Public Two-Year Institution District Service Areas and Racial Segregation
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Note: I include the narrative grant proposal and the timeline. The COVID-19 pandemic completely shifted the actual timeline for this project but I include the proposal timeline to show what I had planned to do.

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Introduction

Despite extensive attention to racial/ethnic segregation within K-12 education (see Reardon and Owens (2014) for a review), scholars have rarely examined segregation in postsecondary education.[1] This is partially due to the fact that most theories of how students choose where to enroll in postsecondary education erroneously assume that students will choose from the entire population of institutions across the United States (e.g., González Canché, 2018; Hillman, 2016). This ignores the fact that one sector of postsecondary education has a significant share of its institutions geographically zoned for certain students: public two-year institutions.

At least 17 states have created service areas or "districts" for each of their public two-year institutions (author's calculations of in-district tuition rates from the Integrated Postsecondary Education Data System). Little is known about the geographic boundaries of public two-year institutions' districts and how they relate to institutional racial segregation. Given this dearth of knowledge, I will study the district boundaries of two-year institutions in order to investigate whether gerrymandering is associated with segregation. As a first step in a larger, nationwide study, I propose investigating the following questions in the state of Texas:

1) Do the district boundaries of public two-year institutions provide evidence of gerrymandering?

2) If gerrymandering is present, is it associated with the racial segregation of the institutions?

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[1] Due to space constraints, race is used to represent race and ethnicity for this proposal but I recognize these are not the same construct.

Texas is a useful state for a case study for three reasons. First, the public two-year sector in Texas is robust and has significant racial variation. Texas has 82 public two-year institutions that educate over 700,000 students, 70% of which are students of color (THECB, 2018). Second, the results of the proposed project would be useful beyond Texas. Texas public two-year institutions have competitive average tuition and fees below the national average (THECB, 2018), which likely correlates with students including two-year institutions as part of the college search and enrollment process. Third, Texas is useful for a pilot study. As will be outlined below, Texas enshrined public two-year institutions' districts into the Texas Education Code. A case study of Texas's two-year institution districts and their relationship with racial segregation will improve the scholarly understanding of racial segregation, will provide preliminary evidence that can be used to create a national study, and provide evidence for the creation of better state and local policies.

Literature Review

The majority of research focused on education boundaries'—typically attendance zone—relationship with segregation has investigated K-12 schools (Yoon & Lubienski, 2018). Even so, researchers have reached mixed conclusions regarding whether K-12 schools gerrymander their school attendance zones and how much of a relationship gerrymandering has with racial segregation. Depending on the comparison group, scholars have found that attendance zone gerrymandering exacerbates (Richards, 2014, 2017) or reduces segregation (Saporito, 2017; Saporito & Van Riper, 2016).

While there is a growing literature focused on K-12 attendance zones and segregation, to my knowledge there is no commensurate research in higher education. This lack of research is concerning as scholars posit that higher education can have segregation issues similar to K-12

(Saenz, 2010) and public two-year institutions in several states create district boundaries through political processes similar to attendance zones in the K-12 sector (Waller, 2003). These institutions also educate a significant share of the higher education students in the United States: approximately 6.5 million students in 2015 (McFarland et al., 2017). Further, in Texas, two-year public institutions educate more students than any other sector (TACC, 2019). It therefore has become increasingly important to examine student performance in this unique context (Cohen, Brawer, & Kisker, 2014).

Conceptual Framework

Similar to the K-12 research (e.g., Richards, 2014), I propose using the student exchange framework to gird this research study (defined below). Richards and Stroub (2015) highlight that "[zone] compactness constitutes the single most important principle of gerrymandering, particularly for schools" (p.6). Compactness can be measured in many ways (Chambers & Miller, 2010) but is often divided into two constructs: indentation (how smooth is the perimeter of the boundary?) and dispersion (how dense is the area within the boundary?). Based on the prior literature, the less indentations and dispersion in a boundary, the more compactness and the less evidence for gerrymandering (Richards & Stroub, 2015).

Student exchange framework posits that indentations and dispersion occur when policymakers deliberately create district boundaries that encompass certain students in the zone at the expense of including other students (Richards, 2014). Therefore, gerrymandering would result from this systematic "exchange" of more desirable students for less desirable ones. This framework does not automatically imply that gerrymandered attendance zones exacerbate segregation. As Richards (2014) argues, states could create student exchanges in order to diversify attendance zones. The potential for exacerbation or reduction in racial segregation is

one of the reasons systematic research is needed to better understand the relationship between

educational boundaries and segregation.

The student exchange framework is applicable to public two-year institutions' districts.

Districts are generally tied to an institution's county or geographically determined by

policymakers. Following student exchange, these boundary determinations allow for the

potential of gerrymandering districts of public two-year institutions, either directly through the

creation of the boundaries or by linking the institution's boundaries to other geographic

boundaries known to exhibit gerrymandering. Since students who live within a district boundary

are more likely to attend their public two-year institution (Waller, 2003), evidence of racial

gerrymandering could be related to institution's racial enrollment. Indeed, there is anecdotal

evidence that some Texas public two-year district boundaries are created to ensure the institution

has more advantaged students enroll (e.g., Reed, 2019). However, no systematic research has

been conducted to see if this is a rare occurrence or prevalent throughout the state.

Data and Methods

For both research questions, I will consult with an advisory board on appropriate data

collection and analysis methods (see study personnel and Appendix B for details).

Data

For the first question (do districts exhibit gerrymandering?), I, along with other research

personnel, will collect data on the 2017 district boundaries for the 82 public two-year institutions

in Texas. Texas public two-year institution districts are outlined in Texas Education Code

(chapter 130, generally sections 162 to 211) and are publicly available. For example, Texas

Education Code Sec. 130.162 outlines the district for Alamo Community College (though only a

text description and not with spatial coordinates) (Texas Education Code, n.d.). Once boundary

data is collected, I, along with research personnel, will convert the data into electronic maps which can be used within geographic information systems (GIS) analysis software. This will create a spatial data set of all Texas public two-year institutions and their corresponding district spatial coordinates.

For the second question (does gerrymandering exacerbate racial segregation?), I propose merging the spatial data, American Community Survey from the US Census (five-year block-level demographic characteristics of districts), and the US Department of Education's Integrated Postsecondary Education Data System (enrollment demographics of Texas public two-year institutions). This data will allow me to assess the degree to which gerrymandering of districts relates to racial segregation.

Analytic Strategy

The proposed research study will use geospatial analysis to investigate the relationship between public two-year institutions' district boundaries and racial segregation. For the first research question, based on the conceptual framework of student exchange, I plan to assess both the dispersion and indentation of the district boundaries in order to assess the level of gerrymandering of the district boundaries. To do this, I will use two measures of dispersion (Reock and Convex Hull indices) and indentation (Schwartzberg and Polsby-Popper indices). There are flaws and strengths in each measure but, if there is consistent evidence across them, there is evidence of gerrymandering. This will allow me to investigate whether there is evidence of gerrymandering in the creation of Texas public two-year institution districts.

For the second research question, continuing to be guided by student exchange, I will analyze the racial segregation for the real districts while taking into account gerrymandering. Due to the variability in estimates in prior K-12 research (e.g., Richards, 2014; Saporito, 2017), I

will analyze the relationship between gerrymandering and segregation in two different ways (based on recommendations in prior literature). First, I will compare the segregation of the area within the real districts and the posited "natural" districts (counterfactual) that would have occurred without gerrymandering. I will do this by constructing Voronoi polygonal districts (similar to Richards, 2014), which create polygonal shapes that align residents with the institution geographically closest to them without leaving gaps in coverage (the way a circle might). Second, I will also measure the concavity of the real districts (similar to Saporito, 2017), which allows me to calculate a number representing the compactness of boundaries (the higher the proportion the more "irregularly shaped" the area and likelihood of gerrymandering).

Similar to prior research, for both analyses, I will use Theil's entropy index of segregation (the racial diversity of the institution in ratio to the corresponding district, Reardon, Yun, & Eitle, 2000; Reardon & Firebaugh, 2002) to investigate districts' relationship with segregation. For the first, I will compare the segregation across districts with segregation across Voronoi polygons (the real and natural districts) for the following groups: total multiracial, resident of color, Black-White, Latinx-White, and Asian-White. For the second, I will estimate an ordinary least squares regression with institutional segregation as the outcome and including the covariate of concavity for the same five groups outlined above. These two different methods of analysis will allow me to investigate whether there is evidence that district boundary construction exacerbates or reduces racial segregation at Texas public two-year institutions. I will also explore how the relationship shifts for these two different methods based on institutional characteristics (e.g., Minority-Serving Institution status, share of students receiving Pell) and based on alternative measures of the counterfactual or baseline comparison for

segregation (e.g., taking into account geographic scale of different districts similar to the work of Reardon et al. (2008)).

Significance

The proposed research project will help expand the field's and policymakers' understanding of how public two-year institutions' service areas are defined and how that is associated with gerrymandering and racial segregation. It will both provide novel research findings and form the basis for a national study investigating the gerrymandering of public two-year institutions' districts. This project will produce geospatial data that I can publish publicly to allow other researchers and policy stakeholders to conduct their own analysis using the districts of Texas public two-year institutions.

This research has the potential to influence the way that state policymakers create public two-year institution districts, which could impact the racial segregation within community colleges. Public two-year institutions educate a significant share of the US postsecondary education population. It matters whether the policy determining who attends which public two-year institutions exacerbates existing racial inequities.

(word count: 1795)

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Research plan for January 1, 2020 to May 31, 2021

Activity	2020			2021
	Spring	Summer	Fall	Spring
Collect and compile all of the publicly available text descriptions of public two-year districts for the analytic time period from Texas Education Code	▓			
Recruit research personnel for work over the summer	▓			
Train research personnel to use geographic information systems	▓	▓		
Full research team constructs electronic maps from the text descriptions of district regions		▓		
Analysis of the geospatial data (research question 1) and the merged geospatial, Census, and Department of Education data (research question 2)			▓	
Draft policy brief			▓	
Submit research to conference			▓	
Draft full research manuscript			▓	▓
Disseminate policy brief				▓
Present research at conference				▓
Submit research manuscript to journal for publication				▓
Publicly publish full geospatial dataset for Texas				▓