The Effects of Accountability on Educational Achievement in Ohio School Districts

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Abstract

The aim of this paper is to determine whether the accountability system has a significant effect on Ohio school districts by means of graduation rates through the 2010-11 to the 2014-15 school years. Using two Fixed Effects models with different measures of accountability, the results showed that the common trend of the lowest performing schools improving the most under the accountability system did occur to Ohio school districts as a whole, indicating that techniques to improve student achievement will also work on a larger scale.

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Introduction

Standardized tests are no new trend, students have been bombarded with these exams since the 1800's [1] but with changes to government responses in the previous years to exam scores, specifically with the strengthening accountability reform presented by No Child Left Behind in 2001, concern has been raised to the effect it has on student achievement. With over 15,000 school closings nationally in the years from 2001-2014[2], many of which were due to forced closure because of inadequate performance, much debate has been raised about the effectiveness of this system. There have also been many arguments that standardized tests are also a poor measure of student learning and can actually have detrimental effects to their learning[3]. But despite all this negativity, high school graduation rates and college enrollment rates have been continually increasing[4].

This paper aims to determine whether this change to the accountability system, that seemingly had negative effects, has actually been increasing student achievement by increasing student educational attainment. By focusing on available standardized test scores of Ohio school districts during the 2010/11 school year to the 2014/15 school year and many factors that could affect student success in an attempt to determine if the increase in high school graduation rates is due to the strict rewards/punishment system enacted by the educational accountability reform.

It has been widely argued that standardized tests are a poor way to measure student achievement (and subsequently the performance of the school as a whole). One such study

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[1] Alcocer, Paulina. "History of Standardized Testing in the United States." National Education Association, www.nea.org/home/66139.htm.

[2] "How Many Public Schools in the United States Have Closed?" National Center for Education Statistics (NCES) Home Page, a Part of the U.S. Department of Education, U.S. Department of Education, 2016, nces.ed.gov/fastfacts/display.asp?id=619.

[3] Neal, Derek. 2010. "Aiming for Efficiency Rather Than Proficiency." *Journal of Economic Perspectives*, 24(3): 119-32.

[4] "U.S. High School Graduation Rate Hits New Record High." *U.S. Department of Education*, 12 Feb. 2015, www.ed.gov/news/press-releases/us-high-school-graduation-rate-hits-new-record-high.

showed that stressing the importance of standardized test scores actually decreased the overall educational well-being of students by unequally and inefficiently distributing resources to the lower-performing students in an attempt to increase the overall performance of the school – by making as many students reach the "proficient" level. However, this was shown by Neal (2010) to actually have negative effects on previously high-performing students based on the lack of resources allotted to them; those students scoring higher than "proficient" did nothing to benefit the school under the accountability system. This led to significant resources being provided to lower-performing students, but very little being provided to the higher-performing students.

If high-performing students are losing out on resources, is the increase in graduation rates due to increased performance of the initially low-performing students, or are all students benefiting from this test-focused environment as it may prepare them better for senior or graduation exams? Previous data has shown that accountability more strongly benefits the lowest-scoring individuals (measured as single students and specific schools), but has little to no effect on the higher-scoring groups. If this is true, the accountability system should be tailored to aid all students to best improve educational achievement.

Accountability

Before delving into the issues being presented, it is important to first understand the ideas being discussed. Accountability systems have existed for a while and have been an important means for groups (either members of a city or government officials) to monitor the performance of both students and schools and include a range of feedback from a simple requirement to publicly report progress, to a strict rewards and punishment system that is in place today.

The concept of Adequate Yearly Progress was first executed by the Title I statute in 1994 that required a ranking system of schools based on their performance to state requirements. This was the initial base for the modern accountability system and created the initial shift in how we define educational progress of schools – from resources being utilized (number of books, student-teacher ratio) or "inputs" to the educational achievement of students defined by the state; the "output"[5].

The No Child Left Behind Act, created in 2001, brought the previously used concept of educational accountability to the spotlight, adding much more beneficial rewards, severe punishments, and additional details that could help schools during their reviews. With accountability being the deciding factor for federal funding provided to public schools, there was significant incentive for schools to perform well on the "semesterly" reviews which were used to calculate a school's accountability grade (A-F). These grades, along with quality reviews, were released to the public and used to determine the actions of the government[6].

The mechanisms of accountability (the rewards and punishment system) consisted mainly of financial aspects as a means to truly incentivize change within schools. Schools that performed well would see increased funding, principals would receive bonuses, and the schools would see positive quality reviews from the community while schools that performed poorly would see diminished funding or all funding would be ended, schools would be on probation in order to get back in the direction of progress, job loss/replacement was an imminent threat, and in some cases schools would either be combined with a charter school or closed down entirely

[5] "7: Accountability." Testing, Teaching, and Learning: a Guide for States and School Districts, by Richard F. Elmore and Robert Rothman, National Academy Press, 2000, pp. 91–101.
[6] "Standards, Assessments and Accountability." *U.S. Department of Education*, www2.ed.gov/admins/lead/account/saa.html.

(Rockoff and Turner, 2010). However, many of the mechanisms (both good and bad) have seen mixed outcomes regarding their effects on improvement (National Academy Press, 2000).

The current system in place is the Every Student Succeeds Acts (ESSA) signed into action by President Obama in 2015 when the requirements of the original system became more impractical for schools and educators to continue. Although the reform itself has changed, as has the required proficiency rating for schools, the remainder of the accountability system has not been significantly altered, and many issues previously addressed are still concerns under ESSA[7].

Previous Literature

There has been much interest on the impact of accountability on student outcomes of different types. In their 2016 paper David Deming and David Figlio provide a framework for understanding educational accountability at the K–12 and higher education levels and address the problem through the classic principal–agent problem and build their arguments based on their previous research. They believe that accountability is most important and effective in educational markets that are the least competitive (such as the K-12 level where there are few options other than public school) and has the largest effect on the lowest-performing schools. The authors believe this same logic holds true at the institutions of higher-education; institutions that are highly dependent on tax-payer support (as opposed to students paying tuition directly) or show poor student achievement (such as graduation rates) would benefit from an accountability system to improve student outcomes (Deming and Figlio, 2016).

[7] "Every Student Succeeds Act (ESSA)." U.S. Department of Education, www.ed.gov/essa?src=rn.

Other authors have focused on more location-specific data. In 2010, Rockoff and Turner evaluated New York City Schools in 2007-2008 using school level data and results of standardized test scores. The authors used a reduced regression discontinuities model and use the discontinuities in the assignment of grades to estimate the impact of accountability in the short run. Their results showed that the lowest graded schools showed stronger increases in student achievement which led to a decrease in the difference in average test scores between the lowest (F) and highest graded (A) schools (a decrease by about 5 points in both math and English). They concluded that accountability caused real changes in school quality that increase student achievement in the short-run based on both proficiency ratings and parents' reviews of the school quality (Rockoff and Turner 2010).

Meanwhile, Rae Anne Dodds attempts to determine policy recommendations for resource allocations in her 2005 dissertation focusing on Texas data. Using data from the Texas Education Agency and National Center for Education Statistics (NCES), she uses cluster analysis to create the Texas education production function and uses a simultaneous equation model to adjust for the endogeneity between socioeconomic factors and student achievement. She concludes interesting findings, including; time and attendance as highly important factors not currently being measured in accountability (time measuring experience with the testing process, shown to have a vital impact on test scores – indicating accountability works better in the long run), quality of teacher and teacher experience are not as beneficial to student success as previously thought, and the attitude of students not being equal as being beneficial to student success. Her research implies that accountability in the long run holds differing results than in the short run (Dodds, 2005).

Also specified in Texas, authors Craig, Imberman, and Perdue examine whether public school districts and individual schools respond to accountability ratings by reallocating resources. By comparing the old and new educational accountability reforms presented in the state, the researchers collect data from the Texas Education Agency (TEA) and use three strategies to determine the budgetary response to school accountability ratings; Regression Discontinuity Strategy, Rating Shock Strategy, and School Fixed Effects Estimation. They found that a considerable portion of extra funds earned through accountability appear to have been used for extra-curricular activities and athletics under the original system and that schools in the observed districts did not find this incentive structure useful and raises the question of whether resources are being channeled to the most effective institutions (Craig et.al. 2010).

A recent study done in 2017 by Hyman looks at the effects on changes in primary school spending on students' college enrollment and completion. Using an original dataset of six cohorts of fourth grade students in Michigan public schools between 1995 and 2000 and their postsecondary outcomes Hyman exploits variation in the school funding formula imposed by Michigan's 1994 school finance reform, Proposal A. He modeled his results with a two-stage least squares regression (to account for endogeneity) and student-level panel administrative data and found that students exposed to $1,000 more spending were seven percent more likely to enroll in college and eleven percent more likely to earn a postsecondary degree. The effects were concentrated among districts that were urban and suburban, lower poverty, and higher achieving (Hyman 2017).

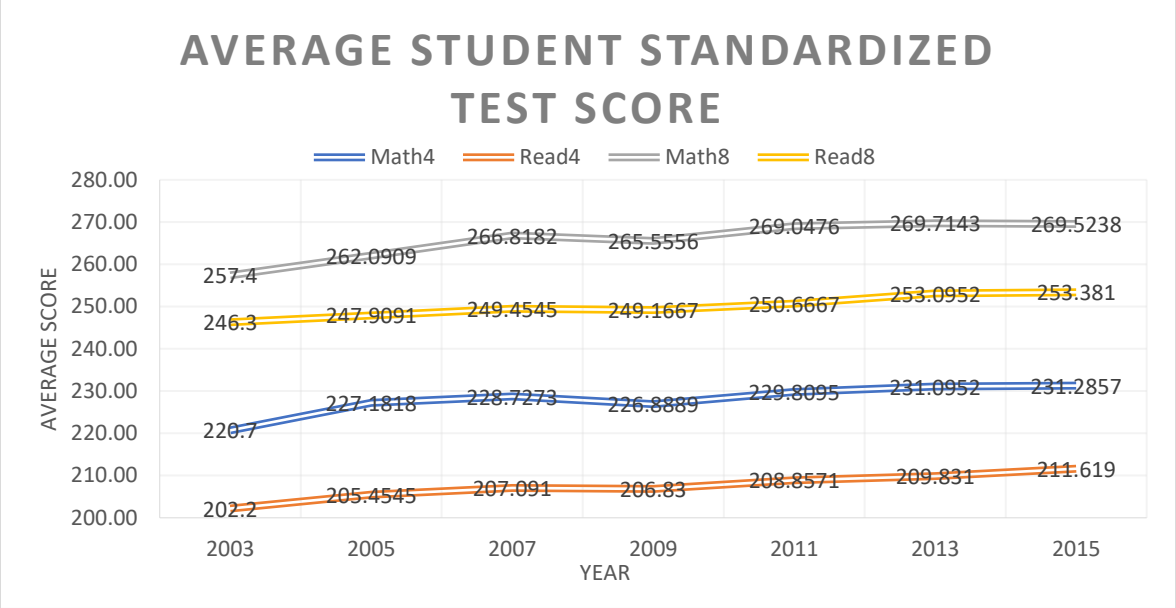
This paper aims to build off these ideas and attempts to determine if accountability has a similar and significant effect on groups as it does on individual students or schools in order to know if this trend holds on a larger scale, as well as determine if the federal funding to the lower

performing schools is a major reason for their improvement. If entire school districts react differently to accountability, new light could be shed on understanding what suits specific area in order to better accommodate these differences and ensure student success and apply these ideas on a larger scale.

Motivation and Research Design

Figure 1 below shows the trends of average proficiency scores in each of the following categories for the odd years from 2003-2015: average 4^{th} and 8^{th} grade math scores ad average 4^{th} and 8^{th} grade reading scores. This data is part of the dataset used in the following regression and is recorded from school districts in Ohio. This increasing trend, along with the overall increase in high school graduation rates is the motivation for the following analysis. With student performance improving in standardized tests, along with increasing high school graduation rates, there is an implication that accountability may be the cause. It has been argued that the increase in student performance (the increased standardized test scores) is due to the financial incentives provided by accountability, which encourages schools to focus more strongly on student performance on these exams. This paper aims to determine if these financial incentives (particularly the changes to federal funding provided to the school) is truly the cause of this improvement in student performance.

Figure 1

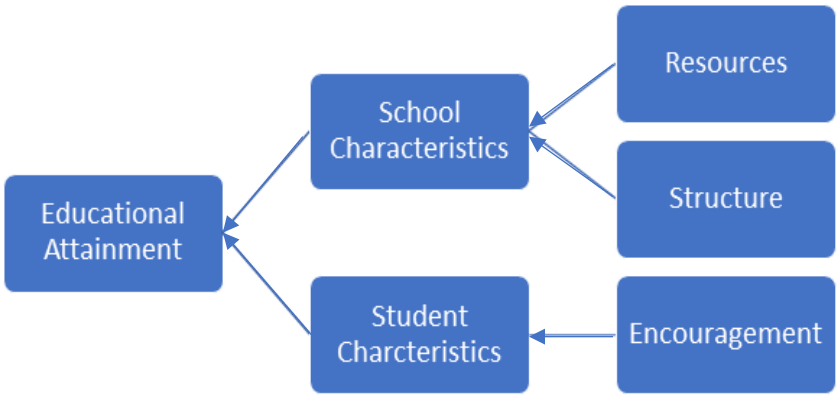


This study will build off other models used in this area of research to examine the effects of accountability on high school graduation rates. Although there is no theoretical model to base this model on, research done previously on the topic has pulled together variables and proven the significance of different factors, allowing this model to adjust for previous findings and use new combinations of variables previously studied. The main studies used are Dodds 2005, Craig et. al. 2010, Hyman 2017, and Rockoff and Turner 2010. The data used will be collected from the Ohio Department of Education[8].

Figure 2 shows the theoretical relationship expected for the following variables.

[8] "Report Card Resources." Ohio Department of Education, education.ohio.gov/Topics/Data/Report-Card-Resources.

Figure 2



Model

$$G_{i,t} = \beta_0 + \beta_1(Sch)_{I,t} + \beta_2(St)_{I,t} + \beta_3(Fin)_{I,t} + \beta_4(Loc)_{I,t} + \beta_5(Acc) + \varepsilon_{i,t}$$

Variable description

Educational Attainment:

Graduation Rate (Grad); the percentage of students graduating high school in the common four-year time frame.

Student Characteristics;

White, Asian, Black, Hisp: percentage of student population that classifies as White, Asian, Black, or Hispanic (self reported by 2016 standards, will be logged in the model).

Disability (Disab): Percent of student population that is identified as having a disability.

School Characteristics:

Structure:

Enrollment (Enroll): Average number of students enrolled in each school district (measured in real values).

Accountability Grade: Measured by accountability letter grade assigned to each school (averaged for school district measures) redefined for numeric values of grades and by proficiency score (Pscore), the numeric score calculated by accountability standards on scaled from 20- 120.

Resources:

Total Expenditure (Texp): Total expenditure spent by school districts (measured in 2016 dollars). Includes administration costs, maintenance, education supplies, employment costs, etc. (will be logged in the model).

Federal Revenue (FedRevPPl): Per pupil revenue provided by federal sources to each school district (measured in 2016 dollars, will be logged in the model).

District Income (Dinc): Average household income for each school district (measured in 2016 dollars). Defined as a dummy variable for average district income less than $40,000 being referenced as a "poverty" area (where the average poverty level in Ohio ranges from $36-43,000 for a family of four[9]).

[9] "Federal Poverty Guidelines." Public Utilities Commission of Ohio (PUCO), www.puco.ohio.gov/be-informed/consumer-topics/federal-poverty-guidelines/.

Data Analysis

Initial Analysis

Table 1

Variable	***Mean***	***Minimum***	***Maximum***
Graduation Rate	*91.937 (6.093)*	*74*	*100*
Proficiency Score	*98.097 (6.6364)*	*73.57*	*110.602*
Grade A	*0.110 (0.313)*	*0*	*1*
Grade B	*0.619 (0.487)*	*0*	*1*
Grade C	*0.238 (0.427)*	*0*	*1*
Grade F	*0.0333 (0.180)*	*0*	*1*
Federal Revenue per Pupil	*770.01 (443.299)*	*193.57*	*2375.99*
Total Expenditure	*10107.17 (2106.78)*	*7181.68*	*21165.53*
District Income	*53.955.36 (19138.56)*	*27280.32*	*127742*
In Poverty	*0.143 (0.351)*	*0*	*1*
Enrollment	*2763.7 (3390.92)*	*451*	*22603*
Asian	*0.014 (0.026)*	*0*	*0.1746*
Black	*0.058 (0.141)*	*0*	*0.8124*
Hispanic	*0.03 (0.036)*	*0*	*0.1967*
White	*0.86 (0.165)*	*0.0964*	*0.9866*

An initial evaluation of the data shows a few important features. The first, looking at Table 1 above, it can be seen that more than 61% of the school districts are assigned a grade of B and, on average, more than 85% of the students within the school districts were identified as White, meaning less than 15% of all students in Ohio are identified as a minority or a race other than white, and in some districts, the percentage of White students rose to almost 99%. Another interesting find was the percentage of districts in poverty, with the average being 17% with 35% variability.

Results:

OLS Regression

The data was initially analyzed using a preliminary regression. Both basic regressions were completed separately to account for the two measures of accountability (the continuous and discrete model) and the summary of results are shown below in Table 2. Although many of the values are highly significant, the overall regression models were poor fits for the data, explaining less than half of the variation in graduation rates (which is expected given this is only a basic regression procedure will is ill-fitting for the data). The full output of each regression are shown in Tables 9 and 10 in the Appendix of this paper.

In these models, accountability appears to benefit the higher performing groups more than lower performing groups, which is defiant of all previous research. These models also show the percentage of black students as having relatively non-existent effect on graduation rates, while the percentage of Hispanic students is highly significant. Finally, these regressions

conclude that federal revenue per pupil has no significant effect on student achievement, while total expenditure is highly significant and robust.

Table 2

Model	***Continuous***	***Discrete***
Variable	*Estimate*	*Estimate*
Proficiency Score	*0.428 (0.052)****	*---*
Grade A	*---*	*10.181 (2.105)****
Grade B	*---*	*8.071 (1.955)****
Grade C	*---*	*2.627 (1.179)*
Federal Revenue per Pupil	*-0.506 (1.000)*	*-0.570 (1.007)*
In Poverty	*-1.32 (1.195)*	*-0.480 (1.179)*
Black	*-0.023 (0.272)*	*-0.198 (0.276)*
Hispanic	*1.039 (0.361)****	*1.01 (0.362)****
Asian	*-0.845 (0.642)*	*0.831 (0.647)*
Total Expenditure	*7.197 (2.666)****	*8.133 (2.685)****

Fixed Effects

Next, the data was first evaluated using a one-way Fixed Effects Model in SAS to regress the graduation rate against the previously reported variables with accountability being measured using the district's proficiency score, while the second was measuring the relationship based on

letter grade received. Both regressions indicate that the only significant values were that of proficiency score (for the continuous model) and whether a district was impoverished (for both models). The overall fit of both models were significant and explained 86% of the variation within graduation rates in schools. The full output can be found within Tables 5-8 in the Appendix. Table 3 below shows the summary of results of both the continuous and discrete Fixed-Effects models.

Based on the results of the regression model, accountability score showed a small but significant, negative relationship with graduation rates, indicating that as the proficiency score increased the growth in graduation rates would decrease meaning a district with a lower proficiency score would see a larger increase in graduation rates than a district with an initially higher proficiency score. For the variable representing the log of federal revenue, the extremely small coefficient indicates that the relationship between federal revenue per pupil and high school graduation rates is relatively inelastic and that changes to federal revenue per pupil has very miniscule effects on student achievement.

It is worth noting that the variable measuring if a district is in poverty was significant and quite large, with impoverished districts having a graduation rate 2.2% -2.7% lower than districts that are not impoverished (for the continuous and discrete models respectively). This implies that district income plays a larger role than federal revenue in affecting student achievement.

The remaining variable coefficients show expected relationships with graduation rates including the race variables which indicate that districts with a higher percentage of certain minorities (Black and Hispanic specifically) are predicted to experience an increase in graduation rates greater than that of districts with a higher percentage of White students. While neither of these values were statistically significant, the implication that districts with a large population of

certain minority students would benefit more than districts with a small population of these minorities, along with the importance of impoverished districts seen in the results, should not be overlooked.

Table 3

Model	***Continuous***	***Discrete***
Variable	*Estimate*	*Estimate*
Proficiency Score	*-0.138 (0.057)*	*---*
Grade A	*---*	*-1.185 (1.769)*
Grade B	*---*	*-1.139 (1.526)*
Grade C	*---*	*-0.793 (1.371)*
Federal Revenue per Pupil	*-0.216 (1.317)*	*0.163715 (1.3395)*
In Poverty	*-2.210 (0.954)***	*-2.695 (0.958)***
Black	*1.033 (0.656)*	*1.014 (0.672)*
Hispanic	*0.629 (0.811)*	*0.841 (0.826)*
Asian	*0.716 (0.844)*	*0.760 (0.851)*
Total Expenditure	*-4.813 (4.536)*	*-3.304 (4.663)*

Focusing on a districts log of total expenditure, the estimate is quite large, although it is statistically insignificant. The coefficient of this variable indicates that the relationship between total expenditure of a district and the graduation rate is negatively related with an elasticity of -

3.3; a ten percent increase in total expenditure will lead to a 3.3% decrease in graduation rates. Although this seems counterintuitive, some studies have concluded that educational expenditures do not hold a linear relationship with graduation rates. Due to the fact that roughly two-thirds of expenditure costs go towards administrative fees rather than educational improvement (such as higher quality teachers or better materials such as books or computers), this relationship is not as shocking[10]. To better understand this relationship, the expenditure variable should be further broken down into the different areas of expenditure, which will not be completed in this study.

The second Fixed Effects model was performed using the specific letter grade as the Accountability predictor and the failing letter grade of D or F being left out as the reference variable. The predictions for repeating variables (such as for race or revenue) are the similar as in the previous model, with a large difference in the effects of accountability. With this model, although insignificant, the variables for the accountability grade indicate that school districts that receive higher letter grades see less change in graduation rates than districts that received a failing grade of D or F. This indicates that schools that perform the worse (in reference to accountability) will see the largest growth in graduation rates out of all the assigned grades. This is in line with statements made in previous literature in which the lowest performing groups benefit the most from accountability.

In comparing the two methods used (the basic regression and the Fixed Effects), many differences arise. First, the basic regression model showed more significance within the model than the Fixed Effects and lead to drastically different conclusions regarding the effects these variables have on graduation rates.

[10] Powers, Thurston. "Education Spending and Outcomes." *American Legislative Exchange Council*, American Legislative Exchange Council, 3 Oct. 2017, www.alec.org/article/education-spending-and-outcomes/.

Limitation and Error

A major concern for this data set was the multicollinearity between many of the variables. After testing the correlation, there was strong correlation between many variables which required a narrowing down of the main variables used in the analysis, however there may still be slight, random correlation between variables.

Another concern was endogeneity, whether graduation had an impact on any of the variables in question, such as the main variables representing accountability. With the main purpose of this paper to determine whether accountability effects student achievement (graduation rates) it may be the case that student achievement prior to graduation effects student performance measures, such as standardized tests performance, which determine the accountability score. This concern is addressed, but the model used for endogeneity (a discrete discontinuities model) is beyond the scope of this paper and will not be performed.

It is worth noting that student success is hard to measure based on specific student characteristics. Students that are more risk averse would be more likely to think long-term and may be more likely to succeed in school while thinking of the future benefits from education. Because this is impossible to measure, and the focus of this paper was only high school graduation, idiosyncratic terms were left out with the argument that student preference is more prevalent in further education and less so at the high-school level where parents are generally still active in their children's life choices. However, some studies have shown that motivation levels of high school students is currently incredibly low and does, in fact, play a role in their performance on standardized tests, as well as a lack of incentives to perform well on these exams (Elmore and Rothman, 2000)

Policy Recommendation

Policy recommendation is difficult due to the differences in school districts. Table 1 shows a large range of values for many of the variables evaluated, indicating that school districts in Ohio vary greatly and, therefore, creating a policy that adequately improves some school districts without impairing others is difficult. Another factor to consider is that many of the variables evaluated are not measured to the complexity that truly exists and the results are based on general factors which may alter the effect of any policies put in place. Because of this, it is recommended that more in-depth research is conducted, breaking down these variables more, before any policies are created based off these results. Therefore, the recommendations of this paper will be based on findings while researching the current accountability system.

A blind spot in the current system is defining *who* is held accountable for school performance; the original Title I statue claims that states are held accountable, however the current law only requires states to collect and analyze data, leaving the effects on accountability to fall on individual institutions. There is also a gap in determining *what* they are accountable for; with the main response being "student performance" which is commonly used under different interpretations. With this in mind, a major policy recommendation is to explicitly define these two concepts under the current system. This should allow for a more clarity within the system and lead to better outcomes of the schools.

Continuing on that thought, accountability needs to be tailored to the modern education system where students meet multiple teachers in their educational careers, and many transfer to different schools as well. While specifically defining these terms, policymakers should account for the intricacy of the modern education system; many teachers play a role in a student's education, and all should be held accountable, although only for their role; the same hold true for

institutions, no one group is held liable. There should also be multiple factors that are used when determining both accountability outcomes and the responses of the state. Education and student outcomes are more complex than a number on a test and a system meant to evaluate education and student outcomes should account for that.

Although not applicable to this paper, another major concern within the system at a national level is that each state is able to define their own requirements for the system, meaning there is little, if any, true standards within accountability. This allows for one state to have low proficiency standards with no state response, and another to have extremely high standards with possibly severe reward or retribution. While this is beyond the scope of this paper, it is worth mentioning that various states (and to some degree various districts) are able to hold schools to different standards which should be officially regulated at a national level.

Conclusion

With the topic of education gaining momentum in both political and social conversation, the accountability system was brought into play with the No Child Left Behind Act in an attempt to increase the educational quality of school systems. This paper analyzed Ohio school district performance over five years to determine whether the accountability system increased student success by increasing graduation rates.

After evaluating the data using two Fixed-Effects models, the results indicated that accountability (both by proficiency score and letter grade) did, in fact, show the largest benefit in the lowest performing school districts, supporting the hypothesis of this paper that this trend would hold to groups on a larger scale than previously researched. The results also concluded that the financial incentives of the accountability system did not contribute as much as previously

believed (and in fact did not contribute significantly at all). It can be concluded, however, that there is a difference between districts that are impoverished and those that are not, along with minorities benefiting more from the system than majority groups which may be an indication of why the system has the effect that it does.

Accountability, on the surface, should benefit all students, however the data indicates that the lowest performing groups involved are improving, and the rest remain stagnant. However, the external pressures of accountability will only work under one specific condition; the internal pressures must be just as strong. Teachers must feel obligated to improve student's well-being as much as they feel forced to by state regulations, and schools must have the means to allow for student improvement- schools that cannot afford decent teachers will only obtain mediocre outcomes. This will always be difficult when the entire weight of student achievement and the burden of poor accountability scores falls solely on teachers and individual schools. The main ways to aid in improving the current system through policy involves clarifying much of the muddled terminology currently in place and redefining who is held accountable.

Future analysis on this topic would include evaluating the data using a discrete discontinuities model to account for the endogeneity of the variables as well as well as delving further into specific details, such as the breakdown of school expenditure on student achievement.

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APPENDIX

Table 4 Descriptive Statistics

Variable	***Mean***	***Minimum***	***Maximum***
Graduation Rate	*91.9371 (6.0927)*	*74*	*100*
Proficiency Score	*98.0965 (6.6364)*	*73.57*	*110.602*
Grade A	*0.1095 (0.313)*	*0*	*1*
Grade B	*0.619 (0.4868)*	*0*	*1*
Grade C	*0.2381 (0.4269)*	*0*	*1*
Grade F	*0.0333 (0.1799)*	*0*	*1*
Federal Revenue per Pupil	*770.01 (443.2987)*	*193.57*	*2375.99*
Total Expenditure	*10107.17 (2106.78)*	*7181.68*	*21165.53*
District Income	*53.955.36 (19138.56)*	*27280.32*	*127742*
In Poverty	*0.1429 (0.3508)*	*0*	*1*
Not in Poverty	*0.8571 (0.3508)*	*0*	*1*
Enrollment	*2763.7 (3390.92)*	*451*	*22603*
Asian	*0.0144 (0.0255)*	*0*	*0.1746*
Black	*0.058 (0.1408)*	*0*	*0.8124*
Hispanic	*0.03 (0.0363)*	*0*	*0.1967*

White	*0.8602 (0.1648)*	*0.0964*	*0.9866*
Disability	*0.1351 (0.0338)*	*0.0754*	*0.2247*

Fixed-Effects Regression Using Continuous Predictor (Pscore)

Table 5

Model		***Continuous***		
Fit Statistics				
SSE	*1008.706*		*DFE*	*156*
MSE	*6.4661*		*Root MSE*	*2.5428*
R-Square	*0.8684*			
F-Value	*10.84*		*Pr > F*	*<0.0001*

Table 6

Model		**Continuous**			
Variable	*DF*	*Estimate*	*Standard Error*	*T-Value*	*P-Value*
Intercept	*1*	*110.242*	*43.5301*	*3.76*	*0.0002*
Proficiency Score	*1*	*-0.13842*	*0.0574*	*-2.41*	*0.0171*
In Poverty	*1*	*-2.21034*	*0.9537*	*-2.32*	*0.0218*
Enrollment	*1*	*-0.00084*	*0.000618*	*-1.36*	*0.1755*
Log Total Expenditure	*1*	*-4.81346*	*4.5361*	*-1.06*	*0.2903*
Log Federal Revenue per Pupil	*1*	*-0.2155*	*1.317*	*-0.16*	*0.8702*
Log Asian	*1*	*0.715935*	*0.8437*	*0.85*	*0.3952*
Log Black	*1*	*1.032669*	*0.656*	*1.57*	*0.1175*
Log Hispanic	*1*	*0.628665*	*0.8105*	*0.78*	*0.4391*
Disability	*1*	*-13.2512*	*19.6819*	*-0.67*	*0.5018*

Fixed-Effects Regression Using Categorical Predictor (GradeA-GradeC, GradeF Reference)

Table 7

Model		**Discrete**		
Fit Statistics				
SSE	*1042.105*		*DFE*	*154*
MSE	*6.7669*		*Root MSE*	*2.6013*
R-Square	*0.8641*			
F-Value	*10.31*		*Pr > F*	*<0.0001*

Table 8

Model		***Discrete***			
Variable	*DF*	*Estimate*	*Standard Error*	*T-Value*	*P-Value*
Intercept	*1*	*136.2837*	*43.3731*	*3.14*	*0.002*
Grade A	*1*	*-1.18496*	*1.7695*	*-0.67*	*0.5041*
Grade B	*1*	*-1.1391*	*1.5257*	*-0.75*	*0.4564*
Grade C	*1*	*-0.79334*	*1.3709*	*-0.58*	*0.5636*
In Poverty	*1*	*-2.69452*	*0.9584*	*-2.81*	*0.0056*
Enrollment	*1*	*-0.00098*	*0.000638*	*-1.54*	*0.1251*
Log Total Expenditure	*1*	*-3.30424*	*4.6627*	*-0.71*	*0.4796*
Log Federal Revenue per Pupil	*1*	*0.163715*	*1.3395*	*0.12*	*0.9029*
Log Asian	*1*	*0.760307*	*0.8505*	*0.89*	*0.39042*
Log Black	*1*	*1.013826*	*0.6715*	*1.51*	*0.1331*
Log Hispanic	*1*	*0.840955*	*0.8259*	*1.02*	*0.3102*
Disability	*1*	*-16.8197*	*20.2319*	*-0.83*	*0.4071*

OLS Regression

Continuous Model

Table 9

Model		***Continuous***		
Model Statistics				
Root MSE	*4.43987*		*R-Square*	*0.4935*
Dependent Mean	*91.86377*		*Adj R-Square*	*0.4703*
Coeff Var	*4.8331*			
F-Value	*21.32*		*Pr > F*	*<0.0001*

Table 10

Model		***Continuous***			
Variable	*DF*	*Estimate*	*Standard Error*	*T-Value*	*P-Value*
Intercept	*1*	*-2.92376*	*25.08802*	*-0.12*	*0.9073*
Proficiency Score	*1*	*0.4283*	*0.05209*	*8.22*	*<0.0001*
In Poverty	*1*	*-1.32005*	*1.19482*	*-1.1*	*0.2706*
Enrollment	*1*	*-0.0004801*	*0.0001032*	*-4.65*	*<0.0001*
Log Total Expenditure	*1*	*7.19723*	*2.66636*	*2.7*	*0.0076*
Log Federal Revenue per Pupil	*1*	*-0.50592*	*1.000765*	*-0.5*	*0.6162*
Log Asian	*1*	*-0.864613*	*0.642255*	*-1.35*	*0.1801*
Log Black	*1*	*-0.02283*	*0.27243*	*-0.08*	*0.933*
Log Hispanic	*1*	*1.03932*	*0.36137*	*2.88*	*0.0045*
Disability	*1*	*-28.15249*	*13.6705*	*-2.06*	*0.0408*

Discrete Model

Table 11

Model		***Discrete***		
Model Statistics				
Root MSE	*4.444*		*R-Square*	*0.4977*
Dependent Mean	*91.86377*		*Adj R-Square*	*0.4693*
Coeff Var	*4.83769*			
F-Value	*17.56*		*Pr > F*	*<0.0001*

Table 12

Model		***Discrete***			
Variable	*DF*	*Estimate*	*Standard Error*	*T-Value*	*P-Value*
Intercept	*1*	*22.88598*	*24.76464*	*0.92*	*0.3566*
Grade A	*1*	*10.18051*	*2.1045*	*4.84*	*<0.0001*
Grade B	*1*	*8.07089*	*1.95454*	*4.13*	*<0.0001*
Grade C	*1*	*2.62672*	*1.95261*	*1.35*	*0.1801*
In Poverty	*1*	*-0.47966*	*1.17869*	*-0.41*	*0.6845*
Enrollment	*1*	*-0.00049076*	*0.00011072*	*-4.43*	*<0.0001*
Log Total Expenditure	*1*	*8.13314*	*2.68545*	*3.03*	*0.0028*
Log Federal Revenue per Pupil	*1*	*-0.56961*	*1.00726*	*-0.57*	*0.5724*
Log Asian	*1*	*0.831234*	*0.64658*	*-1.29*	*0.2013*
Log Black	*1*	*-0.19839*	*0.2757*	*-0.72*	*0.4726*
Log Hispanic	*1*	*1.01009*	*0.36192*	*2.79*	*0.0058*
Disability	*1*	*-26.60255*	*13.77154*	*-1.93*	*0.0548*