ORANGE COUNTY
BOARD OF EDUCATION

AGENDA ITEM ABSTRACT

Meeting Date: **November 12, 2013**

AGENDA ITEM No. **13-11-13**

ACTION: (Y/N) **N**

SUBJECT: Economic Impact of Orange County Schools Report

INFO. CONTACT: Dr. Denise Morton, Dr. Michael Walden   **PHONE**: (919)732-8126

ATTACHMENTS: 1. Executive Summary
2. Power Point Presentation
3. Complete Report

PURPOSE: To provide the Board of Education for informational purposes the Economic Impact of Orange County Schools report.

BACKGROUND: Orange County Schools and Duke University have had a mutual partnership for the last several years. One aspect of the partnership is the annual offer from the Duke School of Public Policy to have their undergraduate or graduate students conduct research on topics of the district's choice.

Orange County Schools' staff requested that the Public Policy students replicate a study that had been conducted in Virginia Beach City Schools in June 2011 on studying the economic impact of that school system.

Ten graduate students in the Duke School of Public Policy with supervision from Dr. Michael L. Walden, a William Neal Reynolds Distinguished Professor at North Carolina State University and Visiting Professor for the Sanford School of Public Policy at Duke University conducted the same type of study for Orange County Schools during the fall semester of 2013. The purpose of the study was to provide the community with an objective, evaluative look at the schools economic impact on the county as a whole and to establish whether student performance has a measurable impact on the local economy.

FINANCIAL IMPACT: none

RECOMMENDATION: The Superintendent recommends that the Board of Education receive the Economic Impact of Orange County Schools report for information.

THE ECONOMIC IMPACT OF ORANGE COUNTY SCHOOLS

Sanford School of Public Policy

Duke University

November 2013

Conducted by Master's degree students Monica Bandy, Darryl Childers, Michael Chiulli, Alyssa Chudnofsky, Margaret Hettinger, Lauren Milam, Marcus Morrow, Mark Muenchau, Jenn Rimbach, and Lucas Westmaas under the direction of Dr. Michael L. Walden, Visiting Professor

EXECUTIVE SUMMARY

Education is the key to progress. It is the key to improvements in a person's paycheck, a community's economic growth, and the world's reduction in poverty. A subtantial volume of academic evidence points to the strong linkage between educational improvement and virtually every measure of standards of living.

Education is also a key part of the Orange County economy. A higher proportion of Orange County residents have a high school education than in the country, and the proportion of Orange County residents with a college degree is almost twice the rate as in the nation. These facts are certainly linked to Orange County's faster economic growth and stronger job market compared to the nation.

Orange County Schools (OCS) has multiple and significant economic impacts on students and the community. Every $1 of OCS operating spending adds $1.15 of total spending in the county, and every one OCS job creates another 0.26 jobs in the county. Also, every $1 million of OCS capital spending generates 4.4 jobs in the community.

Students have their economic future enhanced by graduating from OCS. Each of the last five graduating classes can expect to earn an additional $91 million to $107 million of lifetime income (in 2013 purchasing power dollars) as a result of having an OCS degree. Also, the performance of recent OCS graduates has increased their likelihood of attaining a college degree, and this benefit is estimated to be worth $0.5 million for the last three graduating classes.

Research shows that high school graduates are less likely to engage in criminal activities, lead healthier lives, and are less likely to use public assistance programs. For each of the last five OCS graduating classes, it is estimated this improved behavior saves the public sector approximately $30 million in lifetime spending. Additonal research suggests that superior academic performance of school districts is reflected in local property values. The superior academic performance of OCS relative to the state is shown to be associated with $322 million of additional property value in Orange County and $2.8 million of county property tax revenues.

Lastly, OCS has a significant impact on social commitment and commuinty education in the county. It is estimated that each OCS graduating class in the last four years has engaged in community volunteer activities valued at $221,000. Also, OCS offers education in nutrition and pregnancy choices that have an estimated value of $402,000 and $246,000 respectively.

Together, these results show that Orange County Schools plays a vital role in improving the future of both their students and the community.
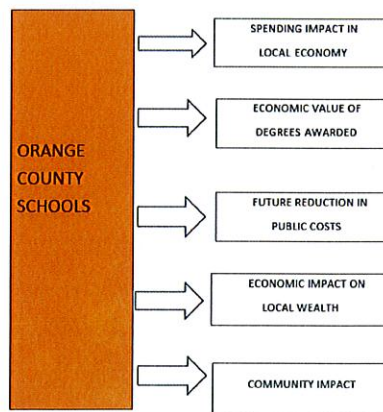
The Economic Impact of Orange County Schools

PRESENTERS: MARK MUENCHAU & LAUREN MILAM

SANFORD SCHOOL OF PUBLIC POLICY
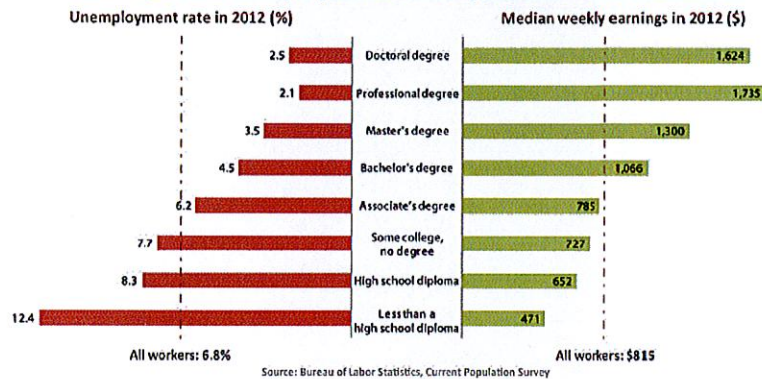
DUKE UNIVERSITY

NOVEMBER 12, 2013

Education: The Key to Progress

• Education is a vital part of the Orange County economy

• Academic evidence shows linkage between educational improvement and virtually every standard of living measure

ORANGE COUNTY SCHOOLS

→ SPENDING IMPACT IN LOCAL ECONOMY

→ ECONOMIC VALUE OF DEGREES AWARDED

→ FUTURE REDUCTION IN PUBLIC COSTS

→ ECONOMIC IMPACT ON LOCAL WEALTH

→ COMMUNITY IMPACT

Education: The Key to Progress

Earnings and unemployment rates by educational attainment

Unemployment rate in 2012 (%)   Median weekly earnings in 2012 ($)

Unemployment rate in 2012 (%)	Degree	Median weekly earnings in 2012 ($)
2.5	Doctoral degree	1,624
2.1	Professional degree	1,735
3.5	Master's degree	1,300
4.5	Bachelor's degree	1,066
6.2	Associate's degree	785
7.7	Some college, no degree	727
8.3	High school diploma	652
12.4	Less than a high school diploma	471

All workers: 6.8%   All workers: $815

Source: Bureau of Labor Statistics, Current Population Survey

Characteristics of Orange County

Key Socioeconomic and Demographic Data of Orange County, 2012

Factor	Orange County	United States
Population	138,550	313,900,000
Median Earnings	48,683	26, 264
% of population aged 65 and over	8.4	13.7
% of persons aged 25 and over with a high school degree	89.8	87.65
% of persons aged 25 and over with a bachelor's degree	53.9	28.5
Population growth rate, 2000-2010 (%)	13.7	9.9

Source: U.S. Census Bureau

Spending and Employment Impacts of Orange County Schools

ECONOMIC IMPACT OF ORANGE COUNTY SCHOOLS
OPERATING BUDGET

Impact	Spending	Employment
Direct Effect	$51 million	991
Indirect Effect	$10 million	79
Induced Effect	$17 million	178
Total Effect	$78 million	1,248

ECONOMIC IMPACT OF ORANGE COUNTY SCHOOLS
CAPITAL BUDGET

Impact	Spending	Employment
Direct Effect	$1.0 mil.	7.1
Indirect Effect	$1.0 mil.	5.5
Induced Effect	$0.8 mil.	4.9
Total Effect	$2.8 mil.	17.5

Development of Human Capital: Value of a High School Degree

Year	Number of Graduates	Value
2013	520	$ 106.7 million
2012	446	$ 91.5 million
2011	465	$ 95.4 million
2010	477	$ 97.8 million
2009	465	$ 95.4 million

Development of Human Capital: Impact on Attainment of a College Degree

•Holding a college degree provides a significant economic advantage over holding only a high school degree

•Economic advantage of holding a college degree can partly be attributed to the high school
  • Based on the increased chances of successfully obtaining a college degree result from improved high school performance

 • Worth $500,000 in additional lifetime income for last three graduating classes

Development of Social Capital

Present Value (2013 $) of Estimated Saved Public Social Costs

Year	Number of Graduates	Crime Cost Savings ($ millions)	Public Health Care Cost Savings ($ millions)	Welfare Cost Savings ($ millions)	Total Savings ($ millions)
2013	447	$21.0	$6.6	$1.9	$29.5
2012	508	$23.8	$7.5	$2.2	$33.5
2011	425	$19.9	$6.3	$1.8	$28.0
2010	458	$21.5	$6.8	$2.0	$30.3
2009	468	$22.0	$6.9	$2.0	$30.9

Impact on Local Wealth

- B to A rating improvement in zip code 27243 results in $26,000 increase in average house value
- OCS performance versus state performance adds estimated $322 million to property values
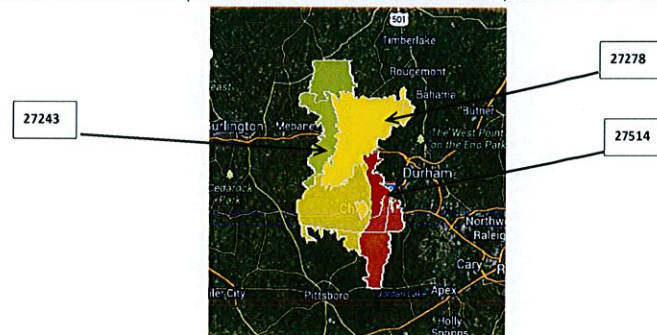
Community Impacts of Orange County Schools

- Nutrition
- Sexual education modules
- Volunteering
  - Education-volunteering relationship
  - High school graduate 127% more likely to volunteer than dropout counterpart
  - Rate of $19.22/hour
  - OCS graduates produce savings of $221,000 annually

Questions?

"Team Orange County" : Monica Bandy, Darryl Childers, Michael Chiulli, Alyssa Chudnofsky, Margaret Hettinger, Lauren Milam, Marcus Morrow, Mark Muenchau, Jennifer Rimbach, and Lucas Westmass;
under the direction of Dr. Michael L. Walden

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Research shows that high school graduates are less likely to engage in criminal activities, they lead healthier lives, and they are less likely to use public assistance programs. For each of the last five OCS graduating classes, it is estimated this improved behavior saves the public sector approximately $30 million in lifetime spending. Additonal research suggests that superior academic performance of school districts is reflected in local property values. The superior academic performance of OCS relative to the state is shown to be associated with $322 million of additional property value in Orange County and $2.8 million of county property tax revenues.

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Together, these results show that Orange County Schools plays a vital role in improving the future of both their students and the community.

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ACKNOWLEDGEMENTS

ABOUT THE AUTHORS

Monica Bandy is a native of Sacrmento, California. She attended the University of California at Berkeley and then was a member of the Teach for America corps in San Francisco. She also taught pre-K for two years in partnership with the San Francisco Head Start program. She will complete her Master's degree at Duke University in May 2014.

Darryl Childers is from China Grove, North Carolina. He received a bachelor's degree from Davidson College and has worked in the areas of education and public health with organizations like the Children's Defense Fund, the Peace Corps, and Americorps. His areas of interest are community development and philanthropy.

Michael Chiulli grew up in Raleigh and graduated from North Carolina State Univeristy with a double major in History and Economics. In the summer of 2013 he interned at the Office of Management and Budget. His interests are economic policy and political strategy.

Alyssa Chudnofsky is from a small town outside of Boston. She received a bachelor's degree in Political Science from Washington University in St. Louis and is concentrating on education policy in her master's program. After graduation, she plans to work in the public sector with a focus on urban education and community school programs.

Margaret Hettinger is originally from Nashville, Tennessee. She graduated from the University of Virginia with degrees in Economics and English Literature. After completing her program, she hopes to work in the public sector and concentrate on higher education and immigration issues.

Lauren Milam is a graduate of the University of Richmond with a bachelor's degree in Political Science. She taught special education to students in Oklahoma as part of the Teach for America program. After completing her studies at Duke, she hopes to remain in North Carolina and work as a budget or policy analyst.

Marcus Morrow is a native of West Virginia and eight-year veteran of the U.S Navy, where his duties included working for President George W. Bush at Camp David. A graduate of UNC-Charlotte, he has worked for the City of Charlotte and for Citizen Schools. His policy interests include economic development, veterans' rights, and poverty.

Mark Muenchau hails from Portland, Oregon and served as a school administrator in South Texas before arriving at Duke University. Upon completing his studies, he plans to re-enter the public education sector in the western U.S.

Jennifer Rimbach has lived in Maryland and North Carolina. With a degree in Romance Languages from UNC-Chapel Hill, she has served as a Peace Corps volunteer in the Phillipines. She has also been an intern with the United Nations Development Fund. Her focus is the intersection of social policy and international development.

Lucas Westmass is originally from Wisconsin and has degrees in History and Political Science from Berkeley. He has taught 9th grade algebra in Philadelphia through Teach for America. Upon completing his program at Duke, he plans to work in education policy in Philadelphia.

Dr. Michael L. Walden, who served as the adviser for the project, is a William Neal Reynolds Distinguished Professor at North Carolina State University and Visiting Professor with the Sanford School of Public Policy at Duke University. With a career spanning 36 years, he is the author of eight books and over 250 ariticles and reports. Among his recognitions is the UNC Board of Govenors Award for Excellence in Public Service. In 2013 he was made a member of the *Order of the Long Leaf Pine.*

EDUCATION: THE KEY TO PROGRESS

A Nation at Risk, released in 1983 by the National Commission on Excellence in Education, promoted national economic competitiveness as a primary reason for pushing school reform. The commission warned, "If only to keep and improve on the slim competitive edge we still retain in world markets, we must decide ourselves to the reform of our educational system for the benefit of all..."[1] Since then, as the United States strives to remain a world super power, economists have continued researching how education impacts economic growth and development.

Over time, economists have been developing empirical estimates of the relationship between education and economic growth. Most of this research is highly technical and uses formal econometric models to test hypotheses using empirical data. Confirmed by the technical economics literature, economists have demonstrated that both individuals and societies gain from the investments made in education. A logical model sets forth three basic assumptions about how education impacts economic growth. First, education increases the human capital (knowledge, skills) inherent in the labor force, which increases labor productivity. Second, education increases the innovative capacity of the economy. Third, education facilitates the transmission of knowledge needed to understand and process new information and to implement new technologies.[2]

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[1] Hanushek Eric, Ludgar Wößmann, Eliot Jamison, and Dean Jamison. "Education and Economic Growth." *Education Next*, Spring 2008, Vol. 8, No. 2.

[2] Miller, Riel. "Education and Economic Growth: From the 19th Century to the 21st Century." CISCO, Education and Economic Growth, and Hanushek, Eric and Ludgar Wossmann, "The Role of Education Qualtiy in Economic Growth." World Bank Policy Research Working Paper 4122, February 2007, pp. 20.

Breaking down the econometric models illustrates that researchers think about the economic impact of education in two ways: how individuals benefit from education and how a nation develops based on its education system.

Measuring the Economic Impact of Education

Microeconomic Analysis

The microeconomic analysis examines the relationship between a person's educational achievement and what they earn. Most studies show consistent results for the personal pay-off from education. For every additional year of schooling, individuals increase their earnings by about 10%. The effects of educational attainment on personal returns are shown in Figure 1.

Figure 1. Earnings and Unemployment Rates by Educational Attainment.

Earnings and unemployment rates by educational attainment

Unemployment rate in 2012 (%)		Median weekly earnings in 2012 ($)
2.5	Doctoral degree	1,624
2.1	Professional degree	1,735
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All workers: 6.8%   All workers: $815

Source: Bureau of Labor Statistics, Current Population Survey

Recently however, there has been a shift from using years of schooling or school attainment as an accurate measure of personal economic growth. Researchers explain that the ideal measure of an individual's education should capture several components, including years of schooling, the quality of the schooling, the nature of the curriculum, and the student's effort. Dahlin explains, "Creating a measure that accurately quantifies these components is difficult. Of these components, an individual's years of schooling is the only directly observable characteristic. We may indirectly measure aspects such as educational quality and individual ability and effort through standardized tests; however, there is disagreement regarding the reliability of such tests."[3] Accurately measuring an individual's education is challenging, but evidence does suggest the quality of education, measured by tests of cognitive skills, is substantially more important for economic growth than the mere quantity of schooling years.[4]

Macroeconomic Analysis

While microeconomic analysis examines individual attainment and ability, macroeconomic literature focuses on the relationship between measures of aggregate level of education attainment for a country as a whole and the country's economic growth, usually in terms of GDP.

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[3] Dahlin, Brian G. "The Impact of Education on Economic Growth: Theory, Findings, and Policy Implications." > http://www.ssc.wisc.edu/~munia/475/dahlin0202.pdf, pp. 6.

[4] Hanushek, Eric and Ludger Wößmann. "Education and Economic Growth." *International Encyclopedia of Education*: Penelope Peterson, Eva Baker, Barry McGaw, (Editors). Vol. 2. Oxford: Elsevier, 2010, pp. 248.

In macroeconomic analysis, economists often use a variable for human capital. Since the workforce's education is a key component of the economy's human capital, the average years of education in the workforce or the cognitive ability of the workforce may serve as a component of an economy's human capital estimation. In other words, Hanushek and Wößmann explain, "The accumulated evidence from analyses of economic outcomes is that the quality of education – measured on an outcome bias of cognitive skills – has powerful economic effects. Economic growth is strongly affected by the skills of workers. What people know matters."[5] They also note that schooling is not the only factor contributing to a country's cognitive skill development, but it is an essential factor. To better understand the influence of cognitive skills on economic growth, it is helpful to look at data comparing nations.

International Data

Beginning in the mid-1960s, international agencies began collecting student test scores in mathematics and science at various grade levels. Hanushek et al. used performance results on 12 of these standardized tests as rough measures of average cognitive skill in a given country. They then assessed how human capital relates to differences in economic growth for 50 countries from 1960 to 2000. They found that countries with higher test scores experienced far greater growth rates. If one country's test score was 0.5 standard deviations higher than another country in the 1960s, the first country's growth rate was, on average, one full percentage point higher annually over the next 40year period than the second country's growth rate. Hanushek et al. write, "Our

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[5] Hanushek and Wößmann, *op. cit.,* pp. 251.

commonsense understanding of the importance of good schools can thus be documented quite precisely. A highly skilled work force can raise economic growth by about two-thirds of a percentage point every year."[6] In their report, the United States is a unique case because while U.S. test scores remain stagnant, economic growth continues.

The United States Exception

The United States' GDP growth rate has been higher than average over the past century, but it continues to struggle competing internationally on cognitive-skills tests. Researchers explain the United States has other advantages that allow its economy to grow. They point out the U.S. maintains freer labor, has less government regulations on firms, and contains less government intrusion on economic activities compared to other countries. The characteristics of the U.S. economy, "encourage investment, permit the rapid development of new products and activities by firms, and allow U.S. workers to adjust to new opportunities."[7] Although the United States' economy has been growing since the 1960s, the country's leaders have continued pushing for improvement on cognitive tests. In 1989, for example, George H. Bush promised a 50-point increase on international standardized tests by 2000. While no gain was made, if this increase was reached Hanushek et al. suggest that GDP would be 4.5 percent greater by 2015. This 4.5 percent increase in GDP is equivalent to the total the U.S. currently spends on K-12 education.   The United States, as well as individual states and school districts, must recognize the importance of cognitive skills on economic growth. America's advantages will be minimized as other countries continue to open their economies and provide more

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[6] Hanushek, Wößmann, E. Jamison, D. Jamison, *op. cit.*
[7] *Ibid.*

education opportunities for their citizens. Beyond observing education's impact on economic development, researchers have also looked at the relationship between education and individual living standards.

Education's Impact on Living Standards

In their study, "Education and the Subjective Quality of Life," Ross and Willigen write, "Education is a root cause of individual well-being: It shapes people's opportunities for employment, the kind of work they do, their income and economic hardship, their social psychological resources, and their distress."[8] They examine the relationship between education and a variety of indicators of subjective quality of life, such as depression, anxiety, anger, aches and pains, malaise, and dissatisfaction. Using two representative samples, they find that well-educated people have lower levels of emotional and physical distress. Poorly educated people also reported having lower levels of enjoyment, hope, happiness, fitness, and energy.[9] Ross and Willigen explain the various factors that contribute to this relationship between education level and quality of life.

They propose working conditions and economic conditions contribute the most to a higher quality of life. First, well-educated people are more likely to employ full-time

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[8]Ross, Catherine E. and Marieke Van Willigen. "Education and the Subjective Quality of Life." *Journal of Health and Social Behavior*, Vol. 38, No. 3, Sep. 1997, pp. 292.

[9]*Ibid*, pp. 275 and 290.

than those with little education. Full-time employment is associated with higher levels of psychological well-being. Second, they suggest education provide access to non-alienated work. This non-routine work involves a variety of tasks and promotes continued learning, which decreases distress. Third, they explain that people with less education experience greater economic hardships with less problem-solving resources. These hardships contribute to greater psychological distress. Fourth, the well-educated reported having higher personal control than the poorly educated. The well-educated had more control over employment, job autonomy, and earnings. People with low levels of personal control have higher levels of psychological distress.

Clear connections exist between the root causes of education inequalities and health inequalities. Evidence shows those with lower levels of education are more likely to die at a younger age with poorer health throughout compared to those with more education. The Institute of Public Health in Ireland finds that people with more education are more likely to be physically active, maintain a healthier diet, practice safer sex, have a greater knowledge of treatment regimens, and can influence child and family health related behaviors.[10] While researchers continue trying to make the relationship between schooling and economic growth clearer and more concrete, the explanation supporting how education impacts health and living standards remains more understandable. The

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[10] Higgins, Claire, Teresa Lavin, and Owen Metcalfe. "Health Impacts of Education, A Review", Institute of Public Health in Ireland, November 2008, pp. 8-10.

complexity surrounding the analysis of education's impact on economic growth makes district-level economic impact reports all the more urgent.

Why This Work Matters

As shown here, it is extremely challenging to quantify economic growth based on educational impacts. The costs, or inputs, are easy to measure while the outputs, such as test scores, social benefits, economic effects, etc. are more difficult to measure. In addition, a number of indirect effects have emerged in the education impact literature. Beyond cognitive test scores, researchers must consider parent's education levels, peer effects, community environment, outside learning opportunities, and many other significant factors. By narrowing the study to a specific district, we are attempting to capture the value added by the Orange County Public School system.

Researchers previously have looked at the impacts of educational attainment and cognitive ability on income or the impacts of educational attainment and cognitive ability on a country's GDP. We want to expand the scope of previous research by specifically looking at how Orange County's education system impacts its citizens' lifetime incomes, college performance and attendance, its development of social capital, the real estate market, and vocational, technical, and community programs.

Figure 2 shows the outline of the report. Economic impact of Orange County Schools is measured in five ways. First is the impact on county income and employment of spending from Orange County School's operating and capital budgets. Second is the economic value of attaining a high school degree, measured by the associated increase in

lifetime income as well as the positive impact on the college performance.   Third is the likely reduction in public sector costs associated with graduation from high school. Fourth is the impact of Orange County Schools on the local wealth – primarily real estate wealth.   Last is the contribution Orange County Schools makes to the community, in areas such as volunteering, nutrition education, and sexual education.   Separate sections of the report present the results for each of these impacts of Orange County Schools.

Before these impacts are discussed and analyzed, a profile of Orange County is presented in the next section.

Figure 2. Economic Impacts of Orange County Schools

ORANGE COUNTY SCHOOLS

→ SPENDING IMPACT IN LOCAL ECONOMY

→ ECONOMIC VALUE OF DEGREES AWARDED

→ FUTURE REDUCTION IN PUBLIC COSTS

→ ECONOMIC IMPACT ON LOCAL WEALTH

→ COMMUNITY IMPACT
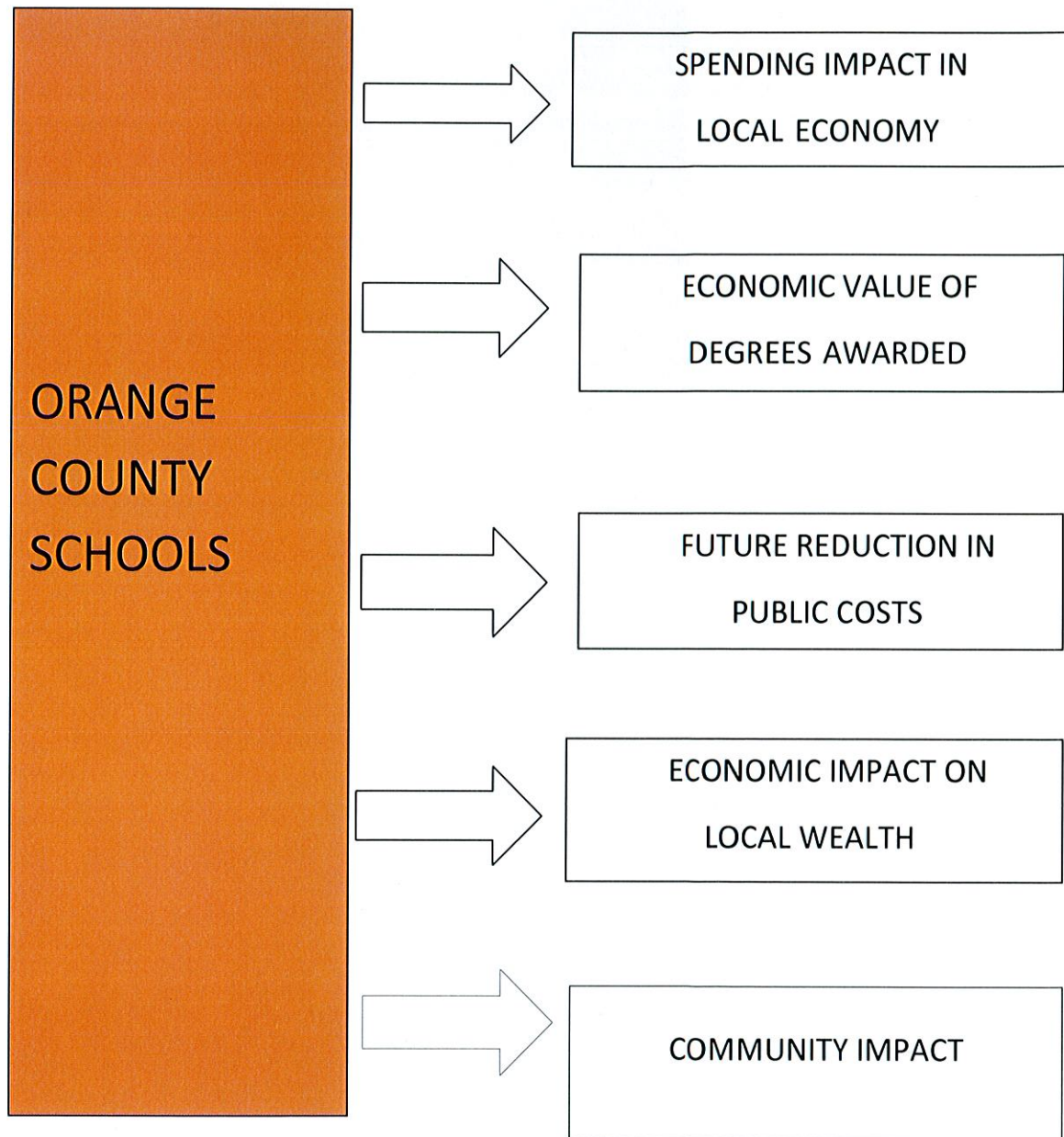
CHARACTERISTICS OF ORANGE COUNTY

Orange County is located in the Central Piedmont region of North Carolina, between the Research Triangle Park and the Triad.[11] In 2010 the county gross regional product was $5.6 billion.[12] Figure 3 shows the location of the county in the state.

Figure 3. Orange County in North Carolina.
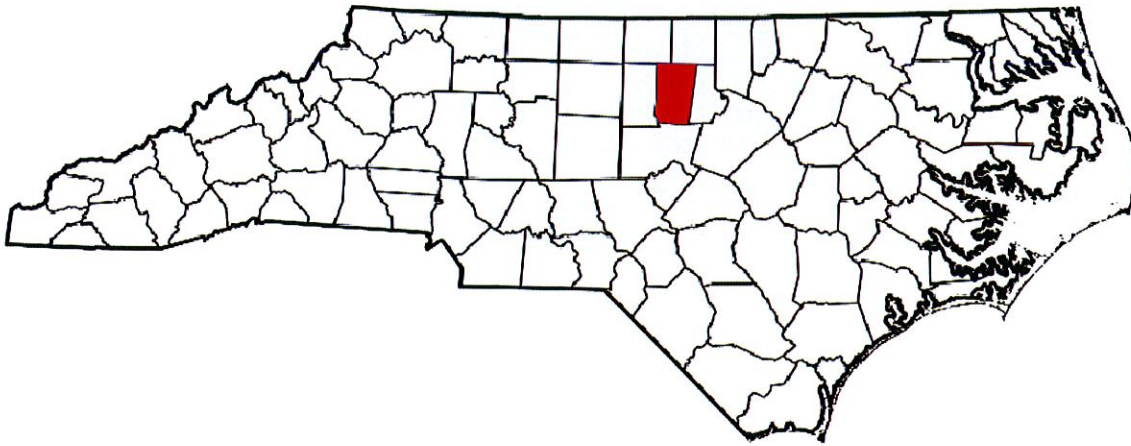
Like the nation, Orange County has experienced dramatic changes in its labor market in recent years. The unemployment rate almost doubled in Orange County from 3.4% in April 2008 to 7.2% in May 2009. The rate then hovered around 7.0% until February 2012, when it started to steadily decline. Orange County performed better than

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[11] NC Department of Commerce, EDIS, ERSI, ESC, Chapel Hill/Orange County Convention and Visitors Bureau, US Census. USDA

[12] *Implan for North Carolina*, Mig., Inc.

Table 1. Economic Structure of Orange County, 2013.
(Percent of Total Employment by Sector)

Sector	Orange County, N.C.	United States
Manufacturing	2.0	8.7
Trade, Transportation, Utilities	6.4	19.9
Information	0.1	2.1
Financial Services	1.7	5.9
Construction	1.9	4.9
Professional and Business Services	9.0	12.6
Education and Health Services	55.1	15.1
Leisure and Hospitality	3.2	9.7
Other Services	2.1	4.1
Federal Government	0.3	2.3
State and Local Government	18.2	14.7

Source: N.C. Dept. of Commerce, EDIS, ERSI, EESC, Chapel Hill/Orange County Convention and Visitors Bureau, U.S. Census, USDA.

the United States, which over that same time period had an unemployment rate spike at 9.4%. More recently, the July 2013 unemployment rate in Orange County was 6.2%, while the United States reported a rate of 7.4%.

A major reason why Orange County has had less fluctuation in its labor market is the county's economic structure. Table 1 compares the county's employment profile by industry to that of the nation. The county has relatively fewer construction workers than the nation.

Construction is a volatile industry, dependent upon several other infrastructures and industries expanding—more specifically, residential and commercial industries. Furthermore, Orange County has far fewer manufacturing jobs, which can be adversely affected by an economic downturn. Buyers can postpone purchases for manufactured goods, when the capital to purchase products is not as easily accessible or available.

Other industries hit particularly hard during an economic downturn are leisure and hospitality jobs, which occurs when consumers have less funds on hand and the opportunity cost to vacation or invest in hobbies is greater than other more essential investments and goods.

Orange County has far more health services and education sector jobs. In fact, employment in areas of education and health services account for more than half the jobs in Orange County. While the education sector has experienced furloughs and salary freezes within the past few years, the population within Orange County has been growing at a rapid rate, and teachers are still needed as the county grows. The health industry has experienced massive growth and stability. With the aging population as well as the influx of new residents within the county, there is more need for health services to be provided. These two industries have helped insulate Orange County from the unemployment rate the rest of the country has faced.

Table 2 compares key socioeconomic and demographic information between Orange County and the nation. Median earnings for Orange County are just under double the national average. The number of individuals with at least a bachelor's degree is also

far above the national average, which greatly contributes to the job opportunities for residents and the relatively low unemployment rate. Furthermore, Orange County is fairly young, compared to the national average. Lastly, the growth rate of Orange County has outpaced the rest of the nation, which contributes to potential job opportunities in the county, particularly in those sectors having a strong local presence.

Table 2. Key Socioeconomic and Demographic Data of Orange County, 2012.

Factor	Orange County	United States
Population	138,550	313,900,000
Median Earnings	48,683	26, 264
% of population aged 65 and over	8.4	13.7
% of persons aged 25 and over with a high school degree	89.8	87.65
% of persons aged 25 and over with a bachelor's degree	53.9	28.5
Population growth rate, 2000-2010 (%)	13.7	9.9

Source: U.S. Census Bureau.

SPENDING AND EMPLOYMENT IMPACTS OF ORANGE PUBLIC SCHOOLS

The section addresses the spending and employment impacts of Orange County Schools [OCS]. Three types of economic impact are covered: direct, indirect, and induced.

The direct effect occurs when OCS pays employees directly, or hires businesses directly to contract with OCS. The indirect impact occurs when spending or employment happens from the expenditures of OCS. For example, a firm that produces school supplies will spend more money buying paper to make notebooks. The additional business that the school system brings to the firm results in increased spending from that firm on supplies, and possibly increased employment as the firm may add jobs to keep up with the demand from OCS. The induced economic impact results from increased spending from those who are paid directly by OCS [the direct effect] and those who are paid indirectly by OCS [the indirect effect]. These employees then make expenditures in the local economy on a variety of items, such as shelter, food, clothing, etc. This spending grows the Orange County economy.

All spending by OCS does not remain in Orange County. "Leakage" occurs when expenditures by Orange County Schools, their suppliers, or workers are spent outside of Orange County. Taxes or fees paid to the federal and state governments, or purchases on a good or service from a firm located outside of Orange County are examples. The "leakage rate" is accounted for in the multipliers used to calculate the economic impact of spending and employment in Orange County. The multipliers are

from the economic development model IMPLAN (impact planning) for Orange County.[13]

This section will first develop the annual spending and employment impacts of the OCS operating budget. Then, the annual spending and employment impacts of the OCS capital budget are presented.

Economic Impact of the OCS Operating Budget

The calculations for this report use the operating budget expenditures for OCS from the past five fiscal years (2008/2009-2012/2013). Over this time period OCS spent an average annual amount of $68 million.

Table 1 shows the direct, indirect, and induced effect of total spending and employment by Orange County Schools. Again, the multipliers account for any "leakage".

The direct effect of spending by OCS is $51 million. This leads to an indirect effect of $10 million, and an induced effect of $17 million. The total spending effect of the OCS operating budget is $78 million. The direct effect of employment from the OCS operating budget is 991 jobs. This leads to an indirect and induced effect of 79 and 178 jobs respectively. The total employment impact of the OCS operating budget is 1,248 jobs.

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[13] IMPLAN (Mig, Inc.) is the most widely used economic development software in the country.

Table 3. Economic Impact of Orange County Schools Operating Budget.

Impact	Spending	Employment
Direct Effect	$51 million	991
Indirect Effect	$10 million	79
Induced Effect	$17 million	178
Total Effect	$78 million	1,248

Source: OCS and IMPLAN.

Table 3 shows that, on average, for every 1 dollar spent by the Orange County Schools, there is a total spending of $1.15 of spending added to the county. Also, for every 1 job created by Orange County Schools, another 0.26 jobs are created in Orange County.[14]

Table 4 shows the impact of the OCS operating budget on different economic sectors. The top sectors affected by OCS spending are professional services, real estate, trade, and transportation.

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[14] $78 million/$68 million equals 1.15, and 1248/991 equals 1.26.

Table 4. Economic Impact of Orange County Schools Operating Budget by Economic Sector.[*]

Sector	Spending	Employment
Agriculture	$0.1 mil.	0.2
Natural Resources	$0.1 mil.	0.2
Public Utilities	$1.5 mil.	1.1
Construction	$0.9 mil.	3.0
Manufacturing	$1.0 mil.	2.4
Trade	$5.0 mil.	28.5
Transportation	$7.7 mil.	20.3
Communications	$4.6 mil.	7.2
Financial Services	$4.7 mil.	12.2
Real Estate	$18.0 mil.	21.7
Professional Services	$19.0 mil.	96.6
Health Care	$2.8 mil.	11.7
Leisure/hospitality	$3.9 mil.	21.8
Personal Services	$0.5 mil.	2.1
State/Local Government	$4.9 mil.	21.2
Federal Government	$1.1 mil.	3.3
Total	$76 mil.	253.4

*Employment numbers omit the direct employment of OCS

Source: OCS and IMPLAN.

Impact of the OCS Capital Budget

OCS also makes capital expenditures. The average capital spending during the past five fiscal years (2008/2009-2012/2013) is approximately $4 million. Again, as with the calculations for the operating budget, the multipliers used to calculate the economic impact of spending and employment for the capital budget account for any "leakage" that might result.

Table 5. Economic Impact of Orange County Schools Capital Budget.

Impact	Spending	Employment
Direct Effect	$1.0 mil.	7.1
Indirect Effect	$1.0 mil.	5.5
Induced Effect	$0.8 mil.	4.9
Total Effect	$2.8 mil.	17.5

Source: OCS and IMPLAN.

Table 5 shows the total impact of spending and employment in Orange County, calculated from the capital budget. The total impact is modest, at $3 million and 17.5 jobs. From this table it can be concluded that every $1 million of capital spending by OCS is associated with approximately 4.4 jobs.

Table 6 shows how the economic impacts of the OCS capital budget are distributed among economic sectors in the county. Construction is the sector most affected, followed by professional service, health care, and personal services.

Table 6.   Economic Impact of Orange County Schools Capital Budget by Economic Sector.

Sector	Spending	Employment
Agriculture	$0.0 mil.	0.0
Natural Resources	$0.0 mil.	0.0
Public Utilities	$0.0 mil.	0.0
Construction	$1.6 mil.	13.2
Manufacturing	$0.1 mil.	0.2
Trade	$0.1 mil.	1.2
Transportation	$0.1 mil.	0.2
Communications	$0.1 mil.	0.1
Financial Services	$0.1 mil.	0.3
Real Estate	$0.2 mil.	0.5
Professional Services	$0.2 mil.	0.7
Health Care	$0.1 mil.	0.6
Leisure/hospitality	$0.1 mil.	0.2
Personal Services	$0.1 mil.	0.3
State/Local Government	$0.0 mil.	0.0
Federal Government	$0.0 mil.	0.0
Total	$2.8 mil.	17.5

Source: OCS and IMPLAN.

DEVELOPMENT OF HUMAN CAPITAL: VALUE OF A HIGH SCHOOL DEGREE

Education, like many industries, has been described in terms of an input-output relationship called an *education production function*.[15] Education production functions relate the various inputs of a student's learning (such as classroom resources, teacher quality, or school size) to measured outputs (such as graduation from high school, income, or standardized achievement test scores). As with other production processes, consumers value the product at the end rather than the individual inputs.

Up to this point, the analysis of Orange County Public Schools (OCS) has focused on inputs—the pieces that go into educating each student. However, most evaluations of schools focus on the output. The focus of this section is to measure the economic impact of OCS by measuring the output, or gain in human capital, of the students in OCS from their degree.

Scholars refer to the value added from education as "human capital." Human capital refers to the knowledge and skills people gain in order to perform labor which produces economic value to themselves and society. Traditionally, individuals with more human capital earn more, can attain better jobs, and are better able to contribute to society. Students, families and communities thus place high value on developing human capital.

Focusing on outputs is consistent with current education policy. Following *No Child Left Behind*, every public school is evaluated according to student performance on year-end standardized tests. Schools use the data from these tests to analyze where students are relative to

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[15] Education Production Functions emerged in 1966 with the publication of the *Coleman Report*. Eric Hanushek and others have since done a great deal of research on the topic.

broader goals such as graduation and success in college or the workforce. It is reasonable to suggest, then, that the goals of K-12 school systems are related to the output goals.

The analysis presented here borrows from numerous studies of the output of universities and colleges.[16] In this method, the added financial value to a student for attaining a college degree is equal to the expected value of the increase in lifetime income. That is, the added benefit of a college degree is the difference between the expected income of a college graduate and the expected income of a high school graduate over the course of one's life. This is called the "income incremental". We can apply this same approach to K-12 public school systems such as Orange County Public Schools. Rather than using the difference between high school graduates' expected income and college graduates' expected income, we instead look at the income incremental from high school dropouts to high school graduates.[17]

However, limitations of this method should be recognized. One major problem is that there are substantial differences between those who drop out and those who graduate. That is, one cannot assume the differences in lifetime earnings are solely the result of OCS. Parent education, inherent talent, and family background have also been shown to influence lifetime earnings.

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[16] See, for example, Michael L. Walden, *Economic Benefits in North Carolina of The University of North Carolina Campuses*, November 2008; Michael L. Walden, *The Economic Impact of North Carolina State University*, August 2010; Robert Beam, Bria Fennessey, Roger Lederer, Grant McDonough, and Shawn Mjelde, *Economic Impact Study of the University of Wisconsin-Superior and the Local Economy*, May 2008; and The Perryman Group, *A Tale of Two States and One Million Jobs*, March 2007.

[17] For an example of an application to public schools, see Economic Modeling Specialists, Inc., *The Economic Impact of Communities in Schools*, May 2012.

A related limitation is the assumption that OCS is solely responsible for all of the training and resulting human capital. Many students receive additional academic support at home, at after school programs, or through other activities. Further, some students transfer into OCS late in their academic careers making their added or lost income only partially due to OCS's training. However, some students also leave OCS and OCS does not "get credit" for these students either. Thus, the claim the OCS is solely responsible for the increased income output is problematic. A large amount of data processing of student records would have been necessary to sort these factors. However, this amount of processing is beyond the scope of this project.

With these cautions in mind, we can proceed estimating the value of the additional human capital created by OCS. In order to estimate the value of the additional human capital created by OCS, it is assumed an average work-life lasts 47 years (from age 18 to 65). The 2010 Census reveals that the income increment or difference between annual earnings of a high school dropout and high school graduate is $8,196.[18] The first step in calculating the added value of OCS is to multiply the added increment by the 47 years of work to find the lifetime earnings. However, $8,196 today is not of equal value in 47 years. Thus the present value of the income increment for each year in the future must be calculated. To accomplish this an appropriate real (inflation-adjusted) long term interest rate is used as the "discount rate" to reduce the levels of future dollars so that they are comparable to present value terms. The real long-term rate used is 3%.[19]

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[18] The annual earnings increment is specifically for Orange County (U.S. Census, *American Community Survey*). It is slightly higher than the $8000 annual increment for the nation. The annual increment ($8196) – in inflation-adjusted dollars – is assumed to be maintained throughout the graduate's work career.

[19] Girola, James. "The Long-Term Real Interest Rate for Social Security", U.S. Department of the Treasury, Research Paper No. 2005-02 (March 30, 2005).

Table 7 shows the results of the calculations for each of the past five OCS graduating classes. The value of the additional human capital generated by OCS ranges from $91 million to $107 million depending on the number of graduates.

Table 7. Present Value (2013$) of Estimated Increment to Lifetime Income

Year	Number of Graduates	Value
2013	520	$ 106.7 million
2012	446	$ 91.5 million
2011	465	$ 95.4 million
2010	477	$ 97.8 million
2009	465	$ 95.4 million

Source: OCS; calculations by author

DEVELOPMENT OF HUMAN CAPITAL: IMPACT ON ATTAINMENT OF A COLLEGE DEGREE

The key intended "output" of a school system involves the learning and skill acquisition of the students themselves. Human capital is defined by the OECD as "productive wealth embodied in labor, skills, and knowledge."[20] This acquired knowledge and these acquired skill sets, or "human capital," yield economic benefits to those students (and others) throughout those students' lives. A significant output of OCS is the human capital developed through a student's education, as applied in their later productive lives.

While the economic impact of holding a high school degree was analyzed in the previous section, there is a further economic impact from successfully completing a college degree. Holding a college degree provides a significant economic advantage over holding only a high school degree. According to a recent analysis of census data conducted by the Pew Research Center, "college graduates on average earn nearly $650,000 more than high school graduates" over the course of their lifetime.[21] It should be noted that it can be difficult and is rarely definitive when one attempts to isolate the value added by education from students' natural capabilities and other characteristics. Recognizing this limitation, this section provides estimates of OCS's impact on human capital due to increased chances of success in college.

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[20] OECD. (2001). *OECD, Glossary of Statistical Terms.* Retrieved September 2013, from http://stats.oecd.org/glossary/detail.asp?ID=1264.

[21] Pew Research Center. (2011, May 16). "Is College Worth It? College Presidents, Public Assess Value, Quality and Mission of Higher Education".

Research suggests that due to the relationship between high school performance and college performance, part of the economic advantage stemming from holding a college degree can be attributed to the high school. This benefit derives from the increased chances of successfully obtaining a college degree that result from improved high school performance.

A 2007 study by Geiser and Santelice found a very strong relationship between students' improved high school performance (measured by GPA) and their successfully completing college education.[22] In his economic analysis, researcher Michael Walden asserts that high schools who "do a better job of training their students can 'claim' some of the additional lifetime income earned by their college graduates."[23] Thus, a significant portion of the economic benefits from completing college education can be attributed to those individuals' high school performance.

Approximately 82% of OCS graduates in the class of 2013 planned to attend college.[24] In Orange County, those individuals holding college degrees have significantly higher incomes than those holding only high school degrees. The median income for those holding a high school degree is $25,000, while the weighted median income for those holding an associate's or bachelor's degrees is $38,000.[25] This is an annual income increment to completing college (versus only high school) of an additional $13,000.

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[22] Geiser, S. and M. Santelices. (2007, June). "Validity of High-School Grades in Predicting Student Success Beyond the Freshman Year: High School Record vs. Standardized Tests as Indicators of Four-Year College Outcomes" *Center of Studies in Higher Education* .
[23] Walden, M. (2012). *"The Economic Impact of Loudoun County Public Schools"*. Walden Economic Consulting.
[24] Data provided by OCS.
[25] U.S. Census, American Community Survey, 2012

To calculate the economic impact for OCS in terms of increased chances of completing a college degree, the findings from the Geiser and Santelice study were applied by using the annual change in GPA of graduating OCS seniors (from one class to the next) as an indicator of improved high school performance. The $13,000 income increment was applied over the expected work lifetime of OCS graduates, assuming this increment remains constant over that time period. The expected work lifetime assumes individuals will work from ages 22-65, or for 43 years. The analysis was done for the aggregate number of OCS graduates in the past three graduating classes.

The Net Present Value, or NPV, of the future earnings was calculated. Taking the NPV involves discounting what future income is worth to individuals from today's perspective, with the purchasing power of a dollar decreasing over time. To calculate this value, future incomes were discounted using a 3% real interest rate.

The findings indicate that for the past three graduating classes, there is almost a $500,000 positive economic impact from the relationship between high school improvement in OCS schools and obtaining a college degree.[26] While there were some negative changes in GPA from one graduating year to the next, the net economic impact is positive.

DEVELOPMENT OF SOCIAL CAPITAL

Social capital is the multidimensional impact of characteristics and behaviors of individuals on a society. Although there is no single agreed upon definition of social capital,

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[26] Details of the calculations are in Appendix A.

there exists some quantifiable measurements that can provide insight into a society's socioeconomic status based on spillover effects from its individuals. These spillover effects can be both positive and negative. In contrast to human capital, which rewards individuals for skills and training at the individual level, social capital relates the collective benefits and costs of each person's characteristic and activity on a macro level.

For example, education is correlated with social capital development. Studies have shown that attainment of higher levels of education have the propensity to positively impact civic engagement such as voter turnout, productivity, and well-being.[27] Education has the ability to alter behavior. An individual without education is less likely to exercise his or her voting rights. Furthermore, extensive research on education, crime, and income indicate an individual with low educational attainment has a higher likelihood of engaging in delinquent activity and accumulating lower earnings over time. Those with more education tend to have better health outcomes, thus putting less strain on public welfare assistance program. Investments in education produce positive net returns on both the individual and society, thereby increasing human and social capital. In other words, investing in education can reduce public costs, especially in safety and Medicaid expenditures.

In addition to contributions to the development of social capital, certain factors such as networks or communities working counter to society's best interest exist. The World Bank gives drug cartels and corruption rackets as examples of social capital that can negatively impact a society's socioeconomic landscape.

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[27] For a review of the literature, see The College Board, 2005, *Education Pays*. Trends in Higher Education Series; and Levin, Henry, Clive Belfield, Peter Muenning, and Cecelia Rouse, *The Costs and Benefits of an Excellent Education for All of America's Children*, Columbia University, January 2007.

A study examining the effects of educational attainment on crime found that for every additional high school graduate, spending on crime reduced by $1,875.34 per year.[28] This annual amount was then converted to annual lifetime savings for a period of 47 years (assuming that each 18 year old high school graduate lives to the age of 65), using a 3.0% real discount rate. The annual lifetime savings per high school graduate is $46,929.82.[29] Table 8 shows the annual savings for all OCS graduates for each of the last five years, which were found by multiplying the number of OCS graduates each year by the annual lifetime savings per graduate. Table 8 shows annual crime cost savings that range from $19.9 million to $23.8 million dollars.

Public health care cost savings were calculated based on a study that examined lifetime reductions in Medicaid and uninsured medical coverage costs.[30] Based on calculations from this study, public healthcare cost savings increase by $14,795.44 for each student that graduates from high school. Table 8 shows public healthcare cost savings for OCS for each of the past 5 years, which ranges from $6.3 million to $7.5 million.

Table 8 also provides an estimate for cost savings per graduate for Temporary Aid to Needy Families (TANF). Research on the public benefit of education suggests that each high school graduate creates lifetime savings of $4,303.82.[31] When these savings are applied to OCS graduates, TANF savings range from $1.8 million to $2.2 million.

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[28] Lochner,Lance, and Enrico Moretti, "The Effect of Education on Crime: Evidence from Prison Inmates, Arrests, and Self Reports, " UCLA and the University of Western Ontario, October 2003. The authors' monetary results have been updated to 2013 dollars using the Consumer Price Index. The authors' lower range of findings is used.

[29] See Appendix B for details on the calculations.

[30] Alliance for Excellent Education, *Healthier and Wealthier: Decreasing Health Care Costs by Increasing Educational Attainment"*. Issue Brief, November 2006. The result is specifically for North Carolina and has been updated to current (2013) dollars and interest rates.

[31] Levin, Henry, Clive Belfield, Peter Muenning, and Cecelia Rouse, *The Costs and Benefits of an Excellent Education for All of America's Children*, Columbia University, January 2007, Table 11. Dollar amounts have been updated to 2013 values and current discount rates.

Lastly, Table 8 provides totals for lifetime savings associated with OCS graduates for each of the last five years. Total savings range from $28.0 million to $33.5 million.

Table 8. Present Value (2013 $) of Estimated Saved Public Social Costs.

Source: Appendix B.

Year	Number of Graduates	Crime Cost Savings ($ millions)	Public Health Care Cost Savings ($ millions)	Welfare Cost Savings ($ millions)	Total Savings ($ millions)
2013	447	$21.0	$6.6	$1.9	$29.5
2012	508	$23.8	$7.5	$2.2	$33.5
2011	425	$19.9	$6.3	$1.8	$28.0
2010	458	$21.5	$6.8	$2.0	$30.3
2009	468	$22.0	$6.9	$2.0	$30.9

IMPACT ON LOCAL WEALTH

Research suggests that homeowners consider school performance and school quality when making the decision to buy a home. While the relative importance consumers place on

school systems when making their choices is debated, most researchers agree that school systems are a factor in the decision making process (Bogart and Cromwell, Weimer and Wolkoff, Hendon).[32]

The federal *No Child Left Behind Act of 2001* requires states to report student test results at each school and penalize schools that are not meeting standards. This has, in effect, made it easier for home buyers to have a clearer picture of what the performance of schools look in the neighborhoods they are considering for a home purchase. Because perspective homebuyers now have greater access to school quality measures, county governments have more incentive to improve their school systems and, thereby, to increase housing values. Though it has been noted by researchers that school test scores are imprecise measures of school performance, this report assumes that the information passed to potential homebuyers through report cards are what influences their decision-making (Kane and Staige).[33]

In North Carolina, schools are issued report cards at the end of each school year detailing student performance and student demographic information. These report cards show how students have performed on English and math exams for each grade level. Florida implemented a similar report card system in 1999, the difference being that North Carolina shows how a school performs in relation to the state and county averages instead of assigning an actual letter grade. Figlio and Lucus conducted a study in Florida during this time to see what the effect of the report

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[32] Bogart, William and Brian Cromwell. "How Much is a Good School District Worth?" *National Tax Journal* (1997): 215-232; Weimer, D. and M. Wolkoff. "School Performance and Housing Values: Using Non-Contiguous District and Incorporation Boundaries to Identify School Effects." *National Tax Journal* (2001): 231-253. Journal; Hendon, William. "Property Values, Schools and Park-School Combinations." *Land Economics* (1973): 216-218.

[33] Kane, Thomas J and Douglas Staige. Improving School Accountability Measures. Working Paper. Cambridge, MA: National Bureau of Economic Research, 2002.

card system had on housing values.[34] They found the grade reports had a significant effect on housing values a year or so after the reports were released, impacting housing values by roughly 10 percent for each letter grade.

To estimate the significance of K-12 public education to the Orange County housing market, the model developed by Figlio and Lucas is applied. Their model uses multivariate regression analysis with common controls to measure the effect of school report cards on homebuyer trends around school areas. The model also controls for housing types, size and housing distances from schools. It should be noted however, that some researchers have disputed Figlio and Lucas' findings, suggesting that the impact of local public schools on the home purchase decision is small (Kane and Staige).[35]

Since North Carolina does not use a traditional A-F grading system on their report cards, the differences in the combined means of both English and Math End-of-Grade (EOG) scores are utilized to assign a letter grade to each school based on the range of their means in relation to the state average. The lowest performing school and the highest performing school along with the state average were used to determine the range in 15 point increments. The grading system is shown in Table 9.

Table 9. Grading System for North Carolina Public Schools.

Grade	Score
A=100-93%	190-177
B=92-85%	176-162
C=84-77%	161-146

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[34] Figlio, David and Maurice Lucas. What's in a Grade? School Report Cards and Housing Prices. Working Paper. Cambridge, MA: National Bureau of Economic Research, 2002.

[35] Kane and Staige, *op. cit.*

D=76-69%	145-131
F=/>68%	>130

The housing prices in Figlio and Lucas' findings are influenced by the average housing prices within a school district. The average housing prices for each home based on its proximity from each school are not available for Orange County. However, grouping the schools together by zip code gives the average housing price is for each zip code in Orange County as in Table 10.

Table 10. Estimated Average House Price by Zip Code in Orange County.

Zip Codes	Average Housing Price
27514	$586,598
27278	$414,064
27243	$266,795
District	$169,000
State	$134,900

Figure 4 is a geographical heat map showing where the zip code locations of the five elementary schools and their average housing price, with dark green areas being the most expensive and red being the least expensive (the progression is dark green, light green, yellow,

dark yellow, orange, and red, with green as zip code 27243, yellow as zip code 27278, and

orange/red as zip code 27514).

Figure 4. Average House Price by Location in Orange County.
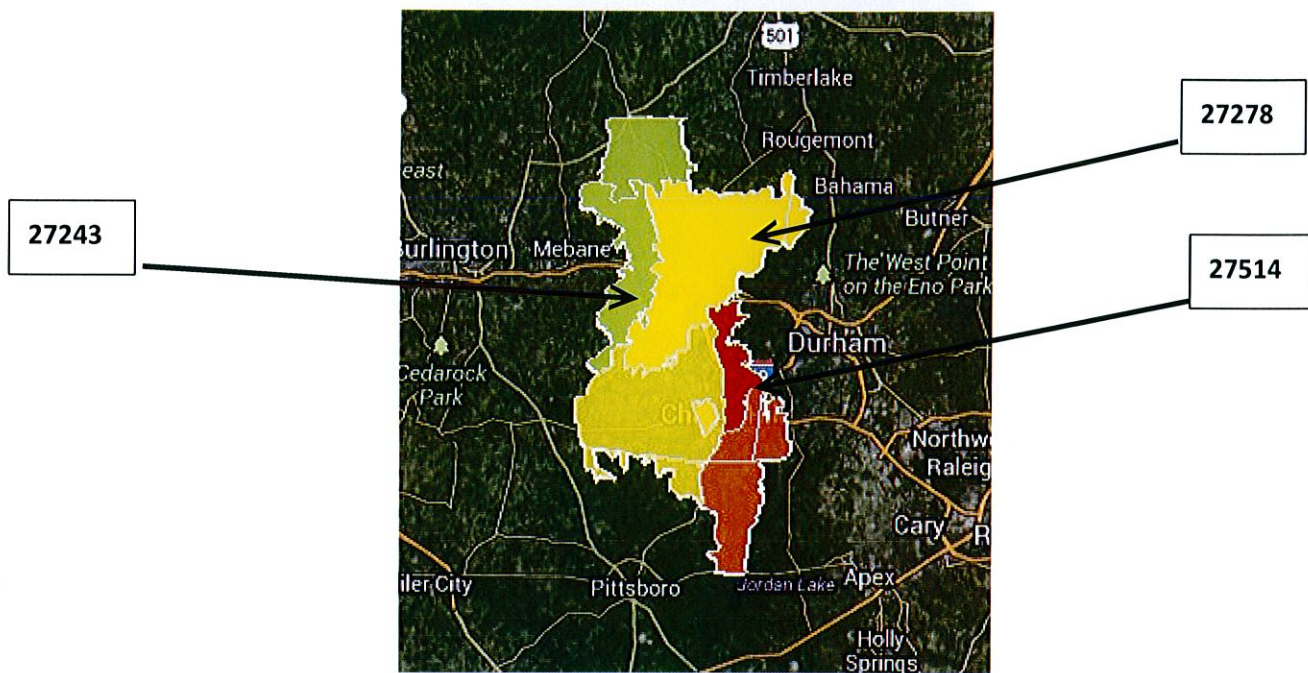
Source: Appendix C.

Appendix C summarizes how each school in Orange County compares with respect to

their combined EOG Score and the average housing price in their zip code. The table shows how

North Carolina categorizes each school by their growth status and their designation. Most of

Orange County's schools are higher than the state average in their composite EOG scores as well

as scores for the district on a whole.

Using Figlio and Lucas' model, it can be assessed how schools may influence housing market values by adding a 10 percent increase for each higher performance category. For example if a school with a B rating in zip code 27243 would improve to an A rating, the average house value in the zip code would increase by $26,000. Comparing the superior academic performance of Orange County Schools to the state performance average, it is estimated this better performance accounts for $322 million of the residential property values in the county and $2.8 million in property tax revenue, as compared to values if OCS performance was the same as the state average.[36]

COMMUNITY IMPACT OF ORANGE COUNTY SCHOOLS

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[36] The Orange County School District Combined EOG score is 6 points higher than the state average (Appendix C), which translates to approximately 0.4 letter grade higher. Multiplying 0.4 by $26,000 and then by the number of owner occupied housing units in Orange County (30,930 in 2010, from the North Carolina State Data Center) gives $322 million. Multiplying $322 million by the county property tax rate of $0.858 per $100 gives $2.8 million in property tax revenues. If renter occupied units are included, the results are $451 million in residential property value and $3.9 million in property tax revenues. Total real property values in Orange County in 2010 were approximately $14 billion (North Carolina State Data Center).

Some effects of Orange County Schools are not easily categorized, but important nonetheless. Nutrition and sexual education modules have important public health and other economic benefits. Moreover, the value of OCS extends beyond just services provided directly, as students and graduates are more likely to volunteer in the community.

Volunteering

Education is the best predictor of volunteer rates according to numerous surveys.[37] Education "heightens awareness of problems, increases empathy, and builds self-confidence," all of which increase one's propensity to volunteer.[38]

High school graduates are more than twice as likely – about 127% more likely – to volunteer than high school dropouts.[39] On average, a high school graduate will produce an estimated 25 more volunteer hours per year than a dropout. *Independent Sector* estimates that the value of a volunteer hour in North Carolina is $19.22.[40] This means that each graduate produces, on average, about $481 more value in volunteer hours than a high school dropout would. On average over the last four years, OCS has produced 460 high school graduates per year.[41] This means that each cohort of OCS graduates over the last four years has produced an

[37] Smith, David Horton. "Determinants of Voluntary Association Participation and Volunteering: A Literature Review." *Nonprofit and Voluntary Sector Quarterly*:243 (1994), pp. 243-263. Pg. 248

[38] Wilson, John. "Volunteering." *Annual Review of Sociology.* 26 (2000), pp. 215-240. Pg. 219.

[39] Hayghe, Howard V. "Volunteers in the U.S.: Who Donates the Time?" *Monthly Labor Review* 17(1991), pp. 17-23.. Author's calculations based on Table 1, pg. 18. See Appendix XX for calculations regarding graduate volunteer rates.

[40] "Independent Sector's Value of Volunteer Time." Accessed September 30, 2013. http://www.independentsector.org/volunteer_time

[41] Author's calculations based on 4-Year Cohort Graduation Rates available at http://www.dpi.state.nc.us/accountability/reporting/cohortgradrate

[42] See Appendix D.

average value of about $221,000 every year. [42] In total, the last four Orange County graduate cohorts produce an estimated $884,000 of value in volunteer-hours every year.

The education-volunteering relationship begins in high school, where students with higher grade point averages (GPAs) are more likely to volunteer than students with lower GPAs.[43] Students are also more likely to volunteer as they age, and GPA can be used as a rough proxy for value-added by the school district. Sundeen and Raskoff estimate that each letter grade increase in GPA boosts volunteer rates by 0.083 hours per month, or one hour per year. Thus, an A student would be expected to volunteer about four hours more per month than a failing student (with other factors such as socioeconomic status and religion also affecting volunteer rates). Although this boost is not large on the individual level, collectively over the past four years, each class of OCS seniors has produced an estimated 1,192 volunteer-hours on average that are directly associated with GPA (again, with other factors such as age, religion and socio-economic status also boosting volunteer rates).[44] While GPA data for non-seniors is unavailable, if it is assumed that GPAs are fairly constant over the course of high school, the cohort average can simply be multiplied by four to get an estimate that applies to all current high school students. Doing so leads to an estimate of 4,768 volunteer-hours produced by OCS students each year directly associated with GPA. Applying an earlier value of a volunteer-hour of $19.22 means that $95,007 of value in volunteer hours can be directly attributed to GPA increases. Even if the value of a volunteer-hour is halved (on the assumption that high school volunteer hours are less productive than post-graduation volunteer hours), the value produced each year by OCS high-school students is $47,504.

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[43] Sundeen, Richard A., and Sally A. Raskoff. "Volunteering Among Teenagers in the United States." *Nonprofit and Voluntary Sector Quarterly.* 23:383 (1994), pp. 383403. Pg. 393
[44] Author's calculations based on Sundeen and Raskoff (1994) and data provided by Orange County Public Schools. Weighted GPAs were used to calculate the boost to volunteer rates.

Together, Orange County students and the last four cohorts of graduates produce an estimated $951,500 of value in volunteer hours every year.

Nutrition Education

Nutrition education is a small part of the overall education curriculum that students receive when enrolled in public school. However, the returns on investment are substantial as proper nutrition and health education at an early age can prevent health costs later in life. A basic understanding of nutrition administered throughout the school system can go a long way towards ensuring healthy and productive citizens.

According to a study conducted by Iowa State University's Center for Agricultural and Rural Development, USDA's Expanded Food and Nutrition Education Program (EFNEP) returns benefits of $10.75 for every $1.00 spent in program costs, mostly in the form of long-term health cost reductions.[45] Another study of the effects of EFNEP on neighboring state Virginia shows benefit-cost ratio of $10.64 for every $1.00 spent in program costs.[46] Due to the more similar populations and more conservative nature of the estimate, the Virginia benefit-cost ratio is used in the present study.

According to the 2012-2013 budget, OCS spent a relatively modest $37,818 in nutrition education. This amount does not account for money spent by the state or the federal government on nutrition. However, using the coefficient from the Virginia study, this amount still yields

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[45] http://www.card.iastate.edu/iowa_ag_review/spring_01/usda.aspx

[46] Lambur et al, "Applying Cost Benefit nalysis to Nutrition Education Programs: Focus on the Virginia Expanded Food and Nutrition Education Program," 2009. Available at http://pubs.ext.vt.edu/490/490-403/490-403.html#L6

benefits of $402,383.52. This is an approximation and does not account for differences between the Virginia population and the Orange County population.

Sexual Education

According to the Organization for Economic Co-operation and Development (OECD), teenage births, along with other factors, are an important indicator of future opportunities for women to pursue education and career prospects. Young mothers are more likely to drop out of school and work in low-paid jobs, with long-term consequences on family welfare.[47]

Fortunately, at 13.0 pregnancies per 1,000, Orange County's teen pregnancy rate is much lower than the state average of 43.8 pregnancies per 1,000.[48] In 2011, the entire county had only 90 teen pregnancies. According to a national survey conducted by Zelnick and Kim, teen girls who receive sex education that includes information about contraceptive uses and benefits are 36.67% less likely to become pregnant.[49] In North Carolina, it is estimated that a teen pregnancy has economic costs of $25,500 per pregnancy.[50]

Every student in Orange County is required to have sexual health education mandated by the state of North Carolina. Assuming the Zelnick study is accurate, Orange County would have had an additional 33 pregnancies in the absence of the sexual education program. Overall, the sexual education program offered by Orange County yields benefits of $841,500.[51] Again, this is

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[47] Organisation for Economic Co-operation and Development, Family Database. http://www.oecd.org/els/family/SF2.4_Births%20outside%20marriage%20and%20teenage%20births%20-%20updated% 20240212.pdf

[48] NC State Center for Health Statistics, 2011 pregnancy statistics available at http://www.schs.state.nc.us/schs/data/pregnancies/2011/preg1519.pdf

[49] Zelnick and Kim, "Sex Education and Its Association with Teenage Sexual Activity, Pregnancy and Contraceptive Use," 1982.

[50] The National Campaign to Prevent Teen and Unplanned Pregnancy Calculator available at http://www.thenationalcampaign.org/costs/calculator.asp

[51] Authors' calculations regarding cost savings from sexual education available in Appendix E.

an approximation and does not account for differences between the nation and the Orange County population.

APPENDIX A. IMPROVED HIGH SCHOOL PERFORMANCE AND COLLEGE EARNINGS

To calculate the economic impact, first were compiled the necessary parameters to calculate the value added by OCS to increased lifetime income from improved high school performance and the consequent greater chances of obtaining a college (bachelor's or associate's) degree.

For each of the past three graduating classes, the proportion of incremental income from a college degree that could be attributed to OCS was calculated by multiplying for each class the following:

- Change in GPA by Graduating Class = change in GPA from one graduating class compared to the previous graduating class from OCS, based on a four-point scale.[52]

- Incremental Lifetime Income from a College Degree (compared to holding a high school degree) = $13,000

- Portion of Incremental Lifetime Income from a College Degree that can be attributed to improved high school performance (as measured by GPA)= 0.34

- # of OCS Graduating Seniors in Each Graduating Class [53]

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[52] GPA information and number of graduates provided by OCS. Taken from NC Public School data at (http://www.ncpublicschools.org/graduate/statistics/) (North Carolina Public Schools)

- The Present Value Factor of lifetime income with a work lifetime of 43 years and a 3% annual real interest rate

According to Geiser and Santelice's 2007 study, the high school GPA is "consistently the strongest predictor of four-year college outcomes."[54] From their findings, for every one-point increase in GPA, a student's probability of obtaining a college degree increases by 34%. This relationship from this study is used to estimate the lifetime income increment of having a college degree that can be attributed to improved high school performance. Orange County provided the data for the GPA averages by graduating class, from which is calculated the change in GPA from one graduating class to the next graduating class. For two years of data, the change was a very small negative value.

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[53]. Taken from NC Public School data at (http://www.ncpublicschools.org/graduate/statistics/) (North Carolina Public Schools)

[54] Geiser and Santelice, *op. cit.*

To calculate the incremental income for a college (bachelor's or associate's) degree, data from the U.S. Census' American Community Survey were used, specifically the median income for Orange County in 2012 by educational level. The median income for those with a college degree, weighted by the proportion of college graduates with bachelor's and associate's degrees, was used (weighting the income differential by the proportion of holders of each type of degree). The median income

of those with a high school degree ($25,000) was subtracted from this weighted

median for college degree holders ($38,000) in order to obtain the lifetime income

increment for a college degree, $13,000. The earnings are reported in inflation-

adjusted dollars. This incremental income was multiplied by the number of graduates

from the past three graduating OCS graduating classes, by 0.82 to account for the

proportion of graduating seniors going to college, and then by 0.34 to conform to

Geiser and Santelice's finding.

As indicated above, it is then necessary to account for the reductions in

purchasing power for dollars in the future from the perspective of today. This involves

discounting future earnings, which is done using an interest rate. To calculate the Net

Present Value (NPV) of the earnings, the present value factor for each of the 43 years

of the work lifetime (assumed to be ages 22-65) was derived. The factor for each year

is as follows: the first year's present value factor was $1/(1+$interest rate, or 0.96), the

second year's factor was $1/(1+$interest rate^2, or 0.93), and so on. The factors are

summed to form the present value factor sum. A 3% real interest rate was used. The

sum of the present value factors over the 43 year work lifetime was 24. The economic

impact for this section were finalized by multiplying the factors found above for each

graduating class and summing the totals, giving a $543,424 total impact.[55]

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[55] GPA data for students planning to attend college were not available; therefore GPA data for all students was used.

APPENDIX B. CALCULATING THE IMPROVEMENTS IN SOCIAL CAPITAL.

Lochner and Moretti's annual estimate was calculated in 1993-valued dollars, so the first

step was to convert it to 2013 dollars. When using 2013-valued dollars, the annual reduction

estimate was $1875.34. To convert to a lifetime amount, the high school graduate's age (18) was

subtracted from the current retirement age (65 years) to derive a future period over which the

annual savings would be realized of 47 years.   The present value is calculated by using the

annuity factor associated with a 3.0% real interest rate and 47 year period, and then multiplying

by the annual amount of $1875.34. This results in a lifetime reduction in crime costs (in 2013 dollars) associated with each high school graduate of $46,929.82. Multiplying $46,929.82 by the number of annual OCS graduates gave the total savings reported in the third column of Table 8.

Savings from reduced public healthcare expenditures were calculated using a study by Alliance for Education Excellence. The cost reductions listed in this study were already expressed in terms of lifetime savings per graduate. The values were in 2005 dollars, however, so they were converted to 2013 dollars to give a lifetime value of $14,795.44. This lifetime value was multiplied by the number of OCS graduates for each of the last 5 years, giving the total savings reported in Table 8.

Lastly, reductions in TANF spending due to OCS graduates were found using research by Levin, et. al. The savings listed in this study were also already expressed in terms of lifetime savings per graduate. The values were converted to 2013 dollar values and applied to the number of OCS graduates for each of the last five years.

Appendix C. Orange County School EOG Scores 2011-2012

School Name	Zip Code	Average Median Housing Price	School Type	Assessed Grade	Designation	Growth Category	Combined EOG Score
Partnership Academy	27278	$ 414,064.00	Academy		School of Distinction	Expected Growth	N/A
Hillsborough Middle	27278	$ 414,064.00	Middle	A	School of Distinction	High Growth	178
Cameron Park Elementary	27278	$ 414,064.00	Elementary	B	School of Distinction	High Growth	174.7
Charles W Stanford	27278	$ 414,064.00	Middle	B	School of Distinction	Expected Growth	167.9
Grady Brown Elementary	27278	$ 414,064.00	Elementary	B	School of Distinction	High Growth	165.7
Pathways Elementary	27278	$ 414,064.00	Elementary	C	School of Distinction	Expected Growth	163.5
Al Stanback Middle	27278	$ 414,064.00	Middle	C	School of Distinction	Expected Growth	160.4
District	**District**	**$ 169,000.00**	**District**		**District**	**District**	**160**
State	**State**	**$ 134,900.00**	**State**		**State**	**State**	**154**
New Hope Elementary	27514	$ 586,598.00	Elementary	C	School Progress	High Growth	152.6
Gravelly Hill Middle	27243	$ 266,795.00	Middle	C	School of Progress	Expected Growth	151.6
Cedar Ridge High	27278	$ 414,064.00	High	C	No Recognition	Expected Growth Not Achieved	148.1
Orange High	27278	$ 414,064.00	High	D	School of Distinction	High Growth	144.1
Efland Cheeks Elementary	27243	$ 266,795.00	Elementary	D	No Recognition	Expected Growth Not Achieved	139
Central Elementary	27278	$ 414,064.00	Elementary	F	No Recognition	Expected Growth Not Achieved	126.4

Source: North Carolina Department of Public Instruction & Trulia Real Estate Estimates

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Appendix C (School Performance Measures)

School Performance on the ABCs

Each year, schools in North Carolina may receive several designations based on their performance on the state's ABCs tests. These designations are awarded on the basis of the percentage of students performing at grade level and on whether the school attained the ABCs growth standards. The designations are defined as follows:

- Honor School of Excellence: At least 90 percent of students' scores are at or above achievement Level III and the school makes or exceeds its expected growth goal. Additionally, the school has met all of its Annual Measurable Objectives (AMOs) targets.

- School of Excellence: At least 90 percent of students' scores are at or above achievement Level III and the school makes or exceeds its expected growth goal.

- School of Distinction: 80-89 percent of students' scores are at or above achievement Level III and school makes or exceeds its expected growth goal.

- School of Progress: 60-79 percent of students' scores are at or above achievement Level III and school makes or exceeds its expected growth goal.

- School Receiving No Recognition: School fails to reach its expected growth goals but has at least 60 percent of its students performing at or above achievement Level III.

- Priority School: School has less than 60 percent of its students' scores at or above achievement Level III, irrespective of making its expected growth status, and is not identified as a Low-Performing School.

- Low-Performing School: School fails to reach its expected growth goal and has significantly less than 50 percent of its students performing at or above achievement Level III.

- High Growth: School made expected growth & at least 60% of the students achieved their growth expectations.

APPENDIX D. HIGH SCHOOL GRADUATES AND VOLUNTEERING

Hayghe (1991) reports volunteer work habits based on the 1989 Current Population Survey. Hayghe provides the hours volunteered per week and weeks per year (Hayghe's Table 4, reproduced below as Table D1).

Table D1.	Usual hours per week and weeks worked in volunteer activity during the year ended May 1989, by sex		
Usual hours per week and weeks worked	Total	Men	Women
Total volunteers (percent)	100.0%	100.0%	100.0%
Hours			
Less than 5	60.0%	58.0%	61.5%
5 to 9	19.9%	20.9%	19.2%
10 to 19	10.8%	11.7%	10.0%
20 to 34	5.8%	5.7%	5.8%
35 hours or more	3.6%	3.7%	3.5%
Weeks			
Less than 5	20.2%	21.7%	19.1%
5 to 14	21.2%	22.4%	20.3%
15 to 26	14.4%	14.6%	14.2%
27 and over	44.2%	41.3%	46.4%
27 to 49	15.9%	12.9%	18.3%
50 to 52	28.3%	28.4%	28.2%

Using these figures, both the average number of hours worked per week and the average number of weeks worked per year per volunteer can be estimated (Table D2).

Table D2.											
Estimates Average Hours per Week and Weeks per Year											
Hours Per Week						**Weeks Per Year**					
Min Rate	Max Rate	Distribution (%)	Min Hours	Max Hours	Estimated Actual Hours	Min Rate	Max Rate	Distribution (%)	Min Weeks	Max Weeks	Estimated Actual Weeks
1	5	60.00%	0.60	3.00	1.80	1	5	20.20%	0.20	1.01	0.61
5	10	19.90%	1.00	1.99	1.49	5	15	21.20%	1.06	3.18	2.12
10	30	10.80%	1.08	3.24	2.16	15	27	14.40%	2.16	3.89	3.02
20	35	5.80%	1.16	2.03	1.60	27	50	15.90%	4.29	7.95	6.12
35	45	3.60%	1.26	1.62	1.44	50	52	28.30%	14.15	14.72	14.43
Hours/Week/Volunteer			5.10	11.88	8.49	**Weeks/Year/Volunteer**			21.87	30.74	26.30

Combining these two measures gives the average hours volunteered per year by each individual volunteer. The minimum estimate of 5.10 hours per week times 21.87 weeks per year yields 111.40 hours per year. The same calculation for the maximum estimate yields 365.24 hours per year. Averaging the two figures yields an estimated 238.32 hours provided by each volunteer.

Next the volunteer rates of graduates relative to high school dropouts to are used to estimate the average number of extra hours produced per year by each high school graduate (Table D3).

Table D3.	**Boost in Volunteer Hours From High School Education**			
Dropout Volunteer Rate	8.30%			
Graduate Volunteer Rate	18.80%			
	Minimum	Maximum	Average	
Each dropout produces	9.25	30.31	19.78	volunteer-hours per year on average
Each graduate produces	20.94	68.66	44.80	volunteer-hours per year on average
So each graduate produces	11.70	38.35	25.02	more volunteer-hours on average than a high school dropout

*Volunteer rates taken from Hayghe (1991) p. 18.

These numbers are the average produced by all graduates combined. Some graduates will volunteer and others will not – out of a class of 100 graduates, it is expected about 19 to be volunteers. While it is unknown *which* 19 graduates will volunteer, it is known that among them, these 100 graduates will produce 44.8 volunteer-hours per year on average, and 25.02 more volunteer-hours per year than 100 dropouts. Multiplying the latter figure by the value of a volunteer-hour provided by *Independent Sector* ($19.22) yields an estimated $481.95 in average value-added for each graduate.

To obtain an estimate of the value added per cohort of graduates, this final figure is multiplied by the average number of graduates over the last four years, which is 495.5. This calculation yields an estimated $220,998.59 in value produced per cohort.

APPENDIX E. CALCULATION OF SAVINGS FROM SEXUAL EDUCATION PROGRAMS

Table E1. Percentage of never-married, sexually active teenage women who have been pregnant, by whether they had sex education including discussion of contraception.

	1976				1979					
	White		Non-White		White		Non-White			
	15-17	18-19	15-17	18-19	15-17	18-19	15-17	18-19	Totals	Weighted Average
Had Sex Ed	0.147	0.172	0.235	0.482	0.154	0.25	0.287	0.482	258	29.23%
(N)	68	58	132	110	123	120	136	139	886	
No Sex Ed	0.212	0.308	0.367	0.538	0.25	0.319	0.492	0.54	137	39.95%
(N)	33	26	30	39	44	47	61	63	343	
Percentage Increase										36.67%

* Taken from Zelnick and Kim (1982), p. 124.

Table E1 shows the different percentages of unmarried, sexually active teenage women who have been pregnant. The treatment is the group that has had sexual education, and the control is the group that has not had sexual education. The study divided the two groups by race and age. The "Totals" field shows the total number of teen pregnancies over the total enrolled in school, with or without the sexual education program. We then calculate the percentage increase in incidence of pregnancies between the two groups, which is 36.67 percent.

Table E2. Orange County Cost per Pregnancy

Total Pregnancies	Cost/pregnancy	Total cost of Pregnancies	Pregnancies prevented by Sex Ed program	Total Cost Savings
90	$25,500	$2,295,000	33	$841,500

*Calculated using data from NC DHHS and the Teen and Unplanned Pregnancy Calculator.

We multiply the number of teen pregnancies in Orange Counties, 90, by 36.67 percent, the percentage increase in pregnancies that would have resulted had the sexual education program not been administered, to obtain the "pregnancies prevented by sexual education

program." This number is found in Table E1. These 33 prevented pregnancies are then multiplied by the cost per pregnancy ($25,500) to give us the total cost savings, $841,500 (Table E2).