DETERMINANTS OF A SCHOOL'S DROPOUT RATE IN WISCONSIN PUBLIC HIGH SCHOOLS

_____

A THESIS

Presented to

The Faculty of the Department of Economics and Business

The Colorado College

In Partial Fulfillment of the Requirements for the Degree

Bachelor of Arts

By

David DeMay

December 2016

DETERMINANTS OF A SCHOOL'S DROPOUT RATE
IN WISCONSIN PUBLIC HIGH SCHOOLS

David DeMay

December 2016

Mathematical Economics

Abstract

This paper looks into the determinants of a high school's dropout rate using panel data from 687 public high schools in Wisconsin. Using an OLS model this paper finds a few variables at the 5% significance level to have an effect on a high school's dropout rate. A school's funding, the racial breakdown of the student body, the education level of the local area, the unemployment rate of the local area, and the school's student to staff ratio were all found to be significant determinants of a high school's dropout rate. An effective initiative in bringing U.S. high school dropout rates down to those of other developed countries has the potential to save the U.S. trillions of dollars. Analyses similar to this one are the first step in achieving that goal.

KEYWORDS: (dropout rate, graduation rate, high school, education)
JEL CODES: (I21, I29)

ON MY HONOR, I HAVE NEITHER GIVEN NOR RECEIVED
UNAUTHORIZED AID ON THIS THESIS

David DeMay
Signature

TABLE OF CONTENTS

Introduction

The dropout rate in the United States is above its economically and socially optimal level. High school dropouts in the U.S. earn $260,000 less over their lifetimes than high school graduates (Rouse, 2005). Considering lost tax revenue and the fact that high school dropouts use more social service resources than graduates, it is estimated that, on average, a single non-graduate will cost $127,000 in lost potential economic benefit over the course of his or her lifetime (Levin, Belfield, Muennig, & Rouse, 2006). Stillwell, Sable, and Plots (2011) estimate the national dropout rate to be around 25%. The high school dropouts from just one year, over the course of their lifetimes, are estimated, as calculated by the author, to cost the U.S. more than $200 billion in lost tax revenue and inflated use of social services. There is an urgent need in the United States to reduce the high school dropout rate to a more reasonable level.

The solution to the United States' dropout problem is not as simple as it may seem. While many would say that the United States undervalues education and needs to increase its spending per student, the U.S. is already spending more per student than most other Western nations according to the National Center for Education Statistics. There is no indication that spending even more will significantly reduce the dropout out rate. As reported by the World Bank, Norway has a high school completion rate of 99.9%, Denmark of 97.9%, Sweden of 97.7%, and Austria of 96.7%. Yet, according to the NCES, the U.S. spends more per student on education than three of these four countries. Indeed, the NCES reports the U.S. spends about 30% more on primary and secondary education per student than the average OECD country. Looking at other

Western nations, it certainly appears possible for the U.S. to reduce its high school dropout rate, a solution that has the potential to save trillions of dollars.

While the United States would greatly benefit from reducing its high school dropout rate, it is not readily apparent how to do so. This paper attempts to determine the causes of dropout rates in high schools, using data from all public four-year high schools in Wisconsin. The data used in this analysis is from the academic year beginning in 2007 to the academic year beginning in 2013, a seven-year span. An analysis on the causes of a school's dropout rate should offer insight into how the problem can be resolved, in turn bettering the lives of would be dropouts and improving the economic outcome of society as a whole.

Many researchers have looked into the determinants of a school's dropout rate. While there is extensive literature on the topic, some of which is detailed below, too few conclusions have been reached. There is still uncertainty in what exactly causes a student to drop out of high school and current models often times disagree with one another. This paper will build on previous studies and use their insights in an effort to further the understanding of the topic.

Literature Review

Bertrand (1962) was one of the first researchers to formally look into the causes that lead to students dropping out of school. In his groundbreaking 1962 paper on the dysfunction in the U.S. schooling system, Bertrand noted the perplexity of a capable student not completing his or her schooling. When the vast majority of research shows that dropping out of high school leads to reduced social and economic outcomes, it is unexpected that a capable student would ever elect to cut short his or her schooling. This perplexity was the motivation behind his work: to gain insight into the causes of a student dropping out of school when this is so often detrimental to the future success of that student.

There are a few variables that consistently appear in the literature. These variables will be detailed first. Bertrand (1962) and many after him found parents' education to be a significant determinant of dropping out of high school. Bertrand took this as evidence that educational values are passed down from parent to child. While Rose (2008) did not directly look into parents' education, she did consider parents' involvement in school in her model of the determinants of a school's dropout rate. Contrary to Bertrand's assumption, Rose found that parental involvement in school activities, which could be used as a proxy variable for parents' commitment and value of education, does not have significant effect on the decision to drop out.

Rose (2008) also considered a school's expenditure per student in her model. Using data from the Illinois State Board of Education and the Interactive Illinois Report Card, she found that an increase in expenditure per student will decrease a school's

dropout rate. This intuitive result has been found by numerous studies. Lofstrom (2007) found the same result when using student-level data from Texas high schools. In all three models where Lofstrom considered spending per pupil as a variable, it was found to be significant with relatively consistent coefficients. A few other variables, such as race, are also consistently found to have same effect across papers and datasets.

Considering race as a variable is common among papers on the topic. Izumi, Shen, and Xia (2013), using data from the Schools and Staffing Survey of 2007/2008 of nationally representative public and private alternative high schools, considered the percentage of minority students at a school as a possible determinant of the dropout rate. In their model based on student and staffing characteristics, the paper found that an increase in a school's minority population will lead to a decrease in that school's predicted graduation rate. Turning back to Lofstrom (2007), he found that a student who is Hispanic or African American has a higher probability of dropping out while an Asian student has a lower probability of dropping out. While most of the literature that considers ethnicity as a variable is constant with the above findings, these results are non-unanimous. Jordan, Kostandini, and Mykerezi (2012), using a logit model to predict an individual's probability of dropping out of high school, found that race was only a significant variable in limited circumstances. The paper notes that the role race plays in acting as a determinate of dropping out had decreased over the years of their study.

The final variable that is consistently present across models is gender. With this variable, Jordan et al. (2012) found a higher dropout rate associated with males than

females. This result is largely in line with the literature. Lofstrom (2007) found the same result in his student level model. In fact, his model showed that gender is a significantly better predictor than race. Though again, in a heavily researched topic, there will be contradictory results. Izumi et al. (2013), at the 5% significance level, did not find gender to be a significant predictor of a school's dropout rate.

Izumi et al. (2013) found more traditional results in their consideration of a school's student to staff ratio, another often considered variable. At the 10% significance level, the paper found that a higher student to staff ratio leads to a higher dropout rate. Their model based on student and staffing characteristics came to this conclusion, while their more built up model that includes school processes failed to find significance in the student to staff ratio. Lofstrom (2007) found that, in all five models where he considered the variable, an increase in a school's student to teacher ratio will lead to an increase in the likelihood an individual student will drop out.

The variables discussed above are commonly considered in the literature on determinants of dropping out of school, though individual papers will consider a multitude of other variables. Some of these include an area's unemployment rate, a school's average teacher experience, and the socioeconomic status of either a student or a school as a whole.

A local area's unemployment rate is considered in Lofstrom's (2007) model, though he arrives at a counter intuitive conclusion. Lofstrom found that the higher the unemployment rate is in an area, the higher the dropout rate will be for the students in that area. This result may suffer from omitted variable bias, a possibility that is

supported by Jordan et al. (2012) which found unemployment to be an insignificant determinant.

Teacher career experience is the last variable considered in this paper that has not yet been mentioned. This variable is surprisingly seldom considered by research in the topic, though a few papers have incorporated it. Ogbuagu (2011) found that an increase in average teacher experience leads to a decrease in factors that lead to a student dropping out.

Socioeconomic status is not considered as a variable in this paper, but it is in many other papers on the topic. Ogbuagu (2011) and Izumi et al. (2013) considered the variable in their analysis and did not find it to be a significant predictor of dropout rate. Bertrand (1962) also considered socioeconomic status in his analysis and concluded that a higher socioeconomic status leads to a reduced dropout rate. Ultimately this paper does not consider the variable as it is reasoned the effect of socioeconomic status is captured by other variables in this analysis.

Through the decades of research into the determinants of a high school's dropout rate, papers have often come to contradictory conclusions. Papers will often consider a few classic variables and then any of a wide array of less considered variables. The literature has reached a consensus in regard to the effect of variables such as race and gender, but there are many other variables with predictive potential that still need to be thoroughly tested.

Theory

Human Capital Theory states that a more highly educated individual will be, on average, more productive and thus worthy of a higher wage. The theory also claims that a society can grow wealthier by increasing the average skills and education attainment of its people. In fact, Rouse (2005) of Princeton University showed that over the course of a lifetime, a high school graduate is expected to earn $260,000 more than a high school dropout. Rouse notes that this translates to roughly $60,000 in potential tax revenue lost by each non-graduate. Factoring in other costs associated with non-completion of high school, Levin et al. (2006) showed the lost potential public economic benefit is $127,000 over the lifetime of a single non-graduate. This leads to the perplexity that Bertrand's research, this paper, and the papers discussed above explore: why many capable students make the seemingly irrational decision of dropping out of school. Papers on the topic attempt to answer this question in the hope that the answer could eventually lead to a more economically desirable dropout rate.

In this paper's exploration of the determinants of a high school's dropout rate, ten variables are considered. The model includes a school's student to staff ratio, funding per student, average teacher experience, average education in the local county, unemployment rate in the local county, the percent of a school's student body that is male, and the racial breakdown of the student body. A dummy variable is also used for year.

It is expected that the more students per staff member, the higher a school's dropout rate will be. It is reasoned that in a school with a lower student to staff ratio,

each student will be given more attention and guidance. This will allow teachers to better identify struggling students while also giving teachers more opportunity to try to help the student before he or she drops out.

It is expected that the higher a school's revenue per student, the lower the dropout rate. A school with a higher expenditure per student is expected to have more resources to help struggling students. This variable is also used as a proxy for the overall wellbeing of an area; a school that has higher revenues per student should be in a higher tax district, which means a wealthier area. In a wealthier area, it is expected that struggling students are able to afford tutors. It is also expected that in a wealthier area, students will have less of a need for a job and can focus on their studies.

It is expected that the higher the average teacher experience in a school, the lower the dropout rate. This is because more experienced teachers are expected to better identify students at risk of dropping out. Once these students have been identified, it is expected that more experienced teachers can also more effectively intervene and offer assistance than less experienced teachers.

The higher the percentage of males at a school, the higher the dropout rate is expected to be. This is because our culture, in the eyes of males in high school, looks down on those who study and do well in school. In a high school, social norms of masculinity can often dictate that a male student must not take his education seriously if he cares about the opinions of his peers.

It is expected that the higher the unemployment rate is in an area, the lower the dropout rate will be for the schools in that area. Students are expected to be wearier of

dropping out if there are fewer jobs available to them once they leave school. Should a student live in an area with a low unemployment rate, that student may feel more confident that he or she could find a job without a high school education, and thus be more likely to leave school.

The last variable considered is the racial breakdown of a high school. The data group all students into either American Indian, Asian, Black, Hispanic, or White. It is expected that the more white a student body, the lower the dropout rate. In this case, percent of student body that is white is behaving as a proxy variable for many small variables, such as teacher and societal encouragement to succeed. For these reasons, it is expected that minority students will have a higher dropout rate.

This paper based its regression primarily on Lofstrom (2007), though adapts his student level equation to the school level. Most papers considering data at the student level will use either a probit or logit model, which would not work for data at the school level. Eight of the ten variables in this paper are considered by Lofstrom, though this model does not consider all the variables he does. Many of the variables that Lofstrom considered are valid at the student level, but not at the school level. The model also is inspired by Rose (2008) which uses an OLS regression of untransformed data at the school level. Many transformations and interactions of the dependent and independent variables were considered for this paper, but for each one it was reasoned that they either weakened or did not add to the model. Often times datasets are not able to fulfil the requirements of the OLS model, though this paper was able to mitigate potential

problems by using the Newey West correction, analytic weighting, and a dataset without unfixable violations of the OLS assumptions.

This paper builds an OLS equation and separates the sample into two groups by school size. One regression is for schools with more than 500 students, while the other regression is for schools with less than 500 students. Of the 2,559 data points considered by this paper, 365 have between 400 and 600 students. This is 13.7% of the data points. The model is given below as equation 3.1.

$$\begin{aligned} \textit{Dropout rate} = {} & \beta_0 + \beta_1 \textit{School funding} + \beta_2 \textit{Area education} + \beta_3 \textit{\% Male} \\ & + \beta_4 \textit{\% American Indian} + \beta_5 \textit{\% Asian} + \beta_6 \textit{\% Black} + \beta_7 \textit{\% Hispanic} \\ & + \beta_8 \textit{Area Unemployment} + \beta_9 \textit{Student:staff} + \beta_{10} \textit{Teacher experience} \end{aligned} \quad (3.1)$$

Fundamentally, this paper aims to further explore the causes of the high U.S. dropout rate by analyzing multiple relevant metrics school by school. Currently, the dropout rate is above economically efficient levels and thus in violation of Human Capital Theory. This research hopes to offer insight into the violation of the Human Capital Theory by exploring the causes of a student to drop out of high school. The objective of the paper is to not only help explain the nation's high dropout rate, but also offer potential recourses to the problem.

Data description

The primary data used in this analysis is yearly panel data from every four-year public high school in Wisconsin. The data span over seven school years, beginning with the school year starting in 2007 and ending with the school year starting in 2013. Each data point is a given school in a given year. There is a total of 2,659 data points in this analysis, which translates to an average of just under 380 four-year public Wisconsin high schools considered per year over the seven years of data. A summary of the data is given in Appendix A.

The data used in this analysis come primarily from the Wisconsin Department of Public Instruction, though one dataset comes from the United States Census Bureau and another from the United States Bureau of Labor Statistics. The data on 'Area education' is the only data taken from the U.S. Census Bureau. It is given by the percent of adults in a county that have a bachelor's degree or higher. These data were collected by county through the Bureau's American Community Survey. On average, around 25% of adults in a Wisconsin county will have a bachelor's degree or higher.

'Area unemployment rate' comes from the U.S. Bureau of Labor Statistics, a department of the U.S. Department of Labor. The data are by county and are updated annually. The data are also given in percent. On average, Wisconsin counties have around a 7% unemployment rate, though about 20 data points had an unemployment rate above 10%.

The rest of the data come from Wisconsin's official education agency, the Wisconsin Department of Public Instruction. The data collection, which is mandated by

the state government, is carried out annually at both the school and district levels. Dropout rates are provided by the agency annually and are given for each school. A dropout is defined by the agency as a student who "(1) either exited during the school term or who exited prior to start of that school term but completed the previous school term and (2) who did not re-enroll by the 3rd Friday of September of the following school term." A student is not considered a dropout in the data if that student either graduated from the school, transferred to another school or approved education program, was suspended or expelled, left due to a serious illness, or died. In this paper, dropout rate is given as a percent. The mean dropout rate across schools is 1.37% over the years of this study, though there are a few schools in certain years with worryingly high dropout rates. Of the 2659 data points, 48 data points had a dropout rate above 10% and five had a dropout rate above 20%. Surprisingly, these schools for the most part have around a few hundred students, meaning they are not necessarily small.

The agency defines the race of each student as either 'Asian', 'American Indian or Alaskan Native', 'Black or African American', 'Native Hawaiian or other Pacific Islander', or 'White'. This information is self-reported and is given at the school level. In this analysis, the racial breakdown by school is given in percent. Wisconsin public schools are around 85% white, 5% black, 5% Hispanic, 2% Asian, and 2% Native American. The black and American Indian populations are more clustered by school, while the Asian and Hispanic populations are more integrated throughout the schooling system.

'Student to staff ratio' is calculated as the number of full time equivalent staff divided by the number of enrolled students. Full time equivalent staff include "licensed instructors, administration, aids/support/other." These data are given at the school level. Schools on average have a student to staff ratio of around 11, though a few schools have exceptionally high ratios. Twenty-seven data points have a ratio higher than forty. It seems likely that many of these incredibly high student to staff ratios do not accurately reflect the situation at the school and perhaps the Wisconsin Department of Public Instruction even incorrectly entered some data. While some of these numbers individually are questionable, there are very few of these outliers and thus are not concerning taken as a whole.

'Teacher experience' is "the number of years a staff member has been employed by an education agency, public or private." The average total teacher experience for each school is the variable used in this analysis. These data are given at the district level and given in years. It seems reasonable to assume that teacher experience is not too variable between schools in the same district and therefore the district level value is directly given to every school within the district. On average, schools have an average teacher experience of 15 years.

'% Male' is the percent of students at a school that are male. These data are at the school level. Schools are on average just over 50% male in Wisconsin, though there are some schools that are almost entirely female and others almost entirely male.

'Revenue per student' is given by the total revenue each school district receives divided by the number of students in that district. This variable is at the district level. It

is assumed that all schools in a district will be given roughly equal funding per student, and therefore each school was given a value for this variable equal to that of the district it is in. Total revenue is defined as the sum of all federal, state, and local revenues. Schools have a large discrepancy in funding per student. The schools that receive the least will spend around ten thousand dollars per student, while those that receive the most will spend roughly triple that. Almost all schools in a given year will spend between $10,000 and $15,000 per student, with only 162 schools in a given year spending upwards of $15,000 per student.

Empirical Results

This paper ran two regressions in an effort to better understand the determinants of a high school's dropout rate. As individual students who drop out of small schools can have a significant effect on their school's dropout rate, the dropout rate of these small schools prove more difficult to predict than larger schools. Therefore, this paper will have one regression for schools where an individual student can have a large impact on the school's dropout rate, and another regression for schools were one student will not have a significant impact on a school's dropout rate. This limit is set at 500; schools with more than 500 students will factor into Regression i, while schools with less than 500 students will factor into Regression ii.

In an effort to further account for differences in school size, analytic weighting was used to control for these differences. Without weighting, one student dropping out of a small school will have an enormous impact on the regression, while a student dropping out of a large school will have a minimal effect. Analytic weighting based on school size controls for this and thus produces more accurate models. The data were also corrected for heteroscedasticity and autocorrelation. A Newey-West regression with lag of two was used. It is hypothesized that the autocorrelation is the result of specific unpredictable events within local communities that have an effect on students dropping out. While it is impossible to know how long the consequences of such events will persist, an estimate of two years seems conservative. The model does not suffer from significant multicollinearity, but it does suffer from non-normality of the residuals as shown by D'Agostino and Belanger's skewness and kurtosis test for normality. While

the residuals are distributed around zero, there is severe kurtosis and skewness. The non-normality of the residuals is a limitation of the model.

The results for Regression i are given in Appendix B and Regression ii results are given in Appendix C. Regression i found six variables to be significant at the 5% level. 'Area education' was found to be significant and negatively related to dropout rate. For every one percentage point increase in the number of adults in a county that have a bachelor's degree or higher, all the schools in that county are expected to see their dropout rate decrease by 0.0532 percentage points.

The regression also found race to be significant. The data give the racial stratification of every Wisconsin public high school. The student body of each school is listed in terms of '% American Indian', '% Asian', '% Black', '% Hispanic', and '% White'. To not succumb to the Dummy Variable Trap, '% White' was omitted from the model. '% American Indian', '% Black', and '% Hispanic' were all found to be significant and positively related to dropout rate. For every one percentage point increase in the percent of a school's student body that is American Indian, that school's dropout rate is expected to increase by 0.108 percentage points. For every one percentage point increase in '% Black', that school's dropout rate is expected to increase by 0.0615 percentage points. For every one percentage point increase in '% Hispanic', that school's dropout rate is expected to increase by 0.0646 percentage points.

'Area unemployment rate' and 'Student to staff ratio' were both also found to be significant. For every one percentage point increase in 'Area unemployment rate', the local schools' dropout rates are expected to decrease by 0.208 percentage points. The

higher the unemployment rate is in a county, the lower the expected dropout rate will be in that county. For every one percentage point increase in 'Student to staff ratio', that school's dropout rate is expected to increase by 0.222 percentage points. Thus the more students per staff member in a school, the higher the dropout rate is expected to be for that school.

All the significant results are all in line with theory, though some variables were not shown to be significant as theory predicted. Theory predicted that the more funding per student a school received, the lower that school's dropout rate would be. With a t-score of only 0.40, the regression did not show significance in this variable. Theory also predicted that the more males in a school, the higher the dropout rate would be for that school. With a t-score of 0.99, '% Male' was not found to be significant. The last variables not found to be significant was 'Teacher experience'. Theory predicted that the more experienced a school's teachers are, the lower that school's dropout rate would be. With a t-score of -1.05, this variable was not found to be significant. This is not wholly unexpected as a case could be made for why less experienced teachers would lead to a lower dropout rate: teachers may decide to not 'go the extra mile' to help a student once they have received tenure and their job is secure. This regression has an R-squared of 0.457 and an F-statistic of 14.0.

The regression for schools with under 500 students did not produce as significant results, as expected. For small schools where a single student can have a large impact on the dropout rate, the dropout rate becomes much more difficult to model. The regression found four variables to be significant. These four variables are 'School

funding', '% American Indian', '% Asian', and '% Black'. The variables 'School funding', '% American Indian', and '% Black' were all found to be positively related to a school's dropout rate. For every $1,000 increase in a school's funding per student, that school's dropout rate is expected to increase by 0.0761 percentage points. For every one percentage point increase in '% American Indian', that school's dropout rate is expected to increase by 0.0500 percentage points. And for every one percentage point increase in '% Black', that school's dropout rate is expected to increase by 0.131 percentage points. The regression found a negative correlation between '% Asian' and dropout rate. For every one percentage point increase in '% Asian', that school's dropout rate is expected to decrease by 0.0864 percentage points.

All the significant variables in this regression are in line with theory, besides 'School funding'. Accounting for units, the relationship in the regression between 'School funding' and 'Dropout rate' is small. Every $1,000 increase in funding per student will only increase that school's dropout rate by 0.0761 percentage points. While this result is unexpected, it was known that predicting the dropout rate for small schools is significantly more challenging than predicting the rate for larger schools. 'Area education', '% Male', '% Hispanic', 'Area unemployment rate', 'Student to staff ratio', and 'Teacher experience' were not shown to be significant. For all of these variables, the 95% confidence interval for the coefficient captured zero. This regression has an R-squared of 0.560 and an F-statistic of 11.5.

It is worth noting that many coefficients do vary significantly between the regressions. Non-nested tests were run between the two regressions on the ten non-

dummy variables in the model. A summary of the results is given in Appendix D. It was found that the coefficients for 'Area education', '% Hispanic, '% Black', 'Area unemployment rate', 'Teacher experience', and 'Student to staff ratio' do differ significantly between regressions. Coefficients for 'School funding', '% American Indian', '% Asian', and '% Male' do not differ significantly between regressions.

Of variables that were found to differ significantly between regressions, 'Area education', 'Area unemployment rate', '% Hispanic' and 'Student to staff ratio' were all variables found to be significant in large schools while no significance was found in small schools. '% Black' was found to be significant in both while 'Teacher experience' was found to be significant in neither. These results tell that the determinants of a school's dropout rate in small and large schools are fundamentally different from one another.

Summary and Conclusion

This paper used data from public high schools in Wisconsin over a period of seven years to model the determinants of a school's dropout rate. Two regressions, based on the same model, were used in this paper: one for schools above 500 students and one for schools below 500 students. For the regression with more than 500 students, the variables 'Area education' and 'Area unemployment rate' were found to be significant and negatively related to a school's dropout rate. The variables '% American Indian', '% Black', '% Hispanic', and 'Student to staff ratio' were also all found to be significant and positively related to a school's dropout rate. In this regression, 'School funding', '% Male', '% Asian' and 'Teacher experience' were all not found to be significant.

This paper then used data from schools with less than 500 students. In this iteration of the model, individual students can have a significant effect on their school's dropout rate. This regression found 'School funding', '% American Indian', and '% Black' all to be statistically significant at the 5% level and positively related to a school's dropout rate. '% Asian' was found to be significant and negatively related to dropout rate. Variables not found to be significant were 'Area education', '% Male', '% Hispanic', 'Area unemployment rate', 'Student to staff ratio', and 'Teacher experience'. This regression would benefit from more data points as a small school's dropout rate is difficult to predict.

The regression for schools above 500 students shows that the elevated high-school dropout rate in the U.S. cannot be brought down by simply increasing schools'

revenue. Solutions must look into the true causes of a high school's dropout rate. It is helpful to note that more experienced teachers do not necessarily produce a lower dropout rate. More experienced teachers may well be better facilitators of learning, but this study still did not find that they lead fewer students to drop out. It would be beneficial for schools attempting to reduce their dropout rate to know that hiring more experienced teachers is also not a likely fix.

The regression did find that a higher unemployment rate will lead to a lower dropout rate. While the regression does not tell why exactly this is the case, perhaps schools could decrease their dropout rate by better communicating with their students. The schools could ensure students know that simply because the student can find a job and earn a paycheck, does not mean that dropping out of school is financially beneficial in the long run.

The regression found that schools in an area with a higher average education will have a lower dropout rate than schools in a less educated area. This paper reasons that is due to the fact that highly educated parents will instill the value of an education into their children. Using this information, schools should be sure that every student fully understands the value of an education.

And last, the regression found that schools with high minority populations will have higher dropout rates than schools with more white students. While it is difficult to say with certainty what the causes of this are, this paper reasons that race is used as a proxy for many weak variables. Perhaps, for example, teachers unknowingly offer less encouragement to students of color. Or perhaps students of color feel less able to

succeed due to some of society's perceptions of race. If either of these are the case, teachers would be well advised to take care in assuring all students feel confident in their abilities and know they can succeed.

While this paper may have significant results, much more study in the topic is needed before the U.S. dropout rate problem can be resolved. As of now, the many studies into the determinants of dropping out have come to a few consensuses, but there is still disagreement in many other variables. An answer to this problem has the capacity to save the U.S. trillion of dollars while improving the lives of thousands of young adults. Additional research will hopefully soon lead to the creation of a widely accepted general model on the determinants of a school's dropout rate.

References

Bertrand, Alvin L. "School Attendance and Attainment: Function and Dysfunction of School and Family Social Systems." *Social Forces* 40.3 (1962): 228-33. Print.

Carr, Peggy G. *Education Expenditures by Country*. Rep. N.p.: n.p., n.d. Print.

Izumi, Masashi, Jianping Shen, and Jiangang Xia. "Determinants of Graduation Rate of Public Alternative Schools." *Education and Urban Society* 47.3 (2013): 307-27. Web. 6 Dec. 2016.

Jordan, J. L., Kostandini, G., & Mykerezi, E. (2012). Rural and urban high school dropout rates: Are they different? *Journal of Research in Rural Education*, *27*(12), 1-21. Retrieved from http://jrre.psu.edu/articles/27-12.pdf

Levin, Henry, Clive Belfield, Peter Muennig, and Cecilia Rouse. "The Costs and Benefits of an Excellent Education for All of America's Children." (2006): n. pag. Oct. 2006. Web. 1 Dec. 2016.

Lofstrom, Magnus. "Why Are Hispanic and African-American Dropout Rates So High?" The Institute for the Study of Labor, Dec. 2007. Web. 6 Dec. 2016.

"Lower Secondary Completion Rate, Total (% of Relevant Age Group)." *Lower Secondary Completion Rate, Total (% of Relevant Age Group) | Data*. The World Bank, n.d. Web. 13 Dec. 2016.

Ogbuagu, Arunma B.Christy, "Factors affecting high school graduation rates in metropolitan Atlanta public schools" (2011). ETD Collection for AUC Robert W. Woodruff Library. Paper 214.

Rose, Jazmen (2008) "What Affects Graduation Rates of Illinois Public High Schools?," Undergraduate Economic Review: Vol. 4: Iss. 1, Article 9.

Rouse, Cecilia Elena. "The Labor Market Consequences of an Inadequate Education." (2005): n. pag. *Literacy Cooperative*. Sept. 2005. Web. 1 Dec. 2016.

Stillwell, Robert, Jennifer Sable, and Chris Plotts. "Public School Graduates and Dropouts From the Common Core of Data: School Year 2008–09." National Center for Education Statistics, May 2011. Web. 1 Dec. 2016.

Appendix A

Table 1

Summary statistics

Variable	Obs.	Mean	Std. Dev.	Min.	Max.	Level
Dropout rate	2659	1.37	2.31	0	32.55	School
School funding	2659	12781	1546	10027	30894	District
Area education	2659	23.87	8.62	11.6	46.6	County
% Male	2659	51.1	6.00	3.13	92.8	School
% American Indian	2659	1.51	4.57	0	75.41	School
% Asian	2659	2.29	3.55	0	26.95	School
% Black	2659	5.05	13.88	0	98.06	School
% Hispanic	2659	5.39	8.97	0	98.71	School
Area unemployment rate	2659	7.11	1.95	3.4	12.9	County
Student to staff ratio	2659	11.0	17.2	3.38	833	School
Teacher experience	2659	14.9	2.28	5.65	28.2	District

Appendix B

Table 2

Regression for schools above 500 students

Variable	Coefficient (t-score)	SE	95% Confidence Interval
School funding	2.43E-5 (0.40)	6.01E-05	[-9.35E-5, 1.42E-4]
Area education	-0.0532 (-6.47)	8.23E-03	[-0.0694, -0.0371]
% Male	0.0571 (0.99)	0.0580	[-0.0566, 0.171]
% American Indian	0.108 (5.85)	0.0184	[0.0718, 0.144]
% Asian	0.0144 (1.07)	0.0134	[-0.0120, 0.0407]
% Black	0.0615 (5.92)	0.0104	[0.0411, 0.0819]
% Hispanic	0.0646 (3.65)	0.0177	[0.0298, 0.0993]
Area unemployment rate	-0.208 (-3.05)	0.0683	[-0.342, -0.0743]
Student to staff ratio	0.222 (2.57)	0.0867	[0.0523, 0.393]
Teacher experience	-0.0499 (-1.05)	0.0475	[-0.143, 0.0433]
constant	-1.88 (-0.66)	2.87	[-7.52, 3.75]

Notes. R-sq=0.457; F=14.0; 1,222 observations.

Appendix C

Table 3

Regression for schools below 500 students

Variable	Coefficient (t-score)	SE	95% Confidence Interval
School funding	7.61E-5 (2.33)	3.26E-05	[1.22E-5, 1.40E-4]
Area education	-9.29E-3 (-1.37)	6.76E-03	[-0.0225, 3.97E-3]
% Male	-3.00E-3 (-0.36)	8.34E-3	[-0.0194, 0.0134]
% American Indian	0.0500 (5.62)	8.89E-03	[0.0325, 0.0674]
% Asian	-0.0864 (-2.25)	0.0384	[-0.162, -0.0110]
% Black	0.131 (8.09)	0.0162	[0.0994, 0.163]
% Hispanic	0.0250 (1.93)	0.0129	[-4.03E-4, 0.0503]
Area unemployment rate	-0.0398 (-0.98)	0.0407	[-0.120, 0.0401]
Student to staff ratio	5.48E-3 (0.83)	6.56E-03	[-7.39E-3, 0.0183]
Teacher experience	-3.27E-3 (-0.26)	0.0126	[-0.0280, 0.0215]
constant	0.0731 (0.10)	0.701	[-1.30, 1.45]

Notes. R-sq=0.560; F=11.5; 1,437 observations.

Appendix D

Table 4

Non-nested test between models

Variable	t-score
School funding	-1.70
Area education	6.20
% Male	0.70
% American Indian	-0.94
% Asian	0.45
% Black	10.44
% Hispanic	-6.79
Area unemployment rate	-2.87
Student to staff ratio	-11.64
Teacher experience	4.30

Notes.

H_0: $Coefficient_{Regression\ i} = Coefficient_{Regression\ ii}$