values for low and medium student's enrollment are both zero, it is assumed that the school has high student enrollment that is over 1,000 students.

Now attention can be turned to the descriptive statistics associated with each variable. Table 1 in Appendix I can be referenced for all the values mentioned in this section. The average graduation rate within the sample is 89.15%. Schools in the sample have graduation

rates as low as 49.6% and as high as 100% during the 2006 fiscal year. The average percentage of students that are from low income backgrounds is 28.23% for the 101 schools in the sample. The standard deviation is 23.54 percentage points for the sample, so there is a lot of variance in the low income variable. The lowest value collected for the percentage of students from a low income background is 1.9%, and the highest is 100%. The mean of the *ParContctRt* variable is 93.35%. Based on public schools included in the model this means that on average, 93.35% of the students have had a parent make contact with the school, or the school has made contact with a parent. This is a surprisingly high average. Data on the parental contact percentage range form 10% to 100%. The average district expenditure is $5,600 per pupil. The standard deviation is $1,520. There is a difference of almost $7,000 between the school with the lowest district expenditures per student and the school with the highest district expenditures per student.

5. Estimation Results

The estimation results for the model are as follows:

$$\widehat{Grad\ Rate} = \underset{(12.835)}{94.996} - \underset{(.04298)}{.294}\ lowincrt - \underset{(.1418)}{.041}\ parcontctRt + \underset{(.4751)}{1.023}\ instrexpd + \underset{(1.7280)}{3.406}\ lowstuenroll - \underset{(1.8744)}{4.479}\ midstuenroll$$

The values on the coefficients and the test statistics that will be discussed for this equation can be viewed in Table 2 of Appendix I. Without using the robust standard errors, the *lowincrt* is the only individually significant variable with a t-statistic of 8.55. However, when adjusting for heteroskedasticity all of the variables except for the parental contract rate variable are statistically significant at the 5% significance level. With the usage of the robust standard errors there are significant changes in the standard errors on the intercept and the variables,

ParContctRt and *MidStuEnroll*. This suggests that heteroskedasticity was present in the graduation rate model.

It was anticipated that *parcontctRt* would have been more likely to take on a positive coefficient indicating a positive relationship between parental contact rates and high school graduation rate. However, the model estimates suggest that there is a negative relationship between *parcontctRt* and high school graduation rate. The variable, *ParContctRt,* has a t-statistic of -.029, and the p-value is .771 (See Table 1 in Appendix I). There is a possibility that there may be reverse causation inherent in the relationship between parental contact and high school graduation rates. This is because the parents may have frequent contact with the schools because the student is not performing well enough to graduate. Due to the fact that the *ParContctRt* variable is individually insignificant, the variable is dropped from the model in a second estimation. All of the other variables from the initial model are included in the final model which is,

$$\widehat{Grad\ Rate} = \underset{(3.7681)}{90.770} \underset{(.04901)}{-.285\ lowincrt} + \underset{(.5233)}{1.0398\ instrexpd} + \underset{(1.7359)}{3.453\ lowstuenroll} \underset{(1.7919)}{-4.323\ midstuenroll}$$

The coefficients, test statistics, and p-values for this model are presented in Table 3 in Appendix I. The adjusted R^2 term is .4868 without parental contact rates being included in the model and .4832 when it is included in the model. *Lowincrt*, *instrexpd*, and the number of students enrolled at a school explain about 50.73% of the variation in the graduation rates among high schools in Illinois.

As expected, the *lowincrt* variable is negative. This corresponds with the idea that the higher the percentage of low income students at the educational institution, the lower the

graduation rate. A one percentage point increase in the percentage of students from low income backgrounds corresponds to a .285 percentage point decrease in graduation rates. The low income rate variable is statistically significant at the 1% significance level with a t-statistic of -5.82. The positive coefficient on *Instrexpd* is in line with reality. The more money that a district expends on each pupil for instructional resources, the better education students are able to get, which results in more students graduating from high school. This variable is significant at the 5% significance level with a t-statistic of 1.99. *Insrexpd* is measured in thousands of dollars, so the coefficient can be interpreted as a $1,000 increase in instructional expenditures per student resulting in a graduation rate increase of 1.0398 percentage points, all else equal.

There is not a clear cut hypothesis on how the number of students enrolled at a school would affect the graduation rates. It could be assumed that a larger number of students may be able to provide some information on the quality of education in the school and the reputation of the school. This would infer a positive relationship between increased student enrollment and graduation rates. On the other hand, it could be assumed that schools with low student enrollment can better provide the resources necessary for students to graduate, thus causing increased student enrollment to have a negative affect on graduation rates. *Lowstuenroll* and *Midstudenroll* are both of individual significance at the 5% level with t-statistics of 1.99 and 2.41, respectively. *Lowstuenroll* has a positive coefficient of 3.453. A school with low student enrollment of 0-500 students is likely to have a graduation rate that is 3.453 percentage points higher that a school with high student enrollment of over 1,000 students. The variable *Midstudenroll* has the opposite effect. It has a negative coefficient of -4.323, which means that a school with midsize student enrollment of 500-1,000 pupils is expected to have a graduation rate that is 4.323 points lower than a large school with over 1,000 students. In essence, these results

provide support for both of the hypotheses suggested earlier. It is my suggestion that further studies be conducted in order to develop more concrete information about this relationship.

6. Conclusion

The percentage of students that are from low income backgrounds, the amount of district expenditures per pupil, and the number of students enrolled at school, measured with two dummy variables for student enrollment for 0-500 students and student enrollment for 501-1,000, are all statistically significant in explaining the variation in graduation rates among high schools in the state of Illinois. These variables explain about 51% of the variance in graduation rates among public high schools that are in the state of Illinois. The model suggests that there is evidence of a strong inverse relationship between the percentage of a high school's student population that come from low income backgrounds and the graduation rate of a school. This is in line with what one would expect. It is common for schools that are in areas where low income families reside to have lower percentages of students that graduate from high school. That is why it is important to support programs that reduce poverty because it allows students to receive the necessary resources for successful completion of not just high school, but all levels of education. *Instrexpd* indicates a positive relationship with graduation rates. School districts that allocate more expenditure to classroom instructors and extracurricular activities are shown to have higher levels of graduation rates. The estimated model also suggests that the size of a school's student enrollment does have some effect on graduation affect. However, the matter of student enrollment could be investigated further. It is possible that more categories would yield even better results.

End Notes

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Appendix I: Descriptive Statistics and Regression Analysis Tables

Table 1: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
GradRate	101	89.15347	9.953578	49.6	100
LowIncRt	101	28.23168	23.54103	1.9	100
ParContctRt	101	93.35347	11.17931	10	100
InstrExpd	101	5.6	1.524592	3.49	10.46
LowStuEnroll	101	.3267327	.4713578	0	1
MidStuEnroll	101	.1188119	.3251808	0	1

Table 2: Regression Statistics with Robust Standard Errors Including Parental Contact Rate Variable

Source	SS	df	MS	Number of obs = 101
Total	9907.37122	100	99.0737122	F(5, 95) = 13.40
Residual	4864.3263	95	51.2034347	Prob > F = 0.0000
Model	5043.04492	5	1008.60898	R-squared = 0.5090
				Root MSE = 7.1557

GradRate	Coef.	Robust Std. Err.	t	P>|t|
LowIncRt	-.2939036	.0429836	-6.84	0.000
ParContctRt	-.0412882	.1417554	-0.29	0.771
InstrExpd	1.023028	.4751306	2.15	0.034
LowStuEnroll	3.406279	1.728043	1.97	0.052
MidStuEnroll	-4.479202	1.874403	-2.39	0.019
_cons	94.99554	12.83538	7.40	0.000

Table 1: Regression Statistics with Robust Standard Errors Excluding the Parental Contact Rate Variable

Number of obs = 101
F(4, 95) = 16.18
Prob > F = 0.0000
R-squared = 0.5073
Root MSE = 7.1309

GradRate	Coef.	Robust Std. Err.	t	P>|t|
LowIncRt	-.285253	.0490062	-5.82	0.000
InstrExpd	1.039788	.5233055	1.99	0.050
LowStuEnroll	3.453403	1.73592	1.99	0.050
MidStuEnroll	-4.323409	1.791886	-2.41	0.018
_cons	90.76916	3.768082	24.09	0.000

Table 4: Standard Errors, T Statistics, and P Values before Controlling for Heteroskedasticity

Explanatory Variables	Std. Err.	t	P>t
LowIncRt	.034366	-8.55	0.000
ParContctRt	.0712568	-0.58	0.564
InstrExpd	.5457664	1.87	0.064
LowStuEnroll	1.843647	1.85	0.068
MidStuEnroll	2.34367	-1.91	0.059
_cons	8.177262	11.62	0.000

Appendix II: Descriptive Graphs

Figure 1:

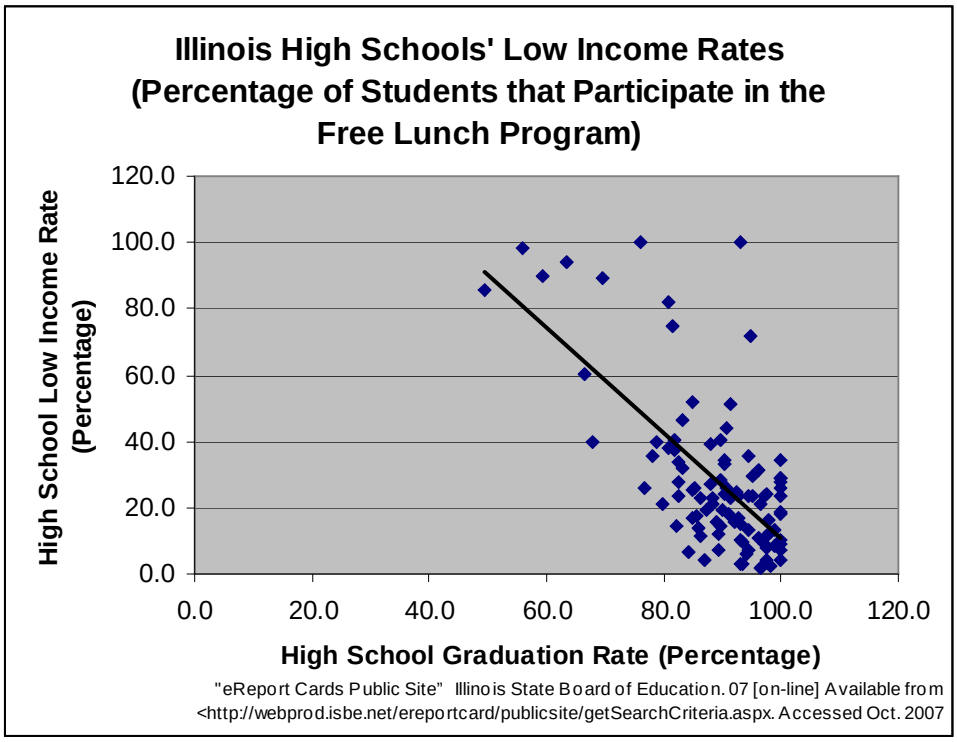


Figure 2:

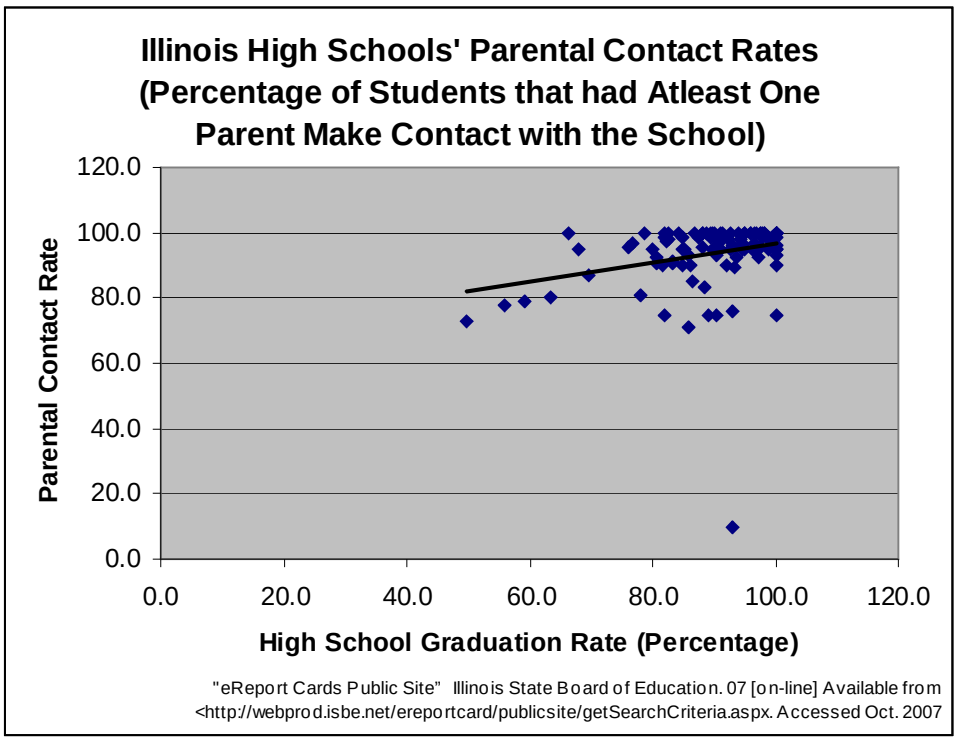
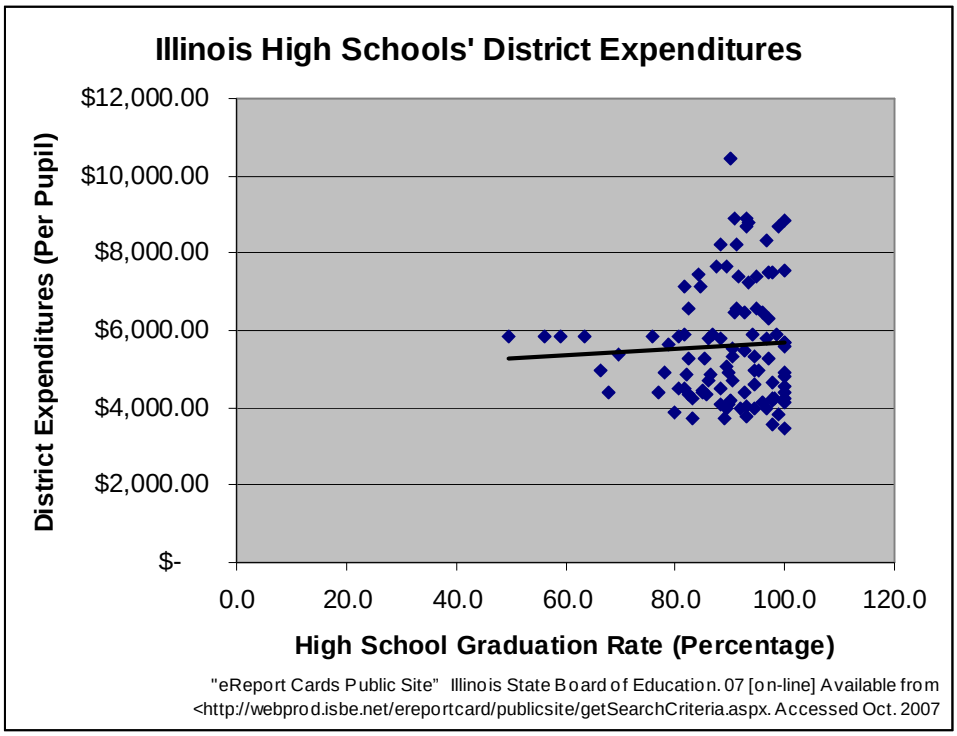


Figure 3:


Illinois High Schools' District Expenditures
$12,000.00
$10,000.00
$8,000.00
$6,000.00
$4,000.00
$2,000.00
$-
District Expenditures (Per Pupil)
0.0
20.0
40.0
60.0
80.0
100.0
120.0
High School Graduation Rate (Percentage)
"eReport Cards Public Site" Illinois State Board of Education. 07 [on-line] Available from
<http://webprod.isbe.net/ereportcard/publicsite/getSearchCriteria.aspx. Accessed Oct. 2007