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Texas is Not Financing College Readiness

Wealth and Inequities Highlighted by the Civil Rights Data Collection

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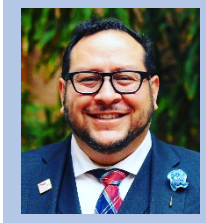
IDRA José A. Cárdenas School Finance Fellows Program

The José A. Cárdenas School Finance Fellows Program was established by IDRA to honor the memory of IDRA founder, Dr. José Angel Cárdenas. The goal of the program is to engage the nation's most promising researchers in investigating school finance solutions that secure equity and excellence for all public school students. The José A. Cárdenas School Finance Fellows Program focuses on and funds school finance research that builds cross-disciplinary and inter-sector perspectives on equity.

Dr. Cárdenas was actively involved in the school finance reform efforts since the early days of the Rodríguez vs. San Antonio ISD litigation when he was superintendent of Edgewood ISD. Following the 1973 U.S. Supreme Court reversal of the Rodríguez decision that found the Texas system of school finance unconstitutional, he resigned from Edgewood ISD to establish IDRA to advocate for school finance reform and improved educational opportunities for all children. He led decades-long efforts to achieve school finance equity and was instrumental in the Edgewood court cases. His research, articles and books provided a blueprint for those interested in bringing about future reform in schools and other social institutions.

In the foreword of Dr. Cárdenas' book, Texas School Finance Reform: An IDRA Perspective, Dr. James A. Kelly stated: "He worked hard, he played hard. And in doing so, never lost sight of his goal. Because, for José, school finance reform was never really an end in itself. It remained a means to a larger end: to improve teaching and learning for all children; in particular, to improve the life chances of the poor and dispossessed."

2019 IDRA José A. Cárdenas School Finance Fellow – Dr. Cristóbal Rodríguez



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Executive Summary

This study examines the relationship between school funding and access to calculus among Texas school districts. Specifically, I posit the question, does Texas school funding influence calculus enrollment?

The analysis uses an ordinary least squares multivariate regression model. The data used for the analysis include the Civil Rights Data Collection (CRDC), National Center for Education Statistics (NCES), and the Texas Education Agency (TEA). The key finding suggests that increases in district-level funding are associated with increases in calculus enrollment among Texas public school districts.

Regression results found that with every unit increase in wealth per weighted average daily attendance (WADA), calculus enrollment increases by 0.01 units, with all covariates held equal. These findings are statistically significant ($P< 0.001$). In addition, this study found disparities between property-rich and property-poor school districts in the number of counselors available to students. Property-rich districts and property-poor districts contain one counselor for every 491 and 311 students per counselor, respectively.

Importantly, inequities exist in the differences in tax burden between property-poor communities and property-rich communities. School districts in property-poor districts tax communities at the highest rate, while property-rich districts can offer lower tax rates and still generate substantially more significant amounts of revenue than their poorer counterparts. School districts in the lowest 20th percentile of wealth per WADA tax their residents at $1.11 per $100 of property value. In contrast, school districts in the 80th percentile of wealth per WADA tax their residents at $1.05 per $100 of property value.

The *Every Student Succeeds Act* requires schools to assess college readiness, yet Texas' state funding formulas fail to allocate money to support it. As a result, college readiness has not received much attention from school finance efforts. Yet, at the same time, studies show that the availability of resources determines students' preparedness to be successful in higher education.

As a new federal and national reform effort emphasizing college and career readiness for high school students takes shape, an essential question around equitable access to college readiness must be asked and connected to school finance considerations. Therefore, this study critically examines the equity of college readiness across schools in Texas and asks: Does school funding influence college readiness inequities?

Answering this question carries policy implications in both legislative and legal arenas, potentially opening pathways to revive federal legal arguments concerning access to equal educational opportunities and address systemic school finance inequities.

A direct implication from this analysis is a need to provide additional funding to directly address college readiness inequities across the state, along with educational leadership considerations to improve college readiness in schools with high proportions of economically disadvantaged students.

The current body of literature lacks a thorough understanding of how school funding structures influence higher education students' performance. This study is one of the first to link school funding to college readiness. The findings in this research contribute to an existing void in the literature aiming to bridge the connections between K12 and higher education.

Introduction

Significance for School Finance Reform and College Readiness

This study specifically examines the effects of Texas school funding on college readiness. Under the 14th Amendment of the U.S. Constitution, states may not deny access to equal educational opportunities to students in public schools. Since the U.S. Supreme Court in 1973 decided in *San Antonio I.S.D. v. Rodríguez* that education was not a fundamental right guaranteed by the U.S. Constitution, states have increasingly fought school finance lawsuits that challenge whether they have met their *state* constitutional requirements to provide an adequate education for all children. In almost every state school funding lawsuit, "adequacy" arguments have been used to challenge school resource inequities (Guthrie, Springer, Rolle, & Houck, 2007).

This study specifically examines the effects of Texas school funding on college readiness.

While such litigation involving education funding adequacy has resulted in some school finance reform, there is indication that it has only slightly improved achievement for economically disadvantaged students (Glenn, 2009). However, recent federal policies may have expanded the measures of education adequacy. The *Every Student Succeeds Act* (ESSA), the federal education law that replaced the *No Child Left Behind Act* in 2015, now includes the concept of *college and career readiness*.

Under ESSA, states were provided support for developing their definitions of college readiness as they connect to three policy dimensions (English, Rasmussen, Cushing, & Therriault, 2016). These three policy dimensions include providing for a well-rounded education leading to college readiness, augmenting the accountability systems to include multiple academic and non-academic measures toward college and career readiness, and developing purposeful assessment systems that lead to more meaningful outcomes (English, et al., 2016).

However, prior to ESSA in 2006, the third called special session of the 79th Texas Legislature passed House Bill 1, which mandated "the establishment of a vertical team of high school educators and college faculty to recommend college readiness standards and expectations, to evaluate the high school curriculum and other instructional requirements to prepare students to succeed in undertaking college-level work, and to recommend steps to align that curriculum with those standards" (pg. 7, Texas Legislative Council, 2006).

Essentially, this defines college readiness with specific knowledge and skills and standards for high school courses that prepare students to successfully complete college-level coursework in math, English language arts, science, and social studies (THECB & TEA, 2009).

Between the time ESSA passed in 2015 and 2019, 44 states, including the District of Columbia, adopted accountability measures related to college readiness (Education Strategy Group, Advance CTE & CCSSO, 2019). It is important to note that prior to ESSA, through the national reform effort using Common Core State Standards, conversations to include college readiness in K-12 accountability systems were in their infancy (Darling-

Hammond, Wilhoit, & Pittenger, 2014). As a result, there have not yet been legal challenges that connect school funding inequities to a lack of access to college readiness indicators, even as battles over "minimum educational adequacy" continue to occur in state courts" (Wise, 1976, p. 482; Glenn, 2009; Guthrie, et al., 2007; Brimley, Verstegen, & Knoeppel, 2020).

Making a school finance-oriented argument for college readiness could provide the best systemic opportunities to meet the goal or mandates of college readiness itself.

For example, though accountability data on college, career, and military readiness in Texas were used for this analysis, specifically with math, such measures have not played a role in Texas' legal mandates that attempt to rectify educational and school funding inequities. Prioritizing college and career readiness can have beneficial results. Table 1 shows the ranking of U.S. states by college enrollment. Texas ranks 40th in college enrollment among all U.S. states.

Table 1: High School Graduates Enrolling in College Within One Year of Graduation by State

Rank	U.S. State	Projected High School Graduates, 2018	First-Time Freshmen Directly from High School Enrolled Anywhere in the U.S. in Fall 2018	Percent of High School Graduates Going Directly to College
	United States	6,907,390	4,397,559	63.7%
1	Mississippi	28,885	23,244	80.5%
2	Connecticut	40,056	31,265	78.1%
3	Massachusetts	73,563	54,505	74.1%
4	New Jersey	103,091	76,312	74.0%
5	New York	205,026	148,482	72.4%
6	Delaware	9,689	6,872	70.9%
7	Rhode Island	11,039	7,707	69.8%
8	South Dakota	8,522	5,907	69.3%
9	Virginia	90,213	62,243	69.0%
10	South Carolina	46,760	32,212	68.9%
11	Louisiana	45,047	30,984	68.8%
12	Tennessee	67,268	46,182	68.7%
13	Minnesota	62,303	42,189	67.7%
14	California	431,009	284,529	66.0%
15	Iowa	35,032	23,113	66.0%
16	Alabama	48,690	32,111	66.0%
17	Maryland	62,688	40,985	65.4%
18	Georgia	108,051	70,630	65.4%
19	Michigan	103,250	66,900	64.8%
20	Florida	181,999	117,494	64.6%
21	Kentucky	46,380	29,722	64.1%
22	Nation	3,456,347	2,200,104	63.7%
23	North Carolina	107,651	68,136	63.3%
24	Ohio	122,452	77,435	63.2%
25	Arkansas	31,315	19,770	63.1%

26	Nebraska	24,001	15,021	62.6%
27	Kansas	35,484	21,965	61.9%
28	Pennsylvania	137,709	85,246	61.9%
29	Illinois	145,526	89,814	61.7%
30	Hawaii	13,702	8,412	61.4%
31	Indiana	75,013	46,001	61.3%
32	New Hampshire	15,256	9,336	61.2%
33	North Dakota	7,743	4,735	61.2%
34	New Mexico	20,841	12,652	60.7%
35	Missouri	68,514	40,609	59.3%
36	Maine	14,353	8,439	58.8%
37	Wisconsin	65,548	38,202	58.3%
38	Nevada	25,077	14,585	58.2%
39	Colorado	58,612	33,982	58.0%
40	**Texas**	**348,578**	**200,734**	**57.6%**
41	Oklahoma	41,851	23,968	57.3%
42	Wyoming	5,864	3,291	56.1%
43	Oregon	36,594	20,358	55.6%
44	Vermont	6,676	3,679	55.1%
45	West Virginia	17,447	9,570	54.9%
46	Montana	9,682	5,225	54.0%
47	Washington	70,411	37,480	53.2%
48	Arizona	68,985	34,558	50.1%
49	Utah	39,100	18,361	47.0%
50	Idaho	20,739	9,111	43.9%
51	Alaska	7,758	3,192	41.1%

Data Source: Integrated Postsecondary Education Data System (IPEDS), National Center for Education Statistics (NCES), National Center for Higher Education Management Systems (NCHEMS)

The new federal policy reform language emphasizing college readiness provides an opportunity for reframing the equitable school funding debate, asking new research questions, and perhaps mounting new adequacy legal challenges that will make a difference in student outcomes. Using data from the federal CRDC, this study explored the connection between school funding and college readiness.

Clearly establishing this connection can provide an opportunity to address federal policy to include college readiness funding or for states to include college readiness as part of their school funding formulas. Additionally, there may be opportunities to explore and revive arguments related to equal educational opportunities and protections guaranteed in the U.S. Constitution. Essentially, making a school finance-oriented argument for college readiness could provide the best systemic opportunities to meet the goal or mandates of college readiness itself.

Access Inequities to College Readiness in Math

While the school finance debate is positioned on achieving an equitable and adequate education, access to the courses and resources that increase college and career readiness continue to be inequitable (Patrick, Socol, & Morgan, 2020). In fact, schools serving greater numbers of students from families with low incomes provide fewer opportunities to learn advanced content, such as Advanced Placement (AP) courses, even though AP courses both prepare students for the academic rigors they will face in college and also provide additional considerations through the college admissions process (Klugman, 2013).

While AP courses are a strong indicator of college readiness, the most reported and greatest indicator is completion of algebra in middle school and calculus in high school.

While AP courses are a strong indicator of college readiness, the most reported and greatest indicator is completion of algebra in middle school and calculus in high school (NCES, 2018). There are two AP Calculus courses: AB Calculus is intended to cover one semester of college calculus, while BC Calculus covers a full year of college-level calculus.

Moreover, NCES (2018) demonstrates how taking advanced math courses in high school not only has a positive influence on achievement levels, but more importantly on enrolling, persisting, and graduating from college. Despite this critical understanding, not enough is being done to address the current inequity of access to high school calculus, as a major point of college readiness.

Strayhorn (2013) finds three indicators that validate college readiness: high school GPA, 12th grade NAEP standardized math score, and 12th grade highest math level. Unfortunately, Strayhorn also found racial and ethnic disparities in college readiness as well, along with other studies (Arnold, Lu, & Armstrong, 2012; Conley, 2007; Houser & An, 2015; Knight & Marciano, 2013). While there are a few cases where a second year of calculus is offered for high school seniors, calculus is by far the highest level math course offered in most public schools, when it is offered, which is the standard requirement for admissions into top colleges (Sparks, 2018).

Not only is high school math achievement a strong predictor of college success, it is particularly the case for students seeking careers in STEM fields.

Not only is high school math achievement a strong predictor of college success, but it is also particularly the case for students seeking careers in STEM fields (Lee, 2012). Additionally, while Lee found that access to higher level math courses in high school informs students' degree of college readiness, Black students' readiness for college types, such as four-year degree programs versus two-year degree programs, varied by the degree of math achievement received at the secondary school level. Unfortunately, while 800,000 high school students take calculus a year, white and Asian American students have much higher calculus enrollment rates than underserved populations (Sparks, 2018).

While there have been studies that focus on the inequitable access to college readiness indicators (Arnold, et al., 2012; Conley, 2007; Houser & An, 2015; Knight & Marciano, 2013) and studies that highlight schools and their college readiness cultures (Martinez, 2017; McClafferty Jarsky, McDonough, & Nuñez, 2009), there have been no studies found that link access to college readiness indicators, like calculus courses, to school funding.

Table 2: Student Enrollment in Calculus by State in 2017-18

Rank	State	Total Enrollment	Calculus Enrollment	
			Number	Percent
	United States	**24,750,697**	**689,952**	**2.79%**
1	Florida	2,779,864	70,039	2.52%
2	Massachusetts	952,995	19,935	2.09%
3	Maryland	893,662	18,375	2.06%
4	New Jersey	1,370,467	27,881	2.03%
5	Pennsylvania	1,724,996	32,704	1.90%
6	Minnesota	880,760	15,864	1.80%
7	Connecticut	536,100	9,600	1.79%
8	California	6,270,442	99,138	1.58%
9	Virginia	1,284,946	20,081	1.56%
10	Ohio	1,756,060	26,987	1.54%
11	New Hampshire	182,660	2,799	1.53%
12	Michigan	1,545,237	23,610	1.53%
13	Illinois	2,020,480	30,786	1.52%
14	Wisconsin	867,894	13,041	1.50%
15	Maine	177,562	2,601	1.46%
16	New York	2,725,826	39,463	1.45%
17	Colorado	899,633	12,470	1.39%
18	Rhode Island	141,522	1,941	1.37%
19	Idaho	295,971	4,057	1.37%
20	Washington	1,094,890	13,924	1.27%
21	Nebraska	316,965	3,915	1.24%
22	Vermont	82,913	981	1.18%
23	Montana	147,402	1,741	1.18%
24	Oregon	573,360	6,772	1.18%
25	Indiana	1,032,579	12,118	1.17%
26	South Dakota	137,042	1,586	1.16%
27	Delaware	138,933	1,602	1.15%
28	New Mexico	339,199	3,891	1.15%
29	Wyoming	94,722	1,000	1.06%
30	Arizona	1,132,436	11,871	1.05%
31	Arkansas	484,562	5,056	1.04%
32	Kansas	490,995	4,813	0.98%
33	**Texas**	**5,302,150**	**48,616**	**0.92%**
34	South Carolina	766,220	7,014	0.92%
35	Alabama	745,128	6,738	0.90%
36	North Dakota	110,469	990	0.90%
37	Georgia	1,766,719	15,673	0.89%
38	Iowa	501,375	4,281	0.85%
39	Kentucky	687,791	5,870	0.85%

40	Alaska	131,895	1,046	0.79%
41	Missouri	929,318	7,127	0.77%
42	West Virginia	278,514	2,113	0.76%
43	North Carolina	1,551,679	10,818	0.70%
44	Nevada	470,644	3,258	0.69%
45	District of Columbia	82,338	558	0.68%
46	Utah	664,827	4,294	0.65%
47	Tennessee	998,421	6,439	0.64%
48	Oklahoma	695,718	4,166	0.60%
49	Louisiana	722,268	4,097	0.57%
50	Mississippi	491,307	2,115	0.43%
51	Hawaii	182,711	445	0.24%
				Data Source: CDRC 2017-18

Texas School Finance as a Case Study

School finance history in Texas is perhaps best understood through its litigation history. First, the infamous U.S. Supreme Court case *San Antonio Independent School District v. Rodríguez* (1973) really is the starting point for all school finance litigation. The Supreme Court found that Texas' property tax-based school finance system was not unconstitutional, even though it resulted in unequal funding for school districts across the state, by declaring that the right to an education is not among the fundamental rights protected by the U.S. Constitution (Jenkins Robinson, 2019).

This created a continuous wave of school finance litigation across states as this essentially forced educational opportunity and equity cases to be applied under state constitutions. This study uses Texas as a case study for two major reasons. First, Texas has a long history of school funding battles centered on equity and social justice (Cárdenas, 1997; Valencia, 2008; Cortez, 2009; Hegar, 2019), and it is the hope that this study will contribute positively to this discourse and policy history.

Texas' Constitution requires the state "to establish and make suitable provision for the support and maintenance of an efficient system of free public schools" (Texas Constitution, Article VII §1). The state's Foundation School Program (FSP) establishes the amount of funding that is to be provided to school districts, using a combination of state sources and local property tax revenues (TEA, 2014).

However, through almost 10 years of school finance litigation since 1984 through the *Edgewood I*, *II*, *III*, and *IV* cases, the school funding formula based on property taxes needed a constitutional equal protections and fairness adjustment as to not over tax property-poor districts (Hegar, 2019; Kauffman, 2009). By creating legislation that would create a tax limit and the additional needed funds for 95% of Texas school districts in financial need, the additional funds would come from a recapture system of funding from property-wealthy districts, or the other 5% that are called Chapter 41 districts in reference to the Texas Education Code (Hegar, 2019).

Eventually in the next 20 years to most recently, from the *West Orange-Cove CISD I* and *II* cases to *Texas Taxpayers and Student Fairness Coalition v. Williams* in 2016, litigation and legislation brought about an approved tax relief system of tax compression that would eventually be described as constitutionally fit by the Texas Supreme Court (Hegar, 2019). To eventually understand some of the school finance variables used for this study, the following explanation of the Texas school finance formula is offered.

This study addresses how some districts invest more toward college readiness outcomes given their maximized tax contributions.

The Foundation School Program, which funds public schools in Texas, carries two components, one for operations funding, which is then informed by Tier I, Tier II, and revenue at the compressed tax rate; and the other component for facilities funding by equalizing interest and sinking fund tax effort (TEA, 2014). Tier I provides districts a basic level of funding to meet all general education requirements based on average daily attendance (ADA), and Tier II supplements that basic funding per student using a weighted average daily attendance (WADA) for each penny of a school district's tax effort above the specified level through the guaranteed yield formula (TEA, 2014).

Beginning in 2006, a property-tax relief law was passed and later modified to limit the minimum and maximum allowable maintenance and operations (M&O) tax rate to compensate property-poor districts for that mandatory compression (TEA, 2014). To further explain how wealth per WADA and M&O tax rate for districts are important considerations in order to address the need for recapture for greater school finance equity, Table 3 compares two example districts, one property poor and one property wealthy (pp. 22-23, TEA, 2014). The table shows the revenue disparities between property rich districts and property poor districts. Evident from Table 3, the history of school finance to ensure greater equity for a state system that is financed through property taxes displays the necessary efforts to ensure all districts receive similar funding levels per WADA, considering the differences in property values, property tax rate (M&O), and the necessary recapture of local revenue.

However, the noted total state and local revenue per WADA between property poor and property rich districts reflects the idea that school funding is indeed equitable. Unfortunately, the M&O rate for property value difference of 11¢ is actually quite substantial for a community or district that has to maximize its tax rate. And there are other unreported revenues through boosters and tax levies and costs that are not included, as well as school or district size and spending flexibilities that will actually offset the revenue per WADA if taken into account. Moreover, this study addresses how some districts invest more toward college readiness outcomes given their maximized tax contributions.

Table 3: Texas School Finance Variables and Recapture

	Property Poor District	Property Wealthy District
WADA	65,960	5,439
M&O rate per $100 property value	$1.17	$1.06
Wealth per WADA	$209,723	$1,190,760
State Aid, Tier 1 (based on students and program funding)	$202,189,204	$1,541,393
State Aid, Tier 2	$35,275,320	$0

Recaptured local revenue	$0	$35,447,388
Total state and local revenue per WADA	$6,593	$6,555

The second reason for selecting Texas is to be able to consider the impacts of school segregation on the variables analyzed. Texas is one of the most segregated states for Black and Latino/a students (Frankenberg, Ee, Ayscue & Orfield, 2019). In fact, Texas is the fifth most segregated state for Black students, and second after California for Latino/a students. Texas is identified as having schools with *intense segregation*, defined as the frequency with which Black or Latino/a students attend a school with 30% or fewer white students (Frankenberg, et al., 2019).

Because funding for schools is based partially on local property values and taxes, residential segregation has always impacted the resources Texas schools have for their students.

Historically, school finance litigation in Texas has been centered on concepts of segregation. Because funding for schools is based partially on local property values and taxes, residential segregation has always impacted the resources Texas schools have for their students (Valencia, 2008). Therefore, it is important to consider the influence that segregation may have on college readiness as well, especially since schools have become more segregated since the *Brown v. Board of Topeka* decision in 1954 (Frankenberg, et al., 2019). While this study does not use measures of segregation as characterized by the five dimensions of residential segregation, as posited by Massey & Denton (1988), based on evenness, exposure, concentration, centralization, and clustering, the findings will provide implications for further analysis using such measures.

All data needed for the study were publicly accessible through federal and state data sources reporting aggregated school and district level data from Texas. Given that, this study uses a quantitative critical inquiry approach, where as a critical quantitative researcher, I "use data to represent educational processes and outcomes on a large scale to reveal inequities and to identify social or institutional perpetuation of systematic inequities in such processes and outcomes" (p. 10, Stage, 2007). Thus, the following specific research question guided the variable analysis and data cleaning to prepare the final statistical analysis.

R.Q.: Does district funding influence district calculus enrollment rates in Texas?

H_1: Higher school district funding (higher wealth per WADA, tax rates, and district expenditures) are associated with an increase in school calculus enrollment rates, when all else is held equal.

H_0: There is no association between school district funding and calculus enrollment rate, when all else is held equal.

This study used quantitative analysis, namely ordinary least square (OLS) linear regression analysis to examine education expenditures as input variables based on the state's school finance formula to explore the relationship to district level calculus enrollment rates.

Data

The CRDC data from the U.S. Department of Education, along with some additional data from the National Center for Education Statistics (NCES), were used for this study because they provide a demographic breakdown by race of students enrolled in a school by grade level and a breakdown enrolled in calculus. To demonstrate the inequity in calculus enrollments, I use the rate of high school seniors (12th grade) who are enrolled in calculus at the school level and aggregated to the district level.

In double-checking data reports with schools, this study found there were schools that had more students enrolled in calculus than they had high school seniors, which typically reflects high school juniors also been enrolled in calculus. The variables and findings are based on what is actually reported and available in the CRDC, NCES, and the Texas Education Agency (TEA) for each school and district in Texas reflective of academic year 2015-16 and based on most recent available data from the CRDC at the time of data analysis (Table 3).

Efforts were made to include other reported student demographics by race-ethnicity but, due to the nature of much smaller enrollment numbers across Texas, only the three largest student groups were used. The school district finance data also came from publicly accessible data from the TEA website. The remaining data points from the NCES were used to calculate the likelihood of enrollment in calculus based on the enrollment of 12th grade students.

The CRDC data are available for all public schools in Texas, including alternative schools, juvenile detention schools, and special education schools, which were excluded in the final analysis. Data were also available for charter schools, but since these schools rely on a different school funding system, this study excluded charter schools in its analysis. Lastly, only schools with 12th grade students were included in the final analysis. Table 4 shows the variables and the sources that were used for the analysis.

Table 4: Data Sources and Variables for Each School District in Analysis

Data Source	Variables
Civil Rights Data Collection	Total enrollment in calculus Percent of first-year teachers (two-year average) Percent of certified teachers Students per counselor Percent of in-school suspension Percent out-of-school suspension
National Center for Education Statistics	Total 12th grade student enrollment (district level) Percent economically disadvantaged students
Combined CRDC & NCES data variables	Rate of 12th grade students in calculus Percent Latino/a 12th grade enrollment Percent Black 12th grade enrollment Percent white 12th grade enrollment
Texas Education Agency: District-level data	District wealth per WADA (weighted average daily attendance) District expenditures per student District property tax rate

Methods

These various data sources were combined to create district level samples. In order to capture the particular effect of district level predictors on school enrollment rate in calculus, we used ordinary least square regression. This model was selected to analyze the overall enrollment rate of high school seniors while controlling for district wealth per WADA; district expenditures; district property tax rate; percent of first-year teachers taken over two years; percent of certified teachers; students per counselor; enrollment rates of economically disadvantaged students, Latino/a students, Black students and white students; and in-school and out-of-school suspension rates.

The model can be specified as follows:

$$Grade\ 12\ Calc = \beta_0 + \beta_1 log(WADA)\ + \beta_2\ log\ \left(\frac{expenditure}{student}\right) + \beta_3 PropertyTaxRate + \beta_4 \%FirstYearTeachers + \beta_5 \%CertifiedTeachers + \beta_6 log\ (SsperCounselor)\ + \beta_7 \%FRLStudents + \beta_8 \%BlackG12 + \beta_9 \%LatinaG12 + \beta_{10} \%WhiteG12 + \beta_{11} \%Out - of - school\ suspension + \beta_{12} \%in - school\ suspension + \varepsilon$$

Where β_0 is the intercept, β_1 to β_{12} are district level explanatory variables. ε is the random error term.

Analysis

Based on the final available district data with complete data variables used for both the descriptive analysis and the multilevel regression analysis, the final analytical sample includes 850 school districts in the final data set. Table 5 shows descriptive statistics of the data, which shows a mean enrollment of 12th grade or high school seniors in calculus as 10% across 850 school districts, with 6% average of teachers in their first year of teaching, 99% of teachers being fully certified and endorsed in their discipline, and a high school average of one counselor per 568 students.

Districts on average have $768,000 of property wealth per WADA and expend $9,240 per student, based on an average 1.08% rate for every $100 of property value. Out of high school seniors, 50% are economically disadvantaged students (per the free or reduced price lunch program), 8% are Black, 38% are Latino/a, and 50% are white.

These characteristics of high school seniors compared to the Texas K-12 student population show a greater white student population and a smaller Black and Latino/a population, which reflect high school push out rates that are greater for Black and Latino/a students. The in-school suspension rate and the out-of-school suspension rate reflect that of the school itself, not of 12th grade students based on available data. The average out-of-school suspension rate is 4% and the in-school suspension rate is 14%.

Table 5: Descriptive Statistics of Regression

Outcome School District Variables	Mean (N=850)
12th grade calculus enrollment rate	0.10
Explanatory School District Variables	
Wealth per WADA (log per $100,000)	7.68
District expenditure per student (log per $1,000)	9.24
District property tax rate (cents per $1 property value)	1.08
Two-year average percent of first-year teachers	0.06
Percent of certified teachers	0.99
Students per counselor (log per 100 students)	5.68
Percent of economically disadvantaged students	0.50
Percent of Black enrollment	0.08
Percent of Latino/a enrollment	0.38
Percent of white enrollment	0.50
Percent out-of-school suspensions	0.04
Percent in-school suspensions	0.14

To further understand the comparison between property poor district and property rich districts, Table 6 compares the averages of the lowest quintile (<20th percentile) and highest quintile (>80th percentile) of high schools in the data set using an ascending rank based on their district's wealth per WADA amount. Initial noticeable differences besides the almost $600,000 wealth per WADA that a difference of 0.06% points in tax rate produces based on varied property values, is that property rich districts provide almost twice as much access to college readiness than property poor districts, with 17% rate of 12th graders with calculus compared to 10%.

Due to the school finance recapture process, districts clearly have similar expenditures per student but also have similar two-year first-year teacher average and percent of certified teachers. The more distinct differences between the lowest and highest quintile are that property poor districts have much fewer students per counselor by almost a difference of 200 students, and property poor districts have slightly greater in-school suspension rates.

Demographically speaking, property poor districts have more economically disadvantaged students, fewer Black students, and more Latino/a students but have similar white student enrollments. A key takeaway here in comparing Table 5 to Table 6 is, given that 95% of school districts receive recapture funds, comparing the lowest quintile of schools to the highest quintile does not produce demographically distinct differences but does provide an idea of how much tax rate differences and property values influence wealth production that is related to difference in college readiness access.

Table 6: Less than 20th Percentile and Greater than 80th Percentile Averages

Outcome Variables 1,545 Schools	**Less than 20th Percentile Wealth per WADA (Property Poor Districts)**	**Greater than 80th Percentile Wealth per WADA (Property Wealthy Districts)**
12th grade calculus enrollment rate	0.10	0.17
Explanatory Variables		
Wealth per WADA	$157,348.51	$749,410.25
District expenditures per student	$10,457.51	$10,929.33
District property tax rate (cents per $1 property value)	1.11	1.05
Two-year average percent of first-year teachers	0.07	0.07
Percent of certified teachers	0.98	0.99
Students per counselor	311.00	491.00
Percent of economically disadvantaged students	0.66	0.50
Percent of Black enrollment	0.05	0.12
Percent of Latino/a enrollment	0.55	0.45
Percent of white enrollment	0.37	0.38
Percent out-of-school suspensions	0.04	0.05
Percent in-school suspensions	0.13	0.10

To answer the research question of, "Do greater district funding variables increase district calculus enrollment rates while controlling for district demographics and equity data?" the OLS linear regression analysis (Table 7) found two significant variables with an R square or the variance explained of 8% using a total of 850 school districts. The first significant variable, and the only variable that informs the school funding formula for Texas, is the wealth per WADA with a positive coefficient of 0.02 at a p-value=0.000, meaning that while holding all other variables constant in the model, when the wealth per WADA increases by 1.00 unit, the 12th grade calculus enrollment rate increases by 0.02 units.

When the wealth per WADA increases by 1.00 unit, the 12th grade calculus enrollment rate increases by 0.02 units.

Table 7: Linear Regression of School Calculus Enrollment Rates

Variables	Coef.	S.E.
Wealth per WADA[a]	0.02***	0.01
District expenditures per student[a,b]	0.01	0.04
District property tax rate[a]	-0.06	0.07
Two-year average percent of first-year teachers	-0.07	0.09
Percent of certified teachers	0.07	0.1
Students per counselor[b]	0.01	0.01
Percent of economically disadvantaged students	-0.1**	0.04
Percent of Black enrollment	-0.15	0.15
Percent of Latino/a enrollment	-0.16	0.13
Percent of white enrollment	-0.2	0.14
Percent out-of-school suspensions	0.01	0.15
Percent in-school suspensions	-0.12	0.07
Intercept	.03	0.42
Number of Districts	850.00	
R-squared	0.08	

Note. ~$p \leq .10$. *$p \leq .05$. **$p \leq .01$. ***$p \leq .001$.
[a] indicates variable was grand-mean centered.
[b] indicates variables was log-transformed.

Unfortunately, and while holding all the variables constant, for every unit increase in economically disadvantaged students, there is a decrease in the 12th grade calculus enrollment rate by 0.1 units. What this means is that the null hypothesis can indeed be rejected as increasing wealth per WADA has a positive influence on increasing 12th grade calculus likelihood rates, especially as the increasing percentage of economically disadvantaged students has a negative influence on 12th grade calculus enrollment rates.

The increasing percentage of economically disadvantaged students has a negative influence on 12th grade calculus enrollment rates.

Conclusion

Using 12th grade calculus enrollment offers the best variable accessible in constructing calculus enrollment rates as an indicator of college readiness as defined by high school courses that prepare students to complete college level coursework (THECB & TEA, 2009). Given that, in order to truly design a study with a more robust data set that reflects college readiness variables, states and districts should provide student level indicators of college readiness specific to all major subjects of English language arts, math, science and social studies.

Resource inequities do in fact exist through teacher quality, class sizes, and other non-general education funding revenues.

It is also important to note that this study additionally used district level finance data and not school level finance data. This creates the assumption that all funding is evenly distributed across high schools in a district as reflected by the state school finance formula. However, while districts generally do distribute funds fairly across schools as mitigated through state and local funding policies, resource inequities do in fact exist through teacher quality, class sizes, and other non-general education funding revenues (Knight, 2019).

Thus, school level finance data that reflect actual teacher salaries and program level funding based on enrollments specific to college readiness courses, like AP, that requires additional training and salary increments, should be provided given that nature of highly segregated schools in Texas. This school dynamic cannot be overstated as an implication of this study, as having access to college readiness is highly influenced by the demographics of a school. Given district level finance data nonetheless, this analysis indeed demonstrates that increasing wealth per WADA in Texas school districts, or more affluent school districts, increases calculus enrollment rates. This means that the more affluent a school district the greater the access to calculus courses.

Additionally, Texas school districts with increasing numbers of economically disadvantaged students have lower calculus enrollment. What is most interesting about this analysis, which demonstrates that wealth per WADA has a positive influence on increasing calculus enrollment rates, is its consideration of place and segregation when considering who tends to live in more affluent school districts and which demographic groups are more likely to be economically disadvantaged students.

College readiness in math is not equally and fairly accessible in Texas public schools.

It is no surprise that economically disadvantaged students have less access to calculus courses and that the more affluent districts have greater calculus enrollment. But even with a recapture school funding formula that provides essentially equal local and state revenue per WADA for Texas public schools, college readiness in math is not equally and fairly accessible in Texas public schools. While this study did not show significance based on other demographic breakdowns of schools, the segregated nature of Texas high schools (Frankenberg, et al., 2019) suggests the need to further understand how access to college readiness varies across race, ethnicity, language ability and region, especially since race/ethnicity and poverty in schools tend to correlate. This race-based examination needs student level data analyses to better understand what is happening within districts and between schools given the nature of segregation.

Further, it should be noted that in 2013, the state weakened high school standards, including removing requirements for higher level math courses and no longer requiring Algebra II. This resulted in a 24% drop in Algebra II course enrollments in rural districts (Bojorquez, 2018). In a state that boasts about its economic power and yet not make that standard expectation or academic requirement in math or in science, technology, and engineering, directly contributes to lowering college readiness access for all students.

In 2013, state weakened high school standards, including removing requirements for higher level math courses and no longer requiring Algebra II.

In the exploratory stage of this study, there are cases of public schools that were not magnet programs where 100% of their students enrolled in calculus at some point in their trajectory. Sadly, such cases were found in high wealth per WADA districts only. This is further indication where the expectations for accessing consistent and the highest levels of math across all grade levels is provided for the few affluent communities, but such double standards exist for all the rest of Texas students. This is more reason to not only invest in math college readiness funding and equity for all students, but also return to an expectation that is held for all Texas students.

Nonetheless, this study demonstrates the paramount need to improve on the current equalizing school funding formula in Texas, which seems to not have an equalizing effect on college readiness in math. More directly, if an equity consideration is made to invest on schools in a manner that makes college readiness in math equitable across Texas schools, then there needs to be a formula that enhances funding directly for college readiness for property poor districts and districts with greater economically disadvantaged student enrollment rates. Therefore, it is unfair and unequal for an equalization school finance system to not consider college readiness given what we know from this study, which is central to the current federal mandates under ESSA.

Further, college readiness inequities and the connection to school finance should at the very least help to incite the next round of school finance policy and legal considerations from a state constitutional perspective or else the current system maintains privilege for some over and sustains inequities for others.

Some highly segregated school districts with high tax rates and low wealth per WADA levels along the U.S.-Texas border are indeed making strong investments in college readiness efforts, either through the use of dual credit efforts, early college high school programs, and AP enrollment.

Lastly, through the process of data and analytical explorations, there are indications of some highly segregated school districts with high tax rates and low wealth per WADA levels along the U.S.-Texas border that are indeed making strong investments in college readiness efforts, either through the use of dual credit efforts, early college high school programs, and AP enrollment. While these data points were not significant, more robust analyses and student level analyses may reflect the strong investments being made through district leadership efforts to do more with less that influence the overall college readiness of their students. We know that leadership matters, but given the size of Texas and its demographics, this dynamic should not be left alone to a few exceptional cases but should rather be guided through state finance policy and college readiness investments across the state that can control for varying demographics if Texas is to truly invest in its future of all of its students.

Policy Implications

To facilitate implications from this study for policy considerations or next steps, the following list is offered.

- **State and federal school finance reform should include additional funding lines and functions that increase enrollment in college readiness courses** like calculus and other AP courses that reflect all four major subjects (English language arts, science, math, and social studies), especially for property-poor school districts and districts with a high proportion of economically disadvantaged students and broken down by school level investments to address the highly segregated nature of Texas. Such concentration funding grants have been created in California and Minnesota to addressing funding inequities to emergent bilingual students, which could be similarly considered in Texas to create such funding grants with a consideration to implementation and sustainment of such funding lines (Alexander & Jang, 2017; Vazquez Heilig, Romero, & Hopkins, 2017).
- Based on the findings here, and since this study only used district level finance data that assumes that school funding is evenly distributed across schools within a district, **there needs to be a similar study of school level funding in relationship to college readiness that considers that inequities of teacher quality, class sizes, and non-general education revenues a school or district receives.** The issue at hand is the nature of segregation, Texas being among the top three states with the greatest segregation of students in schools (Frankenberg, et al., 2019). This reality demands that we also break down the nature of segregation in college readiness within school districts, as there are indications during the data analysis that more integrated school districts tend to have lower enrollments of Black and Latino/a students in calculus. Funding lines directed at improving college readiness tied directly to schools would also help address such inequities.
- Instead of treating calculus enrollment as a privilege and relying on school districts to make such investments through their own increased expenditures, **states must provide additional dedicated funding for college readiness indicators** that considers threshold considerations for economically disadvantaged student demographics for districts, similarly as the point above, such concentration grants could be considered (Alexander & Jang, 2017; Vazquez Heilig, et al., 2017). This investment needs to also ensure that districts are funding educator equity or having the appropriately licensed and endorsed teachers to teach such courses as well across districts, especially for districts that have greater teacher inequities. This means that a study is needed that specifically explores teacher quality inequities specifically tied to college readiness access for students.
- **School finance and education opportunity cases need to argue beyond adequacy and into a consideration for upholding the 14th Amendment to the federal administrative code that now includes college readiness mandates,** especially as an accountability requirement under ESSA.
- As with policies across states that examine and report growth in test scores as an accountability policy, **there should be accountability policies that reflect increasing college readiness course enrollment for economically disadvantaged students and other underserved students**, such accountability

would be novice state policy in the United States that would be critically important to improving enrollment growth in college ready courses.

- As indicated above in the conclusion in the exploratory process of this study, there are indeed cases where district leadership through its governance efforts and superintendent leadership have made significant investments despite their very low levels of wealth per WADA and highest levels of tax rates but are leading examples for enhancing college readiness through early-college high school programs, or increased AP enrollment, and dual credit enrollment efforts. Such cases were observed along the U.S.-Mexico border that serve very high concentrated levels of poverty and Latino/a demographics. These are exceptional cases and not the norm, as such, **there is a clear need for district leaders to be held to such higher standards of increasing college readiness indicators,** and if not held accountable by their governance structures, such state accountability measures would assist such evaluations that uses equity-based accountability measures instead of standardized test scores. Nonetheless, district leaders should be held to such rigorous standards of equity as we do with students.
- Further, it should be noted that in 2013, the state weakened high school standards, including removing requirements for higher level math courses, including no longer requiring Algebra II. In a state that boasts about its economic power and yet not make that standard expectation or academic requirement in math or in science, technology, and engineering, directly contributes to lowering college readiness access for all students. In the exploratory stage of this study, there are cases of public schools that were not magnet programs where 100% of their students enrolled in calculus at some point in their trajectory. Sadly, such cases were found in high wealth per WADA districts only. This is further indication where the expectations for accessing consistent and the highest levels of math across all grade levels is provided for the few affluent communities, but such double standards exist for all the rest of Texas students. This is more reason to not only **invest in math college readiness funding and equity for all students, but also return to an expectation that is held for all Texas students.**
- In order to invest in college readiness indicators and access for all students, especially in math coursework that leads to greater calculus enrollment, **returning to a four-year high level math coursework requirement that includes Algebra II** is essential and a requirement in order to achieve equity and fairness for all students.
- Lastly, in order for Texas to ensure equal and fair access to college readiness for all students from property poor districts who are already maximizing their allowable M&O tax rate, there needs to be in **increase in Tier 2 or recaptured funds that are directly aligned to college readiness indicators,** perhaps with consideration to growing and concentrations of underserved students by race and ethnicity, class, and language ability.

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