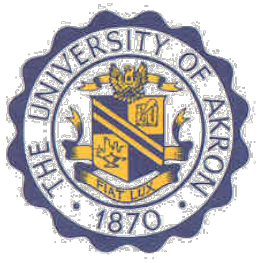
Senior Project
Department of Economics



Income Inequality and Public School Expenditures in Ohio

Benjamin Nypaver
August 2018

Advisor: *Dr. Erickson & Dr. Nelson*

ACKNOWLEDGEMENTS

I would like to acknowledge Drs. Michael Nelson and Elizabeth Erickson for their patience and guidance during the execution of this research. This paper could not have been completed without their expertise, insight, and instruction. I would also like to thank Dr. Francesco Renna for his input and work during my previous attempt at completing this project. Last but not least, I would like to thank my parents for all of their support and advice throughout this process.

TABLE OF CONTENTS

I. Abstract

The United States has experienced an increase in income inequality spanning nearly a century. Both the cause of this increase and its effect on the economy are frequently studied topics for economists, but the results of these studies often conflict. This paper focuses on the effect of income inequality on public school expenditures in Ohio school districts. I have found a statistically significant positive relationship between income inequality and school expenditures, where a 3.4 percent increase in inequality will cause a rise in public school expenditures per pupil of $17.94. This outcome is of a much lower magnitude than that of previous studies, and can be attributed to the inclusion of a measure of the share of property taxes collected from businesses. This variable has been omitted in previous research due to a lack of availability and I find its inclusion to be significant in reducing omitted variable bias on income inequality, artificially inflating its magnitude. The major limitation of this paper is that there is not enough data to support a time series model, which would provide more accurate data on the growth of public school expenditures and income inequality over time.

II. Introduction

Income inequality throughout the U.S. has increased over the past half century, as evidenced by a 30% increase in the Gini coefficient from 1969 to 2016 (U.S. Census Bureau 2017 A-2). Various studies have contested the effects of income inequality on several economic, socioeconomic, and political factors. Multiple studies have indicated a positive relationship between income inequality and violent crime (Fajynbelker, et al. (2002), Hipp (2007)) and a negative relationship between income inequality and trust (Alesina and Ferrara (2002), Ulsaner and Brown (2005)), although there are problems of simultaneity. However, not all research examining the effects of income inequality have been so conclusive. For example, Wilkinson (1990) found a positive relationship between income inequality and mortality, but Deaton and Lobtsky (2009) found no correlation between the two. Similarly, Mellor and Milyo (1998) concluded that income inequality had no effect on a person's individual health, whereas Pickett and Wilkinson (2005) found that income inequality had a negative effect on health. Additionally, the effect seems to vary with the scope of the studyj, i.e. the results of studies that focus on the effect of income inequality on public expenditures across countries (Osberg, et al. (2004)) often have differing results from intra-country studies (Schwabish (2008)). A likely cause for the discrepancy in the researchers' conclusions is unobserved heterogeneity that distorts the observed variables. Even if a researcher focuses solely on developed or undeveloped countries, there are often unobserved heterogeneous factors that can be difficult to measure or compare between observations.

For my research, I predict that I will see a positive relationship between income inequality and public school expenditures, so an increase in income inequality will see a corresponding increase in public school expenditures. To reduce distortion caused by unobserved heterogeneity, I will limit my observations to school districts within the State of Ohio. Unlike previous research, my model will include

a measure for non-residential property taxes. I expect it to positively correlate with both income inequality and public school expenditures because non-residential properties are frequently valued more highly, and are therefore a larger source of taxes. In 2011, the authors Sean Corcoran and William Evans focused on the effect of income inequality with an estimated model of public school expenditures that observed public school districts across the United States over a timespan ranging from 1970 to 2000 (Corcoran and Evans, 2011). Although my research is similar to that performed by the authors previously mentioned, I will focus only on Ohio school districts to reduce unobserved heterogeneity between districts, and will include a variable to measure non-residential property value, which may be a source of omitted variable bias within the model. In this manner, my study will further the economic knowledge on the effects of income inequality.

III. Literature Review

A. Voting Models

Many studies have examined the relationship between income inequality, socioeconomic variables, and public sector outcomes (including public expenditures and spending, and voting outcomes), and a significant number of these have relied on the theoretical framework developed by Duncan Black in 1948. His work aimed to create a theory for the equilibrium distribution of taxation of public expenditures. Black's research showed that over a set of preferences, the option closest to the median will be the option chosen (Black, 1948). This theory laid the groundwork for much of the empirical research that came after and employed what became known as the "median voter model".

Meltzer and Richard (1981) employed the median voter model to estimate the size of government and the demand for redistribution of income. They found that the median voter was decisive under a majority rule, and as the mean income within the tax base increased in comparison to the decisive voter, there was an accompanying increase in taxes. This increase in mean income compared to that of the decisive voter's median income signifies an increase in income inequality as it implies growth in income at the top of the income distribution while the income for those at the middle stagnates. For this model to be true, there must be single-peaked preferences across a single-dimensional political spectrum (i.e. a conservative view vs a liberal view). If multiple peaked preferences arise instead, then the median voter will not be decisive and the theorem cannot apply (Meltzer and Richard, 1981). In 1994, a study posited that those who didn't bear a proposed tax's burden would be in favor of increasing said tax, and in this way if the median voter is decisive, an increase in income inequality would see a preference for higher taxes in the decisive voter. Their results mirrored those of Meltzer and Richard using the Gini coefficient in lieu of the mean-median ratio of income as a measure of income inequality (Alesina and Rodrick, 1994).

Although the median voter can be said to be decisive in many scenarios, other political economy models may fit the data more accurately. For example, another political economy framework that offered an alternative to the median voter model was developed in 1983 by Gary Becker. In his paper, *A Theory of Competition Among Pressure Groups for Political Influence,* he describes a model in which groups of people that share characteristics (income, race, etc) create an "influence function" to lobby for a subsidy or against a tax. This influence function is comprised of the amount of pressure exerted by both the group for a subsidy and the group opposing the resultant tax, and the relative sizes of the groups where the exerted pressure depends on the amount of lobbying done. Becker also assumes that the government will redistribute the resources in the manner that creates the least amount of deadweight loss (Becker, 1983).

Employing this special interest model, Epple and Romano (1998) found that there may even be scenarios where several interest groups unite to lobby against another group. Their paper, *The Ends Against the Middle,* found that in the case of support for public school education it was possible for those at the median of the income distribution to prefer one level of public schooling while those at the bottom and top of the distribution preferred a lower level. Those at the bottom of the distribution were less likely to support public education because the reduction in taxes would increase their consumption, and those at the top substituted public school for a private school option and would not choose to support public schooling because their children would not utilize it (Epple and Romano, 1998).

B. Inequality and the Median Voter

The two pieces of research that laid the foundation for my focus are Corcoran and Evan's *Income Inequality, The Median Voter, and the Support for Public Education,* and Boustan et al.'s, *The Effect of Rising Income Inequality on Taxation and Public Expenditures*. The papers were published in 2011 and 2013 respectively, and sought to estimate the effect of income inequality on local public

expenditures from 1970-2000. Because they both observed decadal changes for their models, they had to control for any Tiebout sorting that occurred in their observations. The theory Tiebout developed suggested that people would sort themselves into communities based on their preferred consumption patterns, which could inflict reverse causality upon the researchers' models. The theorem implies that it may not be income inequality that causes a change in the demand for public expenditures, but rather that people with different income levels choose to locate in communities that match their preferred level of government spending (Tiebout, 1956). To control for the Tiebout sorting, the authors modified their data to create an instrumental variable (IV) that tracked how communities from certain income groups' public expenditures changed over time, eliminating movement of households between communities

Both papers used a data set that encompasses decadal observations collected by the U.S. Census Bureau, and Corcoran's paper focused on school district expenditures while Boustan analyzed nearly all forms of local public expenditures. The authors both utilized a blended median voter and special interest group model and used several different proxies for inequality including the Gini coefficient and the mean to median income ratio, among others. Both authors concluded that a percentage of the increase in public expenditures could be attributed to an increase in income inequality. Boustan et al. found that a 3.4 percent increase in inequality saw an increase in public school expenditures of $514, and Corcoran and Evans found that a 3.4 percent increase in inequality saw an increase of only $207 in expenditures. They reasoned that as income inequality increases and those at the top of the income distribution earn more, the tax bill for the median voter falls and they will support policies that increase public expenditures (Corcoran and Evans (2011), Boustan et al., (2013)).

Boustan et al.'s (2013) research examined the effects of income inequality and racial homogeny on local public expenditures including public schooling, law enforcement, highway maintenance, and a

few others using a special interest model. Boustan et al.'s model estimated the effect of income inequality on public school expenditure that pertains to the model:

$$y = \alpha + \beta_1 \text{income inequality} + \beta_2 \text{natural log of median income} - \beta_3 \text{natural log of population} - \beta_4 \text{percent population black} - \beta_5 \text{percent population Hispanic} - \beta_6 \text{percent population over 65} + \varepsilon$$

Where *y* is measured as public expenditures or public expenditures (the authors ran several regressions on both variables independently) and they measure income inequality by estimating the Gini Index for the school districts/municipalities observed. The authors found that an increase in the population that was Black or Hispanic saw a decrease in total public expenditures over time, which was expected since they hypothesized that as racial heterogeneity decreased there would be an increase in public expenditures. They also expected to see diseconomies of scale concerning the size of the population and the products of public goods and services typically provided by municipalities and schools, implying that as population increases public expenditures will decrease. They expected to see a positive relationship between median income and public expenditures due to the income effect—the median voter will choose to consume more public goods because of an increase in their income. The authors hypothesized a negative relationship between the percent of the population over the age of 65 and school district expenditures because senior citizens tend to be on a fixed income which prevents their budget constraints from widening. The authors also expected an increase in income inequality to be positively correlated with total public expenditures, mainly due to an increase in overall income, which again implies an income effect. They noted, however, that an increase in income in school districts had a mechanical relationship with the amount of state aid received which offset the gain from the income effect (Boustan et al., 2013).

Corcoran and Evans' (2011) model is a blended median voter and special interest group model which focused solely on the effect of income inequality on public school expenditures:

$$y = \beta_1 \text{median income} + \beta_2 \text{income inequality} + \beta_3 \text{percent of population below poverty line} + \beta_4 \text{percent college grads} - \beta_5 \text{percent school aged} - \beta_6 \text{percent over 65} + \beta_7 \text{percent owner-occupied} + \beta_8 \text{percent nonwhite} - \beta_9 \text{index of race fractionalization} - \beta_{10} \text{percent living in urbanized area} + \varepsilon$$

In Corcoran and Evans' model, the authors measure *y* as either public school expenditures or public school revenues, using both independently of one another. They used the mean to median income ratio as their income inequality proxy. The rationale for using this measure for inequality is that as wages at the top of the income distribution grow, the mean income will increase while the median remains unchanged resulting in a larger ratio between the two. The authors saw a positive effect of income inequality on public school expenditures due to a lowering of the tax price of public expenditures to the median voter. They reasoned that an increase in income inequality would reflect an increase in property wealth inequality, and because the property tax system is progressive the median voter's tax price for public school expenditures will be lowered (ceteris paribus) as income inequality increases. Corcoran and Evans also expected (and saw) a positive relationship between the percentage of the population below the poverty line and the percentage of people with bachelor's degrees, because the former group would have an even lower tax bill than the median voter and would therefore vote for increased expenditures while the latter group tends to 1) value education and prefer higher spending in that area and 2) has higher wages.

For the percentage of people over the age of 65 and the percentage of the population school-aged, the authors expected a negative relationship because the former group tends to be on a fixed income and their children are (in most cases) grown and no longer in the public school system, so they do not reap any direct benefits from an increase in public school expenditures. For the latter group the authors expected to see a negative relationship with public school expenditures due to diseconomies of scale—this share of the population consumes the public school expenditures without contributing to

public school revenue. Corcoran and Evans expected negative signs for the index of race fractionalization and the percent living in an urbanized area to be negative because they assume an increase in racial heterogeneity will see less support for publicly provided goods, and that those living in urban areas generally have lower incomes and will not support higher taxes for public goods. Interestingly, the authors observed that an increase in the percentage of the nonwhite population was correlated with an increase in the amount of public school expenditures, which was the opposite of Boustan et al.'s observations. Corcoran and Evans propose the possibility of altruism among those of the same ethnic background, and as the percentage of people of a particular ethnic minority increase they will be more likely to support spending that benefit more people from their minority group (Corcoran and Evans, 2011).

From these two key studies, I have estimated a model that will measure the effect of income inequality on public school expenditures in Ohio's public school districts during the 2016 fiscal school year. Corcoran and Evans ran their model after disaggregating their data into locality and found that their income inequality variable was not statistically significant over every locale type. The authors reasoned that property wealth was likely a contributing factor to the lack of significance of their income inequality variable, but a measure for property wealth was unavailable for their observations. To build upon their research, I will include this measure in my model, and narrow my observations from the entire United States to just the State of Ohio, which will lessen any unobserved heterogeneity between school districts.

IV. Model

The model I propose for my research is developed from both Boustan et al. and Corcoran and Evans' models, and will be a blended median voter and special interest group model. It is estimated as:

$$y = \alpha + \beta_1 income + \beta_2 inequality + \beta_3 population - \beta_4 age + \beta_5 property + \beta_6 business - \beta_7 state + \beta_8 federal + \beta_9 percent + \beta_{10} bachelors - \beta_{11} poverty + \beta_{12} effort + \varepsilon$$

The dependent variable in the model, *y*, is the amount of public school expenditures provided in a school district. The two variables of interest in the model are income inequality (*income inequality)* and the share of property taxes collected from businesses within the school district (*business*). I will measure income inequality in the same manner as Meltzer and Richard and Corcoran and Evans—the ratio of mean to median income. As stated in the hypothesis, I expect to see a positive relationship between the income inequality measure and school expenditures due to an income effect and property tax incidence. Ohio's property tax is an ad-valorem tax, or value added tax which is considered a progressive tax. This implies that those with more property wealth will be taxed more heavily, which follows as one would expect those near the top of the income distribution to accumulate more property wealth. Due to the progressive nature of the tax, those with less property wealth would be more likely to support an increase in public school expenditures because they do not bear the burden of the tax. I expect to see a positive relationship between the non-residential property value of a school district and its expenditures. An increase here may actually lower the tax price for the median voter as businesses will front the higher tax bill. However, it is possible that this cost may be transferred onto employees of the business or consumers, but generally I believe there will be a positive relationship. Additionally, the inclusion of a measure for the share of property taxes collected from businesses should result in a more

accurate estimate of the effect of income inequality on public school expenditures as it is likely that its exclusion caused omitted variable bias on the magnitude of the income inequality measure.

I expect to see a positive relationship between median income (*income*) and the dependent variable—an increase in median income would also see an increase in the amount of revenue that can be raised by the school district. Because the demand function for public goods and services includes income, I have chosen to include median income in the model—excluding it will likely result in omitted variable bias. Pupil density in my model is measured as the number of all K-12 students per square mile (of the school district) and is the proxy for population (*population*). I expect a positive relationship between pupil density and public school expenditures, because a larger population would imply a larger amount of taxes that are able to be collected within the school district.

For the percent of the population over the age of 65 (*age*), I expect it to have a negative relationship with the amount of public school expenditures provided. Generally, this population operates on a fixed income so an increase in its tax bill is usually not supported unless the voting base is particularly altruistic. Although this population may not necessarily see a direct benefit of increased public school expenditures because their children are grown and they no longer need a high-spending public school system they may reap the social benefits of a better school system (capitalized into property values).

My model includes a variable for total property valuation per pupil (*property*) and I predict a positive relationship with this variable and the dependent variable because those school districts with higher property valuations would see higher property tax revenues. I expect to see a positive relationship between the percent of people with a bachelor's degree (*bachelors*) in a school district and public school expenditures. Many studies (Griliches, 1977 and Card, 1999) have shown a positive relationship between educational attainment and income, which correlates to educational attainment and the amount of public expenditures demanded. I expect to see a negative relationship between the

percent of the population below the poverty line (*poverty*) and public school expenditures due to their lower incomes. The Ohio Department of Taxation includes a variable for tax effort, which provides an index of a district's ability to collect property taxes to fund public schools compared to the average capacity for the state. I expect this variable to have a positive relationship with the dependent variable, as the larger the index of tax effort the greater the school district's ability to collect revenue for their public schools.

I expect a negative relationship for state (*state*) revenue due to the mechanical relationship between state aid given to school districts and the amount of property taxes that district is able to collect. More state aid is given to those school districts who collect a relatively small amount of local revenue through property (and for some districts, income) taxes, so I expect to see an increase in state revenue to be correlated with less public school expenditures. However, I expect federal (*fed*) revenue to have a positive relationship with public school expenditures because the bulk of these funds come from Title I funding. Through Title 1, districts receive federal funds based on the percentage of students within the district that come from low to middle income households, so only those districts with a large amount of low income students receive this aid.

V. Data

Variable Description	***Mean (Standard Deviation)***	***Source***
School districts within the state of Ohio not including community, vocational, or private schools *[district]*	302.5 (174.5)	[1]
Median Income reported for the 2016 school year *[income]*	35,336.6 (8,287.5)	[1]
Income inequality calculated as the ratio of the mean income to the median income within a school district *[inequality]*	1.62 (0.3)	[1]
Pupil density calculated as the number of all K-12 students per square mile within the school district *[population]*	110.5 (170.8)	[1]
Percent of the population over the age of 65 *[age]*	16.6 (3.4)	[2]
Percent of the population that identifies as white *[white]*	84.8 (18.6)	[1]
Percent of the population whose household income falls below the national poverty line *[poverty]*	12.7 (7.2)	[2]
Percent of the population that have attained a bachelor's degree or higher *[bachelors]*	21.9 (13.6)	[2]
Total assessed property value divided by average daily membership within school district *[property]*	161,070.6 (72,390.4)	[1]
Share of property taxes collectible that are non-agricultural and non-household *[business]*	22.9 (13.1)	[1]
State revenue per pupil collected from state sources *[state]*	6,124 (2,336.9)	[1]
Federal revenue per pupil collected from federal sources *[fed]*	886.3 (473.2)	[1]
Tax Effort exerted within district, or an index of support that community extends to the public school *[effort]*	1.1 (0.4)	[1]
Urban Locale type, dummy variable where urban=1, else 0 *[urban]*	0.4 (0.5)	[3]
Rural Locale type, dummy variable where rural=1, else 0 *[rural]*	0.5 (0.5)	[3]
Expenditures per pupil within a school district *[dependent variable]*	11,168.9 (1,908.1)	[1]

[1] = FY2016 District Profile Report (Cupp Report) as published by the Ohio Department of Education
[2] = American Fact Finder by the U.S. Census Bureau estimated for the year 2016
[3] = Locale Codes as designated by the Ohio Department of Education

VI. Results

The results from the estimated regression are shown below. To ensure accuracy in the model, I tested for multicollinearity and heteroscedasticity. The test for multicollinearity showed a strong correlation between median income and expenditures per pupil, as well as the percentage of the population with a bachelor's or higher and expenditures per pupil. Both variables had VIF (variable inflation) values of about 7, which were the highest in the model and expected. I would expect to see median income and the percent of the population with a bachelor's degree or higher to be highly correlated with many of the other variables in the model including inequality, property valuation, and the share of the property taxes collected from businesses. I was, however, surprised that the VIF for tax effort was 1.8, implying that this variable is highly independent. Therefore, I believe that it is a valid variable to keep in my model.

In Model 1, most of the estimates of the coefficients were as expected but there were a few surprises. Observing the income inequality variable, I find that a 3.4 percent increase in income inequality will see an increase in expenditures per pupil of $17.94. Comparatively, Boustan et al. (2013) saw an increase of 3.4 percent in their income inequality measure (Gini) would see an increase in income inequality of $514, meanwhile Corcoran and Evans (2011) reported an increase of $207 for the same increase. I had anticipated that the inclusion of the proportion of property taxes collected from businesses would lessen the magnitude of income inequality on public school expenditures, and my estimate reflects that. Although the income inequality measure is statistically significant at the 99% confidence level, the mean expenditure per pupil is $11,170 so an increase of only $17.94 is a relatively small increase. Concerning the share of taxes from businesses, the estimates imply that a 5 percent increase in the share of property taxes collected from business would see an increase in public expenditures of $141.79. This is a larger impact than income inequality, but again, it does not have a huge impact on expenditures.

I had anticipated a positive relation between the percent of the population that identify as white and public school expenditures, but instead it has a negative relationship—a 5 percent increase in the share of the population white would see a decrease in public school expenditures of $58.65. In Corcoran and Evans' (2011) research using observations from the entire country, they found a positive relationship between the two variables. I suspect I observed opposite effect because of the grouping of racial minorities in urban areas which will have increased levels of public expenditures from higher property values. Similarly, I expected to see a negative relationship between the percent of the population over the age of 65 and public school expenditures, but instead the model estimated a positive coefficient implying a 5 percent increase in the share of the population over the age of 65 would see an increase in expenditures of $0.99. However, this variable was not statistically significant in any of the models. Several reasons for the positive relationship could be that this segment of the populations is particularly altruistic, or that the increase in the quality of public schools will be positively capitalized into the value of their homes (even though property tax increases tend to be negatively capitalized into home prices) (Carroll, 1997).

Looking to the other estimates calculated, I see a $1,000 increase in median income would cause a $40 increase in public school expenditures. An increase in pupil density of 1 student per square mile would cause an increase of $1.27 in expenditures, and an increase in the percent of the population below the poverty line of 5 percent would see a decrease in public school expenditures of $1.60. An increase in the total property valuation of $10,000 will see an increase in the dependent variable of $120, and a 5 percent increase in the tax effort index causes an increase in expenditures of $69.07. An increase in federal revenue of $100 will see an increase in expenditures of $101, implying a multiplier effect occurs with revenues collected from federal sources. Surprisingly, Model 1 estimated a positive relationship between state revenue and public school expenditures implying an increase in state revenues of $100 per pupil will cause an increase in public school expenditures of $56.

Also included in the results is the log-linear form of the regression (Model 2). I included this logarithmically transformed model because it will more accurately represent the data if it is heavily skewed as opposed to having a linear structure. For the log-linear equation, the results can be interpreted as such: if there is a 1 percent increase in the mean/median ratio, then I would expect to see an increase in public school expenditures of 3 percent. Similarly, a 1 percent increase in the share of property taxes that is collected from businesses within a school district will see a 25 percent increase in public school expenditures. These results imply a much larger impact of these variables on public school expenditures—the estimates calculated in Model 1 were much smaller than those in Model 2. Interestingly, taking the log of the dependent variable causes the income inequality measure to become statistically insignificant, implying that the data fits a linear regression better.

The last model estimated (Model 3) excludes the tax effort variable. Although the test for multicollinearity did not imply a strong collinear relationship between tax effort and the other independent variables in the model, I ran a regression to ensure that it should be included. Without tax effort, the variables for income inequality and the share of taxes collected from businesses become statistically insignificant, and the overall R-squared value and the F-value are the lowest among the three models. Therefore, I believe it is necessary to include this measure in the model for the most accurate estimate of the coefficients. Among the models tested, I believe Model 1 is the model of best fit—it has the highest R-squared and F-value and the coefficient estimates make sense in the context of the data.

OLS ESTIMATES

	MODEL 1 ***Linear***	**MODEL 2** ***Log-Linear***	**MODEL 3** ***Linear (no tax effort)***
Dependent Variable:	Expenditures Per Pupil	Natural Log of Expenditures Per Pupil	Expenditures Per Pupil
Intercept	123.03 (795.70)	8.36*** (0.07)	4673.98*** (670.83)
Income Inequality [inequality]	527.70*** (215.95)	0.03 (0.02)	65.64 (224.79)
Median Income [income]	0.04*** (0.01)	0.000003*** (0.000001)	0.002 (0.01)
Pupil Density [population]	1.27*** (0.37)	0.0001*** (0.00003)	1.42*** (0.39)
Percent of the Population Over 65 [age]	19.86 (13.99)	0.0009 (0.001)	-3.06 (14.73)
Percent White [white]	-1172.91*** (341.53)	-0.05* (0.03)	-1878.74*** (356.18)
Percent Below Poverty Line [poverty]	-31.99*** (11.03)	-0.003*** (0.0009)	-32.43*** (11.79)
Percent with Bachelors or Higher [bachelors]	54.82*** (7.99)	0.005*** (0.0007)	50.39*** (8.54)
Total Assessed Property Valuation [property]	0.012*** (0.0009)	0.000001*** (8.12E-8)	0.02*** (0.0009)
Percent of Property Taxes Collected from Businesses [business]	2835.76*** (476.72)	0.25*** (0.04)	351.02 (422.17)
State Revenue [state]	0.56*** (0.03)	0.00004*** (0.000003)	0.55*** (0.04)
Federal Revenue [fed]	1.01*** (0.18)	0.00009*** (0.00002)	1.001*** (0.19)
Tax Effort [effort]	1381.35*** (148.65)	0.13*** (0.01)	--
Adjusted R-sq F Value RMSE	0.71 123.16 1030.09	0.69 111.98 0.09	0.67 110.57 1101.84

Standard Deviations are expressed in parentheses, p-values are denoted as such: *** denotes a 99% confidence level, ** denotes a 95% confidence level and * denotes a 90% confidence level,

VII. Conclusion

Building upon previous research, my study aimed to measure the effect of income inequality on public school expenditures. Unlike previous studies, my research focused on school districts from Ohio only and includes a measure for property taxes collected from businesses that was thought to cause an inflated, positive pressure on the income inequality variable due to omitted variable bias. Using linear regression analysis, I found that if income inequality (as measure by the mean to median income ratio) rises by 3.4 percent, I would expect to see a resultant increase in public school expenditures of $17.94. Similarly, a 1 percent increase in the share of property taxes collected from businesses would see a $28.36 increase in public school expenditures. Because the percentage of property taxes collected from businesses was found to be statistically significant at the 99 percent confidence level, I believe it should be included in estimations of public school expenditures. However, I was unable to locate any data that disentangled agricultural and household property taxes. I would assume that being able to measure the amount of property taxes that are collected from agricultural properties would add to the strength of the overall model and increase the accuracy of the income inequality variable. Assuming that the Ohio Department of Education continues to publish the Cupp Report, it would also be of interest to create a time series model that measures income inequality in Ohio over a longer period of time.

The results of this study indicate that although income inequality is a statistically significant factor in the determination of public school expenditures, the magnitude of the effect is relatively low. This implies that government policies that focus on redistributing wealth from the top of the income distribution to the bottom will decrease public school expenditures (as income inequality decreases) but it will not have a large effect on the total amount of expenditures. Instead, policies should be enacted that focus on increasing the tax effort within the school district because they have a larger positive

impact on the effect of public school expenditures. Also, Model 1 implies a very efficient use of federal revenue collected on public school expenditures, so policies that increase federal funding of schools would be very impactful in increasing public school expenditures.

VIII. References

1. Alesina, Alberto, and Eliana La Ferrara. "Who trusts others?." *Journal of public economics* 85.2 (2002): 207-234.
2. Alesina, Alberto, and Dani Rodrik. "Distributive politics and economic growth." *The quarterly journal of economics* 109.2 (1994): 465-490.
3. Becker, Gary S. "A theory of competition among pressure groups for political influence." *The quarterly journal of economics* 98.3 (1983): 371-400.
4. Black, Duncan. "On the rationale of group decision-making." *Journal of political economy* 56.1 (1948): 23-34.
5. Boustan, Leah, et al. "The effect of rising income inequality on taxation and public expenditures: Evidence from US municipalities and school districts, 1970–2000." *Review of Economics and Statistics* 95.4 (2013): 1291-1302.
6. Card, David. "The causal effect of education on earnings." *Handbook of labor economics*. Vol. 3. Elsevier, 1999. 1801-1863.
7. Carroll, Robert J., and John Yinger. "Is the property tax a benefit tax? The case of rental housing." *National Tax Journal*(1994): 295-316.
8. Corcoran, Sean, and William N. Evans. *Income inequality, the median voter, and the support for public education*. No. w16097. National Bureau of Economic Research, 2010.
9. Deaton, Angus, and Darren Lubotsky. "Mortality, inequality and race in American cities and states." *Social science & medicine* 56.6 (2003): 1139-1153.
10. Epple, Dennis, and Richard E. Romano. "Ends against the middle: Determining public service provision when there are private alternatives." *Journal of Public Economics* 62.3 (1996): 297-325.
11. Fajnzylber, Pablo, Daniel Lederman, and Norman Loayza. "Inequality and violent crime." *The journal of Law and Economics* 45.1 (2002): 1-39.
12. Griliches, Zvi. "Estimating the returns to schooling: Some econometric problems." *Econometrica: Journal of the Econometric Society* (1977): 1-22.
13. Hipp, John R. "Income inequality, race, and place: Does the distribution of race and class within neighborhoods affect crime rates?." *Criminology* 45.3 (2007): 665-697.
14. Historical Income Tables: Income Inequality (Table A-2), collected by the U.S. Census Bureau https://www.census.gov/data/tables/time-series/demo/income-poverty/historical-income-inequality.html
15. Mellor, Jennifer M., and Jeffrey Milyo. "Income inequality and health status in the United States: evidence from the current population survey." *Journal of Human Resources* (2002): 510-539.
16. Meltzer, Allan H., and Scott F. Richard. "A rational theory of the size of government." *Journal of political Economy* 89.5 (1981): 914-927.
17. Pickett, Kate E., and Richard G. Wilkinson. "Income inequality and health: a causal review." *Social science & medicine* 128 (2015): 316-326.
18. Ohio Department of Education, FY2016 District Profile Report (Cupp Report) http://education.ohio.gov/Topics/Finance-and-Funding/School-Payment-Reports/District-Profile-Reports/FY2016-District-Profile-Report
19. Ohio Department of Education, Old Locale Codes https://education.ohio.gov/getattachment/Topics/School-Improvement/Federal-Programs/Elementary-and-Secondary-Education-Act/Support-for-Vulnerable-Students-Under-ESSA/Rural-Education-Title-V-B/Rural-Education-Achievement-Program-REAP/Current-Locale-Codes.pdf.aspx
20. Osberg, Lars, Jonathan Schwabish, and Timothy Smeeding. "Income Distribution and Social Expenditures: A Crossnational Perspective." (2004).
21. Schwabish, Jonathan A. "The effects of earnings inequality on state social spending in the United States." *Public Finance Review* 36.5 (2008): 588-613.
22. Tiebout, Charles M. "A pure theory of local expenditures." *Journal of political economy* 64.5 (1956): 416-424.

23. U.S. American Fact Finder https://factfinder.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=t
24. U.S. Census Bureau, Historical Income Tables: Income Inequality (Table A-2), https://www.census.gov/data/tables/time-series/demo/income-poverty/historical-income-inequality.html
25. Uslaner, Eric M., and Mitchell Brown. "Inequality, trust, and civic engagement." *American politics research* 33.6 (2005): 868-894.
26. Wilkinson, Richard G. "Income distribution and mortality: a 'natural'experiment." *Sociology of health & illness* 12.4 (1990): 391-412.