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The Effect of Revenue-Source Mix on Student Performance in Mississippi K-12 Public Schools

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THE EFFECT OF REVENUE-SOURCE MIX ON STUDENT PERFORMANCE IN

MISSISSIPPI K-12 PUBLIC SCHOOLS

by
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A thesis submitted to the faculty of The University of Mississippi in partial fulfillment of
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ABSTRACT

SALLY BOSWELL: The Effect of Revenue-Source Mix on Student Performance in
Mississippi K-12 Public Schools

Local, state, and federal funding for public schools have different stipulations on
how they are used. Local revenue is more flexible, state revenue is controlled by the
Mississippi Adequate Education Program (MAEP) guidelines, and federal revenue is
targeted to specific areas. MAEP largely impacts all public school funding through not
only state revenue stipulations, but also through its funding formula that sets a minimum
contribution per district for state funding. This thesis investigates how a district's revenue
mix of these three different types of funding impacts student performance − ACT scores
and graduation rates − in K-12 public school districts across Mississippi. The analysis
uses data from 135 districts over the years 2015-2017. The results indicate that a change
in the local revenue share to federal revenue share ratio has a statistically significant
impact on ACT scores, but graduation rates are not impacted in the same manner. This
implies that Mississippi public school districts can alter their revenue mix to improve
ACT scores by making changes such as increasing property tax rates to generate more
local revenue for the schools.

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I. INTRODUCTION

"Success" is defined by Merriam Webster as a favorable or desired outcome, a subjective definition that can be interpreted by individuals as they please[1]. Whether a person measures success by money, knowledge, power, or any other metric, these elements all boil down to being aspects of human capital. Human capital is understood to be the investments people make in themselves that enhance their economic productivity (Olaniyan, 2008). Success, of a person or even of a nation, is impossible without human capital. Our human capital is affected by experiences such as competition with colleagues or peers, influence of teachers or parents, and the length and quality of our formal education (Lucas, 2015). This formal education is also known to have a direct effect, larger than other factors, on a person's eventual status or earnings (Jencks, 1979). In fact, the U.S. Bureau of Labor Statistics shows that in 2018 the median weekly earnings for workers with a Bachelor's degree is $1,198, whereas the median weekly earnings of workers with only a high school diploma is $730[2]. One can conclude that with more education comes greater human capital, and with greater human capital comes the opportunity for success.

The direct effect of formal education on human capital, productivity, and success has not gone unnoticed by lawmakers and national leaders worldwide. With the earliest universal primary education system established in Prussia in 1717 and one of the latest free and compulsory systems passed into law by India in 2009, only a handful of

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[1] https://www.merriam-webster.com/dictionary/success
[2] https://www.bls.gov/emp/chart-unemployment-earnings-education.htm

countries remain without laws that make school attendance mandatory[3]. In Mississippi, minors from the age of 6 to 17 are required by law to attend school, and the state is required to provide free education for students between the ages of 5 and 21[4]. Similar requirements are in effect all over the United States, with ages varying slightly for each state. Although the options of private education and homeschooling exist to fulfill the expectation of compulsory education, most parents are electing to send their children to public schools. The National Center for Education Statistics reports that during the 2019-2020 school year, 3.7 million students in the U.S. are expected to graduate from high school, and 3.3 million of these students will be graduating from public schools[5]. With high demand for public schooling must come an equally high supply of resources, and here lies the education responsibility of the government.

Education of the masses is one of the largest expenditures by governments. In the United States during the 2015-2016 school year, total expenditures per student enrolled in K-12 public schooling amounted to $13,847, for a total of $706 billion (over 3.7 percent of Gross Domestic Product). The total includes salaries, employee benefits, supplies, transportation, and building upkeep[6]. Each state spends a different amount on public education. For example, Vermont and New York spend about $20,000 per student, whereas Utah spends less than $8,000. Mississippi spends about $10,000 per student[7]. In fiscal year 2008, over 18 percent of Mississippi's total budget was allocated to K-12

[3] https://ourworldindata.org/primary-and-secondary-education
[4] https://nces.ed.gov/programs/statereform/tab5_1.asp
[5] https://nces.ed.gov/fastfacts/display.asp?id=372
[6] https://nces.ed.gov/fastfacts/display.asp?id=66
[7] https://www.edweek.org/ew/collections/quality-counts-2019-state-finance/map-per-pupil-spending-state-by-state.html

education alone, with even more being set aside for colleges and universities (Miller, 2007).

Since a large portion of all government spending goes to K-12 public education every year, much research has gone into determining what effect this spending has on the quality of education. The metrics can and do vary, but people generally want to discern whether or not more spending on education generates more human capital for students, thus providing individuals with the capability to be more productive and successful. A study done on public schools in Metropolitan Nashville finds the same result as many of its precursors: there does not exist a statistically significant relationship between government expenditure on public education and student performance (Klein, 2007).

However, the more complicated argument over exactly how money is spent may show that more funding can, in fact, improve performance. Eric Hanushek, a critic of the return on public education investment, agrees that more money can improve student outcomes if the money is focused on areas such as teacher pay. He argues that teachers with higher pay will perform better in the classroom[8]. Furthermore, a study of California's efforts to reduce class size found that more funding spent on reducing class size may be more effective for student outcomes if the program is implemented well (Jepsen, 2002). Natural intuition tells one that spending should have some effect on education quality, but the question still remains exactly why and how public education funding affects the outcomes of students.

With conflicting opinions on the effect of public education funding, there exists controversy regarding the politics of government budget allocation for K-12 education.

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[8] https://www.edweek.org/ew/articles/2019/06/05/student-outcomes-does-more-money-really-matter.html

Many politicians stand strong on the opinion that money is not what will fix the public schools in the United States; some often argue to implement changes such as school choice. This opinion has been used in Mississippi to justify the underfunding of the Mississippi Adequate Education Program (MAEP) over the last decade. However, Eric Hanushek says that politicians have construed his work to mean that "resources don't matter and can't matter." In fact, his point is that increased funding does not automatically improve performance, but will do so only if it is more targeted. Teacher pay is an issue on which politicians focus. In the recent Mississippi gubernatorial election, both the Democratic and Republican candidates mentioned teacher pay raises in their platform. This does not necessarily mean existing teachers should be paid more, but rather high salaries may attract better teachers. Most politicians seem to agree that effective education in order to improve student performance is important, but there is considerable debate on how this can be achieved.

Politicians are not the only people thinking about the implications of public school funding. Taxpayers are also concerned with how their money is being spent, in particular on education. Even a taxpayer with no connection to the school system will likely have some stance. Not only is their money going to a benefit they do not receive directly, but also the benefit of education may not be as effective as it should be for the amount of money the taxpayers are providing. A taxpayer with children in the public K-12 system likely has a heightened concern with how funding is affecting performance. Apart from paying for private school or taking on the responsibility of homeschooling, a parent with a child in primary or secondary school has no option but to send his or her child to the local public school. Consequently, parents are the taxpayers who primarily

have a louder voice when it comes to education. A fitting example is the Mississippi Parents' Campaign, which was founded by parents with the mission of promoting better public schools through parent advocacy, primarily through legislative information that determines the level of education offered to their children[9]. Taxpayers do have some control over education funding, as they can vote on local tax levels that impact funding and on legislators who will impact changes on their behalf.

Taxpayers provide funding for public schools through three separate channels: federal, state, and local taxes. Only a small portion of school districts' revenue comes from the federal government, and it is provided to districts through grants and programs. Generally, much of the federal funding is targeted to specific students, such as students from low income families, students with disabilities, and English language learners[10]. A study done by an undergraduate student at the University of California, Berkeley found that an increase in federal revenue causes higher student achievement, and it calls for earmarking funds toward special programs to generally model federal funding to make all revenue more effective (Tow, 2006). In Mississippi, state funding must be used according to the MAEP guidelines, so it is somewhat restricted in its use[11]. Local funding comes from property taxes of those in the community and can be used for anything deemed necessary by locally elected officials[12]. Local revenue may enable taxpayers to hold their district accountable: taxpayers can see how their money is spent and vote on officials who will spend it properly. Conversely, local residents who see their school system

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[9] https://msparentscampaign.org/about/
[10] https://sellingtoschools.com/education-management/federal-education-funding-explained/
[11] https://www.tpcref.org/policy-issues/school-funding/topics-funding/mississippi-adequate-education-program-maep/
[12] https://education.findlaw.com/curriculum-standards-school-funding/education-finance-and-funding-state-and-local-sources.html

failing may be inclined to vote down property tax increases if they feel that their money is being wasted. There is thus some evidence that student performance may depend on the relative contribution of local, state, and federal revenue received by school districts.

This thesis empirically examines whether differences in school districts' revenue-source mixes – local, state, and federal tax revenue – can explain district-level differences in student outcomes. Data from 135 public school districts in Mississippi for years 2015 through 2017 are used. Student performance for each district is measured by 11th grade ACT scores and graduation rates. Multiple regression analysis is used to regress both student performance measures on revenue-source mix variables to estimate the nature and strength of their relationship. Poverty rates and expenditures per student in each district are included in the regression to control for the effects that non-school conditions and general funding levels have on student performance.

The thesis proceeds as follows. Section II discusses local, state, and federal funding sources in Mississippi and explains the MAEP policy and effects since MAEP influences the funding source. Section III presents the data sources and empirical methodology, and Section IV presents the results obtained from the regression analysis, followed by a discussion on how the results relate to the hypothesized effects of different funding sources on student performance. Section V concludes the thesis with an overview of the question at hand, the analysis, and the results and their policy implications.

II. K-12 PUBLIC EDUCATION FUNDING IN MISSISSIPPI

In order to analyze the effect of K-12 public school revenue sources on student outcomes in Mississippi, it is crucial to first understand how local, state, and federal dollars are allotted to districts in Mississippi, and why the source of funds is different across districts.

Legislative, district-wide, and individual attempts to improve the state's K-12 school system began long ago and continue today, as student performance in Mississippi public schools remains far behind other states. A specific program passed into law in 1997 still greatly impacts the state today – the Mississippi Adequate Education Program (MAEP). Created in an attempt to correct low student achievement and funding inequity among Mississippi's school districts by providing schools the resources they need to improve performance, MAEP was passed by the Legislature over the Governor's veto[13]. Although MAEP has not been consistently funded over the last decade, the structure of the funding formula impacts revenue sources within districts and is, therefore, essential to understanding how these sources may impact student performance.

MAEP calculates an appropriate amount of funding for each district based on a per-pupil base cost. This amount is then made up of both a local and a state contribution. Federal funding is distributed to districts in addition to the MAEP base cost and is not based on the amount of local and state contributions. The state provides a minimum of 73 percent of the base cost to each district, which is essentially the difference between what

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[13] https://www.tpcref.org/policy-issues/school-funding/topics-funding/mississippi-adequate-education-program-maep/

the local community is able to provide and the base cost. In districts with less revenue from local property taxes, the state will provide more than 73 percent of the base cost. However, for districts that are able to pay far above 27 percent of the base cost with their local property tax revenue, the state still pays 73 percent of the MAEP base cost calculation[14]. These districts can elect to provide only a fraction of their revenue and contribute 27 percent, or they can provide more of their revenue – above 27 percent of the MAEP base cost calculation – to their school district. The state will pay 73 percent of the base cost regardless. As a result, wealthier districts tend to have greater per-pupil revenues (and thus expenditures) if they choose to contribute over 27 percent of the base cost.

To make the funding rules clearer, Table 1 provides hypothetical examples of how districts with different wealth levels receive their funding. District A represents a poor district that is unable to incur 27 percent of the MAEP base cost with their local tax revenue. The other two districts, B and C, are both able to provide 27 percent of the base cost or more with their local tax revenue, with District B being of average wealth and District C being the wealthiest. District B chooses to contribute only 27 percent of their base cost (less than their local tax revenue), and District C chooses to contribute all of their local tax revenue. Table 1 details how the wealth levels and decisions of the districts affect the total MAEP funding.

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[14] http://www.tpcref.org/policy-issues/school-funding/topics-funding/mississippi-adequate-education-program-maep/

Table 1: District Wealth Differences and Revenue-Source Mix

	Metrics Per Pupil	District A "Poor"	District B "Average"	District C "Wealthy"
Row 1	Base Cost	$5000	$5000	$5000
Row 2	73 percent of Base Cost	$3650	$3650	$3650
Row 3	27 percent of Base Cost	$1350	$1350	$1350
Row 4	Local Revenue	$1000	$1500	$2000
Row 5	Local Contribution (≤ Row 4)	$1000	$1350	$2000
Row 6	State Contribution (Maximum of Row 2 & Row 1 - Row 5)	$4000	$3650	$3650
Row 7	Total MAEP (Row 5 + Row 6)	$5000	$5000	$5650

When looking at the three revenue sources as percentages of the funding total, the 73 percent minimum provided by the state of Mississippi to each district plays a large role. Although in many cases the state contribution will be at least 73 percent of total MAEP funding (local and state funding only), the state contribution will not reach 73 percent of the total revenue makeup of a district. Any additional voluntary contribution over 27 percent of the base contribution by local governments, or federal funding granted to a district, will cause the state contribution to fall below 73 percent of the total revenue makeup. Nonetheless, the state percentage of the total revenue to a district is bounded below and will never approach zero, as the state will always provide a significant amount to each district due to the MAEP minimum. This limits variation across districts in the percent of total revenue that comes from the state. To maximize the local revenue for K-12 education, some districts choose to increase their property tax rate. For example, wealthier districts with community members who are invested in public schools may be inclined to do so. On the other hand, property tax contributions in some areas amount to nowhere near 27 percent of the student base cost due to inadequate tax bases from low

property values or public reluctance for tax increases. Hence, the contribution of local revenue to a district will vary and is less bounded than the state contribution since there is no minimum percentage of the base cost required of the local government. Finally, unlike revenue from local and state governments, federal funding to districts is targeted, often based on income levels, disabilities, or English proficiency, so the federal contribution will vary greatly depending on student characteristics within and across districts in the state.

The variation in source contribution predicted by the MAEP structure for state and local revenue and by the targeted nature of federal funding is reflected in data from the Mississippi Department of Education[15]. Across all districts over the years 2015 through 2017, the maximum state contribution is about 71 percent while the minimum is about 34 percent. A lower bound of 34 percent is relatively high − a result of the 73 percent minimum state revenue contribution of the base cost in place by the MAEP formula. The maximum local contribution to the entire funding mix is about 55 percent, while the minimum is approximately 13 percent. Districts with high property values (and thus more property tax revenue), districts containing community members who place a high value on education, or districts that have a combination of the two receive a relatively larger portion of total revenue from their local government and provide more than half of the K-12 revenue from local taxpayer dollars. Meanwhile, districts with low property values or with constituents that choose to not support property tax increases are thus unable to provide a large amount of local revenue and cannot reach 27 percent of the base cost, causing the minimum total contribution to be considerably lower at 13 percent.

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[15] https://www.mdek12.org/OPR/Reporting/Reports

Finally, variation in federal revenue across districts is also confirmed by the data, with the minimum contribution at roughly 6 percent while the maximum is about 36 percent. Districts with fewer students from low income homes, fewer disabled students, and fewer English learners likely do not qualify for a significant amount of federal funding. The mean of each revenue source indicates that the average district has a funding mix consisting of 54 percent from the state of Mississippi, 30 percent from the local government, and 16 percent from the federal government.

Similarly to how MAEP affects the revenue contribution amounts from local and state governments, the use of the state revenue portion of each district's funding is restricted by the MAEP guidelines. Specifically, state funding can only be used for teacher salaries and benefits, instructional materials, operational costs, transportation, and specific programs like vocational, gifted, alternative, and special education[16]. Other costs, such as administrator and superintendent salaries, must be paid for with the local contribution. As a result of local revenue being allocated to resources by the district's leadership, not only is the spending more flexible, but it is also subject to more scrutiny[17]. People in a community can see the effects of their property taxes on their schools: when children come home with new textbooks or when the high school constructs a new auditorium. Members of a district's school board know that if they do not keep their promises about school spending or appoint appropriate leadership to the schools, the local taxpayers will not put them back in office. On the other hand, a poorly performing district may discourage the community, causing people to vote against property tax increases and

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[16] https://www.tpcref.org/policy-issues/school-funding/topics-funding/mississippi-adequate-education-program-maep/
[17] https://education.findlaw.com/curriculum-standards-school-funding/education-finance-and-funding-state-and-local-sources.html

avoid their money being spent to no avail. In Mississippi, discouragement likely impacts many districts: Education Week's Quality Counts 2019 report ranked the state 47th in educational opportunities and performance[18].

Regarding federal funding, Tow (2006) calls for earmarking of federal funds, specifically addressing the effect of poverty on student performance. Since many federal programs target students with low family income, performance of students living below the poverty line could be greatly impacted by federal funding[19]. In Mississippi, the average percentage of students living in poverty per district is about 32 percent, with the largest percentage of student poverty in a district being 71 percent[20]. In 2008, the Center on Budget Policy and Priorities stated that Mississippi's income inequality is among the nation's worst, confirming that student characteristics related to poverty level will likely vary tremendously (Spillane, 2008). As a result, the state may benefit greatly from targeted federal funding toward students from a lower socioeconomic background.

If the regression analysis in this thesis does, in fact, show that differences in revenue-source mix do have a statistically significant impact on student performance, districts in Mississippi may wish to make attempts to change their revenue mix. For example, if districts that receive a higher percentage of federal revenue compared to local revenue contributions are found to have better student performance, districts can choose to spend local revenue in a way that mirrors the use of federal funds. Since federal revenue is given to districts for targeted groups and programs, Mississippi may benefit in this scenario by using local revenue in districts to increase funding for these specific

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[18] https://www.edweek.org/ew/articles/2019/01/16/highlights-report-mississippi.html
[19] https://sellingtoschools.com/education-management/federal-education-funding-explained/
[20] https://datacenter.kidscount.org/data/tables/8215-poverty-by-school-district#detailed/10/7461-7612/false/871,870,573,869,36,868,867,133,38/any/16733

areas, whether for low income students or English Language learners. Whichever source is found to be more effective in improving student performance, districts can act accordingly in how they budget their expenditure per student. Furthermore, communities can increase or decrease local property tax rates to a certain extent in response to the effectiveness of local revenue on student performance, or districts can apply for more federal grants in response to outcomes improving due to federal revenue. Overall, districts and the people in their surrounding areas can benefit from changes in response to knowledge about which revenue source proves to be most effective in improving student performance.

The regression analysis in this thesis attempts to provide information that has the potential to aide districts in making changes for the betterment of their students. The research hypothesis is that the makeup of a district's funding mix – local, state, and federal tax revenue – will have some statistically significant impact on student performance because the three different revenue sources have separate stipulations and accountability levels. If there is a statistical relationship, these findings can help districts make positive impacts on the lives of their students.

III. DATA AND EMPIRICAL METHODOLOGY

This section discusses the data and methodology used to analyze the effect of different revenue-source mixes on student performance in 135 K-12 public school districts in Mississippi over the period 2015 to 2017. Eleventh grade ACT scores and graduation rates reported by the Mississippi Department of Education are the two measures of student performance used in the analysis. Graduation rates and ACT scores are reasonable measures of performance for several reasons. Beginning in 2015, all 11th graders in Mississippi public schools began taking the ACT during a designated school day. Because the test is no longer optional, ACT scores can now be used as an outcome for performance of all students throughout Mississippi public schools rather than only for students who intended to apply to college. Graduation rates also exist for every student in Mississippi public schools, but they may not be as accurate of a measure of performance since many other factors – such as quality of life at home – could cause a student to make the choice to drop out of high school.

The key variables of interest are local, state, and federal tax revenue contributions to each school district, each measured as the percent (share) of total government (local + state + federal) revenue received as reported by the Mississippi Department of Education. It is not possible to include all three variables in the regression due to multicollinearity caused by the three variables summing to one. Therefore, the ratio of local revenue share to federal revenue share and the ratio of local revenue share to state revenue share are the

two key variables that are used to assess the impact of revenue-source mix on student performance.

Student performance is likely to be affected by other factors that have nothing to do with how much revenue the local, state, and federal governments contribute to a district. For example, a student who comes from a family living in poverty may be prone to worse performance regardless of his or her district's revenue-source mix. Therefore, the effect of poverty on student performance for each district is accounted for by including the percentage of students from families below the poverty line, reported by the Kids Count Data Center[21]. In addition to poverty, the regressions also include district expenditures per student. Certainly this variable may affect student performance, but more importantly the inclusion of this variable allows a comparison of districts' revenue-source mixes and student performance while holding student expenditures constant.

Table 2 provides descriptive statistics for all variables used in the empirical analysis. By looking at both the standard deviation and the range from the minimum to the maximum, the ratio of local revenue share to federal revenue share has much more variation than the ratio of local revenue share to state revenue share. Recall that the state revenue source is bounded below by the 73 percent base cost minimum of the MAEP calculation, causing the ratio of local to state revenue shares to be bounded above – reflected by the maximum of only 1.54. On the other hand, federal revenue is not bounded from below, and some districts receive very little federal funding. Thus, the ratio of local revenue share to federal revenue share has a maximum of 8.37 and is not bounded above like the other ratio variable. Poverty levels across districts vary

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[21] https://datacenter.kidscount.org/data/tables/8215-poverty-by-school-district#detailed/10/7461-7612/false/871,870,573,869,36,868,867,133,38/any/16733

significantly, with a minimum of 9 percent and a maximum of 71 percent throughout the state, and expenditures per pupil vary from \$7,298 to \$14,884. Finally, the range of ACT scores (from 13.5 to 22.2) and graduation rates (from 52 percent to 98 percent) reveals that student performance differs significantly across districts.

Table 2: Descriptive Statistics

Variable	Mean	Median	Standard Deviation	Minimum	Maximum
Local/State	0.59	0.53	0.27	0.18	1.54
Local/Federal	2.13	1.83	1.29	0.38	8.37
Poverty	0.32	0.31	0.10	0.09	0.71
Expenditure	\$9,937	\$9,679	\$1,384	\$7,298	\$14,884
ACT Score	17.35	17.30	1.80	13.50	22.20
Graduation Rate	0.80	0.81	0.07	0.52	0.98

To analyze the effect of the revenue-source mix on district-level student performance, the following regression is estimated for 135 public school districts in Mississippi over the period of 2015 to 2017:

$$Outcome_{it} = \alpha_0 + \alpha_1 Poverty_{it} + \alpha_2 Expenditure_{it} + \alpha_3 \left(\frac{Local}{State}\right)_{it} + \alpha_4 \left(\frac{Local}{Federal}\right)_{it} + \varepsilon_{it}$$

where, for district i in year t, $Outcome_{it}$ is ACT score or graduation rate, $Poverty_{it}$ is the percentage of students from families below the poverty line, and $Expenditure_{it}$ is the total expenditures per student. The variable $\left(\frac{Local}{State}\right)_{it}$ is the ratio of local revenue share and state revenue share, and $\left(\frac{Local}{Federal}\right)_{it}$ is the ratio of local revenue share and federal revenue share.

It is possible that other omitted characteristics of a district also impact student performance. Furthermore, it is possible that student performance from one year to the next is impacted by year-specific characteristics, such as state budget crises or statewide

economic expansions or contractions. To account for these possibilities, district dummy variables and year dummy variables are included in the above regression.

The regressions will show the effect of revenue-source mix across districts on student performance outcomes. As noted previously, the research hypothesis is that a statistically significant relationship exists between the two. If, for example, $\left(\frac{Local}{Federal}\right)_{it}$ has a positive α_4 as its estimated coefficient, then this would indicate that student performance is higher in districts that have a higher local revenue share relative to the federal revenue share. In general, any statistically significant α_3 or α_4 could be used to suggest how a district might improve student performance by altering its revenue-source mix.

IV. RESULTS

Student performance at the district level is measured by two outcomes: ACT scores from all 11th grade students and high school graduation rates. All regression results are shown in Table 3. With ACT score as the dependent variable (columns 1 and 2), the regressions reveal important relationships between a district's revenue-source mix and student performance. Without including the district dummy variables and year dummy variables (column 1), poverty, expenditures per student, the ratio of local to state revenue shares, and the ratio of local to federal revenue shares all have a statistically significant effect on ACT scores. However, once all dummy variables are included to account for district-level or time-specific unobserved factors (column 2), poverty, expenditures per student, and the ratio of local to state revenue shares no longer have a significant impact on ACT score. Only the ratio of local to federal revenue shares still has a statistically significant effect on ACT scores.

Focusing on column 2, which is the preferred specification because of the higher value for adjusted R^2 compared to column 1, a relationship between the local and federal revenue-source mix and ACT scores is evident. In order to reach a full understanding of this relationship, several interpretations of the coefficient on the ratio of local to federal revenue shares follow. For each percentage point increase in the ratio of local to federal revenue shares in a district's revenue-source mix, ACT scores are predicted to increase by 0.00334 points. Alternatively, for an increase of 129 percentage points – which is the standard deviation of the ratio of local to federal revenue shares in a district's revenue-

source mix (see Table 2) – ACT scores are predicted to increase by 0.43 points. Therefore, if a district's average ACT score equals 17.35, which is the average for all districts in Mississippi (Table 2), an increase of one standard deviation in the ratio of local to federal shares is predicted to increase the district's average ACT score to 17.78. These results imply that ACT scores are higher in districts where the percentage contribution of local revenue relative to federal revenue is greater. This finding makes sense because local funding has the most flexible use since the local government and school district are able to decide how the local tax revenue is spent within the district, whereas federal funding is only available for targeted programs. The positive relationship between the ratio of local to federal revenue shares on ACT scores implies that flexibility of tax revenue is beneficial for student performance.

Table 3: Results

Variable	1 Dependent Variable: ACT Score	2 Dependent Variable: ACT Score	3 Dependent Variable: Graduation Rate	4 Dependent Variable: Graduation Rate
Constant	20.384** (0.517)	14.484** (1.126)	0.790** (0.031)	0.779** (0.098)
Poverty	−6.224** (0.774)	−0.163 (1.118)	−0.146** (0.046)	−0.060 (0.097)
Expenditures Per Student	−0.178** (0.056)	0.089 (0.079)	0.007** (0.003)	0.005 (0.007)
Local/State Revenue Shares	−1.904** (0.455)	0.221 (0.756)	−0.141** (0.027)	0.025 (0.066)
Local/Federal Revenue Shares	0.860** (0.099)	0.334** (0.168)	0.034** (0.006)	−0.016 (0.015)
District Dummy Variables	No	Yes	No	Yes
Year Dummy Variables	No	Yes	No	Yes
Adjusted R^2	0.626	0.923	0.228	0.657
Number of Observations	405	405	405	405
Note: *=significant at 10% and **=significant at 5%, Standard errors in parentheses, Data for 135 MS districts 2015-2017				

Now consider the effect of the revenue-source mix on graduation rates, shown in columns 3 and 4 of Table 3. Prior to incorporating the district dummy variables and year dummy variables into the regression (column 3), poverty, expenditures per student, the ratio of local to state revenue shares, and the ratio of local to federal revenue shares all have a statistically significant effect on graduation rates. However, after the district and year dummy variables are included, the results differ significantly. Focusing on column 4, which is the preferred specification for the regression with graduation rates due to the higher adjusted R^2 compared to column 3, there is no statistical relationship between revenue-source mix and graduation rates. In fact, poverty, expenditures per student, the ratio of local to state revenue shares, and the ratio of local to federal revenue shares all fail to have an impact on graduation rates. These findings are not too surprising since the decision to drop out of school is likely made for various personal reasons, many of which may not have any connection with the ability to perform adequately in school or achieve a high ACT score. Students who drop out of school due to the necessity of helping financially support their family or due to a similar situation are not making this decision because of school programs or funding.

In summary, the results show that a district's local to federal revenue-source mix does have an impact on ACT scores. However, no statistically significant relationship is found between the ratio of local revenue shares to state revenue shares and student performance. This may be in part due to the minimum percentage contribution of the state to each district set in place by MAEP. This minimum contribution effectively decreases the range of state contributions and, as a result, bounds the ratio of local to state revenue shares from below. With a smaller range, it is more difficult to gauge the effect

of differing ratios of local revenue shares to state revenue shares in similar districts. Additionally, local revenue has no stipulations, and state revenue only has a few rules put in place by MAEP, while federal revenue is directly funneled to specific programs. The lack of detailed specifications for local and state funding may cause the target of these revenues to be similar, so the effect of the ratio cannot be identified. The results also indicate that there is no statistically significant relationship between poverty or expenditures per student with student performance in both of the preferred models (columns 2 and 4). The lack of statistical significance of the expenditures per student is notable in that it indicates that differences in spending across districts does not translate into differences in performance. This conclusion agrees with many other studies, such as a study done on public schools in Metropolitan Nashville (Klein, 2007) and a study of St. Louis school district (Antle, 2019).

V. CONCLUSION

Local, state, and federal revenue have different possible areas of use within a school district. Local revenue use is decided by local governments and school districts since local revenue can be used on any district function that is deemed necessary. Therefore, community members can hold school officials accountable for allocating the tax revenue to areas in which it is needed. State revenue, which is guaranteed by the state to each district starting at a minimum percentage contribution, is regulated by the MAEP and is more restrictive in its use. For example, state revenue cannot be used to fund administrative salaries. Federal funding is intended for specific programs or groups of students, such as students with low family income or English language learners. As a result, federal funding is the most restricted revenue source regarding its possible uses. Due to the differences in the uses of the three revenue sources, the testable hypothesis of this thesis is that differences in the revenue-source mix across districts may have an impact on student performance.

The two district-level student outcomes were district-wide 11th grade ACT score averages and high school graduation rates. A statistically significant relationship is found between ACT scores and revenue-source mix, but not between graduation rates and revenue-source mix. Specifically, there exists a positive relationship between the ratio of local revenue share to federal revenue share and ACT scores: for every percentage point increase in the ratio of local revenue share to federal revenue share, a district's ACT score is predicted to increase by 0.00334 points. In other words, if a district's average

ACT score equals the statewide average of 17.35, an increase of one standard deviation (129 percentage points) in the ratio of local to federal shares is predicted to increase the district's average ACT score to 17.78. The impact of this ratio on ACT score supports the concept that flexibility of funding sources helps improve student performance. Federal funding is the most restrictive since it is granted for a specific program or area, and local funding is the least restrictive since each district can apply it as they see fit. When considering two otherwise equal districts, if one has a higher percentage of local revenue compared to federal revenue than the other, the ACT scores in the former district are predicted to be higher. Graduation rates are not impacted in the same way as ACT scores. This is likely due to reasons unrelated to educational opportunities which result in students dropping out of high school.

After interpreting the positive relationship between the ratio of local to federal revenue sources and ACT scores, it is evident that a larger percentage of local revenue and a smaller percentage of federal revenue is beneficial for student performance. In order for a district to take advantage of this relationship, it could attempt to increase the local revenue contribution. Communities can increase local revenue for their school district by voting to increase the local property tax rate. However, a property tax increase is not always highly supported or even feasible for members of a community. In districts with many families living below the poverty line, a majority vote for increasing property tax rates may be difficult to achieve. Nevertheless, increased local revenue in a district's revenue-source mix means increased revenue with flexible use and accountability standards set by the community. Mississippi K-12 public school districts could benefit

from an increase in local property tax revenue, but not all Mississippi communities are likely able to provide this change.

Alternatively, districts may benefit from a change in spending requirements for state and federal revenue. If the stipulations placed on these two contributions were more flexible in terms of usage, like local revenue, then all three types of funding could be used however the district sees fit. This may have the same impact as increasing the local revenue percentage since all sources could now be used in the same manner as local revenue. Unfortunately, making changes to stipulations on state and federal revenue usage is difficult and not always possible. State lawmakers must alter the MAEP program to loosen state funding restrictions, and the federal government has to change the current education legislation to make federal funding available for usage broader than targeted programs. Similar to increasing local property tax in Mississippi communities, lobbying for legislation changes on the state and federal level is complicated and not always possible. Although the regression indicates that a higher ratio of local revenue share to federal revenue share in a district's revenue-source mix is associated with higher ACT scores, the process of altering funding contributions to reach this improvement may present a challenge to public school districts across Mississippi.

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