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A Cross-Sectional Examination of Factors Affecting Graduation Rates Across the School Divisions in the State of Virginia.

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Senior Research Project

Submitted in partial fulfillment of the graduation requirements for the Economics major

Defended by

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Abstract

When citizens look to the government, there are multiple services that are expected to be provided. One of the most fundamental services is the access to an education to better prepare the nation's children for the future. Education is not just a service that is expected, it is a necessity in the global world that the United States is competing in. Currently the United State of America is facing large numbers of high school students who are dropping out. This is a major concern for the future productivity and welfare of the nation. What is the problem that has caused the questioning of the United States educational system?

Education is a major expense to society. Yet, while education is expensive, it is the fundamental building block upon which our society has been built. Consequently, questions about what is going wrong with the educational system are raised, since it appears that the number of students who drop out increases every year. This study looks at a range of possible factors that are believed to have an influence on graduation rates across the one hundred and thirty school divisions in Virginia. Eleven variables were tested based on their theoretical explanation of graduation rates. In following sections past studies, the models used, the results, and policy implications will be examined. Multiple regressions were performed, and after conducting this analysis, five variables were found to have explanatory power in terms of the differences in graduation rates. Thirty five point two percent of the deviation in the graduation rate was explained using those variables. The variables that were found to explain the deviation were: the educational attainment of the community, expenditures per pupil, per capita income, percentage of the school population that is white, and the population density of the school divisions.

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Introduction

This study was conducted to examine the relationship between graduation rates and the factors that affect a student's decision to complete their high school education. Multiple factors are examined, using regression analysis, to determine their influence on the school division's graduation rate. This study examines eleven factors that have a hypothesized effect on the graduation rates.

Currently graduation rates for school divisions around the nation are a topic of great debate. In the past, the graduation rates that have been studied are largely in urban areas; however, decreasing graduation rates are not only associated with urban school divisions. Multiple sources have articulated the argument that the current decrease in the graduation rate is a national crisis. The graduation rate is correlated with the future success of the generation because high school graduates earn on average more than people who drop out of high school.

The additional education that is obtained in high school allows a graduate the opportunity to obtain a job that will provide more money than he/she would receive it they dropped out of school. It is important to remember that an increase in education levels makes a community more attractive to business development that require a level of education and understanding that can be obtained in high school. The more education that members of the community have, the more attractive the community looks for business development. "This would increase demand for housing, among many other things, pushing real estate prices up, thus increasing tax revenues for local government to invest in other areas of community" (Bowser 2006). Mr. Bowser addresses the greater economic impacts that increases in education levels have on a community.

The increase in tax revenue is not the only reason that a community becomes concerned about who is, and who is not, graduating from high school. Josh Bowser also described how the increase in graduation rates would lead to a decrease in crime and the people who receive supplementary income. This study will shed light on the factors affecting graduation rates in order to allow government agencies to become better informed so that the number of graduates can be increased. With an increase in the graduation rate society will become more competitive in the global marketplace.

Literature Review

Students all around the country face the decision about whether or not to drop out of high school. The decision to drop out of school is a choice that the student must make by him or herself; however, it is not a decision that is made one day when they roll out of bed. Dropping out of high school causes major effects that the students will face for the rest of their lives. One of these is a decrease in earnings potential and quality of life; however, there are some other effects that result from dropping out of high school.

One of the reasons, that the graduation rate has become a major point of debate nationwide, is the increased costs to society that result when students drop out. The increased costs to society come in many different forms. This is why there has been increased pressure for school divisions to increase the graduation rates.

The societal costs come in the form of lost productivity and the increased costs of supporting low income households through supplemental income. One other societal cost affects future generations. Gary Orfield (2004), discussed the effects which future generations face when a parent, or both parents, drop out of the high school. "Children of drop outs are far more likely to be weak in schools, perform badly, and drop out themselves, thus creating powerful intergenerational social problems (Archer 2008 p.1254)." He went on to explain that, "when an entire racial or ethnic group experiences consistently high drop out rates, these problems can deeply damage the community, its families, its social structure, and its institutions" (Orfield p.2). Thus, it is important to stop the drop out problem before it is too late. There have been multiple studies done to look at the decrease graduation rate problem.

Recent research has focused on the development of policies and procedures that can help curb the drop out problem. Christenson and Thurlow (2004) examined past studies of school drop out prevention programs. They cited a study, done by Dynarski and Gleason in 2002, which identified more individualized student engagement as an attribute of a successful drop out prevention program. The more attention, which is devoted to each student, causes the students to become connected and engaged with the school environment and activity involved in their education. As a student becomes engaged in their learning environment he/she are more likely to finish their education.

In order to examine the effects of more individualized attention the variables, student to teacher ratio and number of schools in the district, were used. Theory supports the idea that an increase in teachers and the number of schools within the division will allow for an increase in engagement, and thus would increase the number of students that completed high school. One study done in California looked at the affects that limiting class size has on student achievement; however, the study was only conducted on K-3 graders (Sharp 2008). " Early analysis points to modest but significantly improved student achievement in California, and equally important, these gains remain even after the students move into larger classes above grade 3, which are not covered by the program" (Sharp p.172). Smaller class sizes helped increase students achievement. While the program only studied K-3 graders there is no reason to think that the achievement would not continue if with smaller class sizes in high grade levels.

Additional research has shown there is a positive relationship between school size and drop out rates. Werblow and Duesbery (2009) conducted research to examine the effect school size has on drop out rates and achievement rates in math. Their research, done with a Hierarchical Generalized Linear Model, tested the two levels: student level and school level.

Werblow and Duesber (2009) found that there is a significant positive relationship between school size and the drop out rate. Results showed that "a quintile increase in school size is associated with a twelve percent increase in average student dropout rate" (Werblow p.19). They found there was no real relationship between school size and the math achievement. They believe that student backgrounds and other differences explained the majority of variation in math scores. Adding to this model, the introduction of an ethnic makeup variable will capture the effects of different ethnic characteristics.

Research has shown that there are different graduation rates for different ethnic groups (Swanson 2004). The ethnic variable will be created using data obtained from the Common Core of Data created by the United States Department of Education for each school division around the state. The variable will represent the percentage of the district enrollment that is Caucasian. Christle, Jolivette, and Nelson's (2007) research showed that as the percentage of Caucasian students decreased the drop out rate increased. Christopher Swanson (2004) mentioned the development of an instrument that can help gauge the risk that a particular student will not complete high school referencing multiple factors including race.

Swanson shared his view that members of socioeconomically disadvantaged groups have lower graduation rates than their Caucasian classmates. Deborah Archer (2008) gathered and reported statistics on graduation rates for different ethnic groups. "In 2003, 75% of White and Asian students completed high school, 50% of African Americans, 51% of Native Americans, and 48% of Latinos graduated from high school" (Archer p.1255).

Along with ethnic background, family influences have an impact on the high school completion rate. "The most influential predictors of school completion are the parent's level of

education and the family income" (Rumberger 2004). Adding to the model the median household income variable is used to capture the communities' income effects on the completion rate. Christle, Jolivette, and Nelson (2007) used the percentage of students who are on a free or reduced lunch program as a measure of the effect that the poverty level has on the completion rate. Data for the free or reduced lunch program is available for the all the school divisions through the Superintendent's Annual Report for Virginia. Weblow and Duesbery (2009) found evidence that the percentage of students on free or reduced lunch increases the drop out rate; "...for every 10% increase in students on free and reduced lunch, schools experience a small but significant increase in student dropout rate ($t = 5.61$, $p < .001$)" (Weblow).

Another variable will be used to capture the effects that a communities' educational level will have on the high school graduation rate. Rumberger (2004) discussed how the family education level is a significant factor on the student's choice to drop out. The variable will measure the effect that the percentage of the each division's population, with some sort of college degree, has on the completion rate. The rationale behind including this variable is that if a student has role models with a college degree they are more likely to finish school.

Bridgeland, Dilulio, and Balfanz (2009) conducted surveys of teachers and principals to determine their perspectives on what leads to a student's decision to drop outs. "Sixty-one percent of teachers and 45% of principals saw lack of support at home as a factor in most cases of students' dropping out (Bridgeland p.22)." Theoretically, family structure would have an effect on the completion rate. Households that have two parents theoretically would be more stable and support students as they completed high school. There is evidence that a single female head of household family has a higher drop out rates because there is less family structure which leads to less support (Bowser 2006). This is mainly because the mother may be working

to support the family or is unable to find work. The student may drop out to help the parent support the family or may drop out due to lack of interest in school and no positive reinforcement.

Yet another factor which has theoretical support is the expenditures per student variable. "Throwing money at the problem will fix it," a commonly held belief is that as expenditures per student increased the completion rates in the district would increase as well. Sharp (2008) and other researchers mentioned in the article discuss the importance of increased funding which will lead to an increase in student success (Sharp p.174). Additional money funneled into the school division has to be properly used to insure that student achievement will increase. An example mentioned by Sharp is the reduction in class sizes and the increase in teacher pay that must be initiated together. If teacher pay does not increase there will be a decrease in the number of teachers. Another effect of low pay is that the quality of teachers in the aggregate will decline, thus, decreasing the achievement potential of the students (Sharp p.174). "From this perspective, then, additional money spent on K-12, if properly targeted and efficiently administered, should be expected to improve student achievement" (Sharp p.174). The expenditures per student variable includes funding from three sources: local, state, and federal. The data will be obtained from the Virginia Superintendent's Annual Report. If the variable is significant, which is theoretically supported, as expenditures increase then drop out rates should decrease. This will be tested in the model.

Bridgeland, Dilulio, and Balfanz (2009) also discussed the effect of incorporating the real world implications of course work. "Seventy percent of teachers and 68% of principals felt connecting classroom learning to real world experiences would help" (Bridgeland p.24). The real world connections that are made in the classroom can benefit a student in multiple ways.

Integrating the course work can help students to maintain their engagement and thus lead to the student staying enrolled in school. In this study a variable that measures the effects of vocational learning will be used to capture any effects. The variable will represent the level of vocational funding which school division spends.

In order to determine the reasons for a student's choice to drop out, an examination of the aggregate factors from across the 130 Virginia school divisions was conducted based on prior research and a theoretical base. The data was collected from multiple government sources and examined using regression analysis. Government sources were used to maintain a higher level of accuracy then with non-governmental based collection.

Theoretical Model

In order to conduct a proper analysis of the graduation rates for each school division a data set of eleven variables was assembled to conduct the regression analysis. The data set was compiled from multiple government sources. The variables that were examined included: Educational Attainment of Community, Population Density, Percentage of Single Female Headed Households, Per Capita Income, Percentage of Students on Free or Reduced Lunch, Expenditures Per Student, Ethnic Makeup of the District, Number of Schools in the Division, Teacher to Student Ratio, and the Vocational Funding Level for the division. Each of those variables collected are based on theoretical principles which lead to their inclusion in the model. The years 2000-2001 to 2003-2004 are the years that this study examines. This year span

represents the four years from the time that the students entered the ninth grade and graduated in 2004. The variables are discussed individually in the following pages.

The variation in the graduation rate is the dependent variable in the regression analysis that is estimated using the eleven variables. The graduation rate variable is identified in the regression outputs as Gradrate. Gradrate was generated by dividing the number of students that graduated in the 2003-2004 academic year by the number of students that enrolled in the ninth grade at the beginning of the 2000-2001 academic year. The data used to generate Gradrate was obtained from two sources: Virginia Superintendent's Annual Report for the number of graduates in 2003-2004 and the United States Department of Education's Common Core of Data (CCD) for the number of ninth graders in 2000-2001.

Overall the data was in the appropriate range with the exception of York County which had a graduation rate of 114%. The unanticipated York County results occurred because of a possible counting error or a large increase in the transfers into the school division. Since the graduation rate is above reasonable results, the York County graduation rate observation was excluded from the data set. Two other school divisions were excluded from the data set used to generate the results. West Point and Colonial Beach Public Schools were excluded because of lack of data for the division. After dropping those two divisions the sample size was one hundred and twenty eight divisions. Along with the exclusions there are four school divisions that are composed of two different political entities. The observations that were composed of two entities are: Bedford City and Bedford County; Fairfax City and Fairfax County; Emporia City and Greensville County; and Williamsburg City and James City County.

The observations were constructed by taking each entity's population and dividing it by the total population of the two entities. The resulting value is a percentage used to construct the observation. The percentage was multiplied by each entity's value and then added together to get the combined observation that was included in the data set. Some of the observations were missing because the division did not report it. E-Views corrects for this, so that there is not an issue with having a few observations missing. These are the only corrections that were made after the data set was assembled.

Since education is usually obtained with a support system it is important to include an education attainment variable. The inclusion of the educational attainment variable is based on the theory that as mentors and other community members have obtained an advanced degree the student will have positive reinforcement and continue on to complete high school. The percentage of people in the school district who have obtained a degree would be positively correlated to the district's graduation rate. To obtain a variable, that measures this effect of community educational attainment, data was gathered from the 2000 Census conducted by the United States Census Bureau. The percentage of people in a division that obtained a high school diploma or above was calculated by dividing the number of people with a degree by the population of the division.

Both of those percentages were available for all of the school divisions in Virginia. The percentage of people who had a high school diploma or above was entered into the model, using the name Education. Likewise, the percentage of people who obtained a bachelors degree was entered into the model, using the name Bachelor. Both of the variables were obtained from the United States Census Bureau. The expected sign of the coefficients for both

variables is positive. As the percentage of the population with a degree increases, the graduation rate is expected to increase as well.

The expenditures per student variable is included to capture the effects that expenditures have on the graduation rate for each school division. The addition of the expenditures variable is to test the hypothesis, that throwing money at the problem will fix it. If this assumption is correct then as expenditures per student increase the overall graduation rate will increase. The data for this variable is obtained from the Superintendent's Annual Report for the 2003-2004 academic year. The report is assembled by the Virginia Department of Education. The hypothesized effect is believed to be positive, thus resulting in an increase in graduation rates as the expenditures per student increase. The variable is named, Eppstu, in the model. The expenditures ranged from a minimum of $6559 to a maximum of $15,977. The complete descriptive statistics for all of the variables are available in Table 1 in the Appendix. The data represents the actual dollar amount that was spent per student in each district. The dollar amount is the amount of money from local, state, and federal sources.

To test the effects that the different ethnic makeup of the districts has on graduation rate, a variable was included in the model. Numerous articles that were research mentioned the differences in the graduation rates for students of different ethnic backgrounds. Most studies looked at the percentage of minority students that are enrolled. This study will look at the percentage of graduates who are Caucasian. The variable, therefore, is named Percentwhite. Theory supports the idea that as the percentage of white students in the district increases the graduation rate will increase. This is why the expected sign of the coefficient is positive. The variable is defined as the percentage of the school population that is White in the 2000-2001

academic year. The data was obtained from the CCD and calculating by dividing the number of white students by the total number of students in the division.

In addition to the ethnic variable, family structure needs to be taken into a account in the model. Thus a variable that measures the percentage of single female headed households was added to the model. The variable is identified as Female in the model. The rationale behind the inclusion of this variable is that as the percentage of single female households increases the graduation rate will decrease. The expected sign of the coefficient is negative which means that as the percentage increases the graduation rate will decrease.

The percentage of single female headed household data was obtained from the United States Census Bureau. The theory behind the Female variable lays at the fundamentals of our society. When there is a parent missing from the household, especially the father, it is more likely that a student will drop out of school. The reasons that a student drops out of school range from lack of support from family members to a disconnect from the school environment. Thus, in households that are headed by single mothers it is more likely that the student will drop out. The drop out may work to support the mother if she is working or to support the family if she is unable to find work.

The number of schools in a division is another important variable that is examined in this study. The number of schools would have a positive impact on the graduation rate. The variable is identified as Number. The hypnotized sign of the coefficient is positive. The rationale behind the positive sign of the Number variable is that as the number of schools that are in the district increases there is greater opportunity for student involvement. Student involvement is not only contained to inside the classroom. As the number of schools in the

district increases there is a greater opportunity for students to become involved in extracurricular activities. If a division only had one high school then all of the students would have to try out for only one team, i.e. football, baseball, etc. While divisions, that have multiple high schools, give students at each school a greater chance of making a team or being involved in other extracurricular activities which they might not have been able to at a larger school.

Yet another theoretical variable is the per capita income of each school division. As the per capita income increases, in a division, the graduation rate would increase as well. Much like the increase in education attainment would cause an increase in the graduation rate, so would the per capita income. When a community has obtained a higher per capita income there is a greater desire to have students graduate since graduating from high school will allow for greater opportunities later in life. Finishing high school allows students to obtain a higher level of income and maintain higher standards of living. The variable is identified as Income and is hypnotized to have a positive coefficient, since an increase in per capita income would result in an increased graduation rate.

While the per capita income variable measures the income per capita of the school division it is important to also consider the poverty level in the schools as a whole. The variable that is included to examine the effect of poverty is the Percentage of Students on Free or Reduced Lunch. This variable measures the percentage of the entire division that is on the Free or Reduced Lunch Program. The program is designed to provide students from low income households free or reduced priced meals while the students are in school. The variable is identified, as Lunch, and is hypnotized to have a negative effect. If the percentage increases then there is a high level of poverty in the school division. The more students who are at or below the poverty level are more likely to drop out of school. Students who are poorer are

more likely to drop out of school to work, move away, or start a family. It is important to measure the effect that percentage of poverty in the division has on the graduation rate.

Along the same lines as the poverty level, the population density has an impact on the graduation rate. If a division is located in a large urban area then there is an increase in societal pressure to drop out of school. A large urban area contains multiple issues that can lead to a decrease in graduation rate. Gangs, higher levels of poverty, and an increase in job opportunities could cause the decrease in graduation rates. The population density measures the number of people in a square mile in the divisions. A higher population density means there are more people living in a square mile area. The variable is identified as Population and is expected to have a negative coefficient. As the population density increases there will also be many more students that will be attending the schools. As a result of the larger number of students attending a school students are more likely to drop out.

Another variable that has been mentioned in past studies is the student to teacher ratio. The ratio measures the numbers of students a teacher instructs on average. Theory suggests that as the student to teacher ratio increases there is less individualized attention paid to each student. The less attention paid to a student the more likely the student is to become disengaged with the school environment and thus dropout. To measure the effects that the teacher to student ratio has on the graduation rate the variable, Teacher, is included in the model. The hypnotized sign is negative. As the student to teacher ratio increases the number of students a teacher works with increases. Thus, leading to dropping out of school because of being disengaged.

Vocational funding is another variable that is examined to determine what effects it has on the graduation rate. The data was obtained from the Superintendent's Annual Report for the 2003-2004 academic year. Vocational funding is measured by the dollar amount spent in the whole division; thus, it is important to look at how much is spent per student. As the amount of funding increases more is spent per student. Past studies have identified an increase in student engagement comes from relating the classroom to real world applications. The vocational funding is identified as, Vocational, in the model and results. The variable represents the vocational funding per student. The funding is hypnotized that there is a positive effect on the graduation rate. The variable was calculated by dividing the amount of vocational funding each division spends by the total enrollment for the division.

The model for the regression is:

$$\textbf{GRADRATE} = \beta_0 + \beta_1(\text{BACHELOR}) + \beta_2(\text{EDUCATION}) + \beta_3(\text{EPPSTU}) + \beta_4(\text{FEMALE}) + \beta_5(\text{INCOME}) + \beta_6(\text{LUNCH}) + \beta_7(\text{NUMSCH}) + \beta_8(\text{PERCENTWHITE}) + \beta_9(\text{POPULATION}) + \beta_{10}(\text{VOCFUNDING})$$

Data Analysis

After conducting regression analysis the model showed success in explaining the variation in graduation rates across the school division in Virginia. The model found that five of the eleven variables were significant in explaining the variation. After conducting the analysis the results are on par with previous studies. Bowser (2006), using seven variables, was able to explain 37.4% of the variation in the graduation rate in his study. Constructing the model four of the same variables that Bowser used were used in this model. The model

explained 35.2% of the variation. This represents the adjusted R-squared of the final model for this study.

Upon completion of the data collection the first regression was run. The results of this regression were:

Dependent Variable: GRADRATE
Method: Least Squares
Sample (adjusted): 1 128
Included observations: 125 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.305836	0.271850	1.125019	0.2630
BACHELOR	0.094444	0.187468	0.503787	0.6154
EDUCATION	0.231337	0.245781	0.941233	0.3486
EPPSTU	1.39E-05	9.09E-06	1.528735	0.1291
FEMALE	-0.497331	0.458584	-1.084492	0.2805
INCOME	2.67E-06	2.14E-06	1.248262	0.2145
LUNCH	0.019914	0.141557	0.140681	0.8884
NUMSCH	-0.000282	0.000424	-0.664642	0.5076
PERCENTWHITE	0.102115	0.071108	1.436050	0.1538
POPULATION	-2.15E-05	9.24E-06	-2.328980	0.0216
TEACHER	0.002494	0.005108	0.488141	0.6264
VOCATIONAL	0.000159	0.000111	1.440873	0.1524

R-squared	0.384103	Mean dependent var	0.726642
Adjusted R-squared	0.324149	S.D. dependent var	0.109429
S.E. of regression	0.089962	Akaike info criterion	-1.887782
Sum squared resid	0.914530	Schwarz criterion	-1.616264
Log likelihood	129.9864	Hannan-Quinn criter.	-1.777478
F-statistic	6.406577	Durbin-Watson stat	2.181042
Prob(F-statistic)	0.000000		

At first glance the regression results looked good. There was an R-squared that represented 38.4% of the variation was explained. However, only one of the eleven variables was significant. The Population variable was significant at 5% level. The variable measures the population density in each of the school divisions. The variable also had the same sign that was hypothesized.

After, discovering the Population variable was significant, another regression was conducted with the only independent variable being Population. The resulting regression results are shown in Table 2 in the Appendix. The results were that the variable was not significant at any level. Thus, it does not appear that the Population variable was the cause of the explained variation alone. Since the variable, did not explain the variation, other regressions were performed.

Two regressions were performed to see what the effects of the two different sets of variables would have. The two regressions broke up the variables based upon whether the variables related to the internal or external environment of the division. The internal variables are factors that the school division can control. The external variables are factors that the school division operates in and cannot control. The external variables are: Bachelor, Education, Female, Income, Population, and Percentwhite. The internal variables are: Eppstu, Number, Lunch, Teacher, and Vocational. The reason for conducting the two regressions was to see what effects, if any, could be tied to one of the two specific areas. The regression results for the outside variables are listed in the Appendix as Table 3. The regression results for the inside variables are listed in the Appendix as Table 4.

Both of the regressions explained 34% and 24% of the variation, respectability. The only variables that were significant are the Population, Percentwhite, Lunch, and Vocational variables. Another regression was conducted with Percentwhite as the only independent variable. It was significant and the adjusted R-squared was 19.4%. The sign was also the same as what was hypothesized positive sign. The significance of the positive sign shows that as the percentage of white students increases the graduation rate increases.

Percentwhite and Population both will be included in the final regression model. Both of these variables represent a significant component that needs to be tested in the regression. The two variables, when run in a regression together, explain 18.9% of the variation. Percentwhite is significant; however, Population is not significant at any level. While Population is not significant it is important that it is still included in the final regression. After looking at the correlation matrix there does not show any major concerns about colineratity. The two appear to only be correlated at a -34.02%. The complete Correlation Matrix appears in the Appendix as Table 5.

Being that Lunch and Vocational were the only two variables that were significant in the interal environment regression Eppstu was introduced into the final regression. Vocational represents the vocational funding per student spent by each school division. Since this would be included in Eppstu, representing expenditures per pupil, Eppstu would be a better variable to measure the effects of expenditures by the school divisions. Thus, it will be included in the final model.

Another variable that was included in the final model was the Income variable. The variable measures the Per Capita Income of each of the school divisions in the state. The Income variable was included because of the effects that income has on the likelihood that students will graduate. The Bachelor variable is also included in the model because of the support that it plays in terms of graduation rates. By the nature of the variables they are correlated with each other; however, after running the tests there does not seem to be any problem in final model.

The final model that represents the best explanatory power is:

GRADRATE= $\beta_0 + \beta_1(\text{BACHELOR})+\beta_2(\text{EPPSTU})+\beta_3(\text{INCOME})+$

$\beta_4(\text{PERCENTWHITE})+\beta_5(\text{POPULATION})$

The results from the model are:

Dependent
Variable: GRADRATE
Method: Least Squares
Sample (adjusted): 128
Included observations:
127 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.379401	0.069449	5.463045	0.0000
BACHELOR	0.245349	0.131904	1.860060	0.0653
EPPSTU	1.25E-05	7.31E-06	1.709570	0.0899
INCOME	3.08E-06	1.49E-06	2.064395	0.0411
PERCENTWHITE	0.181226	0.037800	4.794382	0.0000
POPULATION	-2.20E-05	8.56E-06	-2.573042	0.0113

R-squared	0.378157	Mean dependent var	0.724130
Adjusted R-squared	0.352461	S.D. dependent var	0.110614
S.E. of regression	0.089011	Akaike info criterion	-1.954027
Sum squared resid	0.958673	Schwarz criterion	-1.819656
Log likelihood	130.0807	Hannan-Quinn criter.	-1.899434
F-statistic	14.71658	Durbin-Watson stat	2.198009
Prob(F-statistic)	0.000000		

This model represents the best explanatory power for the graduation rate determinants. Comparing the results to the first regression, with all eleven variables, the following regression results look better: Adjusted R-squared, Akaike, Schwarz, and the number of significant

variables. Other results that look good are the Durbin-Watson, VIFs, and expected signs. All of the signs matched what was hypothesized.

Compared to the first regression the final model has a much better Adjusted R-squared, 35.2% for the final compared to 32.4% for the first. The Akaike info criterion was also better. The first regression was a -1.89 compared to the final model with a -1.95 which shows that the model is a better fit. The same is true for the Schwarz criterion, the first regression had -1.62, while the final regression had -1.82. While the number of variables have decreased, from eleven to five, all five are significant. The variables are significant at the following levels: one variable at the 1% level, two at the 5% level, and two at the 10% level. The first regression only had Population significant at the 5% level.

The Durbin-Watson (DW) test did not really change between the first regression and the final model. The DW changed from 2.181 to 2.198. The overall change is not really significant. A DW value of two, represents that there is no serious problem of serial correlation in the model. Another test that was conducted was the VIFs to test for multicollinearity in the model. The VIF test is conducted by regressing each independent variable, one by one, against the other independent variables. The R-squared value is then input into an equation and the result is the VIF. A VIF greater than five represents that there is multicollinearity between the variables. The equation for calculating the VIF is listed in the Appendix as Table 6. The VIFs for each of the variables is included in Table 6. There does not appear, since the values are well below the standard five, to be a problem with multicollinearity in the model. The largest VIF was for Bachelor which had a VIF value of 3.304. Finally, the resulting signs were compared to the expected signs for each of the variables. All of the signs matched, what was hypothesized.

While all of the variables are significant the overall magnitudes of the different variables range widely. The variables that have the greatest effects are Bachelor and Percentwhite. Bachelor had a coefficient value of .245349 which represents that as the percentage of people in the community who have a Bachelor's degree increases by one percent the graduation rate will increase by .245%. Percentwhite is the same as Bachelor. As the percentage of the white student population increases by one percent the graduation rate will increase by .181%.

Expenditures per student and per capita income are reported in dollar terms; thus, the effects of a change are larger. If expenditures per student increased by $10,000 then the graduation rate would increase twelve and a half percent. Per capita income has the same relationship. A $10,000 increase in per capita income would result in an increase in graduation rates by three point eight percent. The coefficients are small; however, when applied in dollar terms the effects become clear. Lastly the population density variable has a coefficient that is raised to the negative ten power also; however, when applied to an increase in the number of people in the division the effect is clear. If there was an increase of ten thousand people in the division the graduation rate would increase by two point two percent.

Conclusion-Policy Implications

After conducting the regress analysis it is clear to see what some of the determinants of graduation rates are. Of the five variables that were included in the final model. None were from the same circle of influence. The influences that affect student's decisions to graduate or drop out can be classified into two categories. One category being school influences and the other category being outside of the school environment. Four of the variables were outside of the school division's control. The educational attainment, per capita income, population density, and percentage of the school population that is white are variables that the school division works in and cannot control. The other variable Eppstu is a variable that the school divisions can control.

Thus, it is important that the school divisions do not take actions to correct low graduation rates without considering all of the determinants. A school division can provide top dollar resources and facilities but without community support the graduation rate is likely to stay low. While changing school policies can help it is important to get the community involved in to help encourage students to finish school and become productive members of the community.

Education is an important issue that must be studied and examined closely to ensure that the United States remains competitive in the global market. Current graduation rates are lower than what would be expected. Every effort needs to be taken to support students as they work through school. One thing is know, and that is, that when students have a support system they are significantly more likely to finish school and become productive members of society.

Appendix

Table 1

	GRADRATE	BACHELOR	EDUCATION	EPPSTU	FEMALE	INCOME
Mean	0.726642	0.191744	0.743784	8268.584	0.118184	27715.80
Median	0.728000	0.164000	0.742000	7830.000	0.112000	24832.00
Maximum	0.966647	0.637000	0.959000	15977.00	0.261000	59894.00
Minimum	0.379504	0.064000	0.529000	6559.000	0.070000	17576.00
Std. Dev.	0.109429	0.110256	0.086480	1522.076	0.035541	7801.960
Skewness	-0.260239	1.845663	0.105653	2.534452	1.208049	1.287559
Kurtosis	3.229899	6.786635	2.436421	10.73544	4.669700	4.571682
Jarque-Bera	1.686208	145.6484	1.886831	445.4733	44.92409	47.40321
Probability	0.430372	0.000000	0.389296	0.000000	0.000000	0.000000
Sum	90.83020	23.96800	92.97300	1033573.	14.77300	3464475.
Sum Sq. Dev.	1.484876	1.507398	0.927375	2.87E+08	0.156633	7.55E+09
Observations	125	125	125	125	125	125

	LUNCH	NUMBER	PERCENTWHITE	POPULATION	TEACHER	VOCATIONAL
Mean	0.379926	15.54400	0.698245	734.8605	11.09120	89.50328
Median	0.375700	8.000000	0.731980	86.90000	11.10000	72.11000
Maximum	0.724500	208.0000	0.998031	8452.000	15.80000	664.8500
Minimum	0.059500	2.000000	0.019719	6.100000	6.500000	7.420000
Std. Dev.	0.156413	23.21933	0.234135	1396.548	1.766672	81.61961
Skewness	0.108590	5.268256	-0.582902	3.053636	0.025084	3.274119
Kurtosis	2.207826	40.09647	2.393338	13.90356	3.075679	21.51415
Jarque-Bera	3.514097	7745.656	8.995522	813.4710	0.042938	2008.610
Probability	0.172553	0.000000	0.011134	0.000000	0.978760	0.000000
Sum	47.49070	1943.000	87.28068	91857.56	1386.400	11187.91
Sum Sq. Dev.	3.033679	66853.01	6.797556	2.42E+08	387.0203	826058.4
Observations	125	125	125	125	125	125

Table 2

Dependent Variable: GRADRATE
Method: Least Squares
Sample (adjusted): 1 128
Included observations: 128 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.731621	0.010994	66.54984	0.0000
POPULATION	-9.82E-06	6.95E-06	-1.413081	0.1601

R-squared	0.015600	Mean dependent var	0.724315
Adjusted R-squared	0.007788	S.D. dependent var	0.110198
S.E. of regression	0.109768	Akaike info criterion	-1.565400
Sum squared resid	1.518167	Schwarz criterion	-1.520837
Log likelihood	102.1856	Hannan-Quinn criter.	-1.547293
F-statistic	1.996798	Durbin-Watson stat	1.982959
Prob(F-statistic)	0.160097		

Table 3

Dependent Variable: GRADRATE
Method: Least Squares
Sample (adjusted): 1 128
Included observations: 127 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.592623	0.128214	4.622137	0.0000
BACHELOR	0.240061	0.159859	1.501702	0.1358
EDUCATION	0.033110	0.179457	0.184502	0.8539
FEMALE	-0.558456	0.423248	-1.319453	0.1895
INCOME	2.34E-06	1.71E-06	1.367252	0.1741
POPULATION	-1.51E-05	8.19E-06	-1.844816	0.0675
PERCENTWHITE	0.106656	0.058988	1.808099	0.0731

R-squared	0.372274	Mean dependent var	0.724130
Adjusted R-squared	0.340888	S.D. dependent var	0.110614
S.E. of regression	0.089803	Akaike info criterion	-1.928863
Sum squared resid	0.967742	Schwarz criterion	-1.772097
Log likelihood	129.4828	Hannan-Quinn criter.	-1.865171
F-statistic	11.86104	Durbin-Watson stat	2.198024
Prob(F-statistic)	0.000000		

Table 4

Dependent Variable: GRADRATE
Method: Least Squares
Sample (adjusted): 1 128
Included observations: 126 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.749867	0.094255	7.955694	0.0000
EPPSTU	9.06E-06	6.09E-06	1.487980	0.1394
NUMSCH	-0.000188	0.000379	-0.495399	0.6212
LUNCH	-0.365643	0.055686	-6.566204	0.0000
TEACHER	0.002260	0.005323	0.424543	0.6719
VOCATIONAL	0.000208	0.000105	1.970242	0.0511

R-squared	0.279229	Mean dependent var	0.726811
Adjusted R-squared	0.249197	S.D. dependent var	0.109007
S.E. of regression	0.094454	Akaike info criterion	-1.834967
Sum squared resid	1.070579	Schwarz criterion	-1.699906
Log likelihood	121.6029	Hannan-Quinn criter.	-1.780096
F-statistic	9.297685	Durbin-Watson stat	2.230804
Prob(F-statistic)	0.000000		

Table 5

	GRADRATE	BACHELOR	EDUCATION	EPPSTU	FEMALE	INCOME	LUNCH
GRADRATE	1	0.2936	0.3353	0.0687	-0.5217	0.4341	-0.4922
BACHELOR	0.2936	1	0.8035	0.5725	-0.2866	0.6619	-0.4476
EDUCATION	0.3353	0.8035	1	0.2388	-0.3152	0.7292	-0.7051
EPPSTU	0.0687	0.5725	0.2388	1	-0.0079	0.2244	0.0841
FEMALE	-0.5217	-0.2866	-0.3152	-0.0079	1	-0.4795	0.6598
INCOME	0.4341	0.6619	0.7292	0.2244	-0.4795	1	-0.7671
LUNCH	-0.4922	-0.4476	-0.7051	0.0841	0.6598	-0.7671	1
NUMSCH	0.0627	0.4412	0.4286	0.0875	-0.0122	0.3542	-0.1693
PERCENTWHITE	0.4213	-0.0810	0.0737	-0.3351	-0.7418	0.1750	-0.5443
POPULATION	-0.1031	0.6001	0.4096	0.6501	0.1492	0.1801	0.0467
TEACHER	0.0247	-0.0902	0.0671	-0.3694	0.0105	0.0559	-0.1210
VOCATIONAL	0.0940	-0.0515	-0.1721	0.0230	0.0046	-0.1790	0.1138

	NUMSCH	PERCENTWHITE	POPULATION	TEACHER	VOCATIONAL
GRADRATE	0.0627	0.4213	-0.1031	0.0247	0.0940
BACHELOR	0.4412	-0.0810	0.6001	-0.0902	-0.0515
EDUCATION	0.4286	0.0737	0.4096	0.0671	-0.1721
EPPSTU	0.0875	-0.3351	0.6501	-0.3694	0.0230
FEMALE	-0.0122	-0.7418	0.1492	0.0105	0.0046
INCOME	0.3542	0.1750	0.1801	0.0559	-0.1790
LUNCH	-0.1693	-0.5443	0.0467	-0.1210	0.1138
NUMSCH	1	-0.0923	0.2315	0.1507	-0.0146
PERCENTWHITE	-0.0923	1	-0.3402	0.0628	0.1912
POPULATION	0.2315	-0.3402	1	-0.2166	-0.0067
TEACHER	0.1507	0.0628	-0.2166	1	-0.1478
VOCATIONAL	-0.0146	0.1912	-0.0067	-0.1478	1

Table 6

VIF = 1 / (1 – R-squared)

Variable	**R-Square**	**VIF**
Bachelor	0.697354	3.30419
Eppstu	0.493644	1.974895
Income	0.533989	2.145872
Percent	0.232685	1.303246
Population	0.563148	2.289105

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