

education policy analysis archives

A peer-reviewed, independent,
open access, multilingual journal



Arizona State University

Volume 27 Number 15

February 25, 2019

ISSN 1068-2341

Schools as Market-Based Clusters: Geospatial and Statistical Analysis of Charter Schools in Ohio

Elizabeth A. Gilblom

North Dakota State University



Hilla I. Sang

University of Nevada, Las Vegas

United States

Citation: Gilblom, E. A., & Sang, H. I. (2019). Schools as market-based clusters: Geospatial and statistical analysis of charter schools in Ohio. *Education Policy Analysis Archives*, 27(15).

<http://dx.doi.org/10.14507/epaa.27.4091>

Abstract: This study contributes to the growing body of research concerning the strategic geographic positioning of traditional charter schools (TCS) in urban areas and their segregative effect by considering economist Michael Porter's concept of business clusters, in which businesses 'cluster' to maximize their potential profit and to gain access to a customer base. Using a mixed-methods approach, we use geographic information systems (GIS) to perform an Average Nearest Neighbor Analyses (ANNA) to determine if charter and public schools (TPS) cluster in Ohio's Cleveland Metropolitan School District (CMSD). We analyze school enrollment data and the local census tracts using MANOVA to compare the characteristics of TCS and TPS and produce maps of the results. Consistent with other research, we find evidence of increased segregation. The ANNA and MANOVA results indicate that TCS are more clustered than TPS and they tend to locate outside of the poorest communities with higher concentrations of Black and poor individuals.

Journal website: <http://epaa.asu.edu/ojs/>

Facebook: /EPAAA

Twitter: @epaa_aape

Manuscript received: 7/25/2018

Revisions received: 11/11/2018

Accepted: 11/19/2018

Keywords: Ohio; Charter Schools; Access to Education; Race; Poverty; Geographic Information Systems; Segregation; Cluster Grouping

Escolas como *market-based clusters*: Análise geoespacial e estatística de escolas charter em Ohio

Resumen: Este estudo contribui para o crescente corpo de pesquisas sobre o posicionamento estratégico das escolas charter tradicionais (TCS) em áreas urbanas e seu efeito segregativo, considerando o conceito do economista Michael Porter de *clusters* de empresas ou empresas que agrupam para maximizar seu benefício potencial y obtener acceso a una base de clientes.. Usando uma abordagem de métodos mistos, usamos sistemas de informações geográficas (GIS) para realizar uma Average Nearest Neighbor Analyses (ANNA) para determinar se as escolas públicas e charter (TPS) se agrupam no Distrito Escolar Metropolitano de Cleveland (CMSD). Analisamos dados da matrícula escolar e do censo local usando MANOVA para comparar as características de TCS e TPS e produzir mapas dos resultados. Consistente com outras pesquisas, encontramos evidências de aumento da segregação. Os resultados da ANNA e MANOVA indicam que os TCS são mais agrupados que o TPS e tendem a se localizar fora das comunidades mais pobres, com concentrações mais altas de negros e pobres.

Palabras-clave: Ohio; Escolas Charter; Acesso à Educação; Raça; Pobreza; Sistemas de Informação Geográfica; Separação; Agrupamento de *Cluster*

Escolas como *market-based clusters*: Análise geoespacial e estatística de escolas charter em Ohio

Resumo: Este estudo contribui para o crescente corpo de pesquisa sobre o posicionamento geográfico estratégico de escolas charter tradicionais (TCS) em áreas urbanas e seu efeito segregativo, considerando o conceito do economista Michael Porter de *clusters* de empresas, ou empresas que “cluster” para maximizar seu lucro potencial e obter acesso a uma base de clientes. Usando uma abordagem de métodos mistos, usamos sistemas de informações geográficas (GIS) para realizar uma análise de Average Nearest Neighbor Analyses (ANNA) para determinar se as escolas charter e públicas (TPS) se agrupam no Distrito Escolar Metropolitano de Cleveland (CMSD). Analisamos os dados de matrícula escolar e os setores censitários locais usando MANOVA para comparar as características de TCS e TPS e produzir mapas dos resultados. Consistente com outras pesquisas, encontramos evidências de aumento da segregação. Os resultados da ANNA e MANOVA indicam que os TCS são mais agrupados que o TPS e tendem a se localizar fora das comunidades mais pobres, com concentrações mais altas de negros e pobres.

Palavras-chave: Ohio; Escolas Charter; Acesso à Educação; Raça; Pobreza Sistemas de Informação Geográfica; Separação; Agrupamento de *Cluster*

Introduction

Conceptualized by Michael Porter (2000), a business economist and an influential figure in strategic management research, ‘clusters’ are “geographic concentrations of interconnected companies, specialized suppliers, service providers, firms in related industries, and associated institutions (e.g., universities, standards agencies, trade associations) in a particular field that compete but also cooperate” (p. 15). The concept of geographical clusters centers on the idea that businesses have increased efficiency, effectiveness and flexibility when they are in close geographic proximity. Members of a cluster benefit from shared resources, increased competition and productivity and customer access (Porter, 1998). Porter (2000) argues that the prevalence of clusters across national, state and local economies suggests that “companies have a tangible and important stake in the business environments where they are [geographically] located” (p. 16).

The geographic positioning of charter schools within local communities as a response to market-based competition is a continuing concern among researchers for several reasons, including increased racial segregation. Although several other studies examine school segregation and clustering patterns of charter schools, our study makes a unique contribution by using mixed-methods and Porter’s cluster theory to examine the geographic positioning and distribution of school options in an Ohio urban school district with a lasting history of racial and socioeconomic segregation. Understanding the strategic placement of school options as market-based clusters, and with respect to the demographics of their student bodies and local community, addresses the ways in which market forces intensify or diminish racial segregation.

In this paper, we contribute to the current literature on charter schools by examining the potential relationships among community characteristics and the strategic placement of traditional charter schools (TCS) and traditional public schools (TPS) within Cleveland Metropolitan School District (CMSD), the largest urban school district in Cuyahoga County, Ohio. Using a mixed-methods approach, we perform Average Nearest Neighbor Analysis (ANNA) using geographic information systems (GIS) to determine if and to what degree TPS and TCS are clustered inside CMSD and if and to what degree TCS and TPS are clustered on either the east side or the west side of CMSD and we map the results. Additionally, using multivariate analysis of variance (MANOVA), we examine the racial and socioeconomic characteristics of TPS and TCS school enrollments and their local census tract characteristics to uncover concentrations of poverty and race in relation to school locations.

This study addresses three main research questions:

1. Do TPS and TCS cluster within Cuyahoga Metropolitan School District in Ohio and how do these patterns appear in GIS maps?
2. What are the relationships among enrollment characteristics and the local census tract demographics of income and race at TCS and TPS within and outside of Cleveland Metropolitan School District?
3. What are the relationships among enrollment characteristics and the local census tract demographics of income and race within Cleveland Metropolitan School District by school type (TCS and TPS) and location status (east side of CMSD versus west side of CMSD)?

The results of this study make several contributions to debates on the locational decisions of charter schools. First, we add to the existing literature on charter schools and their segregative effect by examining the relationship between neighborhood context and charter schools’ locational decisions in Ohio. Additionally, when GIS mapping techniques have been used in research, it is normally

employed as a descriptive method, rather than an analytic one. Our use of geospatial data coupled with statistical and descriptive analysis is the first study of its kind in Ohio, a state with a contentious history of racial segregation and charter school policy. GIS is an underexploited tool in education research, especially in school choice studies where geospatial patterns are critical to understanding how we can leverage improvements in both local and national public education policy.

Literature Review

Racial and Socioeconomic Segregation and the Public School System

Supporters of school choice programs argue that racial integration will improve through choice policies because, in theory, they can draw students from a broader geographic range than traditional public schools so families can send their children to schools outside of their racially segregated neighborhoods and promote integration (Chubb & Moe, 1995; Finn, 1990; Hoxby, 1998; Nathan, 1996; Thernstrom & Thernstrom, 2004; Wolf, Howell & Peterson, 2000). However, some scholars have not found this hypothesized integration taking place at charter schools (Kotok, Frankenberg, Schafft, Mann, & Fuller, 2017; Mickelson, Bottia & Southworth, 2008). Past research suggests that choice options, including charter schools and public voucher programs, exacerbate segregation by race, socioeconomic status and, at times, ability for several reasons. One reason is that many charter schools seek to serve particular demographics, such as gifted or special needs students (Eckes & Plucker, 2005; Mickelson, Bottia & Southworth, 2008). Multiple studies have indicated that TCS disproportionately enroll high percentages of minority students (Eckes & Rapp, 2005; Green, 2001). Rapp and Eckes, (2007) examined the student bodies at TCS with more than 1,000 students in 32 states and found that two-thirds of the charter schools they analyzed enrolled larger percentages of minority students than TPS. Cobb and Glass (1999) examined aggregated ethnic distributions of charter and traditional public schools for the years 1995–1997 in Arizona and found that, across all years, TCS enrolled a considerably higher proportion of Black students than TPS and, in 1996, American Indian participation increased 300% at TCS. The meta-analysis published by Carnoy, Jacobsen, Mishel and Rothstein (2005), which used data from the federally-sponsored National Assessment of Educational Progress (NAEP) and from state-level studies, indicated that TCS enroll a higher percentage of Black students than TPS. In 2010, the Center for Education Reform's national annual survey of TCS found that the majority of TCS students are minority (52%), at-risk (50%), or low-income (54%), findings that have remained consistent with the previous three years (Allen & Consoletti, 2010). However, charter schools that focus on gifted education tend to be disproportionately White (Mickelson, Bottia & Southworth, 2008).

A second reason for the increasing segregation at choice programs is that they formally and informally permit schools to select students with particular characteristics while excluding others (Lacireno-Paquet, Holyoke, Moser, & Henig, 2002; Mickelson, Bottia & Southworth, 2008; Rapp and Eckes, 2007). While TCS have more opportunities than TPS to create diverse student bodies, since they can recruit students from across traditional district boundaries, Eckes and Trotter (2007) found that some TCS seek to serve economically disadvantaged and minority populations. In their qualitative study of eight high achieving TCS, Eckes and Trotter (2007) found that although TCS leaders found racial integration to be important, their primary goal was serving low-income and minority students. As such, “most [TCS leaders] had purposefully selected neighborhoods or regions [for their TCS locations] that they felt were being underserved by the public education system” (Eckes and Trotter, 2007, p. 73).

Critics of school choice argue that TCS have incentives to “cream” students away from the local public schools, meaning they may seek to admit high-ability students of favorable backgrounds

from TPS who require fewer resources and boost the school's performance, and "crop" students who require more resources to educate (Cobb & Glass, 1999; Henig, 1996; Lacireno-Paquet, Holyoke, Moser & Henig, 2002; Fiske & Ladd, 2001). Critics worry that other students are left behind in TPS that are often underperforming, thereby exacerbating stratification by race and ability (Lee & Croninger, 1994; Wells, 1993). In her meta-analysis of research on the social context of charter public schools, Wells (2009) found that "Charter school reform, due to its lack of safeguards, supports, or incentives for families to do otherwise, leads to more and not less racial and social class segregation, as well as a skimming of relatively advantaged students—in terms of parents' education and involvement, and lack of disabilities or English language limitations—compared to those in nearby public schools" (p. 174). André-Bechely (2007) reminds researchers and policy makers that less privileged families typically lack the resources (e.g. social capital, flexible employment schedules, family support, transportation) to participate in choice options. However, Zimmer, Gill, Booker, Lavertu, Sass & Witte, (2009) found no indication of TCS creaming students from TPS in seven cities across the United States, as students transferring to TPS tended to choose schools with enrollment characteristics similar to the TPS from which they left.

Additionally, whether schools become integrated due to school choice programs may depend on the preferences of parents. Some research has suggested that the general public values integration, but in-depth interviews with Whites and studies of White flight have indicated that most Whites are unlikely to freely integrate with blacks and Latinos (Bonilla-Silva, 2001; Massey & Dentón 1993; Orfield 1996; Renzulli & Evans 2005). Evidence suggests that parents tend to select schools with enrollment characteristics that reflect their own race, socioeconomic status and level of education (Booker, Zimmer, & Buddin, 2005; Garcia; 2008; Mickelson, Bottia & Southworth, 2008; Renzulli & Evans, 2005). Using data from Durham, North Carolina, Bifulco, Ladd and Ross (2009) examined the impact of school choice programs on racial and class-based segregation across all public schools. They found that White students and students with college educated parents were more likely to leave schools with higher percentages of Black students or lower percentages of students with college educated parents if they have access to alternative schools that have higher percentages of White students and students with college educated parents than their previous school. They find that schools in Durham are more segregated by race and class as a result of school choice programs than they would be if all students attended their geographically assigned schools.

However, Weiher and Tedin (2002) conducted a study in which they spoke to 1,008 Texas parents who sent their children to TCS to examine inconsistencies between household schooling preferences and school attendance patterns. They found that the most important factor in choosing a school for White parents was test scores, moral values was most important for Black parents and Hispanic parents identified school discipline as most important. Parents across all racial/ethnic groups cited school racial/ethnic characteristics as the lowest priority among all available choices. However, they found that the racial composition of TCS was a robust predictor of school choice, even after controlling for other influences and considering that few in the Texas sample stated that sending their child to a school with other students of the same race is an important factor in choosing a charter school.

Archbald, Hurwitz and Hurwitz (2018) stated that one perspective of the growing segregation by race and class in public schools is that segregation is not a social or a policy problem. Rather, it is "what the market has produced and people are in the schools they want" (p. 30). Essentially, segregation "is not inherently a problem," but it is an issue if it is associated with inferior outcomes resulting from state education policies, which can create potential legal or social problems (p. 30). They write:

If, school choice policies create sectors of low-performing schools for poor black students (or any class of students), then these unequal outcomes will inevitably

become problems for the community and state—potentially a legal problem (i.e., a violation of equal protection laws), or a policy problem of dealing with dysfunctional schools, or a socio-economic problem of unemployment and community deterioration. (p. 31)

Other studies indicate the detrimental and long-term effects of racial segregation in schools on black children, including lower academic and economic growth (Bankston & Caldas, 1996; Bifulco & Ladd, 2007; Roscigno, 1998; Rumberger & Palardy, 2005; Wells & Crain, 1994). Additionally, the academic achievement of minority students improves in integrated schools (Bankston & Caldas, 1996; Roscigno, 1998). Based upon their review of 21 studies on the long-term effects of school desegregation, Wells and Crain (1994) concluded that Blacks who attend schools with students of other racial/ethnic groups are more likely to attend and succeed in college and live and work in interracial settings.

Locational Positions of Charter Schools

There has been an increasing focus on the role of geography and geospatial and mapping technology to investigate geospatial relationships, including segregation and educational opportunity. The research on the locational patterns of charter schools primarily focuses on visual inspections of GIS maps and statistical analysis of the neighborhoods (i.e. census tracts and block groups) surrounding and adjacent to charter schools and school enrollment characteristics. Archbald, Hurwitz and Hurwitz (2018) performed a longitudinal analysis using maps, Common Core of Data (CCD) and racial and socioeconomic data from the US Census to examine enrollment patterns of five school districts over 26 years in New Castle County, Delaware. Their findings indicated that during the rapid growth of charter schools between 1996 and 2006, charter schools contributed to increasing segregation and a growing correlation between school and neighborhood demographics over time because attendance zones for TPS are neighborhood-based are not designed to produce racially balanced schools and also because students who enroll at charter schools usually come from the immediate neighborhoods.

Using longitudinal school-level data and demographic, economic, and social characteristics of neighborhoods from the U.S. Census, Lubienski, Gulosino & Weitzel (2009) produced GIS maps and performed a geospatial analysis of charter schools in three cities with high proportions of charter schools: Detroit, New Orleans, and Washington, DC. They found that charter schools in each city “showed patterns of exclusionary strategies that schools embraced to enhance market position” and served to increase racial and socioeconomic segregation in each district (p. 601). The researchers indicated that charter schools may be intentionally cultivating particular student demographics by the deliberate choice of school location.

Frankenberg, Kotok, Schafft and Mann (2017) employed individual-level student data (racial and socioeconomic status) from the Common Core of Data (CCD) and from the Pennsylvania Department of Education (PDE) to examine the self-segregative school choices of students transferring to charter schools from public schools. Additionally, the researchers used GIS to locate charter school options within a 10-mile distance from each public school in Pennsylvania. They found that Black and Latino students are strongly averse to moving to charter schools with higher percentages of White students. Conversely, White students are more likely to enroll at charter schools with high White enrollment.

Researchers have described patterns of charter schools locating near, but not directly within, high poverty communities. Gulosino and d’Entremont (2011) examined segregation by comparing the percentages of non-White and White populations in New Jersey charter schools to the racial characteristics of their surrounding areas using GIS maps. Additionally, they examined the literal

geographic positions of charter schools in areas with populations that are greater than 80% White or minority and areas that are more diverse, 20 to 80% White. They found that greater percentages of Blacks are enrolled in charter schools than reside in areas surrounding the TCS and that segregation is most extreme within the immediate census block group surrounding TCS and is most likely due to the clustering of charter schools in areas adjacent to predominantly Black neighborhoods, areas that encircle the homes of the students they will likely enroll.

LaFleur (2016) used data from the U.S. Census American Community Survey to analyze the socioeconomic characteristics of the local census tracts surrounding Chicago's charter schools. She also produced GIS maps to visually inspect the locations of charter schools. Her findings indicated that charter schools position themselves in lower socioeconomic areas yet avoid the most disadvantaged areas. This finding coincides with other researchers who suggest that charter schools purposely avoid the most disadvantaged areas because those high-need students require more resources (d'Entremont, 2012; Lubienksi et al., 2009).

Saultz, Fitzpatrick and Jacobsen (2015) used GIS to visually inspect the locational positions of newly opened charter schools in New York City and conduct bivariate correlations using data from NYC public schools and the U.S. Census to expose relationships between new charter schools and community characteristics. They find that charters are opening in areas of low academic performance, which the researchers attribute to an attempt by charter schools to attract families who may be open to trying a new schooling option.

Saultz and Yaluma (2017) examined charter school locations and school enrollment and community demographics in Ohio using GIS maps and data from the National Center for Education Statistics, Ohio Department of Education and the U.S. Census. They found that charter schools avoid census with the highest poverty or percentages of Black individuals and choose to locate in city centers. They also found that Hispanic students lack access to charter schools since many Hispanics live outside of city centers, except for Cleveland.

The evidence from these studies indicates the significant connection among the locational position of charter schools and racial and socioeconomic stratification. While these studies visually examined the locational position of charter schools, no studies have systematically compared the geographical distribution of charter and public schools within a school district using geospatial analysis to quantify the clustering of specific educational options within a geographical area.

Conceptual Framework

Porter's Cluster Theory

Previous research on different kinds of clusters indicates that businesses/organizations group in small geographic areas to "capitalize on established markets and high demand while simultaneously gaining access to potential new customers to maximize profits" (Gulosino & d'Entremont, 2011). Porter's cluster theory has become a standard concept in economic geography, economics and policy development. 'Clustering' is the phenomenon whereby companies or institutions from the same industry group near one another and share local resources (Porter, 1998). In the field of strategic management, researchers have found that an important part of understanding patterns of competitive success is studying successful clusters of companies (Tallman, Jenkins, Henry & Pinch, 2004). As Porter (1998) argued, "What happens *inside* companies is important, but clusters reveal that the immediate business environment *outside* companies plays a vital role" in how companies continually create competitive advantage (p. 78).

Porter (2000) described clusters as "a geographically proximate group of interconnected companies and associated institutions in a particular field, linked by commonalities and

complementarities... The geographic scope of a cluster relates to the distance over which informational, transactional, incentive, and other efficiencies occur” (p. 16). Clustering theory provides an effective method to understand the ways in which privatized interests in education, specifically charter schools, respond to market-based education reforms and strategically position themselves within communities as a schooling option to maximize enrollments. As Hesketh and Knight (1998) have noted: “If the workings of educational markets are to be understood, clusters of geographically close schools need to be studied.”

Clusters give businesses power in numbers. Rather than operating as an independent entity, which has limited political clout and financial power, a cluster provides small and medium sized businesses the opportunity to increase their power to levels normally reserved for large scale businesses, such as the ability to influence public policy or capitalize on existing infrastructure (Porter, 2000). When local institutions, such as the government or school district, supports the businesses operated in the cluster, the cluster gains power and promotes its own growth. Porter noted that “as the cluster expands, so does its influence with government and with public and private institutions,” meaning that businesses gain strength from operating as a cluster because they can influence or change, which can shape the cluster’s immediate geographic and political surroundings (1998, p. 84).

Porter (1998) stated that clusters increase competition in three ways: they increase the productivity of companies in the area, they determine the direction and pace of innovation, and they encourage other business to join the cluster which expands and strengthens the cluster. Inside the cluster, businesses experience “competitive pressure, peer pressure, constant comparison” which causes the business to set themselves apart from each other (Porter, 1998, p. 83). This competition, Porter (1998) argued, creates an atmosphere of innovation in which companies strive to stay ahead of competitors. It also increases productivity, operational efficiency and facilitates commercialization and new business formation (Porter, 1998).

As the businesses in the cluster continuously maximize their growth and profits, businesses in the same sector who are not located within the boundary of the cluster are not able to stay competitive. As Porter (1998) stated, “companies in the cluster advance relative to rivals at other locations” (p. 84). Businesses outside of a cluster cannot compete and may fail because the cluster’s members benefit from “a collective pool of competitive resources” including assets, skills, customers, workers and even local financial institutions and investors that are familiar with the cluster, all benefits which “reduce the perceived risks of entry – and of exit, should the enterprise fail” (Porter, 1988, p.84).

A cluster’s geographic location is also a strategic consideration. Companies may “locate near the seat of power and the agencies whose approval they require to do business” (Porter, 1998, p. 86). Porter suggests that government policies play a powerful role in encouraging the development of industries and companies. As businesses “cannot operate efficiently under onerous regulatory red tape,” public policy creates the “rules, mechanisms and incentives” that allows businesses to open and form a cluster. By positioning themselves closer to the government offices or powerful individuals, businesses benefit from geographic access to gatekeepers and power players who may prevent or encourage their growth or general operation. In this sense, geographic proximity equates to maximum political influence and, consequently, profit.

Businesses may experience some negative consequences from being in a cluster, including groupthink and government intervention. Groupthink occurs in a cluster when companies become too “inward looking, the whole cluster suffers from a collective inertia, making it harder for individual companies to embrace new ideas, much less perceive the need for radical innovation” (Porter, 1998, p. 85). Additionally, government intervention that increases the cost of production or

that suspends or interferes in competition may prevent the growth of a cluster or the cluster's members (Porter, 1998).

Clusters and Their Customers

According to Porter (1998), customers of clustered businesses benefit from the proximity of businesses because they have a selection of options. For customers, a cluster means that they perceive “their buying risk to be lower because one location provides alternative supplier” (Porter, 1998, p. 83). In other words, if one business cannot provide the services or product a customer needs, there is another business close by that most likely can provide that need. Additionally, since clusters contain businesses with similar services and products, clusters provide customers the opportunity to compare similar products and services and decide which business best fits their needs: “Clusters make it easier to measure and compare performances because local rivals share general circumstances [and] perform similar activities” (Porter, 1998, p. 83).

The cluster's customers are an essential component of the strategic location decisions of the cluster and the businesses within it. Porter stresses the importance of demand factors to the cluster's success, claiming that “it is essential to have a source of demand for the products and services developed in an innovation cluster” (Bailey & Montalbano, 2017, p. 28). If customers are uninterested in the products and services being sold by a cluster of businesses, the cluster will have no value and will have to find customer demand for the products elsewhere. Placing a business near the customer plays a vital role in the success of the business.

Clustered businesses also benefit from having their customers close by because it allows the businesses to keep an eye on market conditions. Familiarity with market conditions provides businesses with insight on upcoming trends in customer demand, which allows the cluster to respond more quickly than businesses outside of the cluster. As Porter (2000) stated, “The presence or emergence of sophisticated and demanding home customers presses firms to improve and provides insights into existing and future needs that are hard to gain in foreign markets” (p. 21).

The Ohio Context

The Cleveland Metropolitan School District in Cuyahoga County, Ohio, is an appropriate focus of study due to the state's support of charter schools and the state's continuing racial and socioeconomic segregation in schools and neighborhoods. Ohio's Black community comprises 1.4 million people, accounting for 12.3% of the state's 2016 total population (U.S. Census Bureau, 2018). Ohio is fourth, tied with Pennsylvania, in the top 20 states with the most racially segregated K-12 schools (Loehrke & Lee, 2014). Nearly 28% of Black students attend K-12 schools in which most students are White, a figure only 5% above the national average (Loehrke & Lee, 2014). Consequently, Cleveland is ranked seventh in the United States for exhibiting one of the highest rates of segregation in the nation. In Cleveland, Blacks overwhelmingly populate on the east side of the city while Whites populate the west side and outside of the city boundary. The Cleveland Black-White dissimilarity score, a score that measures the percentage of one racial group that would have to move to a different neighborhood to end to segregation, is an astonishing 72.6 (Logan, 2013). A score of 60 and above on the dissimilarity index is considered exceptionally high. Additionally, the Cleveland-Elyria-Mentor Metropolitan area ranks first among large U.S. metro areas with population of more than a million in income segregation (Florida & Mellander, 2015). This area also ranks fourth in income segregation among large metros in which the poor are most segregated and fifth among large metros where the wealthy are most segregated (Florida & Mellander, 2015).

Ohio also has a considerable charter school reform history. Since June 1997, when a pilot charter schools program was established by House Bill 215 in Lucas County, Ohio has supported

the development of charter schools, or community schools as they are referred to in the Ohio Revised Code, as an alternative to public schools. At first, charter school locations were limited to “challenged” districts, which included Lucas County and the eight largest urban districts in Ohio, but House Bill 282, passed in 1999, expanded “challenged” districts to include Ohio Urban 21 districts and those districts designated as “Academic Emergency” (Ohio Department of Education, 2017). Two years later, with the passage of House Bill 364, TCS were permitted to open in “Academic Watch” districts (Ohio Department of Education, 2017).

Ohio has two types of TCS: conversion schools and startup schools. Conversion schools “result when a public school district, joint vocational school district or educational service center convert all or part of an existing facility into a community school” (Ohio Department of Education, 2017, p.14). They are independent of the district, are managed by a sponsor and can be located in any Ohio public school district (Ohio Department of Education, 2017).

Under Ohio law, a startup community school may open only in a public school district that Ohio has designated as “challenged” and any school districts designated by the state as being in Academic Emergency or Academic Watch status. School districts that receive grades of D’s or F’s on the Performance Index on the Ohio School Report Cards, which shows student performance on state tests and F’s on report card measures that show students’ math and reading knowledge growth, and the lowest 5% of districts in the state’s Performance Index (PI) score rankings (Ohio Department of Education, 2017). In other words, TCS may open in any Ohio school district with low student achievement and there are no caps on the amount of TCS that can operate in these “challenged” areas. However, House Bill 153 passed in 2011 caps the number of new start-up community schools at 100 per sponsor (Ohio Department of Education, 2017). The largest concentrations of TCS exist in each of Ohio’s “Big 8” Urban Counties, which house the largest urban school districts. In the 2016 school year, the number of TCS that existed in each of these urban counties were: Cuyahoga County (81), Franklin County (77), Hamilton County (22), Lucas County (38), Mahoning County (12), Montgomery County (32), Stark County (8) and Summit County (19).

Facilitated by charter-friendly legislation, TCS have swiftly multiplied in urban districts over the past two decades. Between 1999 and 2013, the growth rate of Ohio’s TCS was double the national rate (Squire, Robson, & Smarick, 2014). In the 2014–2015 school year, there were 39 school districts in Ohio considered to be “challenged” and 17 of these were located in Franklin, Lucas, and Cuyahoga counties. Seven of the 32 school districts in Cuyahoga County were viewed as challenged in the 2014–2015 school year and will continue to hold their current designation through the 2017–2018 school year: Cleveland Metropolitan, East Cleveland, Euclid, Garfield Heights, Maple Heights, Richmond Heights and Warrensville Heights (Ohio Department of Education, 2016). In the 2016–2017 school year, over 117,000 students enrolled in 362 TCS, about 7% of the total public school enrollment in Ohio (Ohio Department of Education, 2017). About 70% of Ohio’s TCS students were enrolled in site-based schools during the 2016–2017 school year and the remaining students attended E-schools (Ohio Department of Education, 2017). In the 2011–2012 school year, 110 of the 355 TCS operating in Ohio were managed by for-profit management companies (Miron & Gulosino, 2013). By the 2017–2018 school year, 169 of 340 Ohio TCS were managed by for-profit management companies (Ohio Department of Education, 2018a).

The Cleveland Metropolitan School District (CMSD) is an urban, portfolio school district located in Northeast Ohio. In 2010, CMSD adopted its Academic Transformation Plan, which implemented a more customized approach to managing schools and expanding the number of new and redesigned schools. This expansion included partnerships with charter schools in Cleveland, including collaborating with charter schools as a sponsor, as a partner, and through the

District/Charter Compact. Currently, CMSD partners with seven schools and sponsors 10 schools (Cleveland Metropolitan School District, 2018). Charter schools are permitted to operate, both as startups and conversions, anywhere inside the CMSD boundary. While CMSD permits charters to operate at any location within its boundaries, the question of whether charters are clustered in communities of certain demographics remains unanswered.

In sum, Ohio allows us to observe and measure aggregate charter school locational strategies to assess the strategic placement of charter schools. Assuming that charter schools are free to locate anywhere within CMSD, our study geostatistically analyzes the literal positioning of TCS in CMSD using the Average Nearest Neighbor Analysis in GIS to determine if TCS and TPS are clustering in census tracts with particular racial and socioeconomic characteristics. As clustering is intended to maximize customers and profit, we draw parallels between the profit-maximizing objective of businesses and the strategic behavior of charter placement within CMSD.

Methodology

Guided by Porter's framework, we employ statistical analysis and GIS technology to spatially analyze the locations of Traditional Charter Schools (TCS) and Traditional Public School (TPS) in Cuyahoga County and CMSD. Researchers search for geographic clusters of related businesses and industries using cluster analysis and algorithms (see Delgado, Porter & Stern, 2016). These statistical methods permit researchers to discover previously unidentified clusters of related industries within both limited and vast geographic areas. Since we are focusing on the spatial distributions of observed TCS and TPS within CMSD, we use ANNA to determine if TCS and TPS have a clustered distribution. We then discuss the results of our analyses in terms of Porter's conceptualization of clusters.

While previous research has visually inspected maps to informally conclude if TPS are concentrated in areas with certain demographics, we employ the Average Nearest Neighbor Analysis (ANNA) calculation in ArcGIS to measure the spatial distribution of TCS and TPS to determine if they have a clustered, random or dispersed spatial pattern. Calculating a statistical value that represents a characteristic of a distribution "is useful because visual analysis can be misleading ... [and characteristics of the distribution] may not be apparent by simply mapping features [in GIS]" (Mitchell, 2005, p. 22). ANNA is a spatial statistics method used to analyze spatial distributions and it is typically used in probabilistic approaches of spatial configurations and it may be used to describe the degree of concentration that exists in a set of data points (Mathian & Sanders, 2014).

In ANNA, the distance between each object (in this case TPS or TCS) and its closest neighbor are measured and averaged to create the Average Nearest Neighbor Index (ANNI). The ANNI is expressed as the ratio of the Observed Mean Distance (OMD), which is the observed, or actual, average distance between two TPS or TCS, divided by the Expected Mean Distance (EMD), the distance that would be expected according to random distribution. This index is used to determine if the features are clustered (if the ratio (R) is between 0 and 1 with 0 indicating the most clustered), random (1 is the minimum threshold of a random dispersion) and the maximum ANNI value of 2.149 denotes the most theoretically dispersed point pattern (Clark & Evans, 1954). An ANNI value of .5 indicates that, on average, nearest neighbors are half of the distance that would be expected under random conditions (Clark & Evans, 1954). The ANNI can be used to compare two distributions to evaluate if one set of points is more or less clustered than another set, in this case, TCS and TPS (Mitchell, 2005). No classification system exists for R values between 0 and 1. However, values closer to 0 are more clustered than values closer to 1.

In ArcGIS, five values are calculated in the ANNA: the OMD, EMD, ANNI, z -scores and p -values. The null hypothesis for ANNA posits that the features analyzed are located in a random

pattern (ESRI, 2018). The χ -test is used as a hypothesis test to determine whether spatial clustering exists and the p -value is a probability (ESRI, 2016). The critical χ -score values for a 99% confidence level are < -2.58 or $> +2.58$ and the P -value associated with a 99% confidence level is $<.01$ (ESRI, 2016). Z -scores that fall between this range represented the expected outcome and they will have a p -value larger than $.01$, so the null hypothesis cannot be rejected (ESRI, 2016). However, χ -scores that fall outside of this range indicates that the observed spatial pattern is unusual and not a result of random chance and the corresponding p -value will be less than $.01$, which indicates that the null hypothesis can be rejected (ESRI, 2016). Each of these values are reported in the results. Using ArcGIS, we produce kernel density maps that illustrate the spatial distributions of TCS and TPS. These maps indicate hotspots of TCS and TPS inside CMSD. After determining the spatial distributions of charter schools and public schools within CMSD and producing maps of the results, we statistically analyze TCS and TPS school enrollments and the census tract characteristics surrounding their locations to determine if patterns of racial and socioeconomic segregation exist. Using ArcGIS, we produce maps that illustrate the racial and socioeconomic characteristics of the schools and their census tracts.

Our analysis is a robust and multistage process that encompasses various statistical methods and techniques to examine the locational positions of charter schools and how they are related to racial and socioeconomic segregation and the stratification of educational opportunity in one urban school district in Ohio. Analyzing how profit-seeking, strategic placement of charter schools occurs in urban settings is of vital concern as for-profit involvement becomes more prevalent in public education, which may cause unequitable arrangements of educational opportunity and increased racial and socioeconomic segregation.

Data Sources

Using a methodology similar to other research that examined the locations of charter schools in other geographic areas (Archbald, Hurwitz & Hurwitz, 2018; Gulosino & d'Entremont, 2011; LaFleur, 2016; Lubienski et al., 2009; Saultz, Fitzpatrick & Jacobsen, 2015; Saultz & Yaluma, 2017), the present analyses incorporate data from the U.S. Census Bureau and the Common Core of Data (CCD) available from the U.S. Department of Education's National Center for Educational Statistics (NCES) for the years 2014–2015. The CCD data contained enrollment characteristics, including race and grade level for the academic school year. It also identified each school as a charter or a non-charter school and if the school was considered a regular, special education, vocational or an alternative school. Each school at the NCES CCD had longitude and latitude information, as well as student counts by race, which were converted into percentage by calculating the total of the racial group within the school (variables BLACK, WHITE, and HISP) over total students of all grades (variables MEMBER). CCD data was merged with data from the Ohio Department of Education website, which includes racial enrollment characteristics and percent of disadvantaged students for each school for the 2014–2015 school year. The percentage of disadvantaged students is a measure reported by ODE that indicates the percentage of the total student enrollment that meets any of the following conditions: students who are known to be eligible to receive free or reduced-price lunches; students who have not submitted an application for free or reduced-price lunch, but who live with a sibling who is eligible for free or reduced-price lunch; students who receive, or whose guardians receive, public assistance, and; students whose parents or guardians have completed a Title I student income form and meet the income guidelines specified (Shams, 2018). Each school was georeferenced in ArcGIS according to the longitude and latitude coordinates provided by CCD. All CCD data were uploaded to the GIS database for analysis.

Census tract data were downloaded from the U.S. Census Bureau website for the year 2015. The U.S. Census data referenced is the American Community Survey (ACS), 5-year estimates and includes the data tables for race (DP05) and income (S1901). Income was included only for households (not for families or non-families) and was grouped for households whose annual income was under \$35,000 or over \$100,000 (combining variables HC01_EST_VC02, HC01_EST_VC03, HC01_EST_VC04, and HC01_EST_VC05).

Sample

The sample (see Table 1) included brick-and-mortar public schools that operated in Cuyahoga County, Ohio. During the 2014–2015 school year, NCES reported that there were 379 schools in Cuyahoga County. Of this total, 367 schools (287 TPS and 80 TCS) were included in this sample. Private schools and public schools that were vocational, special education or other/alternative, online schools and schools that did not report any data or that reported they were closed were excluded from analysis. Also, the profit status of the charter schools' management companies was not examined in our analysis.

Table 1

Enrollment and number of TPS and TCS inside Cuyahoga County, inside CMSD, and inside the east and west sides of CMSD

	Cuyahoga County		Cleveland Metropolitan School District		West side of CMSD		East side of CMSD	
	<i>N</i>	Enrollment	<i>N</i>	Enrollment	<i>N</i>	Enrollment	<i>N</i>	Enrollment
TPS	287	147,927	101	38,626	41	18,088	60	20,538
TCS	80	24,754	66	20,205	24	6,136	42	14,069

Geographic Information Systems (GIS)

A Geographic Information System (GIS) provides a platform for data visualization through dynamic mapping. Typically, maps can be classified into two broad categories: general reference maps and thematic maps (Brewer, 2008). Reference maps illustrate natural and human-made objects in their geographical environment with an emphasis on location. Atlases and topographic maps are examples of reference maps. The goal of reference maps is to provide locational details, including terrain or physical features (Brewer, 2008). Conversely, thematic maps display the geographical distribution of a phenomenon or the spatial associations between several phenomena. The goal of thematic maps is to help users to compare geographical characteristics to the patterns in the map theme and not to show features like streets, cities or bridges. For instance, a map illustrating the average distribution of rainfall throughout the United States is a thematic map.

While GIS can accomplish the goals of general reference and thematic maps, this complex mapping system allows scholars to represent and analyze data with temporal and spatial characteristics without the limitations of traditional maps. GIS offers the ability to create interactive and detailed visualizations that facilitate understandings of the relationships, patterns and trends among georeferenced data, or data that is associated with a location in physical space, which helps users to tell complex stories in a coherent way (Knowles & Hillier, 2008).

Within GIS technology, geostatistical pattern analysis is used to calculate and quantify a pattern of a feature, which then enables the comparison between different patterns and their distribution in a specific geographic area. Pattern analysis tools are used to answer questions such as, “Are the features in the dataset spatially clustered?”

Spatial Analyses

We constructed a data table of attributes for traditional charter schools (TCS) and traditional public schools (TPS) and that contains student enrollment (racial and percent disadvantaged) and locational data. The longitude and latitude data from the Common Core of Data (CCD) was used to geolocate the schools. The longitude and latitude data were then used to identify the census tract number in which each school is located. Census tract data describing the local communities surrounding the schools were downloaded from the U.S. Census Bureau website and added into the data table via spatial join.

For Research Question 1, an Average Nearest Neighbor Analysis (ANNA) was conducted in GIS using two different spatial scales: CMSD and census tracts in which the TPS and TCS are located. We compared the ANNI of TCS and TPS to investigate the distribution and availability of school options within CMSD in two ways. First, we determine if and to what degree TPS and TCS are clustered inside CMSD as a whole. Second, we investigate if and to what degree TPS and TCS are clustered on either of the highly segregated areas of the east side or west side of CMSD. To minimize the chances of receiving a Type I error, we determined statistical significance at a level of $p < .01$.

Statistical Analysis

For Research Question #2, a Multivariate Analysis of Variance (MANOVA) tested for differences in enrollment characteristics (the percentage of Black, White, and Hispanic enrollment) and the local census tract demographics of annual household income (the percentage of households earning \$35,000 or less or earning \$100,000 or more annually) and race (the percentage of Blacks, Whites, and Hispanics) surrounding TCS and TPS within and outside of Cleveland Metropolitan School District (Keppel, 1991; Tabachnick & Fidell, 2007, 2014; Weinberg & Goldberg, 1990). School type (TCS and TPS) and CMSD status (status of being a school located inside CMSD or not) are independent variables while school enrollment characteristics and the census tract characteristics serve as dependent variables.

For Research Question #3, a Multivariate Analysis of Variance (MANOVA) tested for differences in enrollment characteristics (by race and the percentage of disadvantaged student enrollment) and the census tract demographics (annual household income and race) at TCS and TPS located on the east side versus west side of CMSD (Keppel, 1991; Tabachnick & Fidell, 2007, 2014; Weinberg & Goldberg, 1990). This MANOVA examined school type (TPS or TCS) and location status (being located on the east side or west side) within CMSD as independent variables and school enrollment characteristics (the percentage of White, Black, Hispanic and the percentage of students who are disadvantaged) and racial census tract characteristics (the percentage of White, Black, Hispanic individuals living in the census tract surrounding each TPS and TCS) and annual household income (the percentage of households earning \$35,000 or less or earning \$100,000 or more annually) as dependent variables. Unequal variances were assumed for both analyses because Box’s Test of Equality of Covariance and Levene’s Test of Equality of Error Variance were statistically significant at a level of $p < .001$. To minimize the chances of receiving a Type I error, we determined statistical significance at a level of $p < .01$.

Results

Average Nearest Neighbor Analysis Results

Table 2 shows the statistical results of the geospatial analysis performed in Research Question #1. The ANNA for CMSD reveals statistically significant, “clustering” relationships. In CMSD, TCS cluster more (ANNI 0.48, $z = -8.136$) than the TPS (ANNI 0.71, $z = -5.524$). A nearest neighbor index of 0.48 indicates that the average distance between a TCS and its closest neighbor in CMSD (501.13m) is closer than would be expected by chance (1,043.05m). In other words, the distribution of TCS relative to an expected random distribution inside the boundary of CMSD appears to be more clustered. This analysis establishes that the locations of TCS inside CMSD are not random and that they are, in fact, clustered within CMSD and are more clustered than TPS.

Table 2

Average Nearest Neighbor Analysis (ANNA) results

Region	Institution	N	Observed mean distance (meters)	Expected mean distance (meters)	Nearest neighbor ratio	z -score	p -value	Outcome
CMSD	TCS	66	501.13	1043.05	0.48	-8.136	0.000	Clustered
	TPS	101	680.55	954.88	0.71	-5.524	0.000	Clustered
East side	TCS	42	497.37	960.53	0.52	-5.178	0.000	Clustered
	TPS	60	675.72	886.00	0.76	-3.516	0.000	Clustered
West side	TCS	24	507.45	831.93	0.61	-3.731	0.000	Clustered
	TPS	41	687.61	706.37	0.97	-0.325	.745	Random

Additionally, we examined the locations of TCS and TPS on the east side and the west side, split into two parts by the Cuyahoga River, of CMSD. The purpose of this analysis was to determine if and to what degree the locations of TCS and TPS are clustered on each side of CMSD. The results of the east side analysis indicate that TCS display stronger tendency towards cluster (ANNI 0.52, $z = -5.524$) than TPS (ANNI 0.76, $z = -3.516$). On the west side, TCS are clustered (ANNI 0.61, $z = -3.731$) while the locations of TPS are random and not clustered (ANNI 0.97, $z = -0.325$).

Figure 1 is a kernel density map that illustrates the density of TCS within CMSD. The areas highlighted in yellow indicate a midlevel density and the red areas indicate 'hotspots,' areas with higher than average incidence of TCS. This map indicates two areas (marked in red) on the east side and one area on the west side of CMSD that have a high prevalence of TCS. This map supports the finding that TCS are more clustered on the east side of CMSD and less clustered on the west side.

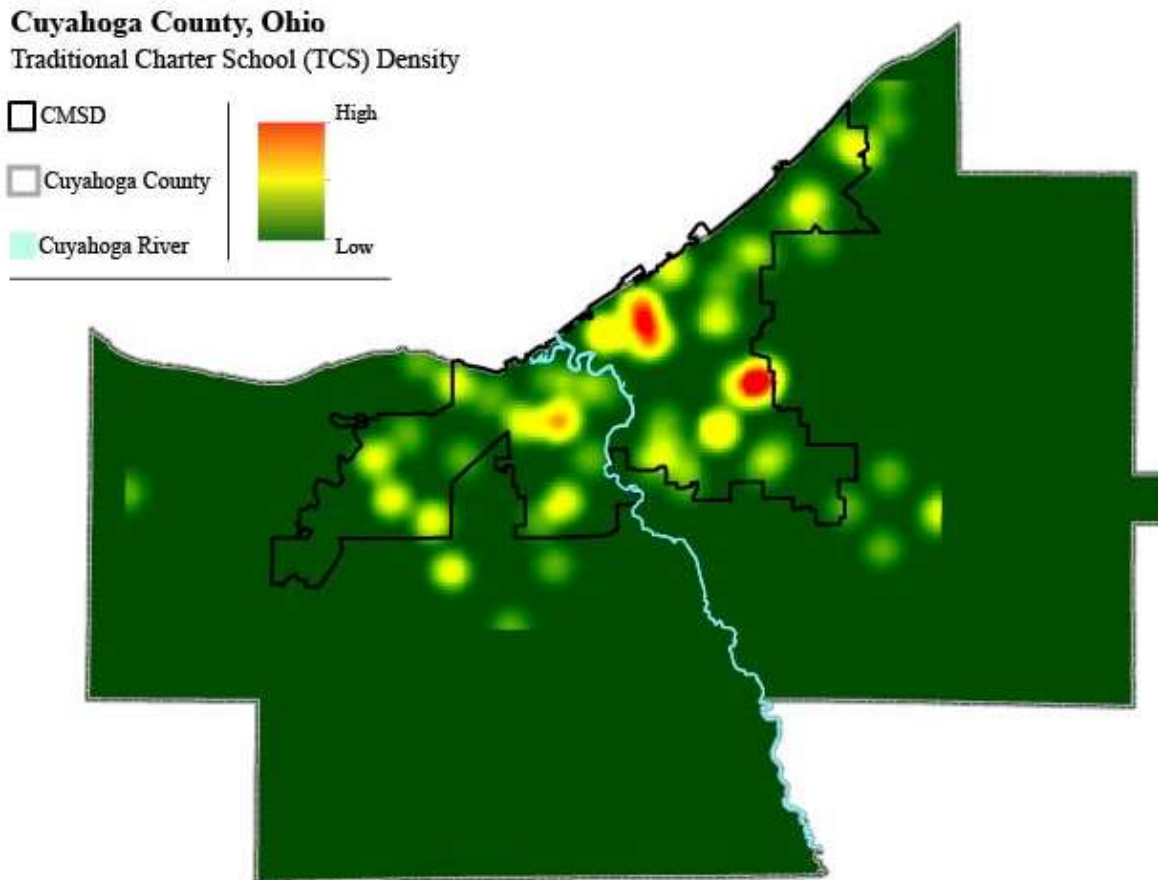


Figure 1: Kernel density map illustrating the density of TCS within CMSD and Cuyahoga County.

Figure 2 identifies hotspots of TPS throughout and outside of CMSD. More TPS hotspots appear on the east side, a finding supported by the ANNA, and only a few larger hotspots appear on the west side. This map supports the ANNA findings that TPS are clustered inside CMSD as a whole, they are less clustered on the east side and have a random distribution on the west side.

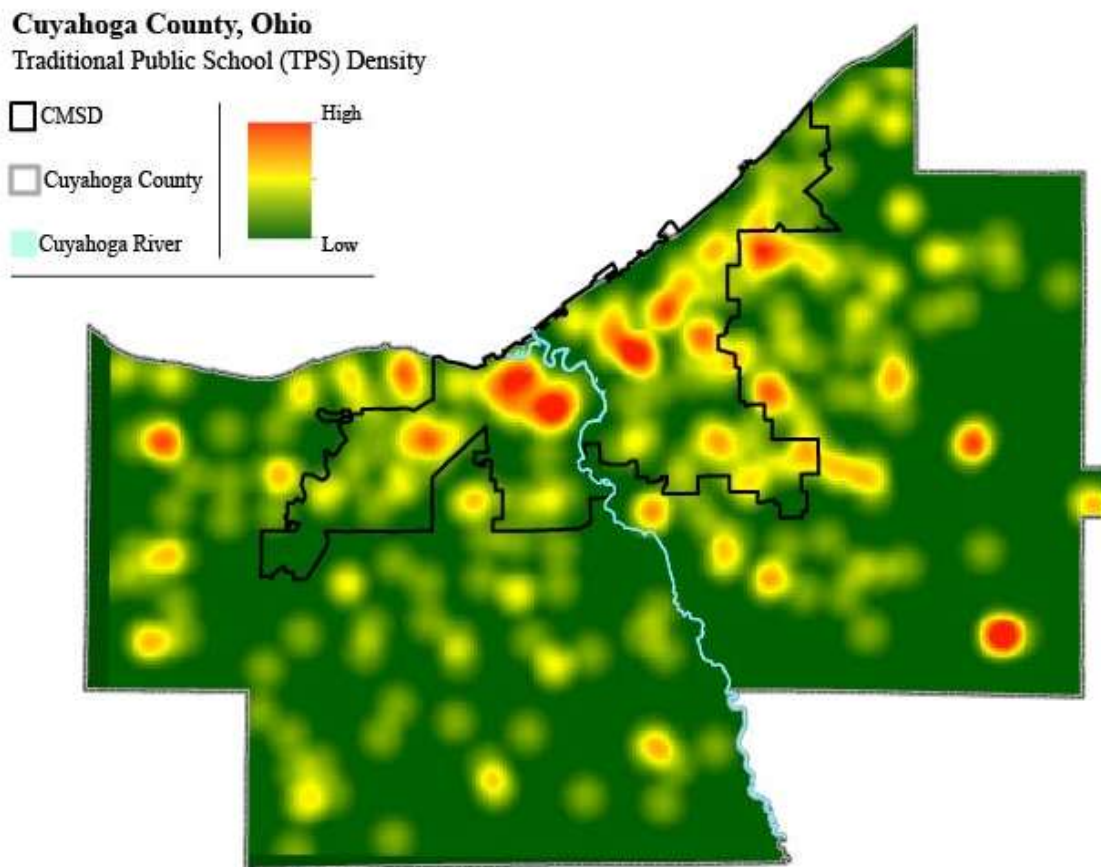


Figure 2: Kernel density map illustrating the density of TPS within CMSD and Cuyahoga County.

These findings indicate that the locations of TCS within CMSD reflect a spatial pattern. TCS are disproportionately located near one another in CMSD as a whole than what would be expected by chance. There is also a strong regional trend on the east side of CMSD which indicates that the locations of TCS on the east side of the river are not due to chance. While TCS are permitted to open as startup and conversion community schools within all of CMSD, as CMSD has low student performance, they are more clustered on the east side of CMSD. While TPS cluster less than TCS within CMSD and on the east side, they have a random and independent distribution on the west side that contrasts with the placement of TCS on the west side.

Statistical Results

For Research Question #2, a MANOVA examined school type (TCS and TPS) and CMSD status (status of being a school located in CMSD or not) as independent variables and school enrollment characteristics and the census tract characteristics of race and annual household income as dependent variables. The results indicated a significant interaction between school status and CMSD status, $Wilks's \Lambda = .837$, $F(355) = 7.66$, $p < .000$, partial $\eta^2 = .163$. Power to detect the effect was 1.00. Univariate test indicated that there were significant differences among enrollment characteristics and census tract characteristics surrounding TPC and TCS that are either located inside or outside of CMSD including the percentage of Black enrollment $F(1,363) = 12.32$, $p < .001$, partial $\eta^2 = .033$, White enrollment $F(1,363) = 15.08$, $p < .000$, partial $\eta^2 = .04$, the percentage of enrolled disadvantaged students $F(1,363) = 57.70$, $p < .000$, partial $\eta^2 = .137$, and the census tract

characteristics surrounding each school type including the percentage of Whites living in the census tract $F(1,363) = 10.22, p < .002$, partial $\eta^2 = .027$, the percentage of Blacks $F(1,363) = 10.39, p < .001$, partial $\eta^2 = .028$, and the percentage of households with an annual income of over \$100,000 $F(1,363) = 9.50, p < .002$, partial $\eta^2 = .026$ (see Table 3). The Hispanic student enrollment, the percentage of Hispanics living in the local census tract and the percent of households living in the local census tracts that have an annual income of under \$35,000 were not significant.

Table 3
Statistically significant MANOVA results for school type (TCS and TPS) and CMSD status (status of being a school located in CMSD or not).

Dependent Variables	F	CMSD School	School Type	Mean	95% Confidence Interval	
					Lower Bound	Upper Bound
% of Whites in the census tract	10.22	Outside CMSD	TPS	73.0	68.6	77.3
			TCS	46.1	30.3	61.9
		Inside CMSD	TPS	36.1	30.2	42.0
			TCS	40.0	32.7	47.2
% of Blacks in the census tract	10.39	Outside CMSD	TPS	21.1	16.4	25.8
			TCS	50.0	32.9	67.1
		Inside CMSD	TPS	55.3	48.9	61.6
			TCS	50.7	42.8	58.6
% Black enrollment	12.32	Outside CMSD	TPS	29.4	24.4	34.4
			TCS	65.3	47.2	83.3
		Inside CMSD	TPS	68.7	62.0	75.4
			TCS	66.0	57.7	74.3
% White enrollment	15.08	Outside CMSD	TPS	57.4	53.4	61.4
			TCS	27.1	12.5	41.6
		Inside CMSD	TPS	13.8	8.4	19.2
			TCS	17.8	11.1	24.5
% Disadvantaged	57.70	Outside CMSD	TPS	35.2	31.9	38.5
			TCS	77.6	65.5	89.7
		Inside CMSD	TPS	98.0	93.5	102.5
			TCS	84.7	79.1	90.2
% of Households with annual incomes over \$100k	9.50	Outside CMSD	TPS	26.1	24.2	28.0
			TCS	13.2	6.2	20.2
		Inside CMSD	TPS	6.1	3.5	8.7
			TCS	6.3	3.1	9.5

Larger Black average mean enrollments at schools outside of CMSD tend to be at TCS (65.3%) while larger White mean enrollments outside of CMSD tend to be at TPS (57.4%). Generally, schools located inside CMSD have larger Black mean enrollments (TCS 66% and TPS 68.7%, respectively) than White students (TCS 17.8% and TPS 13.8%, respectively).

Additionally, census tracts surrounding TPS outside of CMSD have larger populations of Whites compared to Blacks (73.0% versus 21.1%, respectively). Conversely, TPS inside CMSD have larger populations of Blacks living in their local census tract compared to Whites (55.3% versus 40.0%, respectively). TCS located inside of CMSD are in census tracts with larger percentages of Blacks (50.7%) than Whites (40.0%). Significant differences exist in the mean enrollments of disadvantaged students inside and outside of CMSD. Outside of CMSD, TCS have larger mean disadvantaged student enrollments (77.6%) than TPS (35.2%). Inside CMSD, TPS have larger mean disadvantaged student enrollments (98.0%) than TCS (84.7%). Finally, the percentage of mean annual household incomes of \$100,000 or more are greater outside of CMSD. Specifically, census tracts surrounding TPS have larger percentages of higher income households (26.1%) than census tracts surrounding TCS (13.2%). Inside CMSD, higher income households are similar surrounding TPS (6.1%) and TCS (6.3%).

Our findings indicate that there are greater mean percentages of Black students inside CMSD than outside, but there are higher mean Black enrollments at TCS inside CMSD and much lower mean enrollments at TPS outside of CMSD. Black populations are greater inside CMSD and are slightly higher in census tracts surrounding TPS. However, Black populations outside of CMSD are larger in census tracts surrounding TCS. This finding indicates that TCS outside of CMSD tend to be in areas with higher percentages of Blacks despite that the mean percentage of Blacks living in all census tracts surrounding TCS and TPS outside of CMSD is lower (35.6%) than inside CMSD (53%). Conversely, there are higher mean White enrollments outside of CMSD than inside, but there are slightly higher White enrollments at TCS inside CMSD and exceptionally higher White enrollments at TPS outside of CMSD. Mean White populations are much higher in census tracts outside of CMSD, especially surrounding TPS, but they are comparable inside of CMSD. Higher income households are more prevalent outside of CMSD, but they are much higher in census tracts surrounding TPS.

For Research Question #3, a Multivariate Analysis of Variance (MANOVA) tested for differences in enrollment characteristics by race and the percentage of disadvantaged student enrollments and the census tract demographics of income and race by school type (TCS or TPS) and school location (east side versus west side) within CMSD. The multivariate effect of location status (east side or west side of CMSD) was significant, $Wilks's \Lambda = .133$, $F(155) = 112.26$, $p < .000$, partial $\eta^2 = .867$. Power to detect the effect was 1.00. Additionally, the multivariate effect of school type (TCS or TPS) was significant, $Wilks's \Lambda = .744$, $F(155) = 5.93$, $p < .000$, partial $\eta^2 = .256$. Power to detect the effect was 1.00. There was not a significant interaction between location status and school type.

Univariate tests by school type inside CMSD indicated that there were significant differences among enrollment characteristics and census tract characteristics including the percentage of Black enrollment $F(1,163) = 4.54$, $p < .035$, partial $\eta^2 = .027$, White enrollment $F(1,163) = 7.57$, $p < .07$, partial $\eta^2 = .044$, and the percentage of enrolled disadvantaged students $F(1,163) = 31.29$, $p < .000$, partial $\eta^2 = .161$ (see Table 4). The Hispanic student enrollment, the percentage of Hispanics, Whites and Blacks living in the local census tract, and the percent of households living in the local census tracts that have an annual income of under \$35,000 or over \$100,000 were not significant.

Table 4

Statistically significant MANOVA results by school type (TCS or TPS) and school location (east side versus west side) within CMSD.

Dependent Variables	F	Location Type	Mean	95% Confidence Interval	
				Lower Bound	Upper Bound
% of Whites in the census tract	282.15	East side	17.8	14.8	22.1
		West side	68.7	64.5	73.9
% of Blacks in the census tract	231.60	East side	75.2	70.0	78.9
		West side	19.3	13.2	24.5
% of Hispanics in the census tract	195.0	East side	2.8	1.2	4.6
		West side	22.2	20.2	24.6
% Black enrollment	471.49	East side	89.9	86.4	92.9
		West side	32.7	27.4	35.7
% White enrollment	168.29	East side	5.0	2.7	7.9
		West side	31.7	29.5	36.2
% Hispanic Enrollment	294.41	East side	1.7	.1	3.7
		West side	28.7	26.1	30.9
% of Households with annual incomes equal to or less than \$35k	23.10	East side	65.9	63.3	69.1
		West side	54.3	50.9	58.4
% of Households with annual incomes equal to or greater than \$100k	41.61	East side	4.9	3.8	6.0
		West side	8.3	7.0	10.0

Greater Black mean enrollments exist in TPS located inside CMSD (68.7%) compared to TCS (66.0%). Conversely, greater White mean enrollments exist in TCS (17.8%) compared to TPS (13.8%). TPS have greater enrollments of disadvantaged students (98.0%) than TCS (84.7%). The results indicate that CMSD public schools in general (TPS and TCS) serve larger proportions of Black students than White students and slightly larger mean enrollments of Black students are typically at TPS. TPS inside CMSD tend to enroll smaller populations of White students, but TCS enroll more White students than TPS. While both TCS and TPS serve large populations of disadvantaged students, TPS have higher mean enrollments than TCS.

Figure 3 illustrates the census tract and school enrollment racial characteristics inside Cuyahoga County. The CMSD boundary is marked in black and the Cuyahoga River is blue. This map displays the highly segregated nature of CMSD and Cuyahoga County. Black individuals primarily reside on the east side of CMSD (areas marked in blue) while Whites live on the west side and areas outside of CMSD (areas marked in green). The areas marked in beige are areas that are more racially diverse (Blacks account for 25% to 75% of individuals living in the census tract). Additionally, the school enrollments share the same segregated characteristics. Typically, the

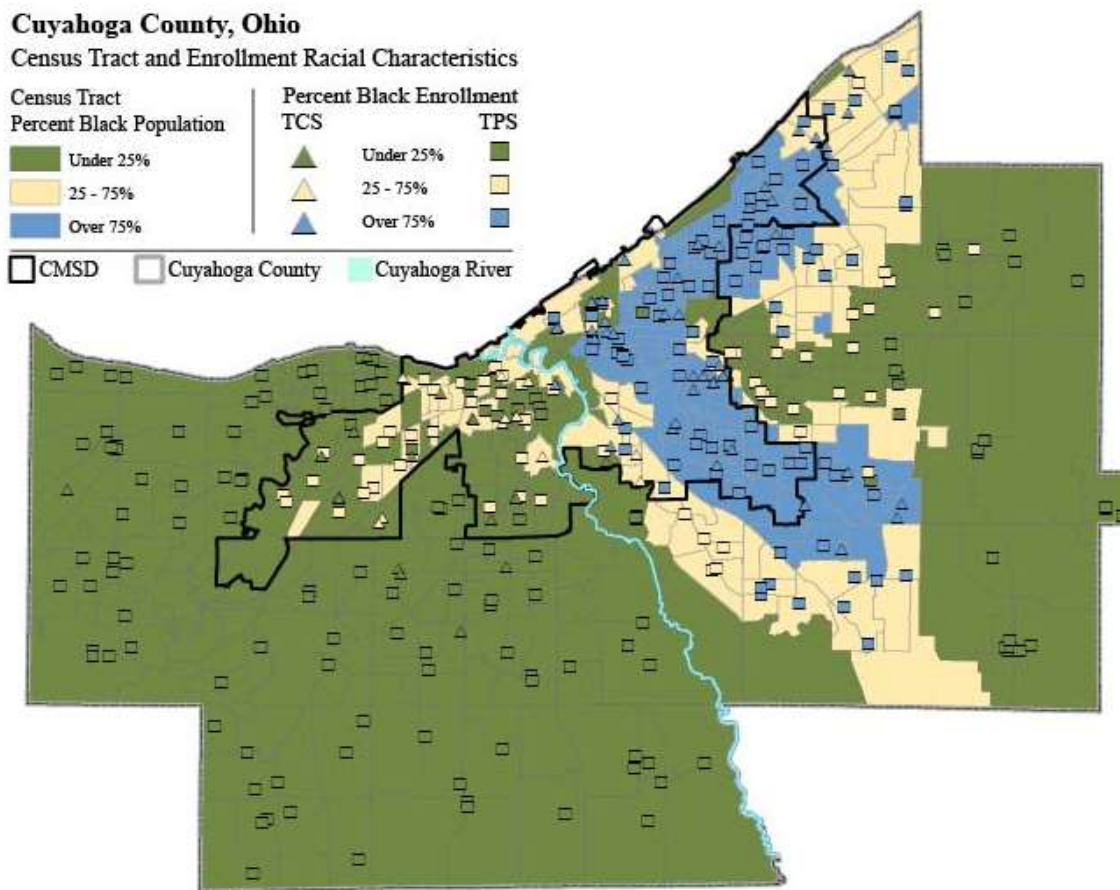


Figure 3: Census tract and school enrollment racial characteristics inside CMSD and Cuyahoga County.

enrollment of the TPS (squares) and TCS (triangles) matches the characteristics of the census tract in which the school is located. This means that squares and triangles are shaded in the same color as the census tract base layer (i.e. a blue triangle is often located in a blue area). However, there are several instances in which there are higher black enrollments at TCS and TPS in racially diverse areas in downtown Cleveland by the Cuyahoga River. But, there are no schools with high black enrollment on the west side of CMSD. This map illustrates that, generally, school enrollments by race tend to match the local community’s characteristics but, variation exists in downtown Cleveland. Also, CMSD is a highly segregated school district.

Univariate tests by location status (east side versus west side) inside CMSD indicated that there were significant differences among enrollment characteristics and census tract characteristics including the percentage of Black enrollment $F(1,163) = 471.49, p < .000$, partial $\eta^2 = .743$, White enrollment $F(1,163) = 168.29, p < .000$, partial $\eta^2 = .508$, Hispanic enrollment $F(1,163) = 297.41, p < .000$, partial $\eta^2 = .644$, , and the census tract characteristics of the percent of Whites $F(1,163) = 282.15, p < .00$, partial $\eta^2 = .634$, Blacks $F(1,163) = 231.60, p < .000$, partial $\eta^2 = .587$, Hispanics $F(1,163) = 195.00, p < .000$, partial $\eta^2 = .545$, and the percentage of households with an annual income equal to or less than \$35,000 annually $F(1,163) = 23.10, p < .000$, partial $\eta^2 = .124$, equal to or greater than \$100,000 living in the census tract $F(1,163) = 14.61, p < .000$, partial $\eta^2 = .082$. The percentage of enrolled disadvantaged students was not significant.

Hispanic and White enrollments are greater on the west side of CMSD (28.7% and 31.7%, respectively) than the east side (1.7% and 5.0%). Hispanic and White populations living in the local census tracts surrounding all TPS and TCS are also greater on the west side (22.2% and 68.7%, respectively) than the east side (2.8% and 17.8%, respectively). Conversely, mean Black enrollments are higher on the east side of CMSD (89.9%) than the west side (32.7%). The mean percentage of Blacks living in the local census tracts on the east side (75.2%) than the west side (19.3%). Households earning equal to or less than \$35,000 annually are more prevalent on the east side (65.9%) than the west side (54.3%) while households earning equal to or greater than \$100,000 annually are more prevalent on the west side (8.3%) than the east side (4.9%). Although not statistically significant, the percentage of disadvantaged students enrolled at both TCS and TPS on the west side and east side are equal (92.7%).

Figure 4 illustrates the socioeconomic characteristics of CMSD and Cuyahoga County and the percentage of disadvantaged enrollment at TCS and TPS. The census tracts marked in blue identify areas in which 75% or more of the households earn \$35,000 or less annually. These lower income households are prevalent on the east side of CMSD in Downtown Cleveland. There are two small patches of lower income households on the west side. However, most of the area inside CMSD is shaded in beige, which indicates that 25–75% of the households earn \$35,000 or less annually. There are high rates of disadvantaged enrollment at TCS (triangles) and TPS (squares) inside of CMSD. Very few schools on the east and west sides have more moderate rates of disadvantaged students. Also, there are several instances in which TCS with high disadvantaged enrollments are located in census tracts with less disadvantaged (beige) individuals, including Cleveland's west side and the border of CMSD on the east side. This map illustrates that the individuals who live inside CMSD tend to have low incomes and the schools enroll high percentages of disadvantaged students. However, there is a concentration of high poverty neighborhoods on the east side of CMSD and Downtown Cleveland, areas with hotspots of TCS marked in the kernel density maps.

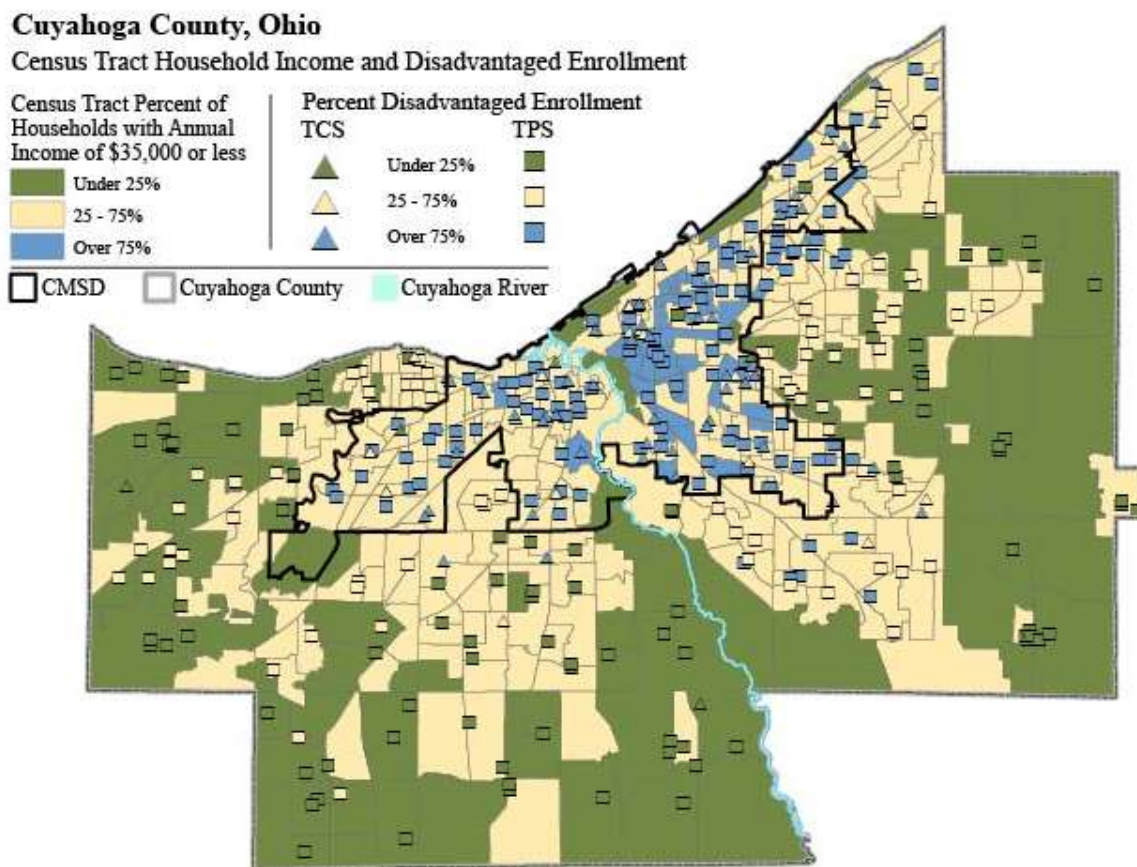


Figure 4: Socioeconomic characteristics of CMSD and Cuyahoga County and the percentage of disadvantaged enrollment at TCS and TPS.

Discussion

Our results indicate the extreme racial segregation that exists in public schools in CMSD. The GIS mapping, spatial analysis and statistical analysis identified a pattern indicating that while TCS are permitted to open and operate anywhere inside the CMSD boundary, TCS cluster in predominantly Black, higher poverty neighborhoods in East Cleveland on the east side of CMSD. The ANNA results show that the spatial distribution of TCS is clustered inside the boundary of CMSD relative to an expected random distribution, indicating that the average distance between TCS and its closest neighbor inside CMSD are closer than they would be expected by chance.

TCS both inside and outside of CMSD have high Black mean enrollments, a finding that aligns with similar studies (Carnoy et al., 2005; Cobb & Glass, 1999; Eckes & Rapp, 2005; Green, 2001; Rapp & Eckes, 2007). Inside CMSD, TCS tend to be in census tracts with about 10% higher mean percentages of Blacks than Whites. They are also in census tracts with slightly more higher income households than TPS. However, TPS are located in census tracts with nearly 20% greater mean percentages of Blacks than Whites. Additionally, although White mean enrollments at TPS and TCS are significantly lower than Black enrollments, the average mean White enrollment at TCS is slightly higher than at TPS. Moreover, the average mean disadvantaged enrollment at TCS is almost 15 points lower than TPS. Therefore, while TCS cluster in the highly segregated east side of Cleveland, an area with higher populations of Blacks and lower income households, they position

themselves in census tracts adjacent to predominantly Black neighborhoods. As a result, TCS that are located in adjacent to predominantly Black communities have enrollment characteristics that are more racially and socioeconomically diverse than TPS located in predominantly Black neighborhoods. TCS who strategically position themselves outside of the most disadvantaged census tracts, areas that tend to be predominantly Black, open themselves to enrolling Blacks, disadvantaged students, Whites and less disadvantaged individuals. These findings coincide with previous research that described patterns of TCS locating near, but not directly within, predominantly black neighborhoods and high poverty communities (d'Entremont, 2012; Gulosino & d'Entremont, 2011; LaFleur, 2016; Lubienski et al., 2009; Saultz & Yaluma; 2017).

But, while TCS are positioning themselves in more racially and economically diverse census tracts, the average mean Black enrollment at TCS (66%) is nearly 50 points higher than the White enrollment (17.8%). This finding coincides with Gulosino and d'Entremont (2011) who found that greater percentages of Blacks are enrolled in TCS than who reside in areas surrounding the TCS, areas bordering the neighborhoods of the students they will likely enroll.

The TPS in CMSD are disproportionately disadvantaged and have greater Black mean enrollments than the TCS. Lower White enrollments in CMSD, especially at TPS, suggests that some Whites and higher income households are not enrolling their children in the public school system and are opting to enroll at private schools in CMSD or leave CMSD altogether. Outside CMSD, average mean White enrollment is significantly higher at TPS and the communities surrounding TPS are predominantly White and reflect higher incomes. As previous research indicates that parents often enroll their children in schools that reflect their own race and socioeconomic status (Booker, Zimmer, & Buddin, 2005; Garcia; 2008; Mickelson, Bottia & Southworth, 2008; Renzulli & Evans, 2005), it is possible that some White families are deliberately not enrolling their children in TPS and are electing to move to more racially homogenous areas.

While White people disproportionately populate the area outside of CMSD in Cuyahoga County, TCS located outside of CMSD are located in more racially diverse areas. But, the Black school enrollment at TCS located outside of CMSD is more than double the average mean White enrollment at TCS outside of CMSD. Additionally, compared to TPS outside of CMSD, the average mean of disadvantaged students enrolled at TCS outside of CMSD is doubled. While supporters of school choice programs argue that racial integration will improve through choice policies because TCS can draw students from broader geographic ranges, these findings indicate that although TCS outside of CMSD are in more diverse areas, the students who enroll are more likely to be Black and have lower socioeconomic backgrounds.

Facilitated by charter-friendly policy that has not only opened the door for TCS to enter the district and create competition with TPS, but has continuously expanded the labeling definition of school districts (i.e. Academic Emergency, Academic Watch, Challenged) in which TCS may operate, the prevalence of TCS in CMSD has increased and permitted them to compete with TPS and economically benefit from educational policy that gives them access to potential new customers and capitalize from public funds. While TCS were created as a "school choice" educational option to serve failing school districts, including CMSD, we find that rather than locating throughout the entire district, as they are permitted to do, TCS cluster in and near communities that are predominantly Black and economically disadvantaged. While business 'cluster' to maximize their potential profit and to gain access to a customer base, we find that one reason TCS may primarily cluster on the east side of CMSD to maximize enrollments. The clustering of TCS outside of the poorest census tracts with high concentrations of Black individuals may indicate that private interests invested in TCS strategically locate in these communities to not only benefit from a steady stream of poor, Black students with limited mobility, but to possibly "cream" high-ability students of favorable backgrounds from TPS who require fewer resources and boost the school's performance,

a finding that aligns with past research (d'Entremont, 2012; LaFleur, 2016; Lubienski et al., 2009). As a result, TPS inside CMSD have higher percentages of Black students, lower percentages of White students and higher enrollments of disadvantaged students than TCS inside CMSD. This finding coincides with Wells' (2009) meta-analysis of research on the social context of charter public schools that indicated that TCS exacerbate racial and class stratification.

Porter stresses the importance of consumer demand for the cluster's success because the cluster will have no value without customers who want a product. Additionally, clustering allows businesses to watch for market conditions and upcoming trends in customer demands. Therefore, placing a business near the customer plays a vital role in the success of the business. Similar to Saultz, Fitzpatrick and Jacobsen (2015) study that found that TCS in New York City are opening in areas of low academic performance to attract families who may be open to trying a new schooling option, the areas in which TCS cluster in CMSD are areas where families may be looking for a better educational option for their children. The enrollment characteristics of TCS inside CMSD reflect slightly higher, but still modest, enrollments of Whites and lower percentages of disadvantaged students compared to TPS. Since TPS in CMSD are underperforming and TCS are claiming they offer a more innovative and unique schooling experience, some families with means in CMSD may send their children to TCS.

Additionally, some families who live within CMSD may apply for a scholarship to send their children to a private school located in the district. The Cleveland Scholarship Program provides scholarship awards of \$4,650 for grades K-8 and \$6,000 for grades 9–12 that are renewable through 12th grade (Ohio Department of Education, 2018b). Parents/guardians are responsible for the difference in tuition not paid by the state and any school fees, including application, registration and after school programs (Ohio Department of Education, 2018b). Priority is given to low-income applicants and other recipients are determined by lottery drawings.

As businesses in clusters experience “competitive pressure, peer pressure, constant comparison”, families and students can shop around for the best TCS for their family. While this study does not systematically examine the curriculum and programs offered at TCS and TPS in CMSD, this district offers a variety of programs, including STEM, STEAM, arts programs and an international baccalaureate program. Since TCS have similar services and products in the cluster, TCS have to remain competitive and offer unique programs that meet the needs of customers. Since “Clusters make it easier to measure and compare performances because local rivals share general circumstances [and] perform similar activities,” students and families become customers and adapt a market-based mentality to evaluate schools in the cluster (Porter, 1998 p. 83). This dynamic shifts people to self-serving consumers who seek to maximize their own interests in a market-based system.

This research brings to mind Archbald, Hurwitz and Hurwitz (2018) statement that one way to view the growing racial and socioeconomic segregation by race and class in public schools due to school choice policy and market principles is, “It's what the market has produced and people are in the schools they want” (p. 30). Essentially, segregation, and not diversity, may be a market choice. If choice policies continue to allow charter schools to use locational strategies to maximize their profits and, subsequently, exacerbate racially and economically stratified communities, the ability of public education to facilitate equitable educational opportunities and desegregated classrooms will be undermined.

Limitations and Future Research

This study does not investigate private schools or public schools that were vocational, special education or other/alternative. Also, this study did not examine how the profit status of a charter affects clustering and locational positioning. More specifically, this research did not examine if for-profit charter schools locate in areas with distinct characteristics and serve student populations similar to or different than non-profit schools. Robertson's (2015) study of 1,386 charter schools operated by EMOs across the United States indicated that for-profit charter schools are less likely than nonprofit charter school to educate larger proportions of socioeconomically disadvantaged students. He suggested that charter schools focused on generating profit aim to serve higher socioeconomic status students, students who tend to have higher student outcomes and require less resources, to maximize their returns. Future research that investigates connections between profit status and school performance in relation to geographic positioning and clustering would benefit researchers' understandings of the growth and performance of charter school clusters and their relationships to racial and socioeconomic stratification. Furthermore, we did not consider transportation, asymmetry of information, or other costs associated with attending charter schools. Student transportation service must be provided in Ohio for students in grades K-8 who live more than two miles from their school. Some school districts also transport students in high school and students who live closer than two miles from their school, but these services are optional and are not required by state law. Future research that attends to these questions will inform policy and equity issues associated with school choice.

References

- Allen, J., & Consoletti, A. (2010). Annual survey of America's charter schools. Center for Education Reform. Retrieved from https://www.edreform.com/wp-content/uploads/2011/09/CER_Charter_Survey_2010.pdf.
- Andre-Bechely, L. (2007). Finding space and managing distance: Public school choice in an urban California district. *Urban studies*, *44*(7), 1355-1376. <https://doi.org/10.1080/00420980701302304>
- Archbald, D., Hurwitz, A., & Hurwitz, F. (2018). Charter schools, parent choice, and segregation: A longitudinal study of the growth of charters and changing enrollment patterns in five school districts over 26 years. *Education Policy Analysis Archives*, *26*(22). <https://doi.org/10.14507/epaa.26.2921>
- Bailey, M. N., & Montalbano, N. (2017). *Clusters and innovation districts: Lessons from the United State experience*. The Brookings Institution.
- Bankston III, C., & Caldas, S. J. (1996). Majority African American schools and social injustice: The influence of de facto segregation on academic achievement. *Social Forces*, *75*(2), 535-555. <https://doi.org/10.2307/2580412>
- Bifulco, R., & Ladd, H. F. (2007). School choice, racial segregation, and test-score gaps: Evidence from North Carolina's charter school program. *Journal of Policy Analysis and Management*, *26*(1), 31-56. <https://doi.org/10.1002/pam.20226>
- Bifulco, R., Ladd, H. F., & Ross, S. L. (2009). Public school choice and integration evidence from Durham, North Carolina. *Social Science Research*, *38*(1), 71-85. <https://doi.org/10.1016/j.ssresearch.2008.10.001>
- Bonilla-Silva, E. (2001). *White supremacy and racism in the post-civil rights era*. Lynne Rienner Publishers.

- Booker, K., Zimmer, R., & Buddin, R. (2005). *The effect of charter schools on school peer composition*. Santa Monica, CA: RAND Corporation.
- Brewer, C. A. (2008). *Designed maps: A sourcebook for GIS users*. Redlands, CA: ESRI Press.
- Carnoy, M., Jacobsen, R., Mishel, L. R., & Rothstein, R. (2005). *The charter school dust-up: Examining the evidence on enrollment and achievement*. Washington, DC: Economic Policy Institute.
<https://doi.org/10.1086/589122>
- Chubb, J., & Moe, T. (1995). Politics, markets, and equality in schools. In P. Harker (Ed.), *The service productivity and quality challenge. International studies in the service economy* (Vol. 5, pp. 435-469). Dordrecht: Springer. https://doi.org/10.1007/978-94-011-0073-1_17
- Clark, P. J., & Evans, F. C. (1954). Distance to nearest neighbor as a measure of spatial relationships in populations. *Ecology*, 35(4), 445–453. <https://doi.org/10.2307/1931034>
- Cleveland Metropolitan School District. (2018). CMSD/Charter School Collaboration. Retrieved June 29, 2018, from <http://www.clevelandmetroschools.org/domain/2528>
- Cobb, C. D., & Glass, G. V. (1999). Ethnic segregation in Arizona charter schools. *Education Policy Analysis Archives*, 7(1). <https://doi.org/10.14507/epaa.v7n1.1999>
- d'Entremont, C. (2012). *Circles of Influence: Rational decision-making, strategic positioning, and the formation of charter school clusters in New Jersey*. (Doctoral dissertation). Columbia University, New York, NY. Retrieved from: <http://hdl.handle.net/10022/AC:P:13429>
- Delgado, M., Porter, M. E., & Stern, S. (2015). Defining clusters of related industries. *Journal of Economic Geography*, 16(1), 1-38. <https://doi.org/10.1093/jeg/lbv017>
- Eckes, S., & Plucker, J. (2005). Charter schools and gifted education: Legal obligations. *Journal of Law and Education*, 34(3), 421-436.
- Eckes, S., & Rapp, K. (2005). Charter schools: Trends and implications. In E. St. John (Ed.), *Readings on Education* (Vol. 19, pp. 1-26). New York: AMS Press
- Eckes, S. E., & Trotter, A. E. (2007). Are charter schools using recruitment strategies to increase student body diversity? *Education and Urban Society*, 40(1), 62-90.
<https://doi.org/10.1177/0013124507304012>
- ESRI. (2016). What is a z-score? What is a p-value? Retrieved October 12, 2018, from <http://desktop.arcgis.com/en/arcmap/10.3/tools/spatial-statistics-toolbox/what-is-a-z-score-what-is-a-p-value.htm>
- ESRI. (2018). *An overview of the Analyzing Patterns toolset*. Retrieved from <http://pro.arcgis.com/en/pro-app/tool-reference/spatial-statistics/an-overview-of-the-analyzing-patterns-toolset.htm>
- Finn, C. E., Jr. (1990). Why we need choice. In W. L. Boyd & H. J. Walberg (Eds.), *Choice in education: Potential and problems* (pp. 3-19). Berkeley, CA: McCutchan.
- Fiske, E. B., & Ladd, H. F. (2001). *When schools compete: A cautionary tale*. Brookings Institution Press.
- Florida, R., & Mellander, C. (2015). *Segregated city: The geography of economic segregation in America's metros* [Technical report]. Martin Prosperity Institute, Rotman School of Management, University of Toronto. <http://martinprosperity.org/media/Segregated%20City.pdf>
- Frankenberg, E., Kotok, S., Schafft, K., & Mann, B. (2017). Exploring school choice and the consequences for student racial segregation within Pennsylvania's charter school transfers. *Education Policy Analysis Archives*, 25(22). <https://doi.org/10.14507/epaa.25.2601>
- Garcia, D. (2008). The impact of school choice on racial segregation in charter schools. *Educational Policy*, 22(6), 805-829. <https://doi.org/10.1177/0895904807310043>
- Green, P. C. (2001). Racial balancing provisions and charter schools: Are charter schools out on a constitutional limb. *Brigham Young University Education and Law Journal*, 65.

- Gulosino, C., & d'Entremont, C. (2011). Circles of influence: An analysis of charter school location and racial patterns at varying geographic scales. *Education Policy Analysis Archives*, 19(8). <https://doi.org/10.14507/epaa.v19n8.2011>
- Henig, J. R. (1996). The local dynamics of choice: Ethnic preferences and institutional responses. In B. Fuller and R. F. Elmore (Eds.), *Who chooses? Who loses? Culture, institutions, and the unequal effects of school choice*. New York: Teachers College Press.
- Hesketh, A. J., & Knight, P. T. (1998). Secondary school prospectuses and educational markets. *Cambridge Journal of Education*, 28(1), 21-35. <https://doi.org/10.1080/0305764980280103>
- Hoxby, C. M. (1998). Analyzing school choice reforms that use America's traditional forms of parental choice. In P. E. Peterson & B. C. Hassel (Eds.), *Learning from school choice*, (pp. 133-156). Washington, DC: Brookings Institution Press.
- Keppel, G. (1991). *Design and analysis: A researcher's handbook* (3rd ed.). Upper Saddle River, NJ: Prentice-Hall.
- Knowles, A. K., & Hillier, A. (Eds.). (2008). *Placing history: How maps, spatial data, and GIS are changing historical scholarship*. Redlands, CA: ESRI Press.
- Kotok, S., Frankenberg, E., Schafft, K. A., Mann, B. A., & Fuller, E. J. (2017). School choice, racial segregation, and poverty concentration: Evidence from Pennsylvania charter school transfers. *Educational Policy*, 31(4), 415-447. <https://doi.org/10.1177/0895904815604112>
- Lacireno-Paquet, N., Holyoke, T. T., Moser, M., & Henig, J. R. (2002). Creaming versus cropping: Charter school enrollment practices in response to market incentives. *Educational Evaluation and Policy Analysis*, 24(2), 145-158. <https://doi.org/10.3102/01623737024002145>
- LaFleur, J. (2016). Locating Chicago's charter schools: A socio-spatial analysis. *Education Policy Analysis Archives*, 24(33). <https://doi.org/10.14507/epaa.24.1745>
- Lee, V., & Croninger, R. G. (1994). Parental choice of schools and social stratification in education: The paradox of Detroit. *Education Evaluation and Policy Analysis*, 16(4), 434-457. <https://doi.org/10.3102/01623737016004434>
- Loehrke, J., & Lee, J. (2014, May 15). Still apart: Map shows states with most-segregated schools. *USA Today*. Retrieved June 28, 2018 from <http://www.usatoday.com/story/news/nation-now/2014/05/15/school-segregation-civil-rights-project/9115823/>
- Logan, J. R. (2013). The persistence of segregation in the 21st century metropolis. *City & Community*, 12(2), 160-168. <https://doi.org/10.1111/cico.12021>
- Lubienski, C., Gulosino, C., & Weitzel, P. (2009). School choice and competitive incentives: Mapping the distribution of educational opportunities across local education markets. *American Journal of Education*, 115, 601 -647. <https://doi.org/10.1086/599778>
- Massey, D., & Denton, N. (1993). *American apartheid*. Cambridge, MA, Harvard University Press.
- Mathian, H., & Sanders, L. (2014). *Spatio-temporal approaches: Geographic objects and change process*. John Wiley & Sons. <https://doi.org/10.1002/9781118649213>
- Mickelson, R, Bottia, M., & Southworth, S. (2008). *School choice and segregation by race, class, and achievement*. Boulder, CO: National Education Policy Center. Retrieved 2018-06- 26, from <http://nepc.colorado.edu/publication/school-choice-and-segregationrace-class-and-achievement>.
- Miron, G., & Gulosino, C. (2013). *Profiles of for-profit and nonprofit education management organizations: Fourteenth Edition, 2011-2012*. Boulder, CO: National Education Policy Center.
- Mitchell, A. (2005). *The ESRI guide to GIS analysis, Vol. 2: Spatial measurements and statistics*. Redlands, CA: ESRI.
- Nathan, J. (1996). *Charter schools: Creating hope and opportunity for American education* (1st ed., Jossey-Bass education series). San Francisco: Jossey-Bass.

- Ohio Department of Education. (2016). 2014-2015-Challenged-District-List-Nov-20-2014 [Data file]. Retrieved from <http://education.ohio.gov/Topics/Community-Schools/Challenged-School-Districts>.
- Ohio Department of Education. (2017). *2016-2017 Annual Report on Ohio Community Schools*. Columbus. Retrieved from <http://education.ohio.gov/getattachment/Topics/Community-Schools/Annual-Reports-on-Ohio-Community-Schools/2016-2017-ODE-Community-Schools-Annual-Report.pdf.aspx?lang=en-US>
- Ohio Department of Education. (2018a). Operator list. [Data file]. Retrieved from <http://education.ohio.gov/Topics/Community-Schools/Directory-of-Community-Schools-Sponsors-and-Operat>.
- Ohio Department of Education. (2018b). Cleveland Scholarship Program. Retrieved October 12, 2018, from <http://education.ohio.gov/Topics/Other-Resources/Scholarships/Cleveland-Scholarship-Tutoring-Program>
- Orfield, G. (1996). The growth of segregation: African Americans, Latinos, and unequal education. In G. Orfield & S.E. Eaton, G. (Eds.), *Dismantling desegregation: The quiet reversal of Brown v. Board of Education*, (pp. 53-71). New York: New Press.
- Porter, M. E. (1998). Clusters and the new economics of competition. *Harvard Business Review*, 76, 77–91.
- Porter, M. E. (2000). Location, competition, and economic development: Local clusters in a global economy. *Economic Development Quarterly*, 14(1), 15-34. <https://doi.org/10.1177/089124240001400105>
- Rapp, K., & Eckes, S. (2007). Dispelling the myth of “White Flight”: An examination of minority enrollment in charter schools. *Educational Policy*, 21(4), 615-661. <https://doi.org/10.1177/0895904806290123>
- Renzulli, L. A., & Evans, L. (2005). School choice, charter schools, and white flight. *Social Problems*, 52(3), 398-418. <https://doi.org/10.1525/sp.2005.52.3.398>
- Robertson, W. B. (2015). Mapping the profit motive: The distinct geography and demography of for-profit charter schools. *Education Policy Analysis Archives*, 23(69). <https://doi.org/10.14507/epaa.v23.1864>
- Roscigno, V. J. (1998). Race and the reproduction of educational disadvantage. *Social Forces*, 76(3), 1033-1061. <https://doi.org/10.1093/sf/76.3.1033>
- Rumberger, R. W., & Palardy, G. J. (2005). Does segregation still matter? The impact of student composition on academic achievement in high school. *Teachers College Record*, 107(9), 1999-2045.
- Saultz, A., Fitzpatrick, D., & Jacobsen, R. (2015). Exploring the supply side: Factors related to charter school openings in NYC. *Journal of School Choice*, 9(3), 446-466. <https://doi.org/10.1080/15582159.2015.1028829>
- Saultz, A., & Yaluma, C. B. (2017). Equal access? Analyzing charter location relative to demographics in Ohio. *Journal of School Choice*, 11(3), 458-476. <https://doi.org/10.1080/15582159.2017.1345239>
- Shams, D. (2018, August 7). FY2016 District Profile Report. Retrieved October 8, 2018, from <http://education.ohio.gov/Topics/Finance-and-Funding/School-Payment-Reports/District-Profile-Reports/FY2016-District-Profile-Report>.
- Squire, J., Robson, K., & Smarick, A. (2014). The road to redemption: Ten policy recommendations for Ohio's charter school sector. *Bellwether Education Partners*.
- Tabachnick, B. G., & Fidell, L. S. (2007). *Using multivariate statistics* (5th ed.). Boston: Pearson Education.

- Tabachnick, B. G., & Fidell, L. S. (2014). *Pearson new international edition: Using multivariate statistics* (6th ed.). Essex, UK: Pearson Education Limited.
- Tallman, S., Jenkins, M., Henry, N., & Pinch, S. (2004). Knowledge, clusters, and competitive advantage. *Academy of Management Review*, 29(2), 258-271.
<https://doi.org/10.5465/amr.2004.12736089>
- Thernstrom, A., & Thernstrom, S. (2004). *No excuses: Closing the racial gap in learning*. New York, NY: Simon & Schuster.
- U.S. Census Bureau (2018). *Demographic and housing characteristics, 2012-2016 American Community Survey 5-year estimates*. Retrieved from
<https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=CF>
- Weihner, G. R., & Tedin, K. L. (2002). Does choice lead to racially distinctive schools? Charter schools and household preferences. *Journal of Policy Analysis and Management: The Journal of the Association for Public Policy Analysis and Management*, 21(1), 79-92.
<https://doi.org/10.1002/pam.1041>
- Weinberg, S. L., & Goldberg, K. P. (1990). *Statistics for the behavioral sciences*. Cambridge, UK: Cambridge University Press.
- Wells, A. S. (1993). The sociology of school choice: Why some win and others lose in the educational marketplace. In E. Rassel & R. Rothstein (Eds.), *School choice: Examining the evidence*, (pp. 29-48). Washington, D.C.: Economic Policy Institute.
- Wells, A. S. (2009) The social context of charter schools. In M. Berends, M. Springer, & D. Ballou (Eds.), *Handbook of research on school choice* (pp. 155-178). New York: Routledge.
- Wells, A. S., & Crain, R. L. (1994). Perpetuation theory and the long-term effects of school desegregation. *Review of Educational Research*, 64(4), 531-555.
<https://doi.org/10.3102/00346543064004531>
- Wolf, P. J., Howell, W. G., & Peterson, P. E. (2000). *School choice in Washington, DC: An evaluation after one year*. Cambridge, MA: Harvard University, Program on Education, Policy and Governance.
- Zimmer, R., Gill, B., Booker, K., Lavertu, S., Sass, T., & Witte, J. (2009). *Charter schools in eight states: Effects on achievement, attainment, integration and competition*. Santa Monica, CA: Rand Corporation. <https://doi.org/10.7249/MG869>

About the Authors

Elizabeth A. Gilblom

North Dakota State University

Elizabeth.Gilblom@csn.edu

Elizabeth A. Gilblom is an assistant professor in the Education Doctoral Program at North Dakota State University. She received her Ph.D. in urban education with a specialization in adult, continuing, and higher education from Cleveland State University. Her research interests include privatization in education, geographic information systems, community-based education and adult education.

Hilla I. Sang

University of Nevada, Las Vegas

Hilla.Sang@unlv.edu

Hilla Sang is a doctoral candidate in Health Policy and Management at Kent State University's College of Public Health. She currently works as the Data Visualization and GIS Specialist at UNLV's Lied Library. Her research interests include spatial analytics, geographic information systems, and health equity.

education policy analysis archives

Volume 27 Number 15

February 25, 2019

ISSN 1068-2341



Readers are free to copy, display, and distribute this article, as long as the work is attributed to the author(s) and **Education Policy Analysis Archives**, it is distributed for non-commercial purposes only, and no alteration or transformation is made in the work. More details of this Creative Commons license are available at <http://creativecommons.org/licenses/by-nc-sa/3.0/>. All other uses must be approved by the author(s) or **EPAA**. **EPAA** is published by the Mary Lou Fulton Institute and Graduate School of Education at Arizona State University. Articles are indexed in CIRC (Clasificación Integrada de Revistas Científicas, Spain), DIALNET (Spain), [Directory of Open Access Journals](#), EBSCO Education Research Complete, ERIC, Education Full Text (H.W. Wilson), QUALIS A1 (Brazil), SCImago Journal Rank, SCOPUS, Socolar (China).

Please send errata notes to Audrey Amrein-Beardsley at audrey.beardsley@asu.edu

Join EPAA's Facebook community at <https://www.facebook.com/EPAAAPE> and Twitter feed @epaa_aape.

education policy analysis archives
editorial board

Lead Editor: **Audrey Amrein-Beardsley** (Arizona State University)

Editor Consultor: **Gustavo E. Fischman** (Arizona State University)

Associate Editors: **David Carlson, Lauren Harris, Eugene Judson, Mirka Koro-Ljungberg, Scott Marley, Molly Ott, Iveta Silova** (Arizona State University)

Cristina Alfaro
San Diego State University

Gary Anderson
New York University

Michael W. Apple
University of Wisconsin, Madison

Jeff Bale
University of Toronto, Canada

Aaron Bevanot SUNY Albany

David C. Berliner

Arizona State University

Henry Braun Boston College

Casey Cobb

University of Connecticut

Arnold Danzig

San Jose State University

Linda Darling-Hammond

Stanford University

Elizabeth H. DeBray

University of Georgia

David E. DeMatthews

University of Texas at Austin

Chad d'Entremont Rennie Center
for Education Research & Policy

John Diamond

University of Wisconsin, Madison

Matthew Di Carlo

Albert Shanker Institute

Sherman Dorn

Arizona State University

Michael J. Dumas

University of California, Berkeley

Kathy Escamilla

University of Colorado, Boulder

Yariv Feniger Ben-Gurion

University of the Negev

Melissa Lynn Freeman

Adams State College

Rachael Gabriel

University of Connecticut

Amy Garrett Dikkers University
of North Carolina, Wilmington

Gene V Glass

Arizona State University

Ronald Glass University of
California, Santa Cruz

Jacob P. K. Gross

University of Louisville

Eric M. Haas WestEd

Julian Vasquez Heilig California
State University, Sacramento

Kimberly Kappler Hewitt University
of North Carolina Greensboro

Aimee Howley Ohio University

Steve Klees University of Maryland

Jaekyung Lee SUNY Buffalo

Jessica Nina Lester

Indiana University

Amanda E. Lewis University of
Illinois, Chicago

Chad R. Lochmiller Indiana
University

Christopher Lubienski Indiana
University

Sarah Lubienski Indiana University

William J. Mathis

University of Colorado, Boulder

Michele S. Moses

University of Colorado, Boulder

Julianne Moss

Deakin University, Australia

Sharon Nichols

University of Texas, San Antonio

Eric Parsons

University of Missouri-Columbia

Amanda U. Potterton

University of Kentucky

Susan L. Robertson

Bristol University

Gloria M. Rodriguez

University of California, Davis

R. Anthony Rolle

University of Houston

A. G. Rud

Washington State University

Patricia Sánchez University of
University of Texas, San Antonio

Janelle Scott University of
California, Berkeley

Jack Schneider University of
Massachusetts Lowell

Noah Sobe Loyola University

Nelly P. Stromquist

University of Maryland

Benjamin Superfine

University of Illinois, Chicago

Adai Tefera

Virginia Commonwealth University

A. Chris Torres

Michigan State University

Tina Trujillo

University of California, Berkeley

Federico R. Waitoller

University of Illinois, Chicago

Larisa Warhol

University of Connecticut

John Weathers University of
Colorado, Colorado Springs

Kevin Welner

University of Colorado, Boulder

Terrence G. Wiley

Center for Applied Linguistics

John Willinsky Stanford University

Jennifer R. Wolgemuth

University of South Florida

Kyo Yamashiro

Claremont Graduate University

archivos analíticos de políticas educativas consejo editorial

Editor Consultor: **Gustavo E. Fischman** (Arizona State University)

Editores Asociados: **Armando Alcántara Santuario** (Universidad Nacional Autónoma de México), **Angelica Buendia**, (Metropolitan Autonomous University), **Alejandra Falabella** (Universidad Alberto Hurtado, Chile), **Antonio Luzon**, (Universidad de Granada), **José Luis Ramírez**, (Universidad de Sonora), **Paula Razquin** (Universidad de San Andrés), **Maria Alejandra Tejada-Gómez** (Pontificia Universidad Javeriana, Colombia)

Claudio Almonacid

Universidad Metropolitana de Ciencias de la Educación, Chile

Miguel Ángel Arias Ortega

Universidad Autónoma de la Ciudad de México

Xavier Besalú Costa

Universitat de Girona, España

Xavier Bonal Sarro

Universidad Autónoma de Barcelona, España

Antonio Bolívar Boitia

Universidad de Granada, España

José Joaquín Brunner

Universidad Diego Portales, Chile

Damián Canales Sánchez

Instituto Nacional para la Evaluación de la Educación, México

Gabriela de la Cruz Flores

Universidad Nacional Autónoma de México

Marco Antonio Delgado Fuentes

Universidad Iberoamericana, México

Inés Dusel, DIE-CINVESTAV,

México

Pedro Flores Crespo

Universidad Iberoamericana, México

Ana María García de Fanelli

Centro de Estudios de Estado y Sociedad (CEDES) CONICET, Argentina

Juan Carlos González Faraco

Universidad de Huelva, España

María Clemente Linuesa

Universidad de Salamanca, España

Jaume Martínez Bonafé

Universitat de València, España

Alejandro Márquez Jiménez

Instituto de Investigaciones sobre la Universidad y la Educación, UNAM, México

María Guadalupe Olivier

Tellez, Universidad Pedagógica Nacional, México

Miguel Pereyra

Universidad de Granada, España

Mónica Pini

Universidad Nacional de San Martín, Argentina

Omar Orlando Pulido Chaves

Instituto para la Investigación Educativa y el Desarrollo Pedagógico (IDEP)

José Ignacio Rivas Flores

Universidad de Málaga, España

Miriam Rodríguez Vargas

Universidad Autónoma de Tamaulipas, México

José Gregorio Rodríguez

Universidad Nacional de Colombia, Colombia

Mario Rueda Beltrán

Instituto de Investigaciones sobre la Universidad y la Educación, UNAM, México

José Luis San Fabián Maroto

Universidad de Oviedo, España

Jurjo Torres Santomé,

Universidad de la Coruña, España

Yengny Marisol Silva Laya

Universidad Iberoamericana, México

Ernesto Treviño Ronzón

Universidad Veracruzana, México

Ernesto Treviño Villarreal

Universidad Diego Portales Santiago, Chile

Antoni Verger Planells

Universidad Autónoma de Barcelona, España

Catalina Wainerman

Universidad de San Andrés, Argentina

Juan Carlos Yáñez Velazco

Universidad de Colima, México

arquivos analíticos de políticas educativas
conselho editorial

Editor Consultor: **Gustavo E. Fischman** (Arizona State University)

Editoras Associadas: **Kaizo Iwakami Beltrao**, (Brazilian School of Public and Private Management - EBAPE/FGV, Brazil), **Geovana Mendonça Lunardi Mendes** (Universidade do Estado de Santa Catarina), **Gilberto José Miranda**, (Universidade Federal de Uberlândia, Brazil), **Marcia Pletsch, Sandra Regina Sales** (Universidade Federal Rural do Rio de Janeiro)

Almerindo Afonso

Universidade do Minho
Portugal

Alexandre Fernandez Vaz

Universidade Federal de Santa
Catarina, Brasil

José Augusto Pacheco

Universidade do Minho, Portugal

Rosanna Maria Barros Sá

Universidade do Algarve
Portugal

Regina Célia Linhares Hostins

Universidade do Vale do Itajaí,
Brasil

Jane Paiva

Universidade do Estado do Rio de
Janeiro, Brasil

Maria Helena Bonilla

Universidade Federal da Bahia
Brasil

Alfredo Macedo Gomes

Universidade Federal de Pernambuco
Brasil

Paulo Alberto Santos Vieira

Universidade do Estado de Mato
Grosso, Brasil

Rosa Maria Bueno Fischer

Universidade Federal do Rio Grande
do Sul, Brasil

Jefferson Mainardes

Universidade Estadual de Ponta
Grossa, Brasil

Fabiany de Cássia Tavares Silva

Universidade Federal do Mato
Grosso do Sul, Brasil

Alice Casimiro Lopes

Universidade do Estado do Rio de
Janeiro, Brasil

Jader Janer Moreira Lopes

Universidade Federal Fluminense e
Universidade Federal de Juiz de Fora,
Brasil

António Teodoro

Universidade Lusófona
Portugal

Suzana Feldens Schwertner

Centro Universitário Univates
Brasil

Debora Nunes

Universidade Federal do Rio Grande
do Norte, Brasil

Lílian do Valle

Universidade do Estado do Rio de
Janeiro, Brasil

Flávia Miller Naethe Motta

Universidade Federal Rural do Rio de
Janeiro, Brasil

Alda Junqueira Marin

Pontifícia Universidade Católica de
São Paulo, Brasil

Alfredo Veiga-Neto

Universidade Federal do Rio Grande
do Sul, Brasil

Dalila Andrade Oliveira

Universidade Federal de Minas
Gerais, Brasil