EDUCATION FUNDING AND INEQUALITY IN KANSAS, 2009-2015

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Kansas cut education funding drastically during the great recession. Unlike most states, which increased education funding once the economy recovered, Kansas further reduced funding for education in 2013. During this period, what was the relationship between funding and inequality of educational achievement and high school graduation in Kansas school districts? This paper examines these relationships using district-level panel data from the Stanford Education Data Archive and the Kansas State Department of Education to account for differences between school districts. Results suggest education funding cuts are associated with rising inequality of academic achievement and inequality of graduation rates. Specifically, a decrease in instructional spending is associated with lower achievement scores for White, Black, and Hispanic students, but the decline is 4 times larger among Black students and nearly 8 times larger among Hispanic students than White students. Similarly, a $1,000 decrease in the general fund per pupil over a cohort's high school career is associated with lower high school graduation rates for all students, but the decline is 1.5 times higher among poor students and, compared to their White counterparts, nearly twice as high among Hispanic men and over four times as high among Hispanic women. Funding cuts, in other words, have a stronger association with educational outcomes among Hispanic, Black, and poor students.

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I. INTRODUCTION

One consequence of the Great Recession was lower state funding for K-12 education in at least 31 states.[1] Evidence suggests that increases in state education funding has benefits for educational achievement (test scores), educational attainment, and high school graduation rates.[2] Relatively little is known, however, about the consequences of state funding reductions for student outcomes.[3] In particular, the consequences of state funding reductions for inequality of student outcomes[4] remain largely unknown.

Although most states increased education funding after the economy began to recover, Kansas continued to reduce education funding in 2013.[5] From 2008 to 2014, Kansas reduced K-12 education funding through its general formula by 14.6% and total state funding by 10.3% in constant dollars.[6] Through the 2017-18 fiscal year, funding through the state formula remains 9.9% lower than in 2008, after adjusting for inflation.[7] Increases in local funding did not make up for these state reductions.[8] Combined state and local funding per pupil declined 7% in Kansas from 2008 to 2014.[9] Furthermore, Kansas discontinued its

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1. MICHAEL LEACHMAN ET AL., CTR. ON BUDGET & POLICY PRIORITIES, MOST STATES HAVE CUT SCHOOL FUNDING, AND SOME CONTINUE CUTTING 1 (2016), https://www.cbpp.org/sites/default/files/atoms/files/12-10-15sfp.pdf [https://perma.cc/EXC5-2DK8].

2. Julien Lafortune et al., *School Finance Reform and the Distribution of Student Achievement* 6, 31 (Nat'l Bureau of Econ. Research, Working Paper No. 22011, 2016), http://www.nber.org/papers/w22011.pdf [https://perma.cc/G6TY-6K47]; C. Kirabo Jackson et al., *The Effects of School Spending on Educational and Economic Outcomes: Evidence from School Finance Reforms*, 131 Q.J. ECON. 157, 160 (2016); Christopher A. Candelaria & Kenneth A. Shores, *Court-Ordered Finance Reforms in the Adequacy Era: Heterogeneous Causal Effects and Sensitivity* 3 (Stanford Ctr. for Educ. Policy & Analysis, Working Paper, 2017), https://cepa.stanford.edu/content/court-ordered-finance-reforms-adequacy-era-heterogeneous-causal-effects-and-sensitivity [https://perma.cc/3YPZ-VX32].

3. For a study measuring the effects of school spending cuts on tests scores and graduation rates, *see generally* C. Kirabo Jackson et al., *Do School Spending Cuts Matter? Evidence from the Great Recession* (Nat'l Bureau of Econ. Research, Working Paper No. 24203, 2018), http://papers.nber.org/tmp/31119-w24203.pdf [https://perma.cc/62DQ-KUCL].

4. Student outcomes refer to test scores, typically called achievement, and high school graduation throughout this paper.

5. MICHAEL LEACHMAN & CHRIS MAI, CTR. ON BUDGET & POLICY PRIORITIES, LESSONS FOR OTHER STATES FROM KANSAS' MASSIVE TAX CUTS 1 (2014), https://www.cbpp.org/sites/default/files/atoms/files/3-27-14sfp.pdf [https://perma.cc/N9NK-RRN7].

6. LEACHMAN ET AL., *supra* note 1, at 4–5.

7. MICHAEL LEACHMAN ET AL. , CTR. ON BUDGET & POLICY PRIORITIES, A PUNISHING DECADE FOR SCHOOL FUNDING 7 (2017), https://www.cbpp.org/sites/default/files/atoms/files/11-29-17sfp.pdf [https://perma.cc/5PQY-G4HS].

8. *Id.* at 6.

9. LEACHMAN ET AL., *supra* note 1, at 14.

funding formula and used a block grant system for distributing education funds in fiscal years 2015 through 2017.[10] These funding patterns make Kansas a valuable case to examine the relationship between education funding and inequality of student outcomes.

10. LEACHMAN ET AL., *supra* note 7, at 16.

II. STATE FUNDING AND EQUALITY OF EDUCATIONAL OUTCOMES

The Coleman Report suggested minimal relationship between school resources and test scores.[11] Despite decades of attention since then,[12] debates about the relationship between school funding and educational achievement continue, with evidence for and against the argument that money does not matter for achievement.[13] Part of the challenge in addressing this question is the wide variation across states in education costs, funding mechanisms, and levels, in addition to variation in social and economic contexts and student characteristics.[14]

Partly to address challenges of state variation, several studies have examined the relationship between school funding and achievement within particular states. For example, research has examined school funding reforms in California,[15] Vermont,[16] Kentucky,[17] and Maryland,[18] finding little impact on inequality of educational achievement. Others have found inconsistent evidence

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11. JAMES S. COLEMAN ET AL., NAT'L CTR. FOR EDUC. STATISTICS, EQUALITY OF EDUCATIONAL OPPORTUNITY 297 (1966), https://files.eric.ed.gov/fulltext/ED012275.pdf [https://perma.cc/S22M-S8UV] ("The data suggest that variations in school quality are not highly related to variations in achievement of pupils.").

12. *See, e.g.*, Eric A. Hanushek, *The Impact of Differential Expenditures on School Performance*, EDUC. RESEARCHER, May 1989, at 45, 45–51, 62; Eric A. Hanushek, *School Resources and Student Performance*, *in* DOES MONEY MATTER?: THE EFFECT OF SCHOOL RESOURCES ON STUDENT ACHIEVEMENT AND ADULT SUCCESS 43 (Gary Burtless ed., 1996); Eric A. Hanushek, *Spending on Schools*, *in* A PRIMER ON AMERICA'S SCHOOLS 69 (Terry M. Moe ed., 2001); Eric A. Hanushek, *The Failure of Input-Based Schooling Policies*, 113 ECON. J. F64 (2003).

13. *Compare* Stephen L. Morgan & Sol Bee Jung, *Still No Effect of Resources, Even in the New Gilded Age?*, RUSSELL SAGE FOUND. J. SOC SCI., Sept. 2016, at 83 ("The overall conclusion of the Coleman Report—that family background is far and away the most important determinant of educational achievement and attainment—is as convincing today as it was fifty years ago."), *with* Bruce D. Baker et al., *Mind the Gap: 20 Years of Progress and Retrenchment in School Funding and Achievement Gaps* 1 (Educ. Testing Serv. Research Report Ser. No. RR-16-15, 2016) ("[A] strong case can be made that state and federal policy focused on improving state finance systems to ensure equitable funding and improving access to resources for children from low-income families is a key strategy to improve outcomes and close achievement gaps.").

14. *See, e.g.*, Caroline M. Hoxby, *All School Finance Equalizations Are Not Created Equal*, 116 Q.J. ECON. 1189 (2001) (explaining that school finance equalization schemes differ for multiple reasons, including broad variation in property values, tastes for education, and the school finance system. Hoxby notes a key difference between equalization regimes that "level up" and "level down").

15. Thomas A. Downes, *Evaluating the Impact of School Finance Reform on the Provision of Public Education: The California Case*, 45 NAT'L TAX. J. 405 (1992).

16. Thomas A. Downes, *School Finance Reform and School Quality: Lessons from Vermont*, *in* HELPING CHILDREN LEFT BEHIND: STATE AID AND THE PURSUIT OF EDUCATIONAL EQUITY 283 (John Yinger ed., 2003).

17. Ann E. Flanagan & Shelia E. Murray, *A Decade of Reform: The Impact of School Reform in Kentucky*, *in* HELPING CHILDREN LEFT BEHIND: STATE AID AND THE PURSUIT OF EDUCATIONAL EQUITY 195 (John Yinger ed., 2003).

18. Il Hwan Chung, *Education Finance Reform, Education Spending, and Student Performance: Evidence from Maryland's Bridge to Excellence in Public Schools Act*, 47 EDUC. & URB. SOC. 412 (2013).

of a relationship between funding and achievement, depending on the methods used.[19]

Of particular interest for this study, Duncombe and Johnston (2004) examined the effect of the 1992 Kansas school funding reform on inequality of spending and achievement.[20] The 1992 reform provided large adjustments for district size–favoring small districts–and, as a result, did not reduce inequality of spending after adjusting for differences in costs across districts.[21] Not surprisingly, therefore, they also found no decline in inequality of achievement or dropout rates.[22]

Complicating interpretation of these studies is that school finance reforms that aimed to achieve equity could level state funding up or down,[23] altering the amount and proportion of district funds received from state and local sources. Recent funding reforms have emphasized adequacy rather than just equality.[24] Thus, the relationship between state funding and equality of student outcomes could differ in the more recent context of adequacy reforms.

Efforts to achieve adequate education funding can conflict with state budget limitations, particularly during a recession or when state revenue declines due to tax cuts.[25] Kansas tax cuts were implemented during the 2008 recession, making it a valuable context to examine the relationship between education funding and student outcomes. That is, Kansas education funding declines were larger and longer than the median state decline.[26] To enhance understanding of the potential implications of state education funding cuts, this paper addresses the following research questions:

> What is the relationship between state education funding and student achievement (test scores) and high school graduation rates in Kansas?

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19. Julie Berry Cullen & Susanna Loeb, *School Finance Reform in Michigan: Evaluating Proposal A*, *in* HELPING CHILDREN LEFT BEHIND: STATE AID AND THE PURSUIT OF EDUCATIONAL EQUITY 215, 240 (John Yinger ed., 2003).

20. William Duncombe & Jocelyn M. Johnston, *The Impacts of School Finance Reform in Kansas: Equity Is in the Eye of the Beholder*, *in* HELPING CHILDREN LEFT BEHIND: STATE AID AND THE PURSUIT OF EDUCATIONAL EQUITY 147 (John Yinger ed., 2003).

21. *Id.*

22. *Id.* at 147–48.

23. Thomas A. Downes & David N. Figlio, *School Finance Reforms, Tax Limits, and Student Performance: Do Reforms Level Up or Dumb Down?* 1–3 (Inst. for Research on Poverty, Discussion Paper No. 1142–97, 1997), https://www.irp.wisc.edu/publications/dps/pdfs/dp114297.pdf [https://perma.cc/2T3F-TTTS].

24. *See, e.g.*, Sean Corcoran & William N. Evans, *Equity, Adequacy, and the Evolving State Role in Education Finance*, *in* HANDBOOK OF RESEARCH IN EDUCATION FINANCE AND POLICY 332 (Helen F. Ladd & Margaret E. Goertz eds., 2015); HELEN F. LADD ET AL., EQUITY AND ADVOCACY IN EDUCATION FINANCE: ISSUES AND PERSPECTIVES 3 (1999).

25. Nick Albares, *Steep Tax Cuts Endanger School Funding, in Kansas and Elsewhere*, CTR. ON BUDGET & POL'Y PRIORITIES (Feb. 17, 2016, 4:45 P.M.), https://www.cbpp.org/blog/steep-tax-cuts-endanger-school-funding-in-kansas-and-elsewhere [https://perma.cc/DS7H-M3SB]; LEACHMAN ET AL., *supra* note 1, at 7–10; LEACHMAN & MAI, *supra* note 5, at 4–6.

26. LEACHMAN & MAI, *supra* note 5, at 5–6.

Does this relationship differ by student characteristics, including race, ethnicity, and poverty?

III. VARIATION BY STUDENT DEMOGRAPHICS

The relationship between education funding and student outcomes may differ by student demographics due to socioeconomic inequalities. Low-socioeconomic status (SES) students receive less academic input at home compared to high-SES students.[27] This has implications for racial and ethnic inequality because Black and Hispanic children are more than twice as likely to live in poverty as White children. In 2016, poverty rates among Black and Hispanic children were 34% and 28%, respectively, compared to 12% among White children.[28] School funding could increase achievement more among Black, Hispanic, and poor students partly by countering socioeconomic inequalities. For example, given unequal learning opportunities at home, the achievement of low-SES, Black, and Hispanic students (who have higher poverty rates) may depend more strongly on school district resources, such as teacher quality. Higher funding would allow districts to provide better resources (e.g., more experienced teachers, higher teacher:pupil ratios, and smaller class sizes),[29] which could increase achievement most for disadvantaged students. Similarly, if teachers prefer to teach in schools with fewer poor or minority students,[30] additional funding could allow schools to attract and retain better teachers in schools with more disadvantaged students.[31] To state the point succinctly, higher school funding could increase educational outcomes more among low-SES, Black, and Hispanic students than among high-SES, White students, narrowing gaps in achievement and high school graduation rates. This is the hypothesis examined in this study.

Rigorous analyses estimating effects of state finance reforms offer evidence

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27. *See generally* Karl L. Alexander et al., *Lasting Consequences of the Summer Learning Gap*, 72 AM. SOC. REV. 167–180 (2007); ANNETTE LAREAU, UNEQUAL CHILDHOODS: CLASS, RACE, AND FAMILY LIFE (2003); DORIS R. ENTWISLE ET AL., CHILDREN, SCHOOLS, AND INEQUALITY (1998); BETTY HART & TODD R. RISLEY, MEANINGFUL DIFFERENCES IN THE EVERYDAY EXPERIENCE OF YOUNG AMERICAN CHILDREN (1995).

28. *Children in Poverty by Race and Ethnicity*, KIDS COUNT DATA CTR., http://datacenter.kidscount.org/data/tables/44-children-in-poverty-by-race-and-ethnicity [https://perma.cc/7ZU8-GEMP].

29. Baker et al., *supra* note 13, at 2–3, 26–28.

30. C. Kirabo Jackson, *Student Demographics, Teacher Sorting, and Teacher Quality: Evidence from the End of School Desegregation*, 27 J. LAB. ECON. 213, 214–217 (2009); Eric A. Hanushek et al., *Why Public Schools Lose Teachers*, 29 J. HUM. RES. 326, 347–352 (2004).

31. STEVEN GLAZERMAN ET AL., INST. FOR EDUC. SCI., TRANSFER INCENTIVES FOR HIGH-PERFORMING TEACHERS: FINAL RESULTS FROM A MULTISITE RANDOMIZED EXPERIMENT xxv–xxxvii (2013), https://ies.ed.gov/ncee/pubs/20144003/pdf/20144003.pdf [https://perma.cc/UU6M-ZHPG]; Susan Moore Johnson et al., *How Context Matters in High-Need Schools: The Effects of Teachers' Working Conditions on Their Professional Satisfaction and Their Students' Achievement*, 114 TCHRS. C. REC., no. 10, 2012, at 1.

in support of these heterogeneous effects. For example, evidence suggests that greater funding equality narrows SAT score gaps by parental education[32] and increases student test scores in low-income districts.[33] Examining within-district inequality, Wenglinsky (1998) finds no association between district spending and mean achievement measures, but a weaker association between socioeconomic status and achievement in districts with higher spending.[34] These findings are intriguing, but are based on cross-sectional 1992 data and measure funding and achievement at different levels (district and school).[35]

Furthermore, existing research tends to examine the implications of funding for socioeconomic differences in achievement.[36] Yet school districts or individual schools can have contradictory effects on inequality by income and race.[37] Evidence also suggests school funding and resources may matter more for certain educational outcomes than others. For example, school funding may be more important for educational attainment–such as high school graduation rates–than for achievement.[38] Thus, research examining both achievement and high school graduation rates, as well as variation by race, ethnicity, and poverty, is required to understand whether education funding may have unequal implications for student outcomes.

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32. David Card & A. Abigail Payne, *School Finance Reform, the Distribution of School Spending, and the Distribution of Student Test Scores*, 83 J. PUB. ECON. 49, 78–80 (2002).

33. Lafortune et al., *supra* note 2, at 31; Joydeep Roy, *Impact of School Finance Reform on Resource Equalization and Academic Performance: Evidence from Michigan*, 6 EDUC., FIN. & POL'Y 137, 163–65 (2011); Jonathan Guryan, *Does Money Matter? Regression-Discontinuity Estimates from Education Finance Reform in Massachusetts* 24–25 (Nat'l Bureau of Econ. Research, Working Paper No. 8269, 2001), http://www.nber.org/papers/w8269.pdf [https://perma.cc/5KJR-NGBP]; Leslie E. Papke, *The Effects of Spending on Test Pass Rates: Evidence from Michigan*, 89 J. PUB. ECON. 821, 838 (2005); THOMAS DOWNES ET AL., MASSINC, INCOMPLETE GRADE: MASSACHUSETTS EDUCATION REFORM AT 15, 53 (2009), https://www.bostonfed.org/-/media/Documents/nesg/downes_zabel_edreform_massinc.pdf?la=en [https://perma.cc/PCN2-GBLC].

34. Harold Wenglinsky, *Finance Equalization and Within-School Equity: The Relationship Between Education Spending and the Social Distribution of Achievement*, 20 EDUC. EVALUATION & POL'Y ANALYSIS 269, 267–77 (1998).

35. *Id.* at 269, 272.

36. *Id.* at 270; Card & Payne, *supra* note 32, at 50.

37. Jennifer L. Jennings et al., *Do Differences in School Quality Matter More Than We Thought? New Evidence on Educational Opportunity in the Twenty-First Century*, 88 SOC. EDUC. 56, 77 (2015); ANTHONY S. BRYK & MARY ERINA DRISCOLL, NAT'L CTR. ON EFFECTIVE SECONDARY SCH., THE HIGH SCHOOL AS COMMUNITY: CONTEXTUAL INFLUENCES AND CONSEQUENCES FOR STUDENTS AND TEACHERS 1, 29 (1988), https://files.eric.ed.gov/fulltext/ED302539.pdf [https://perma.cc/CM55-MADS].

38. *See e.g.*, Jennings et al., *supra* note 37, at 58, 78; Jackson et al., *supra* note 1, at 158; David Card & Alan B. Krueger, *School Resources and Student Outcomes: An Overview of the Literature and New Evidence from North and South Carolina*, 10 J. ECON. PERSP. 31, 31–32 (1996).

IV. RESEARCH METHODS

A. Achievement Data

Data for analyses of achievement and graduation rates are drawn from different sources. I use annual district-level measures of achievement (and achievement gaps by race and ethnicity) from the Stanford Education Data Archive (SEDA 2.0; Reardon et al. 2017).[39] Achievement is measured in grade-equivalent units, so a value of one is equivalent to one full year in school (Fahle et al. 2017).[40] Inequality of achievement is measured in the same units, so a White-Black achievement gap of one would indicate that White students in that district are, on average, one grade level ahead of Black students in that subject (Fahle et al. 2017).[41] Achievement measures include English/Language Arts and Math test scores for each year 2009-2013 and for each grade 3-8.[42] Although SEDA data are available for years 2014 and 2015 in other states, data for 2014 are not available for Kansas. Year refers to the spring of each academic year throughout the paper, so 2009 represents the 2008-2009 academic year.

The main analyses use average district-level achievement in English/Language Arts for grades 3-8, weighted by grade-level enrollment. Results are similar for Math achievement and when predicting grade-specific achievement, accounting for grade-level differences in achievement (i.e. adding grade-level fixed effects to regressions).

The SEDA data provide achievement measures for each district, grade, and year in which there are at least 20 students in each cell or group (i.e. at least 20 Black students in each grade and year within a district). Values for observations with less than the required sample size are suppressed for privacy reasons. The implications for this study are that sample sizes are lower for measures of achievement among Black and Hispanic students and for measures of inequality of achievement (i.e. White-Black gaps and White-Hispanic gaps in achievement). In addition, SEDA data omit observations in which the state test participation rate is less than 95%; students in the same state, subject, grade, and year took different tests; or states did not report sufficient data (Fahle et al. 2017:13-14).[43] Overall, SEDA drops 10.5% of district-grade-year-subject observations (Fahle et al. 2017:37).[44] Missing rates are higher in Kansas, due to

39. Sean F. Reardon, Andrew D. Ho, Benjamin R. Shear, Erin M. Fahle, Demetra Kalogrides, & Richard DiSalvo, *Stanford Education Data Archive (SEDA)*, STAN. DIGITAL REPOSITORY (May 2016), https://purl.stanford.edu/db586ns4974 [https://perma.cc/R7WF-XA5V].

40. Sean F. Reardon, Andrew D. Ho, Benjamin R. Shear, Erin M. Fahle, Demetra Kalogrides, & Richard DiSalvo, *Stanford Education Data Archive Technical Documentation (Version 2.0)*, STAN. CTR. FOR POL'Y ANALYSIS (2017), https://cepa.stanford.edu/seda/download?nid=2016&destination=node/2021 [https://perma.cc/AZ3G-N7QG].

41. *Id.*

42. *Id.*

43. *Id.*

44. *Id.*

small numbers of Black and Hispanic students in many districts.

I link these data using National Center for Education Statistics (NCES) district ID to Public Elementary-Secondary Education Finance Data from the Census Finance Survey (called F-33), which include annual revenue and expenditure details for each district 2009-2013.[45] I use these data to calculate annual district-level measures of per pupil spending on instructional expenses and per pupil spending on wages for instructional staff. All currency is adjusted for inflation to 2016 dollars. The SEDA 2.0 data include Kansas achievement data for 2015, but I limit analysis to 2009-2013 because F-33 data for 2015 are not yet available and Kansas achievement data are not available in 2014.

District-level control variables, compiled by SEDA from the Common Core of Data and other sources, adjust for annual district characteristics, including the proportion of students who have Limited English Proficiency; are eligible for free or reduced price lunch; or are of minority ethnic or racial background (Hispanic or Black). Additional district controls include student enrollment and number of schools.

B. High School Graduation Rate Data

I gather annual district-level high school graduation rates by race, ethnicity, and free lunch eligibility from the Kansas State Department of Education for the years 2010 to 2015.[46] Graduation rates are measured using the five-year adjusted cohort formula among public high schools.[47] This formula calculates the district-level graduation rate as the number of students who graduate in five years with a regular high school diploma divided by the number of students who entered high school five years earlier, adjusted for transfers in and out of the district (i.e. adding to the denominator students who transferred in and subtracting those who transferred out).[48] Prior to the 2009-2010 academic year, Kansas used different methods of calculating graduation rates. Therefore, data prior to 2010 are not comparable and are not examined here.

Graduation rates are measured with error, because of inaccurate or incomplete information about students who transfer in or out of the district.[49]

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45. *Local Education Agency (School District) Finance Survey (F-33) Data*, NAT'L CTR. FOR EDUC. STAT., https://nces.ed.gov/ccd/f33agency.asp [https://perma.cc/7U5Z-B9HH].

46. *Kansas K-12 Report Generator*, KSDE DATA CENT., http://datacentral.ksde.org/report_gen.aspx (select "Grad. Rate: 5-Year Cohort by Type, Race & Gender (ESEA Formula – 2010 and Later) for "Select a Report" and "2015-2016" for "Select a School Year").

47. A high school cohort is a group that starts high school in the same year and school district and, if they progress through high school on time, would graduate in four or five years. KAN. STATE DEP'T OF EDUC., KANSAS GRADUATION AND DROPOUT INFORMATION HANDBOOK 7 (2016), http://ksde.org/Portals/0/TLA/Graduation and School Choice/Graduation and Dropout/Kansas Graduation and Dropout Information 2016-2017.pdf [https://perma.cc/QP44-LPFL].

48. *Id.*

49. Richard J. Murane, *U.S. High School Graduation Rates: Patterns and Explanations*, 51

Because states differ in their method for calculating graduation rates, examining one state reduces concern that state differences in both funding and measurement of graduation rate could bias results. Inequality of graduation rates are calculated as the graduation rate among White students minus the rate among Black or Hispanic students. Inequality by poverty status is calculated as the graduation rate among those who do not qualify for free lunch minus the graduation rate among those who do.

Graduation rate data are linked to district-level finance data from the Kansas State Department of Education for 2008 to 2015, adjusted for inflation to 2016 dollars. These data are linked using the state district identification number and include per pupil measures of state aid and general fund budget. Per pupil state aid represents the total amount of funds each district received each academic year from the state divided by total enrollment in the same year. Per pupil general fund budget is the amount of money each district received in its general fund budget divided by total enrollment (i.e. the amount each district had available to spend on each student). According to the Kansas State Department of Education (2017:1), "the General Fund is primarily equalized state aid" and can be spent on various programs.[50] It is distinguished from the supplemental general fund (the Local Option Budget), which is revenue from local property taxes and state aid to adjust for unequal local support.[51]

A typical high school career is four years, so single-year measures would understate the relationship between funding and graduation rate. Therefore, I calculate four-year moving averages of per pupil state aid and per pupil general fund. I use a three-year average when predicting 2010 graduation rates to prevent losing observations when four previous years of finance data are not available. Funding is therefore measured with more error in 2010.

The same district-level control measures used in the analyses of achievement data are linked to the graduation rate data using NCES identification number.[52] These measures–available from 2009 to 2015–include the proportion of students who: have Limited English Proficiency; are eligible for free or reduced price lunch; or are of minority ethnic or racial background (Hispanic or Black). Additional district controls include student enrollment and number of schools. Some of these control measures are unavailable in 2016 and I therefore limit analyses to 2010-2015. However, analyses are consistent with those presented below when imputing missing 2016 values based on 2015 values and examining 2010-2016 data. As with the finance data, I calculate four-year moving averages for each of these control variables. Because of the time range available, these averages are based on three years of data in 2011 and two years

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J. ECON. LITERATURE 370, 376–80 (2013).

50. KAN. STATE DEP'T OF EDUC., USD BUDGET: FUND SUMMARIES 1 (2017), http://www.ksde.org/Portals/0/School%20Finance/budget/Budget_Fund%20Summaries.pdf [https://perma.cc/H3R8-G7YL].

51. *Id.*

52. *Local Education Agency (School District) Finance Survey (F-33) Data*, *supra* note 45.

of data in 2010.

C. Statistical Analyses

Kansas school districts receive varying amounts of funding from the state based partly on enrollment, student characteristics, and property tax base and effort.[53] The concern for this study is that district characteristics related to state funding or spending may also be associated with student outcomes. For example, districts with a higher proportion of students eligible for free lunch may have lower achievement and graduation rates and receive more state funding per pupil (due to a higher enrollment weighting for at-risk students in the Kansas funding formula).[54] Similarly, districts in areas with a higher cost of living may spend more per pupil on instruction and have higher achievement. To address these concerns, I examine within-district changes in funding and achievement. Specifically, I include district fixed effects in all regressions to adjust for time-constant differences between districts. I also include year fixed effects in all models to account for differences over time (e.g., the recession).

Equation 1 predicts district-year achievement measures with district (*i*) and year (*j*) fixed effects, a measure of education funding (in this case, instructional expenditures per pupil), and time-varying controls (*X*) for district characteristics. Standard errors are adjusted for district-level clustering in all models. Controls include the proportion of students who qualify for free or reduced-price lunch, are learning English, Black, or Hispanic, as well as enrollment (logged to reduce skew), and number of schools in the district. In analyses predicting grade-specific achievement, controls also include grade-specific enrollment (logged to reduce skew) and grade-level fixed effects. Sensitivity analyses excluding controls yield similar results. β_1 estimates the extent to which a change in the amount a district spends on instruction per pupil is associated with a change in achievement. If β_1 is positive, it would suggest that an increase in instructional spending is associated with higher achievement.

$$\text{Achievement}_{ij} = \alpha + \beta_1 \%\ \text{Inst. Spending}_{ij} + \beta_k X_{ij} + \text{District}_i + \text{Year}_j + \varepsilon_{ij} \quad (1)$$

Analyses predicting high school graduation rates are similar. However, because high school typically takes four years, finance measures and all control measures are averaged over four years. In Equation 1, district high school graduation rate measures replace achievement measures. Thus, high school graduation rate in district (*i*) and year (*j*) is predicted by a four-year moving average of state revenue, and four-year moving averages of district-level controls (*X*). Controls include the same measures as when predicting achievement (averaged over four years). Sensitivity analyses excluding controls

53. KAN. LEGISLATIVE RESEARCH DEP'T, SCHOOL FINANCE HISTORY 7–16 (2015), http://www.kslegresearch.org/KLRD-web/Publications/Education/2015_school_finance_history.pdf [https://perma.cc/2TWC-JMDY].

54. *Id.* at 13.

yield similar results.

When predicting graduation rate, β_1 estimates the extent to which a change in the amount a district received from the state (over each high school cohort's four-year career) is associated with a change in graduation rate. If β_1 is positive, it would suggest that an increase in state revenue is associated with a higher graduation rate. As in the achievement analyses, standard errors are adjusted for district-level clustering in all models.

Although fixed effects account for stable differences between districts, it is still possible that some factor is driving both district funding and graduation rates. To address this concern, I use difference-in-differences analyses that take advantage of the transition to block grant funding in the 2015 academic year.[55] Block grant funding froze district funding, which effectively increased per pupil funding in districts with declining enrollment but decreased it in districts with growing enrollment. This policy affected all districts, but it had different implications depending on enrollment trends. I compare changes in achievement gaps and graduation rates in districts that grew during the block grant period to those in which enrollment decreased in the same period. Specifically, I compare achievement gap changes from 2013 to 2015 and graduation rates changes from 2014 to 2016 by change in district enrollment. SEDA achievement data are not available for Kansas districts in 2014 or after 2015, which prevents examining alternative years. High school graduation rates may take longer than one year to respond to funding changes, so changes from 2014 to 2016 may underestimate effects of reduced funding per pupil.

Equation 2 estimates graduation rate (or achievement gap) in district (*i*) in year (*j*) with an indicator for whether the year is after the block grant transition (post-block, 2015 in achievement analyses and 2016 in graduation rate analyses), an indicator for whether the district enrollment grew from before to after the block grant transition (grew), and an interaction between the two.

$$\text{Grad Rate}_{ij} = \alpha + \beta_1 \text{Post-Block}_{ij} + \beta_2 \text{Grew}_{ij} + \beta_3 \text{Post-Block}_{ij} * \text{Grew}_{ij} + \beta_k X_{ij} + \varepsilon_{ij} \quad (2)$$

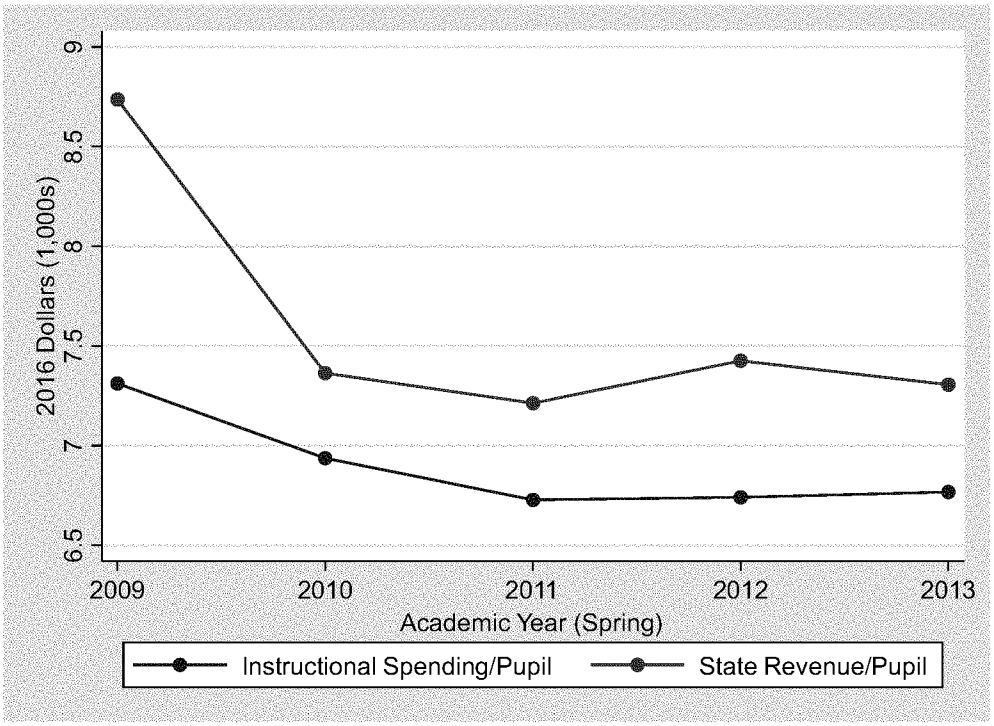
The parameter of interest, β_3, estimates whether graduation rates changed more with the transition to block grant funding in districts that grew (and therefore received lower funding per pupil) than in districts that shrank. Controls (*X*) are the same as those included in the full analyses, with two exceptions. Enrollment is not included because enrollment changes are the identification strategy and number of schools is not included the graduation rate analyses because it is not available in 2016. Results are shown with and without controls.

55. LEACHMAN ET AL., *supra* note 7, at 6.

V. RESULTS

Average instructional spending in Kansas was declining from 2009 to 2013. Figure 1 illustrates this trend, showing that the average amount districts spent per student declined from approximately $7,300 in 2009 to $6,700 in 2013. Figure 1 also shows that state revenue per pupil declined even more steeply than instructional spending over this time period, and the decline occurred mainly in 2010, falling from approximately $8,700 in 2009 to $7,300 in 2010. In the achievement data, the median decrease in instructional spending from 2009 to 2013 was 6%.

Figure 1: Mean Instructional Spending and State Revenue per Pupil 2009-2013



Source: 2009-2013 SEDA 2.0 and F-33 data. Funding measures are in 2016 dollars.

Descriptive statistics on achievement and graduation rate data are presented in Appendix Tables A1 and A2. Table A1 compares districts with low and high decreases in instructional spending. That is, districts in the High Spending Decrease column experienced large declines (more than 5%) in instructional spending per pupil from 2009 to 2013. Districts in the Low Spending Decrease column experienced small declines (less than 5%) or increases in instructional spending per

pupil. Table A1 shows that average achievement is lower for all groups in districts with large declines in instructional spending. White-Black achievement gaps are also larger in districts with high instructional spending cuts, but White-Hispanic gaps are smaller. These mean differences, however, are not statistically significant and regression analyses are required to account for changes over time, as well as differences between districts.

Table A2 provides mean high school graduation rate data, comparing districts above and below median state aid per pupil. The overall average graduation rate in all district-year observations from 2010-2015 was 88.7%, but rates differed by gender, race, ethnicity, and free lunch eligibility. Specifically, graduation rates were higher among women and white students and lower among men, Hispanic, Black, and free lunch-eligible students. Furthermore, graduation rates were consistently higher, and inequality of graduation rates was lower, among district-year observations that received higher state aid per pupil. With the exception of the difference among white women, these differences are all statistically significant ($p<0.05$). However, as with the achievement differences, these differences could reflect changes over time or between districts.

Tables 1-3 present regression results of achievement data. Table 1 predicts English/Language Arts (ELA) achievement, aggregated across grades 3-8 in each district. Accounting for differences between districts and over time, results in Table 1 suggest that instructional spending per pupil is positively associated with aggregate ELA achievement, particularly among Hispanic students, and negatively associated with racial inequality of ELA achievement. Specifically, a $1,000 decrease in instructional spending per pupil is associated with an increase in the White-Black achievement gap equivalent to a quarter of a grade level ($p<0.05$) and a decrease in Hispanic achievement equivalent to one grade level ($p<0.01$).

Table 1: Predicted Aggregate English/Language Arts Achievement by Race and Ethnicity

VARIABLES	(1) White-Black Gap	(2) White-Hispanic Gap	(3) Black	(4) Hispanic	(5) White
Inst Spending per pupil	-0.26*	-0.12	0.12	1.10**	0.12+
	(0.12)	(0.10)	(0.25)	(0.25)	(0.07)
% Free/Reduced Price Lunch	-1.29	0.80	7.93	-5.32+	-1.31+
	(4.23)	(1.52)	(5.45)	(3.12)	(0.72)
% English Language Learners	-0.55	0.18	-10.71	-6.96*	-0.89
	(5.22)	(2.21)	(11.73)	(3.20)	(3.11)
% Black	-3.83	-3.60+	8.98*	9.43	1.05
	(2.56)	(2.07)	(3.46)	(6.64)	(2.35)
% Hispanic	-0.91	4.63**	0.28	2.79	1.17
	(1.78)	(1.71)	(2.32)	(3.27)	(1.32)
Enrollment (log)	-0.63	-0.80	2.83	0.75	0.85+
	(1.62)	(1.01)	(2.40)	(2.27)	(0.44)
Number of Schools	0.00	0.03*	0.03	-0.08*	0.06*
	(0.02)	(0.01)	(0.04)	(0.03)	(0.03)
Constant	9.81	6.48	-25.58	-4.53	-0.38
	(14.87)	(8.78)	(22.48)	(20.10)	(3.27)
District & Year Fixed Effects	Y	Y	Y	Y	Y
Observations	96	219	96	226	1,081
R-squared	0.07	0.36	0.15	0.34	0.03
Number of Districts	23	51	23	54	248

Source: 2009-2013 SEDA 2.0 and F-33 data, limited to district-year observations with achievement and funding data. Achievement is measured in grade-equivalent units.

All models include district and year fixed effects. Funding measures are in 2016 dollars. Robust standard errors are in parentheses.

** $p<0.01$, * $p<0.05$, + $p<0.1$

Models 2 and 3 in Table 1 suggest no relationship between instructional spending and the White-Hispanic achievement gap or mean achievement among Black students. The coefficient for instructional spending is positive, but only reaches significance at the 90% level when predicting achievement among White students.

Table 2: Predicted Grade-Specific English/Language Arts Achievement by Race and Ethnicity

VARIABLES	(1) White-Black Gap	(2) White-Hispanic Gap	(3) Black	(4) Hispanic	(5) White
Inst Spending per pupil	-0.14	-0.22*	0.35*	0.63**	0.08+
	(0.09)	(0.11)	(0.13)	(0.20)	(0.04)
% Free/Reduced Price Lunch	0.60	1.59	1.28	-0.92	-0.51
	(3.83)	(1.42)	(4.19)	(2.25)	(0.52)
% English Language Learners	-1.52	0.27	2.47	-5.48	-2.14
	(5.18)	(2.18)	(7.26)	(4.12)	(1.78)
% Black	-2.10	-3.75+	7.23+	8.18*	1.99
	(2.16)	(1.98)	(3.62)	(3.77)	(1.67)
% Hispanic	0.77	3.70*	0.16	-1.00	0.76
	(1.50)	(1.70)	(1.46)	(2.21)	(0.86)
Enrollment (log)	-1.79+	-0.46	3.16+	1.43	0.61+
	(1.02)	(0.86)	(1.75)	(1.32)	(0.33)
Enrollment (log) – Grade	0.54	0.10	0.17	0.43	-0.21*
	(0.54)	(0.39)	(0.96)	(0.40)	(0.09)
Number of Schools	0.01	0.06**	0.01	-0.05*	0.04*
	(0.02)	(0.02)	(0.03)	(0.02)	(0.02)
Constant	15.04	3.38	-27.49+	-9.46	4.47+
	(11.03)	(8.09)	(15.92)	(12.49)	(2.41)
Grade Fixed Effects	Y	Y	Y	Y	Y
District & Year Fixed Effects	Y	Y	Y	Y	Y
Observations	456	1,002	457	1,028	6,289
R-squared	0.03	0.09	0.89	0.90	0.85
Number of Districts	22	50	22	53	260

Source: 2009-2013 SEDA 2.0 and F-33 data, limited to district-grade-year observations with achievement and funding data. Achievement is measured in grade-equivalent units.

All models include district, year, and grade fixed effects. Funding measures are in 2016 dollars. Robust standard errors are in parentheses.

** $p<0.01$, * $p<0.05$, + $p<0.1$

Table 2 provides results of regression models predicting grade-specific ELA achievement. Regression models are the same as those in Table 1, but add grade fixed effects to account for grade-level achievement differences. In contrast to the results in Table 1, The coefficient for instructional spending is not significant in Model 1, predicting the Black-White achievement gap. However, Models 2-4

indicate that lower instructional spending is associated with an increase in White-Hispanic inequality and lower achievement among both Black and Hispanic students (all $p<0.05$). In fact, a $1,000 decrease in instructional spending per pupil is associated with a slight decrease in ELA achievement among White students ($p<0.10$), but the decrease is four times larger among Black students and nearly eight times larger among Hispanic students. Consistent with the stronger benefit among Hispanic students, a decrease of $1,000 in instructional spending is associated with an increase in the White-Hispanic achievement gap of approximately one fifth of a grade level.

Figure 1 showed steeper declines in state revenue compared to instructional spending, raising questions about how responsive instructional spending is to state revenue. Table 3 examines the extent to which instructional spending is associated with state revenue, accounting for differences between districts and over time. Including the same controls as the models in Table 1, Model 1 suggests that a $1,000 decline in per pupil state revenue is associated with a $220 decline in per pupil instructional spending. Excluding controls, Model 2 suggests the same decline is associated with a $310 decline in instructional spending. Standardizing this coefficient yields an elasticity of 0.57; a one percent decrease in per pupil state revenue is associated with a 0.57 percent decrease in per pupil instructional spending. Models 3 and 4 predict per pupil instructional spending on wages and suggest a slightly weaker association between state revenue and instructional wages spending (an elasticity of 0.50 in Model 4).

Table 3: Predicted Instructional Spending per Pupil

VARIABLES	(1)	(2)	(3)	(4)
	Inst Spending per pupil		Inst Spending on Wages per pupil	
Per Pupil State Revenue	0.22**	0.31**	0.14**	0.18**
	(0.05)	(0.06)	(0.03)	(0.03)
% Free/Reduced Price Lunch	-0.67		-0.92*	
	(0.56)		(0.37)	
% English Language Learners	2.16		1.77	
	(1.77)		(1.10)	
% Black	-2.91+		-1.90	
	(1.74)		(1.16)	
% Hispanic	-0.27		-0.30	
	(0.74)		(0.50)	
Enrollment (log)	-4.00**		-1.95**	
	(0.47)		(0.29)	
Number of Schools	0.01		0.00	
	(0.01)		(0.01)	
Constant	33.05**	4.45**	16.79**	2.60**
	(3.54)	(0.42)	(2.20)	(0.24)
District & Year Fixed Effects	Y	Y	Y	Y
Observations	1,081	1,081	1,081	1,081
R-squared	0.59	0.41	0.68	0.60
Number of Districts	248	248	248	248

Source: 2009-2013 SEDA 2.0 and F-33 data, limited to district-year observations with achievement and funding data.

All models include district and year fixed effects. Funding measures are in 2016 dollars. Robust standard errors are in parentheses.

** $p<0.01$, * $p<0.05$, + $p<0.1$

Overall, results in Table 3 suggest a substantial association between instructional spending and state revenue in a district. However, the different trends in Figure 1 and the estimates in Table 3 suggest instructional spending is not perfectly determined by state funding. Rather, districts may have taken steps to shield instructional spending from reduced state revenue.

Table 4 presents results of regressions predicting inequality of high school graduation rates. The models include the same controls and fixed effects as in the achievement analyses, but controls are averaged over the previous four years to measure district characteristics during the typical length of high school for each graduating cohort. Predicting White-Hispanic inequality, Models 1 and 2 find that state aid and general fund budget amounts per pupil are associated with smaller gaps. That is, a $1,000 decrease in state aid per pupil, over the four years of each cohort's

high school career, is associated with a 3-percentage point increase in White-Hispanic inequality of high school graduation rates (p<0.10). A decrease of $1,000 in the general fund budget per pupil over a cohort's high school career is associated with an increase of 8 percentage points in the White-Hispanic gap (p<0.01). Similarly, Model 6 suggests that a $1,000 decline in the general fund budget per pupil over a cohort's high school career is associated with an increase of nearly 4 percentage points in the free lunch gap in graduation rates (p<0.05). Other coefficients for funding measures in Table 4 do not reach significance.

Table 4: Predicted Gaps in Graduation Rates by Race, Ethnicity, and Free Lunch Eligibility

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	White-Hispanic Gap		White-Black Gap		Free Lunch Gap	
State Aid/Pupil	-2.96+		-1.15		-1.38	
	(1.56)		(2.79)		(1.19)	
General Fund/Pupil		-7.93**		1.96		-3.83*
		(2.88)		(2.63)		(1.76)
% Free/Reduced Price Lunch	-40.08	-29.45	31.94	36.67	-2.72	-0.73
	(29.66)	(29.29)	(59.66)	(59.11)	(22.71)	(22.58)
% English Language Learners	-11.52	-5.41	-61.82	-66.10	-3.36	0.54
	(45.65)	(41.10)	(62.96)	(65.95)	(59.62)	(59.67)
% Black	187.52	139.40	41.26	51.08	270.33**	257.81*
	(118.09)	(123.75)	(120.59)	(120.81)	(102.58)	(103.98)
% Hispanic	9.28	12.16	219.89+	218.05+	85.46*	86.16*
	(42.91)	(42.62)	(111.72)	(110.86)	(38.75)	(38.65)
Enrollment (log)	15.19	1.13	8.14	9.63	27.60**	19.43*
	(14.52)	(14.28)	(26.04)	(25.90)	(9.23)	(9.28)
Number of Schools	0.16	0.20	0.52	0.47	-0.49	-0.51
	(1.15)	(1.14)	(1.15)	(1.14)	(1.18)	(1.17)
Constant	-78.53	65.92	-88.34	-122.55	-165.01**	-85.73
	(100.24)	(107.63)	(182.86)	(186.34)	(62.93)	(68.78)
District & Year Fixed Effects	Y	Y	Y	Y	Y	Y
Observations	1,224	1,224	665	665	1,665	1,665
R-squared	0.02	0.03	0.05	0.05	0.04	0.04
Number of Districts	276	276	208	208	283	283

Source: 2010-2015 KSDE data, linked to SEDA 2.0 covariates, limited to district-year observations with graduation rate and funding data.

All independent variables are four-year moving averages. To maintain the full sample, funding measures in 2010 are 3-year averages, controls measures in 2010 are 2-year averages, and control measures in 2011 are 3-year averages. All models include district and year fixed effects. The free lunch gap is the

graduation rate among students who are not eligible for free lunch minus the graduation rate among students who are eligible for free lunch. Revenue is measured in 2016 dollars. Robust standard errors are in parentheses.
** p<0.01, * p<0.05, + p<0.1

Figure 2 compares coefficients predicting graduation rates among students by race, ethnicity, and poverty status (eligibility for free lunch), from models including the same controls and fixed effects as those in Table 4. The figure shows that coefficients are typically higher among Hispanic, Black, and free lunch-eligible students, compared to other groups. For example, a $1,000 decrease in the general fund per pupil over a cohort's high school career is associated with lower HS graduation rates for all students (5 percentage points), but compared to White students, the decrease is nearly twice as high among Hispanic men and over four times as high among Hispanic women. Similarly, a $1,000 decrease in state aid per pupil over a cohort's high school career is associated with in a 2-percentage point decrease in graduation rates for all students, but compared to their White counterparts, the decrease is more than twice as high among Black men and among Hispanic and Black women. Compared to all students, the association between per pupil general fund amounts and graduation rates of both men and women is about 1.5 times stronger among students eligible for free lunch. Thus, both Table 4 and Figure 2 suggest a stronger relationship between education funding and graduation rates among Hispanic, Black, and poor students.

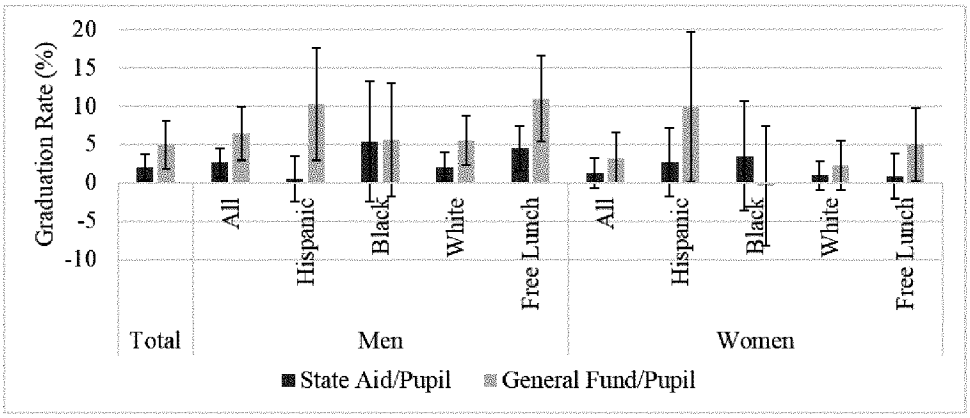


Figure 2: Predicted Graduation Rate by Revenue Type and Student Demographics

Coefficients are from separate models including the same controls as those in Tables 4 and 5.

Revenue is measured in 2016 dollars and represents a 4-year moving average (3 year average in 2010 to maintain the full sample).

Table 5 suggests a potential mechanism for the relationship between funding and graduation rates: student-teacher ratios. Regressions in Table 5 predict the pupil:teacher ratio in each district and year, averaged over the previous four years, with the same controls and fixed effects as models in Table 4. Models 1 and 2 suggest that the amount a district receives in its general fund for each student is associated with lower pupil:teacher ratios. This relationship holds whether using a single-year or four-year moving average measure of general fund budget per pupil. The coefficients for state aid per pupil in Models 3 and 4 are negative, but they are small and do not reach significance. Results are similar when predicting a single-year measure of student-teacher ratio. Thus, Table 5 suggests that the student-teacher ratio could be one factor that accounts for the relationship between education funding and inequality of graduation rates. That is, graduation rates among Hispanic, Black, and poor students may be more strongly related to district student-teacher ratios, which are in turn dependent on the district general fund budget.

Table 5: Predicted Student-Teacher Ratio

VARIABLES	(1)	(2)	(3)	(4)
	Pupils per Teacher (4-year Moving Average)			
General Fund/Pupil – 1 year	-0.19**			
	(0.05)			
General Fund/Pupil – 4 year avg		-0.37**		
		(0.12)		
State Aid/Pupil – 1 year			-0.01	
			(0.03)	
State Aid/Pupil – 4 year avg				-0.03
				(0.10)
% Free/Reduced Price Lunch	2.01	2.24	2.01	2.06
	(1.67)	(1.72)	(1.76)	(1.72)
% English Language Learners	-5.71	-5.80	-6.28	-6.31
	(6.80)	(7.02)	(7.08)	(7.13)
% Black	13.18*	13.08*	14.69*	14.62*
	(5.93)	(5.97)	(6.14)	(6.10)
% Hispanic	0.31	0.71	0.64	0.65
	(2.19)	(2.34)	(2.25)	(2.26)
Enrollment (log)	9.05**	8.44**	9.33**	9.32**
	(1.52)	(1.64)	(1.61)	(1.67)
Number of Schools	-0.17**	-0.17**	-0.17**	-0.17**
	(0.06)	(0.06)	(0.06)	(0.06)
Constant	-44.73**	-39.21**	-48.17**	-48.02**
	(10.03)	(11.21)	(10.88)	(11.63)
District & Year Fixed Effects	Y	Y	Y	Y
Observations	1,676	1,676	1,676	1,676
R-squared	0.43	0.44	0.42	0.42
Number of Districts	283	283	283	283

Source: 2010-2015 KSDE data, linked to SEDA 2.0 covariates, limited to district-year observations with graduation rate and funding data.

All control measures are four-year moving averages. To maintain the full sample, funding measures in 2010 are 3-year averages, controls measures in 2010 are 2-year averages, and control measures in 2011 are 3-year averages. All models include district and year fixed effects. Revenue is measured in 2016 dollars. Robust standard errors are in parentheses.

** $p<0.01$, * $p<0.05$, + $p<0.1$

I conduct several sensitivity analyses to assess robustness of the results. Analyses of both achievement and graduation rate data are replicated excluding

controls for district characteristics. Results are similar to the main analyses, which include controls. Achievement results are similar when predicting Math rather than ELA achievement. Results are also similar when predicting grade-specific achievement and accounting for grade-level differences in achievement. In addition, results predicting achievement are similar when using per pupil instructional spending on wages, rather than general instructional spending. This is consistent with the large proportion of instructional spending that pays wages (60% on average in these district-years) and also with evidence of a relationship between achievement and teacher quality and experience.[56]

Finally, to reduce concern about a potential endogenous relationship between funding and graduation rates, Tables 6 and 7 present results of difference-in-differences analyses taking advantage of the transition to block grant funding. Because funding under block grants did not change with enrollment, districts in which enrollment increased experienced a decline in per pupil funding. Consistent with the analyses above, Model 1 in Table 6 suggests that White-Hispanic achievement gaps increased more in districts that grew–and therefore received less funding per pupil–with the transition to block grant funding. Although White-Hispanic gaps were lower before block grant funding in districts that grew, these gaps increased more (0.34, equivalent to 1/3 of a grade level) under block grant funding in districts that increased enrollment ($p<0.05$). Model 2 indicates that results are consistent when including controls, but the difference is smaller and less precise (0.22, $p<0.10$). Estimates predicting White-Black achievement gaps are positive, but do not reach statistical significance.

56. Linda Darling-Hammond, *Teacher Quality and Student Achievement: A Review of State Policy Evidence*, 8 EDUC. POL'Y ANALYSIS ARCHIVES 1, 23 (2000), https://epaa.asu.edu/ojs/article/view/392/515 [https://perma.cc/P82C-UDLN].

Table 6: Predicted Gaps in Achievement by Race and Ethnicity – Difference-in-Differences Analyses

VARIABLES	(1)	(2)	(3)	(4)
	White-Hispanic Gap		White-Black Gap	
Grew x Post-Block Grant	0.34*	0.22+	0.10	0.03
	(0.16)	(0.13)	(0.31)	(0.36)
Grew 2013-2015	-0.27+	-0.31*	-0.17	-0.23
	(0.14)	(0.12)	(0.19)	(0.20)
Post-Block Grant	-0.18	-0.08	0.28	0.34
	(0.15)	(0.11)	(0.29)	(0.33)
% Free/Reduced Price Lunch		-0.84*		-0.15
		(0.38)		(0.60)
% English Language Learners		1.91+		-1.91
		(1.04)		(2.92)
% Black		-1.81+		-1.41
		(1.00)		(1.33)
% Hispanic		-0.28		-0.22
		(0.89)		(2.39)
Number of Schools		0.01**		0.01**
		(0.00)		(0.00)
Constant	1.21**	1.34**	1.59**	1.73**
	(0.10)	(0.15)	(0.10)	(0.27)
Observations	92	92	37	37
R-squared	0.04	0.34	0.12	0.40

Source: 2013 and 2015 SEDA 2.0 data, limited to district-year observations with achievement gap data. Achievement is measured in grade-equivalent units. Grew 2013-2015 is an indicator for whether district enrolment increased from 2013 to 2015. Post-Block Grant is an indicator for observations in 2015, after the transition to block grant funding. Grew x Post-Block Grant is an interaction between these two indicators.

Robust standard errors are in parentheses.

** p<0.01, * p<0.05, + p<0.1

In Table 7, Models 1 and 2 predict the White-Hispanic gap in graduation rates and suggest that reduced funding per pupil increased this gap. Specifically, Model 1 suggests that the White-Hispanic gap increased by four more percentage points after the block grant among districts that grew compared to districts that shrank. The difference is only marginally significant (p<0.10) without controls for student characteristics. However, when including controls in Model 2, the difference is larger (5.45 percentage points) and reaches significance at the 95% level. The coefficient of interest is not significant in models predicting White-Black or Free

Lunch gaps. This could indicate no relationship, but could also reflect the short time period, because high school typically takes four years and therefore effects may appear in the future. Overall, results in Tables 6 and 7 offer further support that education funding has stronger effects on achievement and graduation rates among Hispanic students. Tables A3 and A4 provide mean values for achievement and graduation rate gaps by enrollment change before and after the block grant transition.

Table 7: Predicted Gaps in Graduation Rates by Race, Ethnicity, and Free Lunch Eligibility – Difference-in-Differences Analyses

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	White-Hispanic Gap		White-Black Gap		Free Lunch Gap	
Grew x Post-Block Grant	4.21+	5.45*	-2.85	-2.38	1.40	2.60
	(2.48)	(2.74)	(3.04)	(3.16)	(2.05)	(2.28)
Grew 2014-2016	-2.85	-1.69	0.21	1.59	-1.32	-1.49
	(1.81)	(1.78)	(2.52)	(2.42)	(1.70)	(1.70)
Post-Block Grant	-0.24	-0.11	-0.06	-0.36	-3.10*	-3.02*
	(1.25)	(1.37)	(1.97)	(2.06)	(1.25)	(1.38)
% Free/Reduced Price Lunch		-28.93**		-15.92*		-6.40
		(6.44)		(6.30)		(5.10)
% English Language Learners		-12.11		-60.17*		-38.61**
		(15.59)		(29.64)		(13.34)
% Black		16.26		13.79		34.07**
		(14.25)		(16.50)		(12.29)
% Hispanic		32.34**		58.15**		23.32*
		(11.69)		(19.60)		(10.35)
Constant	-0.96	5.92*	-2.52+	-1.62	12.31**	13.38**
	(1.10)	(2.34)	(1.33)	(2.25)	(1.03)	(2.05)
Observations	423	367	228	205	560	462
R-squared	0.01	0.10	0.01	0.07	0.01	0.04

Source: 2014 and 2016 KSDE data, linked to SEDA 2.0 covariates, limited to district-year observations with graduation rate data.

Control measures are four-year moving averages. The free lunch gap is the graduation rate among students who are not eligible for free lunch minus the graduation rate among students who are eligible for free lunch. Revenue is measured in 2016 dollars. Robust standard errors are in parentheses.

** p<0.01, * p<0.05, + p<0.1

VI. CONCLUSION

Using district-level panel data on educational achievement and high school graduation rates, this paper examines the relationship between education funding and student outcomes in Kansas during a period of funding cuts. Furthermore, the paper questions whether this relationship varies by student race, ethnicity, and poverty status. Existing research suggests a potential negative relationship between funding and within-district socioeconomic inequality[57], but methodological limitations or a tendency for research to focus on socioeconomic inequality[58] warrant further examination of within-district inequality by race and ethnicity as well.

Results from this study suggest reduced instructional spending is associated with higher inequality of achievement by race and ethnicity and lower achievement among Black and Hispanic students. Specifically, a decrease in instructional spending is associated with lower achievement scores for White, Black, and Hispanic students, but the decline is 4 times larger among Black students and nearly 8 times larger among Hispanic students compared to White students. Instructional spending is strongly associated with state revenue, with elasticities around 0.5, but trends are consistent with the possibility that districts sheltered instructional spending from state funding cuts. These results are consistent with those of Jackson[59], who found that districts with larger funding cuts reduced spending on non-core operating expenses more than other districts, but also reduced spending on instructional expenses.

Consistent with achievement results, analyses of high school graduation rate data suggest lower state aid and general fund budget per student are associated with higher inequality in graduation rates by ethnicity and poverty status. Specifically, a $1,000 decrease in the general fund budget per pupil over a cohort's high school career is associated with lower high school graduation rates for all students, but the decline is 1.5 times higher among poor students and, compared to White students, the decline is nearly twice as high among Hispanic men and over four times as high among Hispanic women. These results offer a potential explanation for the finding that income inequality at the bottom of the income distribution is associated with lower high school graduation rates among disadvantaged students.[60] Kearney and Levine do not find evidence that reduced public school funding explained the link between

57. Wenglinsky, *supra* note 34, at 12.

58. *Id.* at 10; Card & Payne, *supra* note 32, at 49.

59. Kirabo et al., *supra* note 3, at 24.

60. Melissa S. Kearney & Phillip B. Levine, *Income Inequality, Social Mobility, and the Decision to Drop Out of High School*, BROOKINGS PAPERS ON ECON. ACTIVITY, Spring 2016, at 333, 342, 356, https://www.brookings.edu/wp-content/uploads/2016/03/kearneytextspring16 bpea.pdf [https://perma.cc/C5ZJ-88SM].

income inequality and lower graduation rates.[61] In some contexts, however, rising income inequality (such as that spurred by the 2008 recession) could contribute to both reduced education funding and lower graduation rates among disadvantaged students.[62]

Student-teacher ratio (measured as a four-year moving average) is strongly associated with per pupil general fund budget (using both single-year and four-year measures), which suggests a potential mechanism for the relationship between education funding and inequality of graduation rates. That is, the likelihood of graduation among Hispanic and poor students may depend more strongly on the student-teacher ratio in their district during their high school career. Results are similar using a single-year measure of student-teacher ratio. Thus, although districts may shelter instructional spending from state funding cuts, the student-teacher ratio does increase when the general fund budget decreases. This increase may help explain the stronger relationship between graduation rates and state funding among Hispanic and poor students.

Using panel data and district and year fixed effects, analyses presented here estimate the relationship between education funding and within-district inequality when accounting for stable differences between districts and aggregate state changes in student outcomes over time. Although this study offers improvements on some existing analyses of within-district inequality and education funding[63], a key limitation is that it cannot establish a causal relationship. That is, some factor could drive district funding or spending and student outcomes. Controls for district characteristics such as the proportion of students eligible for free lunch and learning English cannot rule out this possibility, but help reduce this concern. Furthermore, difference-in-difference analyses taking advantage of the transition to block grant funding are consistent with those in the main analyses, suggesting that a decline in per pupil funding increases White-Hispanic inequality in both achievement and graduation rates. Other limitations include the relatively small number of districts with achievement data for Black and Hispanic students and the narrow range of years with achievement data. This limits the generalizability of the results and hinders examination of a longer time period. Despite these limitations, the stronger association between education funding measures and student outcomes among Hispanic, Black, and poor students is consistent with the possibility that state education funding cuts have a disparate impact on educational opportunity among these groups. In addition to Kansas, 30 other states also reduced education funding during the recession.[64] If funding cuts have a disparate impact by race, ethnicity, and poverty status, equality of opportunity may have declined during the recession in many locations in Kansas and beyond.

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61. *Id.* at 337.

62. Timothy M. Smeeding et al., *Poverty and Income Inequality in the Early Stages of the Great Recession*, *in* THE GREAT RECESSION 82, 116–19 (David B. Grusky et al. eds., 2011).

63. Wenglinsky, *supra* note 34, at 10.

64. LEACHMAN ET AL., *supra* note 1, at 5.

VII. APPENDIX

Table A1: Descriptive Statistics – Kansas Achievement Data 2009-2013

Variable	Mean	Std. Dev.	N	High Spending Decrease	Low Spending Decrease
Aggregate Achievement					
Black	4.61	1.20	96	4.47	5.17
Hispanic	5.08	1.09	225	5.00	5.37
White	6.24	0.75	1081	6.22	6.27
White-Black Gap	1.47	0.49	96	1.50	1.37
White-Hispanic Gap	1.04	0.52	219	1.01	1.14
Grade-Specific Achievement					
Black	4.48	1.91	457	4.21	5.54
Hispanic	4.90	1.91	1026	4.82	5.23
White	6.16	1.76	6289	6.15	6.17
White-Black Gap	1.57	0.70	456	1.62	1.41
White-Hispanic Gap	1.24	0.74	1002	1.23	1.31
Grade-Specific Enrollment	151.77	346.41	6583	194.73	92.74
Grade	-0.07	0.08	6459	-0.11	0.00
Funding					
Instructional Spending/Pupil ($1k)	6.82	0.92	1081	6.76	6.90
Instruc. Wages Spending/Pupil ($1k)	4.11	0.61	1081	4.13	4.07
State Revenue/Pupil ($1k)	7.59	1.69	1081	7.45	7.79
Other District Characteristics					
% Free/Reduced Price Lunch	0.35	0.14	1081	0.36	0.34
% English Language Learners	0.04	0.09	1081	0.05	0.03
% Black	0.03	0.05	1081	0.03	0.02
% Hispanic	0.09	0.13	1081	0.11	0.08
Enrollment	2140.55	4841.25	1081	2758.11	1294.13
Number of Schools	5.67	8.67	1081	6.78	4.13
Year	2010.99	1.42	1081	2010.99	2010.98

Source: 2009-2013 SEDA 2.0 and F-33 data, limited to district-year observations with achievement and funding data. Achievement is measured in grade-equivalent units. Grade-specific measures include all district-grade-year

observations with achievement and funding data. Funding measures are in 2016 dollars.

The High Spending Decrease column provides mean values among district-year observations below the median for percent change in instructional spending per pupil from 2009 to 2013. These districts experienced the largest decrease in instructional spending per pupil. The Low Spending Decrease column is limited to observations equal to or above the median for percent change in instructional spending per pupil from 2009 to 2013. These districts experienced the smallest decrease or a small increase in spending per pupil.

Table A2: Descriptive Statistics – Kansas Graduation Rate Data 2010-2015

Variable	Mean	Std. Dev.	N	Low State Aid/Pupil	High State Aid/Pupil
HS Graduation Rates					
Total	88.66	9.82	1679	87.57	89.75
Men	87.76	11.11	1678	86.45	89.07
Hispanic Men	87.17	18.74	996	84.05	92.07
Black Men	85.21	19.99	501	82.52	92.80
White Men	88.84	10.96	1676	87.79	89.90
Free Lunch Men	78.52	19.16	1612	75.04	82.08
Women	89.58	11.08	1675	88.81	90.34
Hispanic Women	88.59	17.62	940	85.74	93.44
Black Women	89.26	17.62	472	87.55	94.15
White Women	90.42	11.03	1675	89.90	90.94
Free Lunch Women	81.81	18.27	1613	79.18	84.48
White-Hispanic Gap	-0.11	15.08	1226	2.14	-3.09
White-Black Gap	-1.95	15.60	666	0.04	-6.40
Free Lunch Gap	13.56	16.26	1668	16.21	10.91
Funding					
State Aid/Pupil ($1k)	5.32	1.47	1679	4.23	6.40
General Fund/Pupil ($1k)	8.09	1.45	1679	7.38	8.79
State Aid/Pupil ($1k) - 4yr moving avg	5.44	1.44	1679	4.55	6.33
Gen. Fund/Pupil ($1k) - 4yr moving avg	8.46	1.54	1679	7.77	9.14
Other District Characteristics					
% Free/Reduced Price Lunch	0.37	0.13	1679	0.35	0.40
% English Language Learners	0.05	0.10	1676	0.05	0.04
% Black	0.02	0.04	1679	0.03	0.01
% Hispanic	0.11	0.14	1679	0.12	0.09
Enrollment	1623.49	4142.48	1679	2516.26	731.78
Number of Schools	4.84	7.65	1679	6.34	3.33
Pupils/Teacher	12.92	2.94	1679	14.15	11.70
Year	2012.51	1.71	1679	2012.12	2012.90

Source: 2010-2015 KSDE data, linked to SEDA 2.0 covariates, limited to district-year observations with graduation rate and funding data.

Revenue is measured in 2016 dollars. The low state aid per pupil column provides mean values among district-year observations below the median for state aid per pupil. The high state aid column is limited to observations equal to or above the median.

Table A3: Mean Achievement Gaps 2013 and 2015: Difference-in-Differences

Panel A: White-Hispanic Gaps

	Pre-Block Grant	Post-Block Grant	Difference
Enrollment Decreased	1.21	1.03	-0.18
Enrollment Increased	0.94	1.10	0.16
Difference	-0.27	0.07	0.34

Panel B: White-Black Gaps

	Pre-Block Grant	Post-Block Grant	Difference
Enrollment Decreased	1.59	1.87	0.28
Enrollment Increased	1.42	1.81	0.39
Difference	-0.17	-0.06	0.10

Source: 2013 and 2015 SEDA 2.0 data, limited to district-year observations with achievement gap data. Achievement is measured in grade-equivalent units.

Table A4: Graduation Rate Gaps 2014 and 2016: Difference-in-Differences

Panel A: White-Hispanic Gaps

	Pre-Block Grant	Post-Block Grant	Difference
Enrollment Decreased	-0.96	-1.20	-0.24
Enrollment Increased	-3.81	0.16	3.97
Difference	-2.85	1.36	4.21

Panel B: White-Black Gaps

	Pre-Block Grant	Post-Block Grant	Difference
Enrollment Decreased	-2.52	-2.58	-0.06
Enrollment Increased	-2.32	-5.23	-2.91
Difference	0.21	-2.64	-2.85

Panel C: Free Lunch Gaps

	Pre-Block Grant	Post-Block Grant	Difference
Enrollment Decreased	12.31	9.21	-3.10
Enrollment Increased	10.99	9.29	-1.69
Difference	-1.32	0.08	1.40

Source: 2014 and 2016 KSDE data, limited to district-year observations with graduation rate data. Gaps in graduation rates are measured in percentage points.