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Dual Language Immersion Programs in the Era of School Choice: A Case Study of Greater Los Angeles

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Dual Language Immersion Programs in the Era of School Choice: A Case Study of Greater Los Angeles

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Doctor of Philosophy in Education

by

Clémence Darriet

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ABSTRACT OF THE DISSERTATION

Dual Language Immersion Programs in the Era of School Choice: A Case Study of Greater Los Angeles

by

Clémence Darriet

Doctor of Philosophy in Education

University of California, Los Angeles, 2024

Professor Lucrecia Santibañez, Chair

Dual language programs provide content instruction in two languages by leveraging the linguistic assets of English speakers and English learners. By elevating the status of the home language, students develop higher levels of bilingualism, reclassify at higher rates, and have improved self-concept. In this way, dual language has been seen as a tool to provide access to high quality education to language minority students. These programs have grown rapidly in the last two decades, yet there is concern that they are concentrated in predominantly white, English-only, middle-class neighborhoods, and/or in those undergoing significant demographic changes, with little or decreasing access for linguistic minority students. This is attributed to school choice which may push school and district decision-makers to use dual language to attract student populations they feel might increase enrollment, leading to exclusionary behaviors of linguistic minorities. However, most studies on this topic are limited to single school or district cases, and few have explored the notion of school choice and program expansion using longitudinal administrative data from multiple districts.

In this mixed-methods study, I examine the growth of dual language schools in the context of school competition across 80 public school districts in Los Angeles County between 2000 and 2022. To do this, I use publicly available school and neighborhood-level data in combination with in-depth interviews with principals and district leaders (local policy makers). I examine how school and neighborhood characteristic trend data across time and explore which of these factors are correlated, if at all, with schools founding programs. Using the notion of market-based competition and social constructions of target populations, I then explore how competition impacts principals and other leaders' decision to open dual language programs, how target populations are defined and what this can tell us about linguistic minority population access to these programs. Finally, I explore the use of dual language as a competitive strategy and explore program founding on subsequent Kindergarten enrollment.

The dissertation of Clémence Darriet is approved.

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To Jon

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Dual Language Immersion Programs in the Era of School Choice: A Case Study of Greater Los Angeles

Introduction

Two-way dual language (henceforth TWDL) is a type of language program that offers content language instruction in two languages. In the long history of multilingual instruction, TWDL programs are particular in that they specifically aim to provide content instruction to multiple linguistic-background groups of students simultaneously, including English Learner classified and English-speaking populations. First founded in the 1960s in Miami Dade, they have become popular since the 1990s, with recent estimates figuring the number of programs at 4,300 across the entire country (Do, 2023). Prior scholarship has found that being enrolled in TWDL leads to improved outcomes for students (Steele et al., 2017), improved rates of bilingualism (Babino, 2017), and socio-emotional outcomes and feelings of cultural pride (García-Mateus & Palmer, 2017). Additionally, the history of bilingual education as a social justice project aimed to redress exclusion of language minority students in public schools is well documented (M. T. García & Castro, 2011). For language minority students often marginalized in educational contexts, access to high quality educational programmatic options is vital, and TWDL presents an important opportunity for this. While the goal of combining children from diverse backgrounds may be important in fomenting cross-cultural connections (a tenet of TWDL), scholarship has critically examined the power dynamics stemming from this (Valdés, 1997, 2018). From a sociological, racio-linguistic lens, scholarship has examined the implications of programs of choice that cater to multiple groups of students, and the implications this presents for serving language minority students (Bernstein et al., 2020; Chávez-Moreno, 2021).

Within this examination of the implications for access, an avenue of research regards the role that TWDL plays in the context of school choice, specifically the choice provided to parents in selecting a

public school (magnet, specialized program, charter, etc.) within or outside of their assigned school and district. In addition to being a language program, TWDL is a program of choice. Generally, these programs are housed in a neighborhood public school. In some districts, like New York City public or Los Angeles Unified, a formalized and/or centralized process for choosing schools exists where parents enter their preferred public school (either magnet, charter, or neighborhood). Several studies have examined the role that school choice – in conjunction with enrollment decline that it may engender – plays in leading to TWDL program founding (Bernstein et al., 2021). A connection has been found in seeing TWDL as a strategy to boost enrollment (Darriet & Santibanez, 2024), increase a school's standing in the localized marketplace and address academic disparities between language minority and English-speaking students. These strategies indicate the role that leadership plays in enacting language policy at the local level. In addition, they point to an important area of research which is to consider potential sources of variation within the set options of responses available to leadership, considering leaders' backgrounds, their beliefs, as well as school populations, neighborhood contexts and district policy.

This dissertation examines the growth of TWDL programs across 22 years (2000 to 2022) in three parts. It descriptively examines the growth of TWDL programs alongside school and neighborhood factors including enrollment, competition and neighborhood economic characteristics. It then explores the role that school choice plays in program founding by examining how measures of competition (defined by the number of nearby schools and the share of enrollment a school has relative to its neighbors) have changed over time and the extent to which they contribute to TWDL program founding, controlling for school and neighborhood factors. It then explores the roles that school and

district leadership play in program founding, and examines the connection between program founding and program framing, focusing on how students and their parents are defined. It examines differences in enrollment between program and host school given that most TWDL programs are strands within a larger school setting. Finally, it explores the relationship between program founding and measures of enrollment and competition, examining the difference in enrollment and competition associated with a school becoming TWDL.

Study 1: Examining the Link Between School Competition and Dual Language Program Emergence Between 2000 and 2022 in Greater Los Angeles

Abstract

This study examines the relationship between school competition and the emergence of two-way dual language (TWDL) programs in Los Angeles County elementary schools from 2000 to 2022. Using a longitudinal dataset of school and neighborhood characteristics, the research explores how competitive pressures from school choice policies may influence TWDL program adoption considering the unique history of desegregation, school choice and bilingual education. I use fixed effects logistic regression to estimate the relationship between key school and neighborhood variables and program founding. I find that measures of competition and enrollment decline are associated with program founding, though differences emerge between LAUSD and all other districts in the county. In LAUSD, I find that TWDL and charter program growth are associated with higher likelihood of program founding, while in other districts the reverse is true. All districts experience a negative association between enrollment and program founding, suggesting that enrollment decline may play a role in schools' decision to establish a TWDL program. The study contributes to literature on school choice and bilingual education by quantitatively examining TWDL expansion in relation to competition over time.

"As I saw [another nearby dual language program] be so much favored, we decided in our school [to open one]. Part of it was due to loss of enrollment, because a lot of times I would have to sign permits for […] students to go to that school. We decided, well let's open one here."

(Rosa Navarro, Elementary dual language Principal)

The above quote from Rosa (a pseudonym), principal of a neighborhood elementary school in Los Angeles, provides insight into the motivation behind a school's decision to open a two-way dual language (henceforth TWDL) program. TWDL programs are specialized language programs with roots in civil rights era and immersion language programs, designed to provide equitable access to education for language minority students, including English Learner classified students. Rosa's quote, however, reveals another important phenomenon in the founding of her program. As she explains, school choice generated competition for enrollment as students in her school opted to attend a nearby neighborhood school. In addition, a changing neighborhood context left her school with fewer school-aged children. She thus decided to open her TWDL program as a strategy to boost declining enrollment and retain these students. Rosa's experience does not seem isolated, as recent scholarship suggests that in an era of school choice, TWDL may be used as a strategy for schools competing against one another. There are concerns that goals of equity in dual language may be compromised when schools reframe their students as customers and TWDL programs as a niche product. For example, schools may seek to focus their recruitment efforts to attract predominantly middle-class, white students (Bernstein et al., 2021; Chaparro, 2021) creating a two-tiered system within a school,

consistent with the idea that choice leads schools to attract students they feel are likely to succeed and less likely to need additional supports (Lacireno-Paquet et al., 2002). Programs opened under such conditions may hesitate to push transformative agendas in order to keep parents enrolled (Bernstein, 2021), their presence may lead to increased racial and ethnic stratification throughout the district (Bernstein, 2021), they make decisions without the input from minority parents (C. G. Cervantes-Soon, 2014), and they may market two-way as a niche product to attract middle class parents to predominantly working-class schools (Chaparro, 2021; Dorner et al., 2021; Kim, 2022). To date, however, most studies on this topic have focused on case-study, qualitative analyses and little is known about the relationship between choice and dual language program founding across districts.

This paper builds upon prior research in the field of bilingual education by examining the growth of dual language programs quantitatively and longitudinally across all elementary schools in Los Angeles County. It explores where programs are founded and the characteristics of their host schools and neighborhoods. It further adds to the literature on school choice by considering traditional public schools and their responses to increased competition. It quantitatively explores whether school competition (induced by choice) is related to TWDL emergence using a novel dataset combining enrollment, neighborhood and TWDL founding years for all public elementary schools across Los Angeles County between 2001 and 2022. Key measures of competition include the number of nearby schools and each school's share of enrollment.

Research Questions

The following questions guide this study:

RQ 1: What are school- and neighborhood- characteristics of schools adopting TWDL prior to program adoption? How do these characteristics change over time?

RQ 2: What is the relationship between competition and TWDL program adoption? What is the moderating effect of school and neighborhood composition?

Background

What is school choice?

Modern day school choice is comprised of various mechanisms – magnets, charters, and open enrollment among others – representing a shift toward seeing choice in schooling as a means to alleviate segregation (though choice has also historically been used to maintain segregated schools), redress failing schools and/or respond to parent dissatisfaction with their assigned school. The first type of choice, magnet schools, were first developed in the late 1960s as specialized public schools designed to create voluntary desegregation (J. Wang & Herman, 2017). The 1972 Emergency School Aid Act provided funds to open magnets, and subsequent desegregation orders led to the expansion of magnet schools across the country given the pushback against forced busing. Since the 1990s and the supreme court ruling of Parents v Seattle in 2007, many magnet schools have abandoned their racial quotas and focus solely on academic entry requirements. Charter and open enrollment represent two other mechanisms of choice (vouchers are yet another but not considered in this study as they do not exist in California). Charter schools are autonomous, publicly funded schools of choice, while open enrollment is a mechanism that allows any student to transfer to another public school within or outside their home school or district. The first official school choice laws passed in Minnesota in 1987

(allowing open enrollment (Rubenstein & others, 1992)) and 1991 (allowing charter schools (Urahn & Stewart, 1994)). Other states, including California, followed suit soon thereafter with their own laws establishing and regulating public school choice. Federal legislation, in the form of the Improving America's Schools Act (IASA) passed in 2000, contained provisions for students to attend a school outside of their zoned school and funds to open charter schools. The re-authorization of the Elementary and Secondary Education Act (ESEA) through No Child Left Behind in 2001 further promoted school choice by tying federal funding to accountability measures, thereby infusing school improvement with choice. These latter forms of choice sought to stimulate the education market through deregulation (Chubb & Moe, 1988; Friedman, 1955, 1997), provide more targeted curriculum to at-risk student populations, and generally improve the level of education for all students through competition with the philosophy of a "tide that lifts all boats" (Hoxby, 2003). As a result of increased access to school choice, the percentage of students attending their assigned public school has generally decreased since 2012, from 89% in 2012 (95% CI [88.17,89.79]) to 84.2% in 2016 (95% CI [83.18,85.23]) and to 86.8% in 2019 (95% CI [86.05,87.45]) (U.S. Department of Education, 2018). Furthermore, the share of students who attended a charter school increased from 6.1% in 2012 (95% CI [5.51,6.71]), to 7.9% in 2016 (95% CI [7.04,8.77]) and 9.5% in 2019 (95% CI [8.71,10.28]). Finally, the share of students attending a magnet school in 2019, the only year for which data parses between magnet and regular public school, was 6.2% (95% CI [5.62,6.69]).

How do public schools respond to school choice?

Since funding is tied to enrollment, schools are motivated to attract and retain students who might otherwise elect to leave to stay financially solvent. Some scholars have found that traditional

public school and district response to competition is generally focused on marketing (Lubienski, 2005), resulting in few meaningful organizational changes (Davis, 2013). Other scholars, however, have identified important changes to the organizational structure of districts known as the Portfolio Management Model, whereby central offices in public districts have shifted to operating as managers of a diverse set of relatively autonomous schooling options, including charter, magnet, and open enrollment (Bulkley & Henig, 2015). These have been documented in large urban districts (serving more than 10,000 students) such as Baltimore, Chicago, Detroit, New Orleans, Los Angeles Unified, New York City, and Philadelphia. For example, one study in Baltimore found that the district responded to enrollment decline by increasing school-choice options like magnet schools and by merging under-enrolled schools (Burdick-Will et al., 2020). This led to considerable intra-district movement of students, with nearly half of all elementary students (48%) attending a school outside of their attendance zone (Nerenberg, 2022). Another district in Texas experienced increased charter expansion and responded by implementing a district-wide dual language program, other specialized offerings like STEM/STEAM and by expanding intra-district choice (Duarte, 2022). Los Angeles Unified, one of the districts in this study, has developed several choice options consistent with the portfolio model, including open enrollment, charter and magnet schools, specialized programs housed in traditional neighborhood schools, zones of choice (an initiative that created high school markets in some neighborhoods but not others (Campos & Kearns, 2021)), expansion of 'public school choice' and pilot schools (Perez & Madera, 2015) and school turnaround (Strunk et al., 2016).

In other cases, response to choice seems less driven by a Portfolio Management Model and more by individual school leaders' decision making. Response to choice may be impacted by where

schools 'see' themselves relative to their competitors (Jabbar, 2015). Schools with higher status experience more demand and may be less inclined while schools designated as failing or underperforming may be less able to respond to competition (Holme et al., 2013). Within those schools that do respond to competition, they may see and push for creating 'niche' programs that set their school apart from surrounding competitors. These include expanding Gifted and Talented options, increasing the number of Advanced Placement (AP) courses, or developing a theme or focus on arts, STEM, or language immersion. In addition to changing market, curricular or organizational elements, choice may lead schools to engage in 'skimming' or attracting students they feel will be the most likely to succeed (Howe et al., 2001) through application processes and subtle forms of deterrence or encouragement, even if this means circumventing district policy (Jennings, 2010). In one study in El Paso, Texas, for example, researchers found that open enrollment led to increased competition and organizational change that varied by school. Lower performing schools responded by opening specialized programs and focusing on marketing while higher performing schools used screeners to selectively choose incoming students (Kotok et al., 2017).

What is the connection between school choice and two-way dual language programs?

Bilingual education scholars have found a link between school choice and TWDL program emergence. TWDL programs operate in an interesting space as they are both language programs geared toward English Learner classified students – required by law – and programs of choice. They provide instruction in two languages and are premised on maintaining and developing students' bilingualism while providing content and grade-level instruction. The first modern-day dual language program was founded at the Coral Way School in Miami-Dade in 1963, as an educational experiment to serve

recently arrived Cuban refugees and English-speaking children (Kester et al., 2023). Similar programs would later open in California in Redwood city and in Los Angeles, at the Linwood Howe elementary school in Culver City Unified in 1971 (Cohen, 1974). Decades of research has demonstrated cognitive (Barac et al., 2014; Bialystok, 2011), academic (Steele et al., 2017), linguistic (Umansky & Reardon, 2014), and socioemotional benefits (Bailey, 2022) to participating in these programs for language minority and English speaking students, and their proliferation in the last twenty years is a testament to this. Indeed, Do (2023) documented some 4,300 programs in 2020. TWDL programs are premised on providing bilingual content instruction to English speakers and partner language speakers. Oftentimes, the student population of these programs is highly diverse in terms of racial, immigration, socio-economic and linguistic backgrounds.

In the era of school choice, these programs have been found to arise as a way to compete for prospective students, since they are often housed as a "strand" within a neighborhood public school and can pull students from anywhere in and out of a district. In some cases, TWDL program emergence has been tied to gentrification. Indeed, neighborhoods that see an increase in school choice options are more likely to undergo gentrification (Pearman & Swain, 2017). Incoming parents of comparatively higher wealth may choose to opt out of their neighborhood school in search of higher performing options (Schock et al., 2022). In one Philadelphia neighborhood, Chaparro (2021) found that the local elementary school opened its dual language program specifically for gentrifying parents who "would only consider [the school] if they got a spot in the bilingual immersion program" (p.450, 2021). The school also saw the program as a "competitive edge" (p 444, Chaparro, 2021). Do (2023) examined the relationship between neighborhood gentrification and DL emergence across the country.

She found that DL programs were positively related to gentrification, and that this was especially so where communities had lower levels of partner language speakers. In a tri-state study of California, Arizona and Texas, Bernstein et al. (2021) found that school and district leaders cited that "several DLBE programs were created as a direct response to competition from school choice" (p 397). Not all two-way program emergence has been tied to gentrification, however. In a Texas case study, Duarte (2022) found that the school in question had suffered enrollment loss since choice had been introduced in the district, leading to the expansion and marketization of the dual language program as a strategy to bring students back. In another New York City case study, the school in question – formerly underenrolled and underperforming - "opened [the dual language program] as a way to attract a new population of students to the school and increase enrollment, using Japanese DLBE as a means toward that end." Similarly, Dorner et al.'s (2021) multi-state study found that one of the sites in which they conducted interviews had been in part designed as a magnet to bring students in from across the city. Finally, a Colorado-based case study by Pearson et al. (2015) found that a dual language program "saved" a neighborhood school from closure after school choice had led parents to opt for other schools in the district.

What is the implication of dual language programs operating as a school choice response?

Critical literature has found that the landscape of choice, especially when considering language service programs like two-way immersion, may lead to the very inequities school choice seeks to dismantle. One of the outcomes is racial and socioeconomic stratification. Generally, critics have found that school choice leads to increased segregation (Hailey, 2021; Roda & Stuart Wells, 2013; Sohoni & Saporito, 2009) with white parents specifically tending to self-segregate when given the choice (Bifulco

& Ladd, 2007; Saporito, 2003). In one longitudinal student-level analysis of Pennsylvania schools, Kotok et al., (2015) found that school choice resulted in higher levels of segregation. In this, principals and schools are not passive recipients in a choice system. Jennings (2010) conducted qualitative interviews and found that two of the three school principals studied circumvented district rules prohibiting academic screening to attract students. Principals took advantage of loopholes in admission guidelines to "counsel out" low-performing students. Related to dual language, critical scholars have found that stratification within dual language programs may also occur. Berstein et al. (2021) found that "schools in the district were increasingly gentrifying --white and Asian parents with a higher SES had begun to see [the dual language program] as the flagship and were flocking there"(p 401) leading to stratification. Discursively, Cervantes-Soon (2020) found the notion of choice tied to TWDL in a document analysis of programs in Georgia and North Carolina. She identified a narrative targeting white, middle-class values for TWDL to be present in the documents she analyzed. Similar narratives marketing dual language toward English speaking audiences resulted in material consequences, with dual language programs placed in schools with fewer students of color and fewer English learners was found in Utah (Valdez et al., 2016). Chavez-Moreno (2021) and Palmer (2010) both found that Black/African American and Latinx students were discursively and physically excluded/under-enrolled from the dual language programs under study. Finally, two studies examining parental choice in New York City Public schools found that white and gentrifying parents exercised choice and selected dual language programs, which they framed as a morally superior and multicultural version of more segregated gifted and talented programs (Kim, 2022; Roda et al., 2024). In the Roda et al. case, dual language programs underenrolled Latinx and low-income students despite district policy aiming for a

50/50 split of the population and there being sufficient students in the school and surrounding neighborhood from those groups to meet these population requirements.

Taken together, these studies underscore the need to examine the role that choice and competition play in neighborhood schools' programmatic decision, and the demographic and socioeconomic characteristics of dual language programs across time. To date, only a few studies have quantitatively examined the expansion of dual language programs in Utah (Valdez, 2016), Chicago (Domínguez-Fret & Oberto, 2022) and across the U.S. (Do, 2023). However, none have examined this expansion within the context of school choice and few still have done so longitudinally. Examining trends over time in school enrollments, neighborhood factors

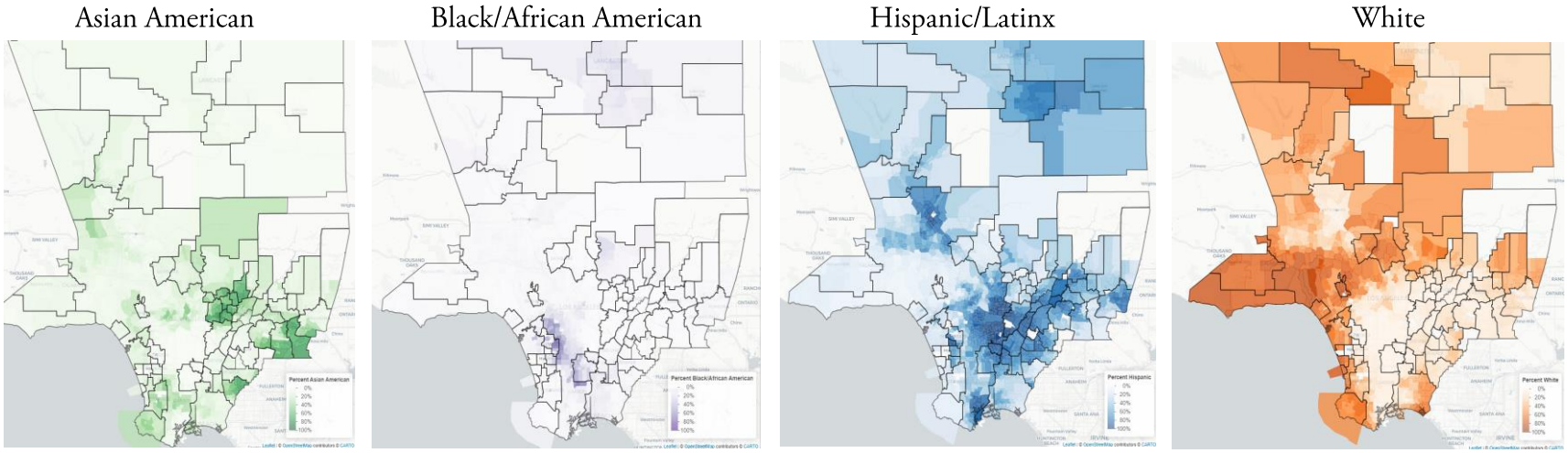
The Context: Why Los Angeles County?

Los Angeles county is a large, geographically, and demographically diverse county spanning nearly 5,000 square miles, comprised of 88 cities and numerous unincorporated areas, and with a population of around 10 million people. The county includes rural, suburban, and highly urbanized areas. There are 80 districts that offer elementary schools. The largest school district is Los Angeles Unified, which is comprised of some 570 elementary schools, and the smallest is Gorman Joint comprised of only one elementary school. This wide variety makes it ideal to explore choice and dual language offerings in a variety of settings. As of 2022, 46 of the 80 public school districts offered at least one dual language program. The county is roughly 48 percent Hispanic or Latinx (of any race), 25 percent non-Hispanic white, 15 percent Asian American and nearly 8 percent Black/African American. There is considerable variation across and within districts due to policies of housing segregation and patterns of migration. Figure 1 shows the composition by race and ethnicity at the

elementary attendance zone level in 2020, highlighting the geographic concentration and dispersion of racial/ethnic groups across the county.

Historically, Los Angeles County presents an important case in both school choice and bilingual education, as the location of a number of important events and court cases which shape the current landscape of education. The history of segregation, challenges to segregation via schooling, development of bilingual education all play major roles in shaping the current landscape of schooling today.

Figure 1 - *Share of Residents by Race/Ethnicity Across Los Angeles County Districts, 2020*



Note. Neighborhoods are defined by school attendance zones for the year 2015. Census data obtained at the block level and assigned to attendance zones. Black outlines are district borders. Share represents the share of the population.

A brief history

Los Angeles County schooling patterns are reflective of the long history of immigration and housing segregation that shaped city and neighborhood borders. In the early 20th century, white residents set up racial covenants and actively and violently persecuted minoritized groups from buying and/or living in homes across the city. These covenants excluded Black/African Americans from living in certain parts (predominantly the west side) but also Jewish, Mexican Americans, and Asian Americans (Mandel, 2022; Rothstein, 2017). Other forms of oppression like the establishment of sundown towns in Glendale, Burbank, South Pasadena, neighboring Los Angeles shaped the demographic character of these outlying cities that remain to this day (Rago, 2023).

These events and policies spilled into public schools, where attendance zones and school placement mirrored patterns of segregation. They did not come without contestation, however. Throughout the 20th century, nearby communities argued for integration in Alvarez v. Lemon Grove in San Diego County (1931) and Mendez v. Westminster in Orange County (1946). Both argued on behalf of Mexican Americans who had been segregated out of their local school. The Westminster case is notable as it is considered the precursor to Brown v Board for both its content and the fact that the governor of California at the time – Earl Warren – would go on to preside over the supreme court during the Brown v. Board decision. In Jackson v Pasadena (1963) lawyers argued that the Pasadena school district gerrymandered a school zone to preserve its segregated nature (Lozano, 2007). Immediately following the Jackson ruling, which argued in favor of the plaintiffs that school districts were accountable for desegregation, lawyers sued the Los Angeles Unified district (LAUSD) on behalf of an African American student wishing to integrate a predominantly white school located closer to

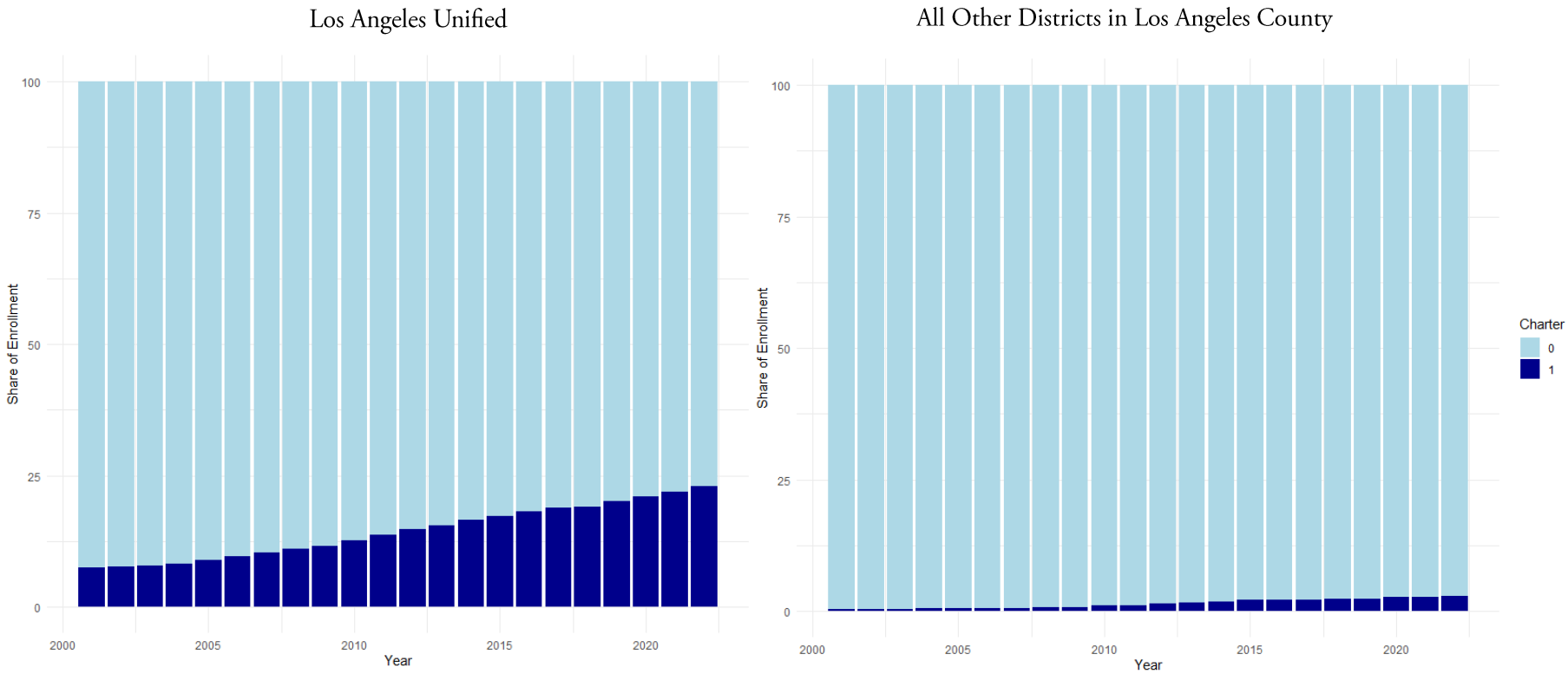
his home. The case, known as Crawford v. Los Angeles Unified would last some 19 years as it made its way to the supreme court (Santos, 2016). It also resulted in the passage of Proposition 1, which changed the California constitution and ended forced busing. As with Pasadena, LAUSD was found accountable to remedy school segregation, and though the district initially proposed a set of voluntary mechanisms including permits with transportation and expansion of magnet schools. Federal legislation like the 1972 Emergency Education Aid Act provided funds that expanded magnet schools as a mechanism to encourage voluntary desegregation. However, the district was ultimately ordered to devise a plan for mandatory desegregation, which lasted from 1978 to 1981. Social upheaval like the Watts Riots of 1965 and the LA Blowouts of 1968 had brought to light severe inequalities along housing, policing, and educational lines that existed in Los Angeles (Board of Education of the City of Los Angeles, 1968; M. T. García & Castro, 2011; Santos, 2016). In light of these events as well as the district's desegregation efforts, white parents removed their children from the district, opting to move out of the city or send their children to private schools. Between 1966 and 1970, for example, LAUSD lost 80,000 white students (J. Schneider, 2008). Once a majority white district, by 1980 LAUSD was majority Hispanic/Latino and Black/African American. Interestingly, the Crawford case brought to light the complexity that Mexican American (Chicano) residents advocated for increased equity in schooling but generally opposed forced busing because it did not sufficiently address children's access to bilingual programs. Bilingual education programs had been developed in the 1970s following the passage of the federal Bilingual Education Act (1968), the Lau Remedies (1974), and the state-level Chacon-Moscone Bill (1976) which brought funds to develop bilingual and bicultural programs in predominantly Chicano areas of the city (Gandara et al., 2000; Los Angeles Unified

School District, 1973). LAUSD's desegregation plans had not sufficiently elaborated how these programs would be preserved. In sum, Los Angeles Unified is unique in its long history of desegregation, choice, and bilingual education.

Charters and Traditional School Expansion

Since the state first implemented charter schools in 1992, charter schools have greatly expanded throughout Los Angeles County, but specifically in LAUSD. Charter growth was fueled by the passage of Proposition 39 in 2000 which mandated districts to allow charters use of any unoccupied space they had, and Proposition 51 in 2016 which allocated 500 million dollars toward school facilities. As mentioned previously, LAUSD experienced dramatic increases in the number of charter schools, and the share of student enrollment in charters now figures at around 20% of total elementary enrollment while all other school districts have experienced a moderate growth in the share of charter school enrollment (See Figure 2). This contrasts with elementary charter enrollment across all other districts in Los Angeles County, which increased from .5% in 2001 to nearly 3% in 2022. By comparison, the statewide elementary charter enrollment figured at around 11% in the 2022 school year (California Department of Education, 2023). This is in comparison to elementary charter enrollment nationwide, which was at 7% in 2021 (National Center for Education Statistics, 2023).

Figure 1 - *Share of Total Elementary Enrollment by Charter vs. Non-Charter, LAUSD vs All Other Districts, 2000 - 2022*



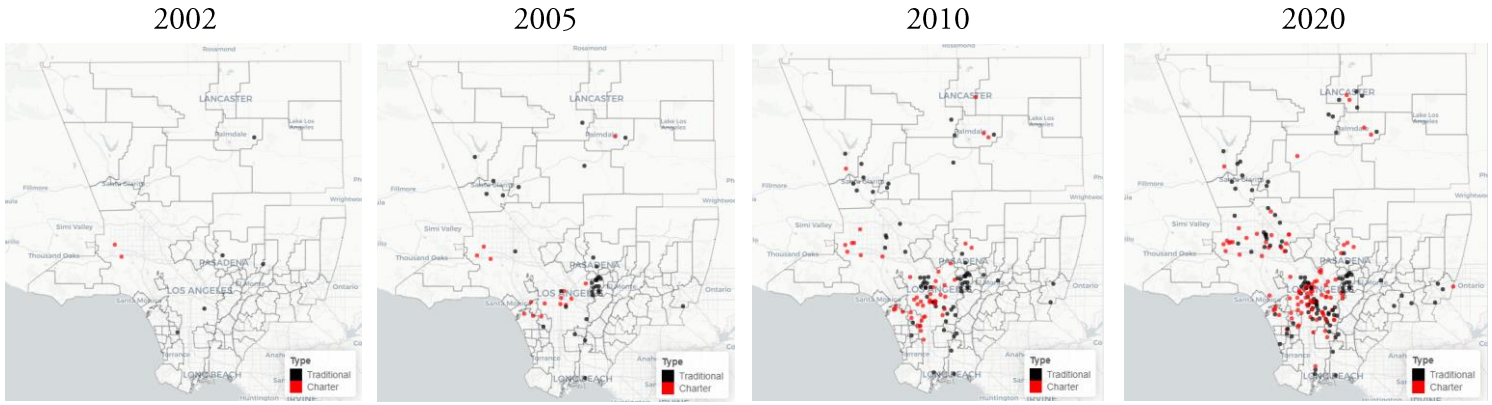
Note. Elementary enrollment for all public (charter and non-charter) schools in Los Angeles Unified or all traditional public-school districts in Los Angeles County.

On average, the county has experienced an average yearly population decline of one to three percent, depending on the year. Elementary enrollment in any type of charter (district or independently administered) across all schools and districts in Los Angeles County increased from 35 thousand students in 2001 to 92 thousand in 2022, a threefold increase. By comparison, traditional public-school elementary enrollment decreased from 818 thousand in 2001 to 436 thousand in 2022. Thus, enrollment decline has occurred both as result of an increase in charter enrollment but also general decrease in elementary-aged children.

In addition to the expansion of charter options, districts have also experienced changes in their number of traditional public schools. For example, between 2000 and 2022, 14.9% of districts gained at least one traditional public school, 50% stayed constant, and 35% lost at least one school. Notably, LAUSD added 54 traditional, public elementary schools in this time frame, following the small-schools movement, and the need to alleviate severe overcrowding in district schools in the 1990s and early 2000s (See Figure 3).

Furthermore, state policy has provided a framework for allowing parents to select a school of their choice that goes beyond the expansion of charter schools. For example, California law stipulates that districts must provide open enrollment options for students to transfer to any school within the district (California Education Code. ARTICLE 4. Powers and Duties, n.d.). The Allen Bill further mandates that the child of a parent working in a school district but living in another may request transfer into the district (California Education Code 48204. ARTICLE 1. Persons Included, n.d.).

Figure 2 - *Growth of Traditional and Charter Public Schools, by District and Year*



Note. Traditional schools (in black) are non-charter schools that are founded after 2001. Charter schools (in red) are either directly or locally funded. Dark grey outlines represent district borders.

Districts have tools to maintain balances, caps, and priorities according to capacity and other considerations (See Figure A1 for example district page). Importantly, specialized programs like TWDL may set up their own enrollment priorities that may consider academics, such as a language proficiency exam (See Figure A2 for a breakdown of enrollment priorities in TWDL programs across the county). Thus, despite the important differences experienced by Los Angeles Unified in school choice (with the rise of charter schools), all districts in the county experience school choice to some extent through the combination of open enrollment/transfers, specialized programs, magnet schools, and charter schools.

Two-way dual language (TWDL)

TWDL programs, combining English and partner language speakers, were first founded in Miami-Dade in 1964 to serve recently arrived Cuban immigrants. In Los Angeles, one of the first TWDL programs was founded in Culver City, serving English speaking Anglo-American and Mexican American students under the supervision of then UCLA professor Dr. Russell Campbell who had been inspired by the St. Lambert French-English immersion school in Canada (Cohen, 1974). Years before the Culver City program, however, efforts to develop and maintain bilingual programs were led by social activists, predominantly Mexican-origin Americans who advocated for culturally responsive education, of which bilingual education was a part. Bilingual-type programs were documented as far as the 1950s, for example with book exchange programs along the border with Mexico (Petrzela, 2010). The 1968 LA Blowouts saw high school students in Los Angeles Unified walk out of school to advocate for greater cultural sensitivity, increased numbers of bilingual teachers and programs in light of high dropout rates of predominantly Chicano-serving schools (M. T. García & Castro, 2011).

Congressional hearings held before the passage of the landmark Bilingual Education Act of 1968 were held in Los Angeles among other cities. The Bilingual Education Act was a part of the Johnson administration's War on Poverty and as a result early iterations of the Act targeted low-income, Spanish speaking majority schools. Though these requirements were later dropped, it had the effect of tying bilingual education to remediation, and importantly of tying bilingual education to English-Learners as opposed to all bilingual students, only some of which are designated English Learners. Federal and state monies flowed to Los Angeles in the 1970's and bilingual programs opened in predominantly Spanish-background schools. By the 1980s and early 1990s, backlash against bilingual education came in the form of Proposition 227 in California (other states like Arizona and Massachusetts passed their own bills), which passed in 1998 and severely restricted English Learner classified student access to bilingual education. Across the state, bilingual education enrollment dropped from 29% to 12%, post passage. However, as Gandara et al. (2000) and others (E. E. García & Curry-Rodríguez, 2000) found, the level of experience, the extent to which the school's or district's climate permitted it, and prior instructional decisions and beliefs led to great variation in how schools and teachers implemented the provisions of 227. In some instances, schools transformed their programs into TWDL. Thus, California's, and Los Angeles long standing history with bilingual instruction and activism is an important context.

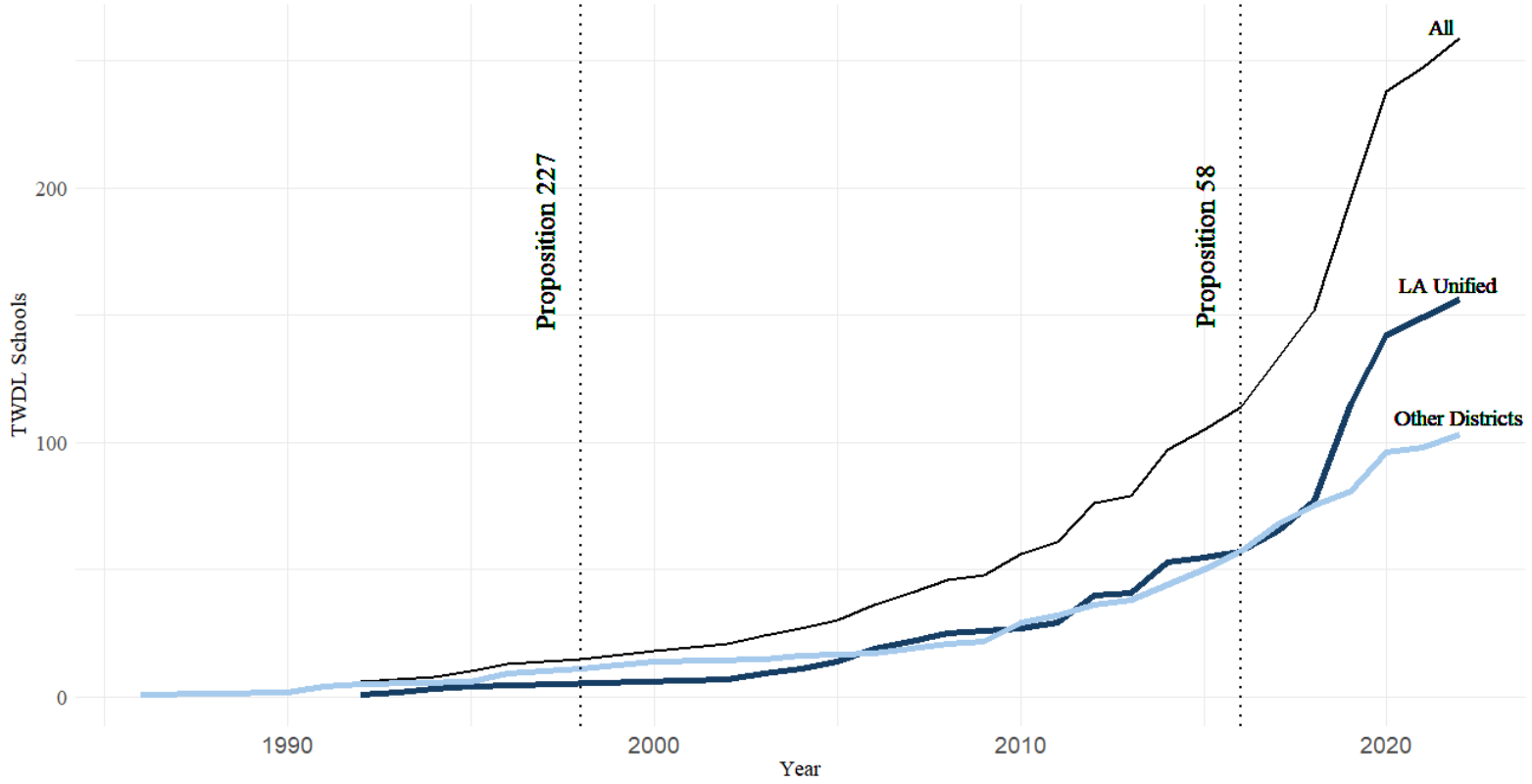
Even though they provide important linguistic services for English-Learner classified students, TWDL programs are also a program of choice, meaning that parents must apply for placement into the program. As a specialized program of choice, acceptance in TWDL typically comes with an intra-district form if a parent is not already zoned to the school in which the program exists. In the case of

a parent residing in a neighboring district, the parent must typically request an inter-district transfer. However, there is considerable variation by district (See Figure A2). Typically, TWDL programs give priority to siblings and to those living in the school's zone, making the placement of programs important in access since transportation is often not provided. Sometimes priority is also given to certain students to achieve a balanced population of English and partner language speakers. Some programs operate fully as programs of choice and do not give priority to in-zone students, though this is rare. When there is more demand than available spots in the program, TWDL programs typically exercise a lottery mechanism or enroll students on a first-come, first-served basis. With few exceptions, TWDL programs are a 'strand' within a school, meaning that they enroll only a fraction of the total school population.

TWDL programs are in 46 of the 80 school districts that offer elementary school enrollment in Los Angeles County. Other language programs include world language immersion (geared toward English speakers) and one-way immersion (geared toward English Learners)[1]. LAUSD comprises more than half of all programs. Figure 4 shows the growth of TWDL programs in the county since 1986. Programs began to grow beginning in the mid-2000's and accelerated following the passage of Proposition 58 in 2016.

[1] World language programs teach content instruction in two languages, but the student population is typically made up of monolingual English speakers with no heritage or background with the language. On the other hand, one-way immersion programs typically serve English learners (and heritage language speakers) and were developed to promote bilingualism and English learning for English Learner classified students. These programs stem from transitional bilingual programs and are also known as maintenance bilingual programs.

Figure 3 - *TWDL Program Growth Between 1986 and 2022, Across All Los Angeles County Districts*



Note. The first vertical line represents the passage of Proposition 227 which mandated English instruction for English Learner classified students and was widely understood to limit the number of bilingual instruction programs, and the second vertical line represents the passage of Proposition 58, which reversed those restrictions.

Table 1 shows the breakdown by program language, strand and school type. Most programs are Spanish language (about 80% of all programs) and are a strand within their school. Finally, nearly 90% of all elementary TWDL schools in Los Angeles County are housed in traditional neighborhood schools, while seven percent (n = 19) are magnet schools, and four percent (n = 11) are charter schools.

Data

School Level Data

Elementary public-school data is obtained from the California Department of Education (CDE) for all 80 public school districts in Los Angeles County. I define "elementary" as a school that offers at least three grade levels between kindergarten and 6th grade. All schools in the sample offer at least the third grade. I exclude schools that offer two or fewer elementary grade levels (e.g., 4-5 or K-1), non-traditional public schools (e.g., community day schools, alternative schools, opportunity schools) and schools that teach partially or fully virtually. I include both directly and locally funded charter schools. I focus on elementary schools since they comprise most TWDL schools. In addition, their catchment area is smaller than middle or high schools making it easier to draw connections between neighborhoods and schools. Data include school longitude and latitude, enrollment by race and ethnicity, percentage of students eligible to receive free and reduced priced meals, percentage of English Learner (EL) and other language statuses such as Fluent English Proficient (FEP), and Reclassified Fluent English Proficient (RFEP).

Table 1 - *Elementary Program Details, all Years and Districts in Los Angeles County*

Language			Strand			Type of School		
	n	%		n	%		n	%
Arabic	1	0.4%	No	19	7.3%	Traditional	230	88.5%
Armenian	5	1.9%	Yes	205	78.8%	Charter	11	4.2%
French	3	1.2%	Missing	36	13.8%	Magnet	19	7.3%
German	1	0.4%						
Hebrew	1	0.4%						
Japanese	3	1.2%						
Korean	11	4.2%						
Mandarin	20	7.7%						
Multiple	4	1.5%						
Spanish	211	81.2%						
Total	260	100%	**Total**	260	100%	**Total**	260	100%

I identify all public TWDL schools and the founding years of their TWDL program using a combination of a publicly available database of multilingual programs from 2018/2019 available from the California Department of Education and manual canvassing of schools and districts. Founding years were obtained from a combination of publicly available lists from districts, school webpages, news archives, and direct communication with school principals when the date could not be obtained from publicly available sources. I also identify any other type of bilingual program offering, including one-way immersion and developmental bilingual programming.

Some schools have more than one TWDL program, or a combination of two way and one-way. If there were multiple TWDL programs, the year of founding corresponds to the first program's founding. If, on the other hand, the school has multiple types of programs, then I record the year of founding of the first TWDL program. In all cases, I record the structure, language, and type of other language program and code as binary if a school has another language program. There are a total of four schools that have multiple language programs within one school. California does not provide publicly available data on student enrollment in TWDL (or any other language program for that matter), therefore this data is at the school and grade level. I use TWDL program founding years to create a binary variable that takes the value of 1 the year a school founds a dual language program, and a 0 otherwise. I calculate school-level measures including the percentage enrollment by race, ethnicity, poverty, and English Learner status. I also calculate the year-over percentage change and the cumulative percentage change over time to understand trends.

Neighborhood level data

Prior studies that focus on geospatial population analysis use the census block, tract, and school attendance boundaries as proxies of a neighborhood. Given that this study examines elementary school neighborhoods, and that most elementary students attend their zoned school, I use a school's attendance boundary as a proxy for neighborhood. National survey data suggests that most students still attend their assigned neighborhood school despite the weakening of the school-neighborhood link (National Center for Education Statistics, 2016). Local studies suggest students do not travel far to attend school, including in cities with varied levels of developed public transportation systems, though research from Los Angeles Unified suggests that students do travel out of their zone to attend a specialized program (He & Giuliano, 2018). In some cases, if a neighborhood school converts into a charter or magnet, these schools may enroll students from the former boundary if the school was once a zoned school. In addition, most dual language schools in Los Angeles County are neighborhood schools, therefore I define a neighborhood as a school's attendance zone.

Attendance Zones

I collect attendance boundaries from the School Attendance Boundary Survey (SABS) administered by the National Center for Education Statistics (NCES). School identifiers included in NCES are used to merge school-level data and their attendance zone (See Appendix B). I utilize a combination of 2009/10, 2010/11, 2013/2014 and 2015/2016 elementary school attendance boundaries from the National Center for Education Statistics (NCES) due to data missingness, with most zones coming from the 2015-2016 vintage (see Appendix B). The same attendance boundary is used for all twenty years of data. I filter for elementary attendance zones that contain at least three

elementary grade levels between kindergarten and 6th grade, dropping those zones for schools that include, say, grades K-2nd or 4th-5th. There are a total of 237 schools that do not have elementary zones, typically if they are currently closed, or are charter or other non-zoned schools. In that case, I assign this school to whichever zone it is located in, resulting in some zones having more than one school.

Neighborhood Demographic and Economic Data

To understand the impact that neighborhood characteristics might have on TWDL program emergence, I collect data related to neighborhood demographics – population counts by race and ethnicity and assessed home values. For economic change and a measure of gentrification, I do not create an index of change (as other studies have in the past) but rather calculate variables of change for each individual variable from one decade to the other beginning in 1990 for Census data and 2000 for Zillow data. I calculate the county median percentage change in home values and create a binary for zones that fall below or above this value.

Block-level race/ethnic population counts are from the Decennial Census for years 1990, 2000, 2010 and 2020. The year 1990 is used to establish variables of change in the year 2000. Block-level population counts are interpolated, using areal weighting, into school attendance zones meaning that, for example, 90% of a block's population is assigned to an attendance zone if 90% of the block fits in that attendance zone (Saporito, 2017). Roughly 92% of blocks fit entirely within one attendance zone, and another 6% within two attendance zones (See Appendix B for further details).

I use housing data as a proxy for wealth. For this, I obtain single-family median home assessed values from Zillow's Assessor and Real Estate Database (ZTRAX) for years 2000, 2010 and 2021. ZTRAX is a comprehensive, longitudinal dataset of individual housing units that includes assessed

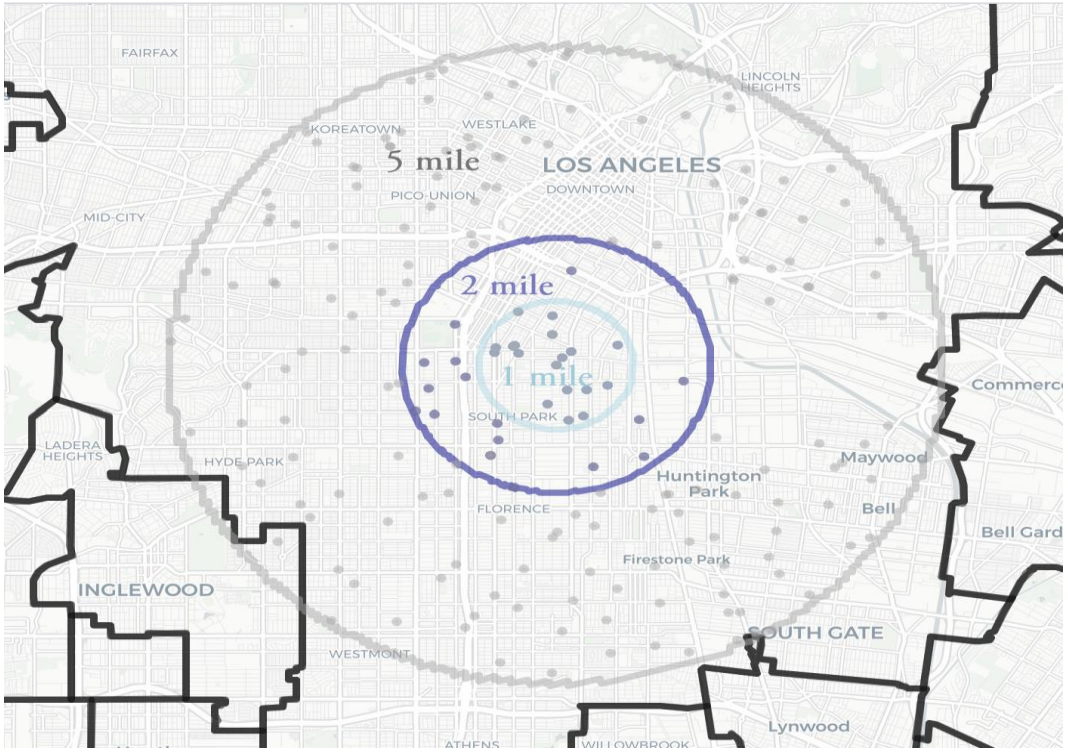
values identified by their parcel number (Imberman & Lovenheim, 2016). California is particular in that Proposition 13 (passed in 1978) sets home valuation increases to no more than 2% a year and 1% of the total value of the home, with valuations changing only when a property changes hands. I use the package *Sparklyr* (Luraschi et al., 2023) to read, filter and clean the data. I filter for single-family residences as they comprise most residences in Los Angeles. I remove extreme values in the .99 and .01 percentiles and calculate inflation adjusted home prices in 2022 dollars. Housing units are located within a school zone if the center of the parcel lies within the zone (see Appendix B for more details). Finally, I calculate the median home value for each school attendance zone and year.

Measures of Competition

To understand the relationship between school competition and program founding, I calculate multiple measures of competition that draw from prior literature and participant interviews (See Appendix C for further details). To do this, I construct 1-, 2- and 5- mile radii around each elementary school in the sample and calculate three measures of competition: 1) the number and type (DL, charter, magnet) of other elementary schools in each radius, 2) the focal school's share of enrollment and 3) the radius' Herfindahl-Hirschman Index (HHI) (See Appendix C). These three measures allow me to examine the multi-faceted role that competition might play for traditional public schools, for example the idea that TWDL schools might compete against one another, or they might compete against charter schools. Thus, a district that has established open enrollment but has few charter schools would see the share of enrollment be more important measure of competition than the total number of nearby schools, as this would mean that traditional public schools are competing against one another rather than against charter schools. I calculate these variables for all schools in all years of the sample and

separate the measures by district and non-district schools. Figure 5 shows the conceptualization of competition using a 1-, 2-, and 5-mile radius around a focal school (in center with three concentric circles). In this case, the 5-mile radius contains schools that are in another district (the lower left part of the circle), and therefore would be counted as neighboring, out-district schools.

Figure 4 - *Elementary Schools in a 1-,2-, and 5- Mile Radius*



Note. All dots represent an elementary that shares at least one grade level with the focal school (in center). Black outlines represent other districts. The bottom left school located in another district would be considered out of district.

Table 2 depicts a fictitious example of School A, B and C. The share is a simple calculation of the share of enrollment that each school has, by taking the sum of all students for each grade that is shared by the focal school and dividing it by the number of schools in the radius. Some important issues with these measures are that the number of schools in a radius and the share of enrollment may not be randomly distributed across schools. For example, schools located in more urban areas are likely to be located near a greater number of schools, and those located in smaller school buildings may by design have a lower share of students. I address this by calculating the percentage change in these variables, with the year 2000/2001 as the baseline, assuming that the share of enrollment would not increase or decrease over time, all things being equal.

Table 2 - *Example Calculation of Share of Enrollment*

	Grades offered	Kinder	1st	2nd	3rd	4th	5th	6th	Avg
School A (Focal school)	Enrollment	10	7	10	24	33	15		
	Share of enrollment	41.6%	17.9%	16.9%	38.7%	37.9%	28.3%	NA	30.2%
School B	Enrollment		9	15	17	17	26	37	
School C	Enrollment	14	23	34	21	37	12		
Total	Total enrollment	24	39	59	62	87	53		
	Total schools	2	3	3	3	3	3		

Note. Share of enrollment is calculated by dividing the focal school's enrollment by the total enrollment of shared grades of schools in the buffer. In the case of kindergarten, for example, only School A and School C share Kinder enrollment. However, all schools in the buffer share 1st grade, and therefore the calculation of the share of Focal School A 1st grade enrollment is based on the total 1st grade enrollment for all three schools, while the share of enrollment for kinder is based on two schools.

Final Sample

The final sample is comprised of 26,620 observations, 1,386 elementary schools, across 22 years of data. Census and Zillow data is observed at three time points (2000, 2010 and 2020). There are a total of 80 school districts, and 46 of these have TWDL schools. LAUSD has 156 programs, while the average number of TWDL programs for other districts is about one. There are important differences across districts, not least in size. LAUSD, the largest district in the county and second largest in the country, has some 550 elementary schools, while the average district has only about nine schools. The second largest district has some 48,000 elementary students and 60 schools, compared to the 250,000 elementary students in 550 schools for LAUSD.

I present descriptives and corresponding p-values for schools that never become TWDL ('never-TWDL') and schools that at some point become TWDL ('TWDL') in Los Angeles Unified and all other districts in Los Angeles County in Table 3. In Los Angeles Unified, TWDL schools tend to not be charter schools, tend to be larger schools (by student population) and tend to experience greater overall enrollment decline. Demographically, TWDL schools enroll a larger share of Hispanic, English Learner and bilingual students (those fluent English and reclassified students). The majority of English Learner classified students in the district speak Spanish. In terms of competition, TWDL schools in LAUSD also experience a greater number of nearby schools, though this is likely because, geographically, most TWDL schools are located near the city center. Because of this, the HHI and enrollment share are all lower for TWDL schools. TWDL schools are in neighborhoods with higher percentages of Hispanic residents, and lower median home values. These characteristics are largely similar across all other districts in LAUSD though with less extreme variation.

By contrast, never-TWDL schools have higher proportions of white students, consistent across all school districts, as well as lower shares of Spanish-speaking English Learner students. This is reflected in neighborhood demographics, where there are greater shares of white residents in never-TWDL schools, as well as higher median assessed values. These schools also hold a greater share of enrollment at all distances, even though they are on average smaller schools (with lower total enrollment). They have fewer other schools nearby, though group differences are not significant for districts other than LAUSD.

Table 3 - *Descriptives of TWDL and Never-TWDL Schools, All Time Points*

	Los Angeles Unified			All Other Districts in Los Angeles County		
	Never-TWDL	TWDL		Never-TWDL	TWDL	
School Variables	M (SD)	M (SD)	p-value	M (SD)	M (SD)	p-value
Charter	0.2 (0.4)	0.0 (0.2)	0.00	0.0 (0.2)	0.0 (0.0)	0.00
Magnet	0.1 (0.3)	0.1 (0.3)	0.00	0.0 (0.1)	0.1 (0.2)	0.00
Enrollment	568.5 (284.1)	706.2 (328.4)	0.00	582.5 (200.5)	594.7 (209.0)	0.01
% Asian American	4.2 (6.7)	3.5 (9.5)	0.00	10.1 (15.8)	11.0 (16.7)	0.02
% Black/African American	10.9 (18.3)	8.8 (14.4)	0.00	8.0 (12.0)	6.2 (10.9)	0.00
% Hispanic	66.1 (29.8)	81.3 (20.8)	0.00	56.9 (29.7)	64.1 (27.2)	0.00
% White	14.6 (21.3)	4.1 (9.1)	0.00	19.2 (22.7)	13.6 (18.4)	0.00
% English Learner	34.5 (21.7)	46.2 (17.9)	0.00	28.7 (19.3)	36.7 (17.2)	0.00
% Fluent English Proficient	19.6 (10.7)	21.6 (8.2)	0.00	13.8 (10.5)	15.4 (8.1)	0.00
% Mandarin speaking EL	0.4 (2.3)	0.2 (1.3)	0.00	4.1 (10.9)	4.5 (11.2)	0.19
% Spanish speaking EL	82.4 (24.9)	92.8 (16.1)	0.00	72.8 (30.9)	74.7 (30.9)	0.01
Competition Variables						
1-mile Radius						
Other schools	3.7 (2.9)	5.0 (3.1)	0.00	2.2 (1.7)	2.3 (1.5)	0.00
Other TWDL	0.5 (1.0)	0.8 (1.2)	0.00	0.1 (0.4)	0.2 (0.4)	0.10
Other charters	0.7 (1.1)	0.9 (1.4)	0.00	0.1 (0.3)	0.1 (0.3)	0.34
Out-District TWDL Schools	0.1 (0.4)	0.3 (0.5)	0.00	0.1 (0.4)	0.2 (0.4)	0.00
HHI	3551.2 (2417.6)	2602.3 (1762.5)	0.00	4535.1 (2641.1)	4192.0 (2394.1)	0.00
Enrollment Share	32.6 (25.6)	25.0 (18.3)	0.00	43.9 (27.5)	41.2 (25.0)	0.00
2-mile Radius						
Other schools	14.7 (9.4)	18.9 (9.2)	0.00	6.4 (3.8)	6.6 (3.6)	0.02

Other TWDL	1.5 (2.6)	2.3 (2.9)	0.00	0.4 (0.8)	0.4 (0.8)	0.30
Other charters	2.6 (2.9)	2.8 (3.2)	0.00	0.2 (0.5)	0.2 (0.5)	0.16
Out-District TWDL Schools	0.4 (0.7)	0.6 (0.6)	0.00	0.4 (0.8)	0.7 (1.1)	0.00
HHI	1186.5 (1053.3)	854.2 (947.0)	0.00	2143.9 (1815.6)	1840.3 (1218.0)	0.00
Enrollment Share	10.2 (10.4)	8.0 (9.8)	0.00	20.1 (18.4)	17.6 (12.8)	0.00
5-mile Radius						
Other schools	74.2 (43.0)	89.5 (40.7)	0.00	13.8 (11.4)	13.5 (9.0)	0.12
Other TWDL	7.5 (10.6)	9.5 (11.3)	0.00	0.8 (1.6)	0.9 (1.3)	0.03
Other charters	11.4 (9.3)	12.8 (10.4)	0.00	0.4 (1.3)	0.4 (1.1)	0.99
Out-District TWDL Schools	1.9 (2.3)	2.0 (2.3)	0.96	3.7 (5.4)	4.6 (5.6)	0.00
HHI	235.7 (212.7)	182.3 (182.5)	0.00	1253.9 (1380.9)	1049.1 (655.1)	0.00
Enrollment Share	1.9 (2.0)	1.7 (2.2)	0.00	11.7 (13.8)	9.9 (6.9)	0.00
Neighborhood						
% Asian American	9.9 (9.7)	9.0 (11.5)	0.00	15.1 (16.6)	17.3 (17.5)	0.00
% Black/African American	10.3 (16.8)	10.8 (15.3)	0.10	7.3 (10.9)	6.0 (8.2)	0.00
% Hispanic	48.4 (29.1)	66.1 (24.5)	0.00	43.8 (26.7)	49.3 (25.6)	0.00
% White	28.4 (27.5)	11.9 (14.8)	0.00	30.9 (25.0)	24.5 (21.1)	0.00
Median home value ($)	337501.6 (163362.0)	285366.6 (109775.9)	0.00	332953.6 (165714.7)	304709.1 (108147.1)	0.00
N	8040	3161		13224	2195	
Schools	445	156		681	104	

Note. Calculations are means for all schools across all districts, across all years of data. TWDL are schools that become TWDL at some point during this time frame. Fluent English proficient designates a student whose home language is not English but has tested proficient on English Language assessments. HHI is the Herfindahl index which takes the sum of the squared market share of school 's' with 'n' schools in the neighborhood. The HHI is for all shared grades in the radius (1, 2 and 5 mile). A lower value of HHI indicates greater market competition and a higher value tending toward 10,000 indicates higher market concentration. A value of 10,000 represents total market concentration, or a single school in the radius. P value is the result of a two-sample t-test assuming unequal variances.

Analytic Approach

To answer research question 1, I examine and compare never-TWDL and TWDL schools on key measures of competition, school, and neighborhood characteristics over time. I calculate standard measures of mean and standard deviation and perform tests of significance to examine group differences. In addition, I examine differences between LAUSD and all other districts, as prior literature attests to the historical particularity of LAUSD with both school choice and bilingual education. Research question 2 examines the relationship between competition and TWDL program adoption, considering the potential impact of neighborhood composition. To answer this question, I adopt a discrete-time survival analysis framework to understand factors contributing to a school founding a program, with school-level data, including year of program founding, collected each year of the sample. To do this I use a subset of the data that considers only observations for schools that either never adopt a program or all years prior and the first year of program adoption for schools that adopt a program. Standard errors are clustered at the school level to account for serial correlation of schools resulting from repeated observations. Given that the outcome variable is a binary indicator that takes the value of 1 the year a program is founded, I define P_{idt} as the probability that school *i* in district *d* and year *t* adopts a TWDL program. To account for common shocks to all schools, I model a year- and district- fixed effect logistic regression in Equation 1 using year dummies. The inclusion of district fixed effects accounts for between-district variation.

$$\log\left(\frac{p_{idt}}{1-p_{idt}}\right) = \beta X_{idt} + \alpha_t + \mu_d + \varepsilon_{idt} \qquad (1)$$

Where β represents the coefficients of vector X, representing a series of school and neighborhood covariates. The outcome represents the log odds of a school opening a TWDL program, holding other variables constant, α_t corresponds to the year fixed effects, μ_d represents the district fixed effects, and ε_{idt} is the error term.

An issue with this estimation strategy exists if competition is non-random. If the very reasons charters, new neighborhood schools, and declining share of enrollment arise is for precisely the same reasons that might compel a neighborhood school to open a TWDL program, then the estimate would be biased either upwards or downwards. It is highly likely that these reasons are indeed similar. Prior literature has indicated that low-performing, and low-income schools experienced greater competition, and so if these factors are not included, they would lead to an overestimation of the effect of competition. For example, if enrollment decline is positively associated with competition, say because a school is not performing well and parents are looking for other options, and the neighborhood school responds by founding a TWDL program, then the estimate on competition would be overestimated, because it would fail to capture the effect of enrollment on school decision making. Prior literature has found that enrollment, achievement, and poverty are indeed correlated with competition. For example, high poverty schools experiencing low-performance may enter into a spiral of decline, as was documented in Menken et al. (2023) in New York City and Pearson et al. (2015) in Colorado, whereby declining test scores lead to declining enrollment which lead to further declining test scores. In New York, the TWDL program was part of an explicit "turn around" strategy to improve the school's reputation and bring students in, while in Colorado, the TWDL program was founded at a time of sustained declining test-scores and increasing levels of poverty. Charter schools had been implemented

in the state since 1998, and in New York City, early work in the study of charter schools found that many of them opened near neighborhood schools that were lower income and high minority (Black/African American) neighborhoods (Hoxby & Murarka, 2009). In Colorado, school choice policies enacted in 1994 allowed parents to choose any in- or out-district school. The school studied in Pearson et al., (2015) found that many parents opted out of the school because of its perceived negative reputation owing to its high minority, high poverty rate. Though not cited as a cause, the school opened its dual language program in 2004/2005, years after it had experienced sustained low achievement and parent opt out on account of low achievement. In the southwest, Imberman (2011) found that low-performing schools (which tend to be low-income schools) were likelier to experience increased charter penetration. Neighborhood contexts, such as population turnover may lead to declining public school enrollments in favor of school choice, especially when the gentrifying community is white (Pearman, 2020). Qualitatively, Chaparro found that in one gentrifying Philadelphia neighborhood, the development of the TWDL program and enrollment decline in the neighborhood school was directly related to gentrification as a way to attract incoming parents who might otherwise not attend the local school. The district had previously experienced increased charter schools as a result of low-performance and declining funding, where low-performing schools were either closed, converted or turned over to charter management organizations. These studies suggest that enrollment decline, high poverty, and gentrification may lead to increased competition in the form of increased numbers of nearby charters and declining enrollment share as parents opt out of their neighborhood schools. To address this, I include these school and neighborhood factors in my model.

I also test the relationship between nearby charter school increases and declining enrollment share in Los Angeles County schools and find that enrollment decline and increasing poverty rates is positively related to increasing numbers of schools, charters, and declining enrollment share. This lends credence to the notion that neighborhood public school characteristics are a driver of competition and should indeed be accounted for.

Findings

The research questions aim to understand TWDL program emergence over time. I examine differences between schools that have yet to establish their TWDL programs and never-TWDL schools (schools that never found a program) at all time points of the study. For the second research question, I explore the relationship between measures of competition related to program founding and examine the moderating effect of neighborhood change on this. For each question, I examine LAUSD separately from all other districts, given the history with desegregation, white flight, and charter enrollment that is particular to that district, as well as its significant difference in size.

RQ1 - What are school- and neighborhood- characteristics of schools adopting TWDL prior to program adoption? How do these characteristics change over time?

In this section, I examine differences between school- and neighborhood- level variables for schools that have yet to establish their TWDL program ('pre-founding TWDL') and those that never do ('never-TWDL'), and examine these differences over time. Table 4 shows the differences between these schools across all time points for school and competition variables, and across 2000/2001, 2010, and 2020/2021 for neighborhood variables (census and Zillow data). These variables are the cumulative percentage change for all school and competition characteristics, and the percentage

changes for census and housing characteristics (which are only available at three intervals). In LAUSD, across all time points there was a significant difference in enrollment decline between never-TWDL and pre-founding TWDL, t = 16.95, p < .001, with pre-founding TWDL experiencing greater enrollment decline (M = -1.6 %, SD = 3.5%) than their never-TWDL counterparts (M = .3%, SD = 7.2%). This difference is also significant for all other districts in the county, t = 6.11, p < .001, though less pronounced between pre-founding TWDL (M = -.9%, SD = 3.1%) and never-TWDL schools (M = -.2, SD = 9.1%).

Disaggregated by race and ethnicity, we see somewhat divergent trends between LAUSD and all other districts in the county. Asian American student enrollment has generally declined for pre-founding TWDL schools in LAUSD, while it has generally increased for all pre-founding schools in other districts. Black/African American student enrollment has increased more modestly for pre-founding schools in both LAUSD and all other districts, while Hispanic enrollment has declined for pre-founding TWDL schools in LAUSD and modestly increased in pre-founding TWDL schools in other districts.

Competition variables include the percentage change in the number and type of nearby schools at three distances (1-, 2- and 5- miles), as well as the share of enrollment a school has relative to its neighbors. In LAUSD, all distances show a significant difference in the rate of change in the number of nearby schools between pre-founding and never-TWDL schools, t = 8.21 p < .001 (at the 1-mile radius), with pre-founding TWDL experiencing a greater rate of change in nearby schools (M = 2.2%, SD = 3.9%) compared with never-TWDL schools (M = 1.5%, SD = 3.3%). At 1- and 5-miles, pre-founding TWDL experienced greater growth in the number of nearby charters (M = 1.5%, SD = 4.9%

at 1-mile, and M = 12.2%, SD = 11.8% at 5-miles) compared to never-TWDL schools (M = .9%, SD = 4.2% at 1-mile and M = 10.7%, SD = 12 at 5-miles). At 2- and 5-miles, pre-founding TWDL experienced a greater increase in the number of nearby TWDL schools (M = 5.9%, SD = 9.3% at 2-miles, and M = 10.8%, SD = 10.3% at 5-miles) compared with never-TWDL schools (M = 4.7%, SD = 8.7% at 2-mile, and M = 7.9%, SD = 8.8% at 5-miles). The enrollment share relative to neighboring schools decreased for pre-founding TWDL schools compared with never-TWDL, and the HHI, the measure of competition (with a lower value indicating greater competition) decreased. This means that, in LAUSD, pre-founding TWDL schools were in areas that experienced greater levels of competition from nearby schools, which included nearby TWDL and charters as well as traditional public schools, enrollment share and HHI.

In all other districts, a different pattern emerged. Either pre-founding and never-TWDL schools did not experience meaningful differences in the increase of nearby schools (say for example, the general increase in nearby schools at 1-mile, t = .20, p = 0.80), or never-TWDL schools experienced a greater increase in the number of nearby schools (M = .2%, SD = 1.8 at 2-miles), nearby charter (M = .9%, SD = 3.0% at the 5-miles) or nearby TWDL schools (M = .1% , SD = 1.0% at 1-mile) than pre-founding TWDL schools (M = 0, SD = 0 for nearby TWDL schools at 1-mile, M = .2%, SD = 1.6% for nearby charters at 5-miles, M = 0%, SD = 1.7% for nearby schools at 2-miles). As for other measures of competition such as enrollment share, I find that never-TWDL schools experience greater increases in their share of enrollment relative to pre-founding TWDL at all distances. I find that the HHI value increases more for pre-founding TWDL, suggesting that they experience greater levels of competition, though the direction of this change is also positive for never-TWDL, though smaller in

magnitude. Overall, and across all time points, these descriptive findings suggest that there are differences between LAUSD and all other districts in how they have experienced competition. While both sets have experienced greater enrollment decline for pre-founding TWDL schools and changes in the levels of competition, LAUSD has experienced greater decline and greater increases in the level of competition for pre-founding TWDL schools.

Table 4 - *Descriptives of Pre-Founding TWDL and Never-TWDL, All Years*

	Los Angeles Unified			All Other Districts in Los Angeles County		
	Never-TWDL	pre-founding TWDL		Never-TWDL	pre-founding TWDL	
School Variables	M (SD)	M (SD)	p-value	M (SD)	M (SD)	p-value
Δ% Enrollment	0.3 (7.2)	-1.6 (3.5)	0.00	-0.2 (9.2)	-0.9 (3.1)	0.00
Δ% FRPM	0.7 (5.6)	0.3 (2.3)	0.00	2.0 (6.2)	0.9 (3.4)	0.00
Δ% Asian American	1.1 (15.5)	-1.1 (18.5)	0.00	3.1 (40.8)	6.9 (79.4)	0.09
Δ% Black/African American	2.0 (23.9)	0.4 (15.3)	0.00	1.7 (18.4)	0.6 (17.7)	0.03
Δ% Hispanic	1.5 (11.3)	-1.3 (3.8)	0.00	3.9 (37.4)	0.6 (6.4)	0.00
Δ%White	4.9 (25.7)	6.5 (26.5)	0.02	-1.6 (17.3)	-2.4 (11.2)	0.03
Δ% English Learner	-0.4 (15.8)	-2.8 (11.7)	0.00	2.4 (17.5)	-0.1 (6.3)	0.00
Δ% Fluent English Proficient	1.3 (16.9)	-0.5 (1.2)	0.00	0.3 (5.6)	-0.3 (1.3)	0.00
Δ% Spanish speaking EL	-0.7 (16.2)	-2.7 (11.5)	0.00	2.9 (14.0)	0.0 (7.6)	0.00
Δ% Mandarin speaking EL	-2.1 (6.9)	-1.6 (5.3)	0.00	-0.9 (12.5)	0.1 (13.6)	0.01
Competition Variables						
1-mile Radius						
Δ% Other schools	1.5 (3.4)	2.2 (3.9)	0.00	-0.0 (1.9)	0.0 (2.6)	0.84
Δ% Other TWDL	1.0 (3.9)	1.0 (3.6)	0.52	0.1 (0.9)	0.0 (0.0)	0.00
Δ% Other charters	0.9 (4.2)	1.3 (4.9)	0.00	-0.0 (1.0)	0.0 (0.6)	0.01
Δ% Out-District Schools	0.1 (1.4)	0.0 (1.7)	0.65	-0.0 (1.8)	-0.3 (2.5)	0.00
Δ% HHI	-0.7 (2.1)	-0.9 (2.0)	0.00	0.1 (1.6)	0.3 (1.8)	0.02
Δ% Enrollment Share	1.3 (13.9)	-0.2 (3.4)	0.00	0.9 (11.3)	0.6 (3.1)	0.04
2-mile Radius						
Δ% Other schools	1.3 (1.8)	1.6 (1.7)	0.00	0.2 (1.8)	0.0 (1.7)	0.00

Δ% Other TWDL	3.2 (6.6)	3.1 (6.1)	0.54	0.2 (1.4)	0.0 (0.4)	0.00
Δ% Other charters	4.7 (8.8)	5.9 (9.3)	0.00	0.1 (1.9)	0.2 (1.9)	0.17
Δ% Out-District Schools	0.3 (3.4)	0.5 (4.2)	0.06	0.1 (2.1)	0.4 (2.3)	0.00
Δ% HHI	-0.3 (4.0)	-0.5 (3.5)	0.01	0.2 (2.0)	0.3 (2.0)	0.05
Δ% Enrollment Share	2.9 (27.5)	-0.1 (4.1)	0.00	1.0 (14.8)	0.6 (3.5)	0.00
5-mile Radius						
Δ% Other schools	1.3 (1.0)	1.5 (1.1)	0.00	0.2 (1.3)	0.2 (1.4)	0.57
Δ% Other TWDL	10.4 (12.0)	12.2 (11.8)	0.00	0.8 (2.9)	0.2 (1.6)	0.00
Δ% Other charters	8.0 (8.9)	10.8 (10.3)	0.00	0.5 (3.1)	0.7 (3.3)	0.05
Δ% Out-District Schools	0.6 (2.2)	1.0 (2.6)	0.00	0.5 (2.9)	0.5 (1.4)	0.96
Δ% HHI	-1.3 (1.0)	-1.4 (1.1)	0.01	-0.0 (1.0)	-0.0 (1.1)	0.79
Δ% Enrollment Share	1.3 (8.0)	-0.4 (3.3)	0.00	0.8 (11.2)	0.6 (4.9)	0.13
Neighborhood Variables						
Δ% Asian American	202.6 (3310.4)	3.4 (63.7)	0.00	46.6 (252.3)	32.0 (87.7)	0.00
Δ% Black/African American	14.7 (57.5)	67.6 (725.8)	0.00	50.0 (375.7)	10.8 (57.5)	0.00
Δ% Hispanic	22.2 (32.2)	19.4 (33.2)	0.00	53.9 (233.6)	25.3 (50.4)	0.00
Δ% White	-1.1 (45.3)	-7.5 (49.9)	0.00	-5.2 (244.7)	-26.2 (35.7)	0.00
Δ% Median home value	3.3 (11.2)	1.8 (8.0)	0.00	2.7 (9.5)	1.7 (7.2)	0.00
N	8040	2026		13224	1241	
Schools	445	139		681	87	

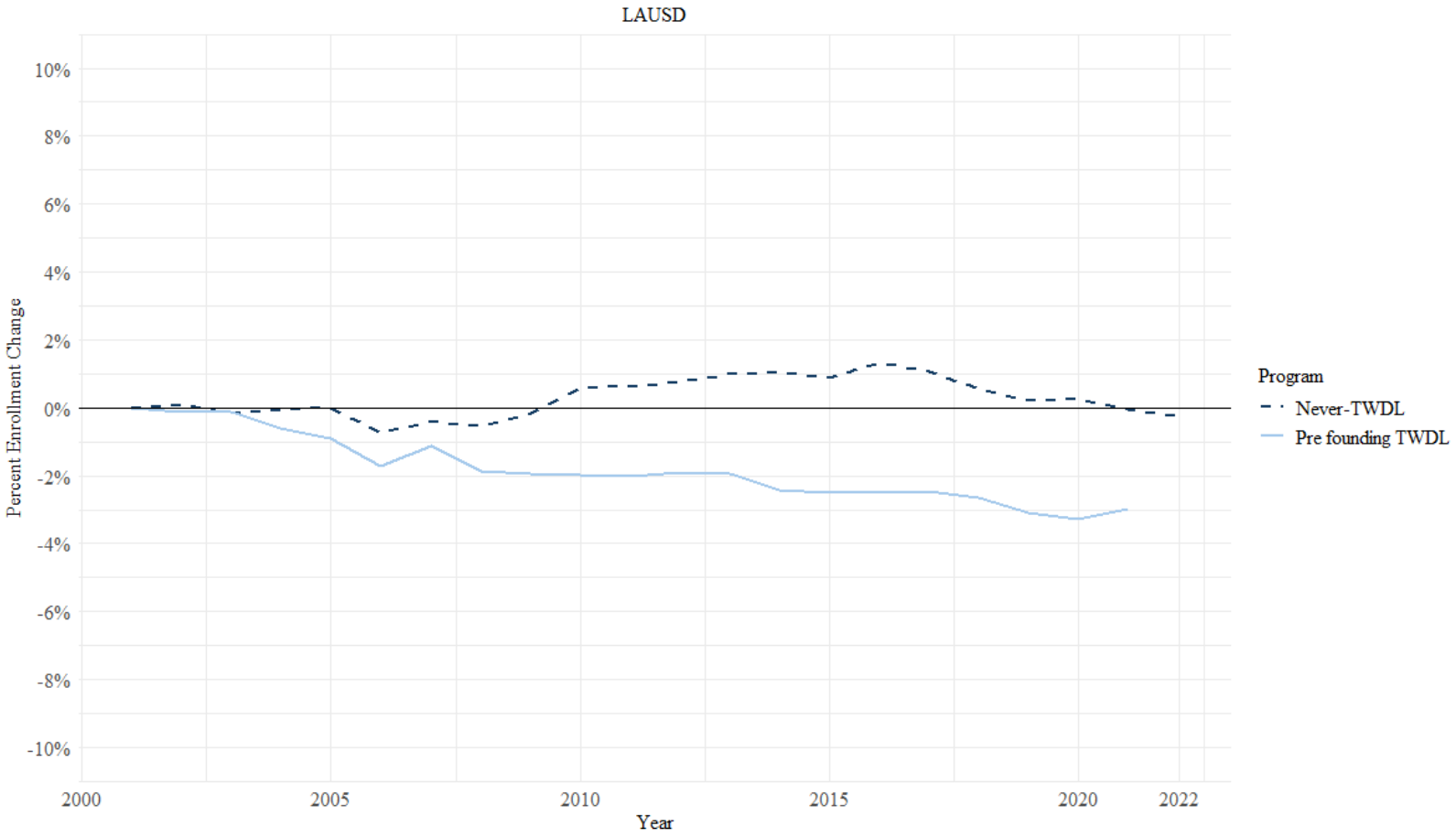
Note. Calculations are means for all schools across all districts, across all years of data. TWDL are schools that become TWDL at some point during this time frame. Fluent English proficient designates a student whose home language is not English but has tested proficient on English Language assessments. HHI is the Herfindahl index which takes the sum of the squared market share of school 's' with 'n' schools in the neighborhood. The HHI is for all shared grades in the radius (1, 2 and 5 mile). A lower value of HHI indicates greater market competition and a higher value tending toward 10,000 indicates higher market concentration. A value of 10,000 represents total market concentration, or a single school in the radius. Neighborhood - level change values are calculated for years 1990 - 2020 for the census, and 2000 - 2021 for Zillow ZTRAX. Zillow ZTRAX values are for assessed values of homes. Homes are (re)assessed only when they are sold or built. The % change represents the percentage change from the prior census. P value is the result of a two-sample t-test assuming unequal variances. Percentage change in Asian American residents is calculated for only finite values, and percentage change in Black residents in all other districts is calculated without extreme values (those above 10,000 % change), representing fewer than 5% of the total observations.

School Level Trends

I now examine school-level trends at each time point, comparing pre-founding TWDL and never-TWDL schools. Figures 5 and 6 (and corresponding Table D1) show enrollment trends across LAUSD and all other districts in the county. In LAUSD, pre-founding TWDL schools experience greater enrollment decline than their never-TWDL counterparts beginning in 2008, $t = 2.37$, $p = 0.02$. Before this year, both never-TWDL and pre-founding experience declining enrollment, but by 2008, never-TWDL schools begin to experience increasing enrollment trends that persist through 2020. For example, in 2010 the average enrollment increase for never-TWDL schools was roughly half a percentage point ($M = .57$, $SD = 8.89$) compared to pre-founding TWDL schools which saw an average decline in enrollment of nearly 2% ($M = -1.97$, $SD = 3.88$). Figure 5 shows that these enrollment trend differences between pre-founding and never-TWDL schools persist across time.

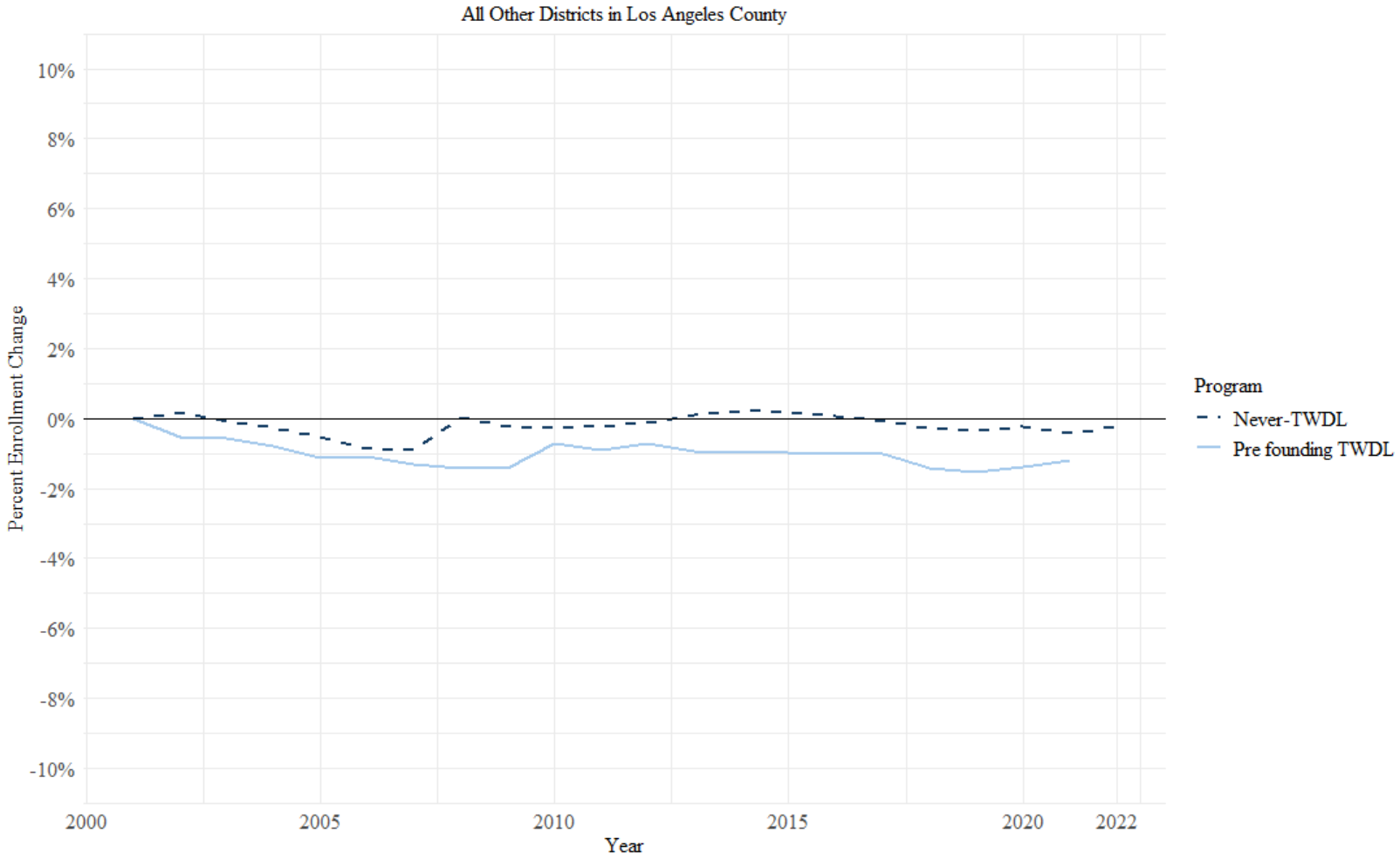
In all other districts (Figure 6 and corresponding Table D1), across nearly all time points both never-TWDL and pre-founding TWDL schools experience enrollment decline, but pre-founding TWDL schools' declines are more pronounced and sustained over time. However, it is not until 2013 that these differences begin to be significantly different from one another. Indeed, by 2013, pre-founding TWDL schools experience a -.93% change in enrollment, while never-TWDL experience a .10% increase in enrollment ($t = 2.02$, $p = 0.04$). These differences persist until 2020.

Figure 5 - *Average Percentage Change in Enrollment for TWDL and Never-TWDL Schools, LAUSD, 2000 - 2022*



Note. Calculations are means of the average percentage change over time, representing the school-wide enrollment trend. In any given year, pre-founding TWDL are schools that have yet to establish their program but will in the future. Never-TWDL schools are those that never found a program within the time span. Data for 2001 is at 0 as this is the first year of data availability for enrollment. Data for pre-founding TWDL stops in 2021 as there are no more pre-founding schools in 2022. See Table D1 for full table with tests of significance.

Figure 6 - Average Percentage Change in Enrollment for TWDL and Never-TWDL Schools, All Other Districts in Los Angeles County, 2000 - 2022



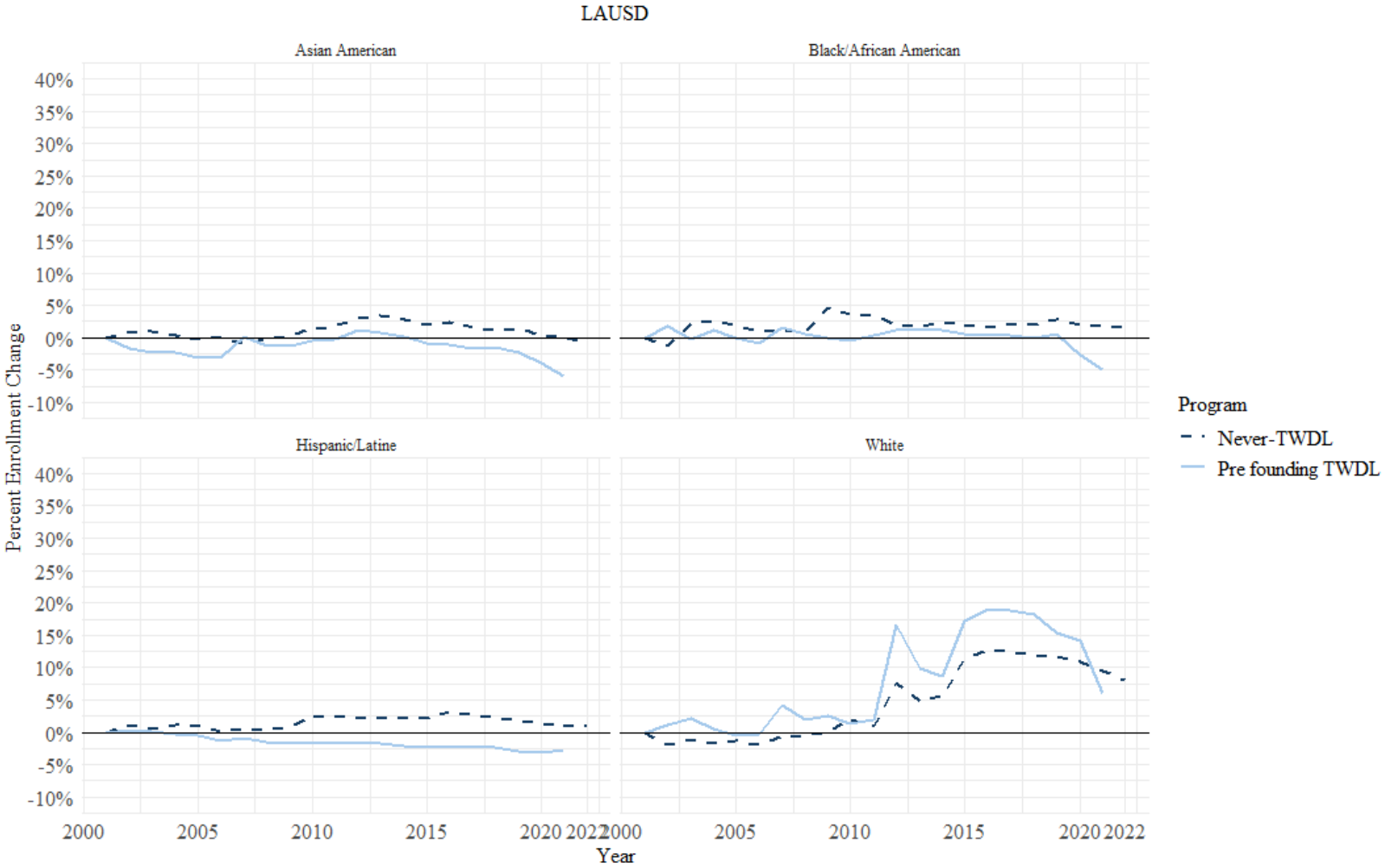
Note. Calculations are means of the average percentage change over time, representing the school-wide enrollment trend. In any given year, pre-founding TWDL are schools that have yet to establish their program but will in the future. Never-TWDL schools are those that never found a program within the time span. Data for 2001 is at 0 as this is the first year of data availability for enrollment. Data for pre-founding TWDL stops in 2021 as there are no more pre-founding schools in 2022. See Table D1 for full table with tests of significance.

Figures 7 and 8 (and corresponding Tables D2 – D5) disaggregate enrollment trends by major race and ethnic subgroups. In LAUSD, Asian American student enrollment trends do not differ significantly between never-TWDL and pre-founding TWDL, except in the years 2019 – 2021, where pre-founding TWDL schools experience significant enrollment trend differences, t = 1.84 p = 0.07 (for 2019). In 2019, pre-founding TWDL schools experienced about a -2% decrease in Asian American enrollment (M = -2.39, SD = 12.37) while never-TWDL schools experienced about 1% increase (M = 1.37, SD = 12.35). Black/African student enrollment trends similarly did not differ between never-TWDL and pre-founding TWDL, except in 2019, where pre-founding TWDL schools experienced a significant decrease in Black/African American enrollment compared with never-TWDL schools, t = 1.87 p = 0.08. In fact, in 2020 Black/African American enrollment was declining nearly 3% from prior years (M = -2.75%, SD = 9.08) compared with never-TWDL schools which saw an increase of nearly 2% from prior years (M = 13.05, SD = 13.05). By contrast, white student enrollment trends exhibited differences between never-TWDL and pre-founding TWDL between 2015 and 2018, t = 1.73 p = 0.09 (for 2015). White student enrollment trends increased for both never-TWDL and pre-founding TWDL schools, but the increase was more pronounced for pre-founding TWDL schools between 2015 and 2018. For example, in 2015, white student enrollment increase by an average of 17% in pre-founding TWDL schools (M = 17.12, SD = 30.27) and 11% in never-TWDL schools (M = 11.20, SD = 31.84). Hispanic student enrollment trends mirror school-wide trends, and pre-founding and never-TWDL schools exhibited significant differences between 2008 and 2021, t = 2.54 p = 0.01 (for 2008). In 2008 for example, pre-founding TWDL schools experienced an average

enrollment decrease of one and half percentage points (M = -1.57, SD = 4.87) compared with never-TWDL schools which saw an increase of .23% (M = .23, SD = 10.07).

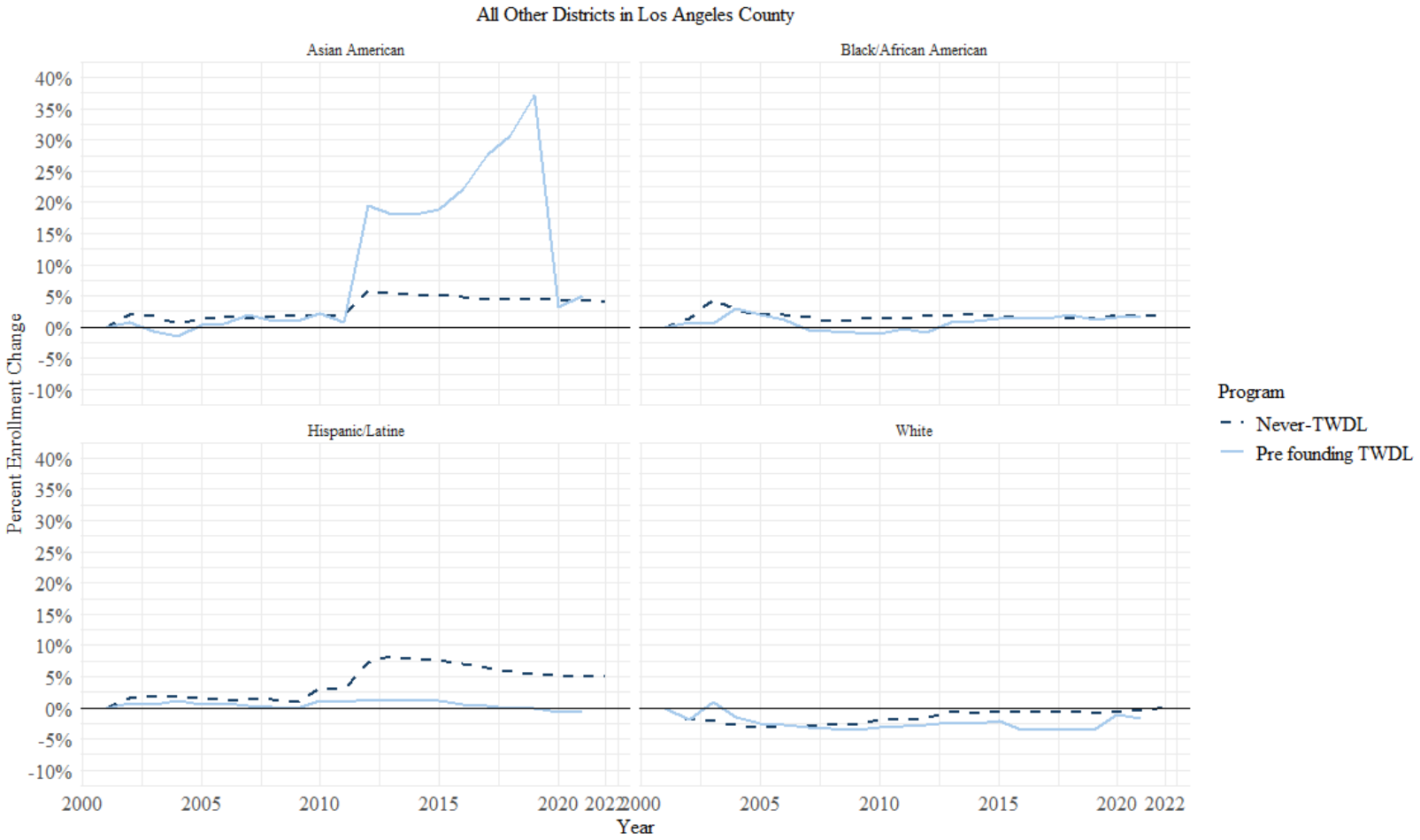
In all other districts in Los Angeles County, average enrollment trends for Asian American and Black/African American student enrollment did not differ significantly between pre-founding and never-TWDL schools. Hispanic and white student enrollment trends differed significantly between pre-founding and never-TWDL schools. Between 2010 and 2021, pre-founding TWDL schools consistently experienced smaller increases or net declining enrollment trends for Hispanic students. For example, in 2011, pre-founding TWDL schools experienced enrollment trends of under a percent (M = .85, SD = 6.08) compared never-TWDL schools which experienced an average of nearly three percent (M = 2.85, SD = 14.28). Pre-founding TWDL schools experienced greater enrollment declines in white student enrollment between 2016 and 2019, compared with never-TWDL schools. For example, in 2016 pre-founding TWDL schools experienced a decline of three and half percentage points (M = -3.51, SD = 7.02) compared with never-TWDL schools which experienced an average decrease of under a percentage point (M = -.81, SD = 16.38).

Figure 7 - *Average Percentage Change in Enrollment by Student Subgroup and for Pre-Founding and Never-TWDL Schools, LAUSD, 2000 - 2022*



Note. Calculations are means of the average percentage change over time, representing the school-wide enrollment trend for that subgroup population of students. In any given year, pre-founding TWDL are schools that have yet to establish their program but will in the future. Never-TWDL schools are those that never found a program within the time span. Data for 2001 is at 0 as this is the first year of data availability for enrollment. Data for pre-founding TWDL stops in 2021 as there are no more pre-founding schools in 2022. Full data table can be found in Tables D2 – D5.

Figure 8 - Average Percentage Change in Enrollment by Student Subgroup and for Pre-Founding and Never-TWDL Schools, All Other Districts, 2000 - 2022



Note. Calculations are means of the average percentage change over time, representing the school-wide enrollment trend for that subgroup population of students. In any given year, pre-founding TWDL are schools that have yet to establish their program but will in the future. Never-TWDL schools are those that never found a program within the time span. Data for 2001 is at 0 as this is the first year of data availability for enrollment. Data for pre-founding TWDL stops in 2021 as there are no more pre-founding schools in 2022. Full data table can be found in Tables D2 – D5.

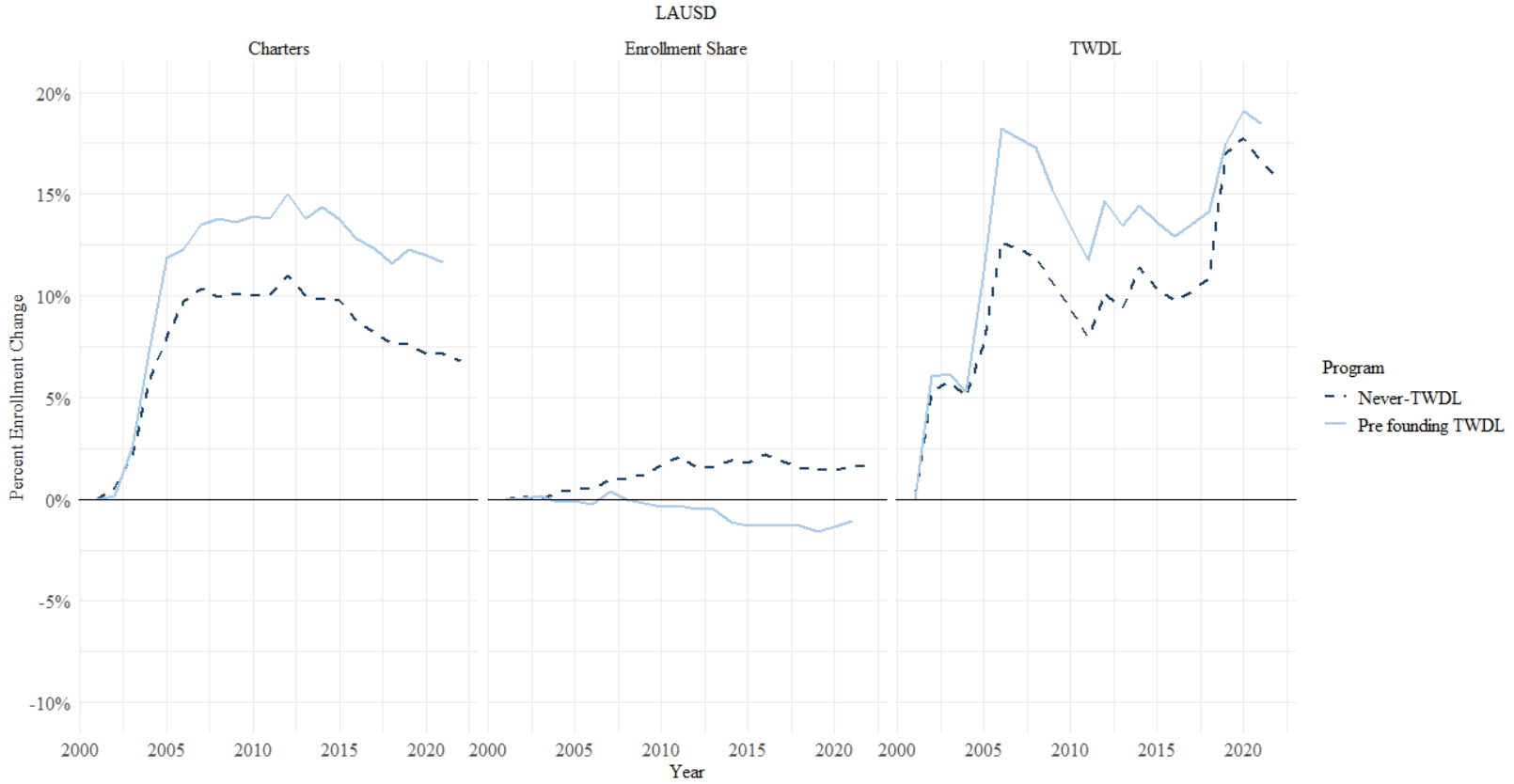
Competition Trends

Next, I examine the competition between schools prior to founding a program, compared to schools that never establish a TWDL program. Competition includes the percent change in the number of schools nearby (in a 1-, 2-, and 5- mile radius) as well as the percent change in the share of enrollment a school experiences prior to founding a program. In Figures 9 and 10, I examine the cumulative percentage of these variables at the 5-mile radius (with 1- and 2- mile radius tables in Appendix D). In LAUSD, elementary schools experienced a marked increase in the number of nearby elementary charter schools. Pre-founding TWDL schools experienced a greater increase in the number of nearby charters between 2005 and 2021, compared to never-TWDL schools, $t = 2.94$ $p < .001$ (for 2005). For example, in 2005 pre-founding TWDL schools experienced about a 10% increase (M = 11.88, SD = 12.35) in the number of nearby charters, while never-TWDL schools experienced an 8% increase (M = 7.97, SD = 11.63). These percentage increases persist through 2021. Consistent with enrollment loss experienced by pre-founding TWDL schools, these schools also experienced a decline in their enrollment share compared with never-TWDL schools. These differences are significant beginning in 2008, $t = 1.96$ $p = 0.05$. For example, in 2009, pre-founding TWDL schools experienced an average decline in their share of enrollment by -.2% (M = -.19, SD = 3.95) compared with never-TWDL schools which experienced an increase in their share of enrollment by an average of one percentage point (M = 1.22, SD = 6.70). A similar pattern emerges for the growth in nearby TWDL schools, whereby pre-founding schools experience a greater increase in nearby TWDL schools relative to never-TWDL. At the 1- and 2-mile radius, the average percent increase in nearby charter and TWDL programs for pre-founding TWDL schools is greater than never-TWDL schools, though these

differences are not statistically significant. The percent change in enrollment share decreases at a greater rate for pre-founding schools, and this is significantly different from never-TWDL schools which experience an average increase in their enrollment share.

In all other districts in Los Angeles County, pre-founding TWDL schools experienced a slightly greater increase in the number of nearby charters, compared with never-TWDL, but these differences were not statistically significant, $t = .86$ $p = .39$ (in 2012). For example, in 2012, pre-founding TWDL schools experienced an average of one percentage point increase in the number of nearby charters (M = 1.35, $SD = 4.16$), compared with .89% for never-TWDL schools ($M = .89$, $SD = 3.57$). A similar pattern emerges for the change in enrollment share, where pre-founding schools experience an average change that is smaller than never-TWDL, but these differences are not significant. By contrast, I find that pre-founding TWDL schools experience a smaller percent increase in the number of nearby TWDL schools, and these differences are significantly different from never-TWDL for nearly all years, $t = 2.88$ $p = 0.01$ (for 2016). For example, in 2016, pre-founding TWDL schools experience a .4% percent increase in the number of nearby TWDL schools ($M = .41$, $SD = 2.04$), compared with a 1.40% increase for never-TWDL schools ($M = 1.40$, $SD = 4.15$). These patterns are consistent at the 1- and 2- mile radius.

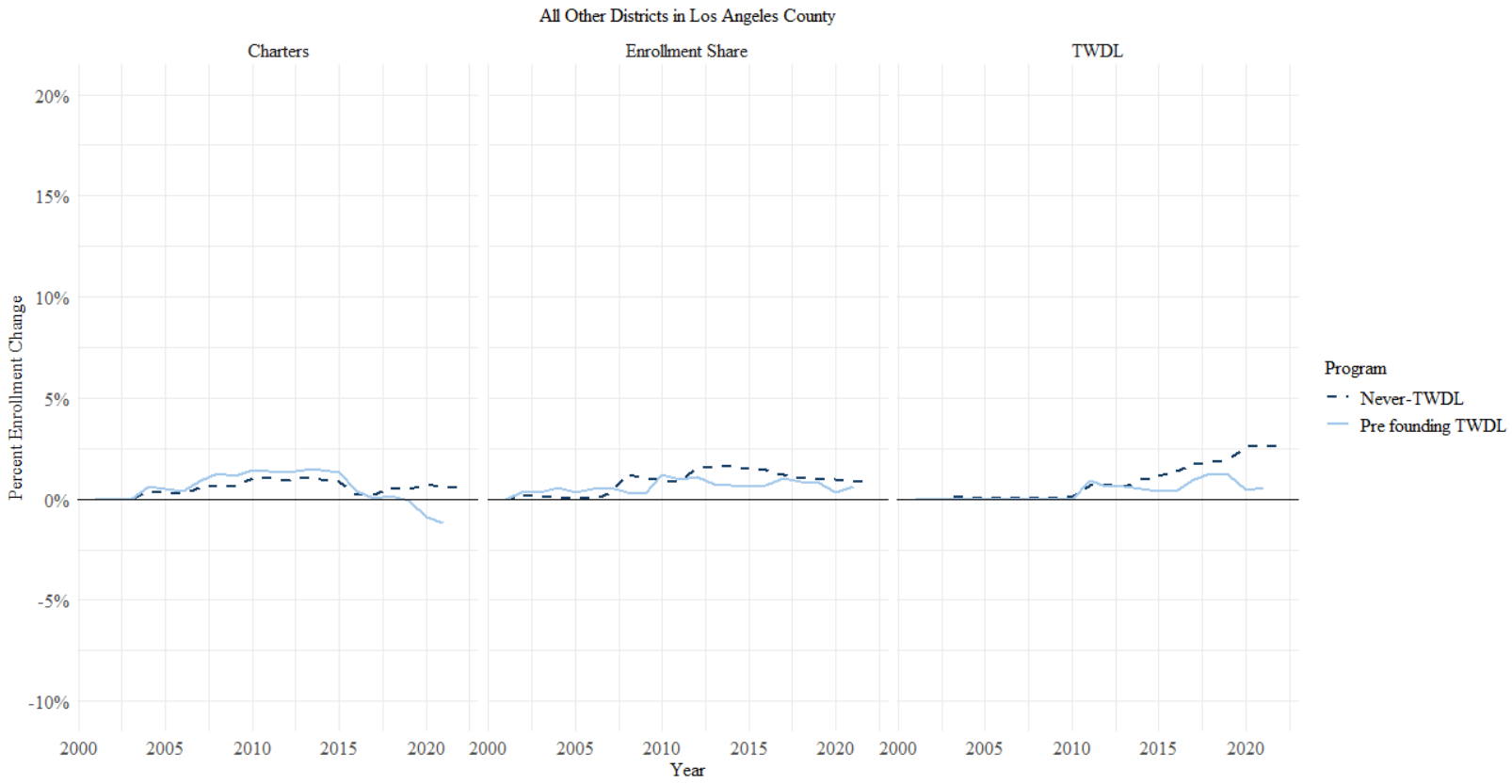
Figure 9 - *Competition Trends of Pre-Founding TWDL and Never-TWDL Schools, LAUSD, 2000 - 2022*



Note. Calculations are means of the average percentage change over time, representing competition trends at the 5-mile radius. In any given year, pre-founding TWDL are schools that have yet to establish their program but will in the future. Never-TWDL schools are those that never found a program within the time

span. Data for 2001 is at 0 as this is the first year of data availability for competition figures. Data for pre-founding TWDL stops in 2021 as there are no more pre-founding schools in 2022. Full data tables can be found in Tables D6 - D8, and tables for the 1- and 2- mile radius can be found in Tables D9 – D14.

Figure 10 - Competition Trends of Pre-Founding TWDL and Never-TWDL Schools, All Other Districts, 2000 - 2022



Note. Calculations are means of the average percentage change over time, representing competition trends at the 5-mile radius. In any given year, pre-founding TWDL are schools that have yet to establish their program but will in the future. Never-TWDL schools are those that never found a program within the time

span. Data for 2001 is at 0 as this is the first year of data availability for competition figures. Data for pre-founding TWDL ends in 2021 as there are no more pre-founding schools in 2022. Full data tables can be found in Tables D6 - D8, and tables for the 1- and 2- mile radius can be found in Tables D9 – D14.

Neighborhood Change

Finally, I examine neighborhood characteristics including the share of residents (and percent change from the prior census) in a school's attendance zone at three time points (2000, 2010, and 2020). For this analysis, all schools are assigned to a school zone (most from the 2015 attendance school survey) regardless of whether they have a zone or not. I also examine the median home value (and percent change) for all single-family homes in the zone at three time points (2000, 2010 and 2021). In this case, a pre-founding TWDL school neighborhood is the attendance zone of an elementary school which will at some point in the panel open a TWDL program but has not yet done so.

Tables 5 and 6 (with corresponding data tables D14 and D15 in Appendix D) show the total population, share of residents, and median home values in neighborhoods with pre-founding TWDL and never-TWDL schools across time. The percentage change in these values is provided for the total resident population and assessed home values (expressed in 2022 dollars). In LAUSD, the share of Asian American residents has been consistently lower for pre-founding TWDL schools, compared with never-TWDL, though these differences are only significant in 2010, $t = 2.25$ $p = .03$. For example, in 2010, the share of Asian American residents in pre-founding TWDL school neighborhoods averaged almost eight percent ($M = 7.89$, $SD = 10.15$) compared with never-TWDL schools which average about 10% ($M = 10.34$, $SD = 10.14$). The share of Black/African American residents has, by contrast, been higher on average in pre-founding school neighborhoods compared with never-TWDL neighborhoods, though these differences have only been significant in 2020, $t = 4.13$ $p < 0.001$. For example, in 2020 the average share of Black/African American residents in a pre-founding TWDL

school neighborhood was about 10% (M = 10.41, SD = 10.55) compared with never-TWDL school neighborhoods which average about nine percentage points on average (M = 8.47, SD = 12.56). Both Hispanic/Latinx and White resident populations have been significantly different between pre-founding and never-TWDL. The share of Hispanic/Latinx residents has been consistently higher for pre-founding TWDL school neighborhoods, t = 5.84 p < 0.001 (in 2020). For example, in 2020, pre-founding TWDL school neighborhoods were composed of, on average, nearly 75% Hispanic/Latinx residents (M = 74.26%, SD = 19.01), compared with 52% for never-TWDL school neighborhoods (M = 52.50%, SD = 27.86). By contrast, pre-founding TWDL schools have been located in neighborhoods with significantly fewer White residents, on average, compared with never-TWDL schools, t = 7.35 p < 0.001 (in 2020). For example, in 2020, pre-founding TWDL school neighborhoods were on average, made up of about eight percent white residents (M = 8.03, SD = 9.75) compared with never-TWDL school neighborhoods which were made up of, on average, a quarter white residents (M = 24.74, SD = 23.93). These differences were significant at all three time points. In addition, pre-founding TWDL schools were in neighborhoods whose median home values were consistently lower than never-TWDL schools, t = 2.78 p = 0.01. For example, in 2021, pre-founding TWDL schools were in neighborhoods whose median home value was about $350,000 (M = 353,078.75, SD = 60,658.34) whereas never-TWDL schools were located in neighborhoods with a median home value of about $470,000 (M = 469,894.96, SD = 240,536.13). These differences have persisted across the three time points. Examining variables of change, I find that pre-founding TWDL neighborhoods experienced population decline of about one and half percentage points (M = -1.44, SD = 5.22) between 2010 and 2020 compared with never-TWDL neighborhoods which experienced

population growth over that time (M = 2.65, SD = 8.63), and home value percent change that was comparable to never-TWDL school neighborhoods and not statistically significant (of about 30% for both types of neighborhoods, M = 31.37, SD = 6.54).

In all other districts in Los Angeles County, differences between pre-founding TWDL and never-TWDL differed from LAUSD. For example, the share of Asian American residents was higher across all time points (for example, M = 28.65, SD = 17.31 for pre-founding TWDL school neighborhoods versus M = 17.77, SD = 18.26 for never-TWDL schools) but these differences were not significant at conventional levels, t = 1.65 p = .15. The share of Black/African American residents was lower for pre-founding TWDL neighborhoods at all time points (for example, M = 6.08, SD = 6.03 for pre-founding TWDL and M = 6.54, SD = 8.82 for never-TWDL in 2020), though again not significant at conventional levels, t = .20, p = .85. The share of Hispanic/Latinx residents was slightly higher for pre-founding TWDL school neighborhoods in 2000 and 2010, and lower in 2020, but these differences were also not significant at conventional levels. Finally, the share of white residents was lower for pre-founding TWDL schools at all time points, and these differences were significantly different from never-TWDL in 2000 and 2010 (for example, in 2010 M = 23.36, SD = 20.58 for pre-founding schools and M = 28.91, SD = 24.30 for never-TWDL schools). The median price of homes was lower for pre-founding TWDL schools, though again these differences were significant only in 2000 and 2010. Examining variables of change, I find that resident populations increased for both pre-founding and never-TWDL neighborhoods at both time points, and median home prices increased by almost 30% for both types of schools, with no significant differences between the two.

Table 5 - Neighborhood Characteristics, LAUSD, 2000 - 2020

	LAUSD						
	2000		2010		2020/2021		
	Never-TWDL	Pre-founding TWDL	Never-TWDL	Pre-founding TWDL	Never-TWDL	Pre-founding TWDL	
	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	
Total Population	9586.91 (4762.25)	9367.02 (3472.28)	10164.45 (5206.67)	9489.96 (3656.54)	10347.38 (5669.57)	9077.55 (3173.50)	
% Asian American	9.18 (9.19)	7.51 (9.62)	10.34 (10.14)	7.89 (10.15)	10.37 (9.51)	4.68 (6.66)	**
% Black/African American	11.50 (18.63)	13.05 (18.41)	10.72 (17.70)	10.38 (14.16)	8.47 (12.56)	10.41 (10.55)	
% Hispanic/Latinx	45.28 (29.33)	65.26 (25.19)	49.08 (29.16)	68.34 (23.96)	52.50 (27.86)	74.26 (19.01)	***
% White	31.08 (29.03)	12.11 (15.12)	27.23 (27.16)	11.60 (14.87)	24.74 (23.93)	8.03 (9.75)	***
Assessed Home Value ($)	267731.91 (104318.51)	224999.41 (57350.57)	358139.12 (153110.31)	293119.90 (83894.61)	469894.96 (240536.13)	353078.75 (60658.34)	***
Δ% Population Change			6.52 (17.74)	4.65 (22.59)	2.65 (8.63)	-1.44 (5.22)	**
Δ% Ztrax Change			35.10 (15.61)	30.03 (14.21) *	32.79 (14.71)	31.37 (6.54)	

*** p<0.001, ** p<0.01, * p<0.05, .p<.1

Note. Calculations are the total population count, the share of the population by race/ethnic subgroup, and the median home value in 2022 dollars. The last two rows are the percentage change in the population count and assessed home values. These values are only available for 2010 and 2020/2021. In any given year, pre-founding TWDL are schools that have yet to establish their program but will in the future. Never-TWDL schools are those that never found a program within the time span. Included are between-group tests of significance assuming unequal variances. See Table D15 for full table.

Table 6 - Neighborhood Characteristics, All Other Districts in Los Angeles County, 2000 - 2020

	All Other Districts in Los Angeles County					
	2000		2010		2020/2021	
	Never-TWDL	Pre-founding TWDL	Never-TWDL	Pre-founding TWDL	Never-TWDL	Pre-founding TWDL
	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)
Total Population	7444.42 (4780.89)	9243.62 (10598.53)	9925.35 (17278.96)	9132.05 (9458.03)	10794.45 (21240.23)	7771.49 (2253.30)
% Asian American	13.01 (14.41)	15.29 (16.28)	16.46 (17.80)	20.59 (20.18)	17.77 (18.26)	28.65 (17.31)
% Black/African American	7.85 (12.02)	6.80 (9.75)	7.00 (10.93)	5.42 (8.01)	6.54 (8.82)	6.08 (6.03)
% Hispanic/Latinx	41.03 (26.52)	45.39 (24.89)	44.93 (26.63)	48.35 (25.41)	48.13 (25.99)	46.25 (23.98)
% White	35.06 (25.99)	29.23 (21.34)	28.91 (24.30)	23.26 (20.58)	23.55 (21.45)	14.93 (11.46)
Assessed Home Value ($)	273636.27 (111423.68)	254398.16 (76401.67)	362091.47 (162761.85)	333670.09 (112238.42)	460208.87 (248476.22)	409006.32 (135807.23)
Δ% Population Change			22.17 (53.35)	18.55 (48.21)	2.54 (13.51)	3.61 (4.23)

Δ% Ztrax Change	28.91 (13.65)	27.51 (12.68)	28.57 (14.92)	25.07 (4.46)

*** p<0.001, ** p<0.01, * p<0.05, .p<.1

Note. Calculations are the total population count, the share of the population by race/ethnic subgroup, and the median home value in 2022 dollars. The last two rows are the percentage change in the population count and assessed home values. These values are only available for 2010 and 2020/2021. In any given year, pre-founding TWDL are schools that have yet to establish their program but will in the future. Never-TWDL schools are those that never found a program within the time span. Included are between-group tests of significance assuming unequal variances. See Table D16 for full table.

RQ2: What is the relationship between school and neighborhood characteristics and TWDL program development?

I next estimate the relationship between competition and program founding, for LAUSD and all other districts in the county at the 1-, 2- and 5-mile radius separately, controlling for school- and neighborhood level factors, including a school's prior enrollment trend. Descriptive findings suggest that meaningful differences exist between LAUSD and all other districts in the county. LAUSD experienced greater enrollment decline and greater growth in competition. As a very large district (for example the next largest district has a fraction of the number of elementary schools), LAUSD may have experienced a significant different policy approach to TWDL growth not seen in other districts, which merits a separate examination. The outcome is the binary variable of program founding, which takes the value of 1 the year that a school adopts a program, and a 0 otherwise. Table 7 shows the regression outputs for both LAUSD and all other districts in Los Angeles County.

In LAUSD, I find that measures of competition are for the most part not significantly associated with program founding, after controlling for year and sub-district effects, and school and neighborhood trends, save for some notable examples. I find that the likelihood of program founding increases by 15% for every percentage increase in the count of nearby schools ($OR = 1.52$, $SE = 0.066$), but this is only at the 2-mile radius. I find a positive and significant relationship between increasing number of nearby TWDL schools and program founding at the 2-mile radius ($OR = 1.027$, $SE = 0.015$). For charter schools, I find a similar association exists at the 5-mile radius ($OR = 1.036$, $SE = 0.020$). I find a 3.6% increased likelihood of program founding with charter growth and a 2.7% increased likelihood with TWDL growth.

Table 7 - *Regression Outputs*

	Los Angeles Unified			All Other Districts in Los Angeles County		
	1-mile	2-mile	5-mile	1-mile	2-mile	5-mile
%Δ in number of nearby schools	1.030 (0.032)	1.152 (0.066)*	0.837 (0.375)	0.967 (0.081)	0.703 (0.166)*	0.809 (0.393)
%Δ in number of nearby TWDL	0.990 (0.025)	1.027 (0.015).	0.985 (0.015)	0.008 (0.599)**	0.738 (0.110)**	0.825 (0.066)**
%Δ in number of nearby charters	1.011 (0.026)	1.003 (0.016)	1.036 (0.020).	1.058 (0.163)	0.978 (0.086)	1.067 (0.074)
%Δ in enrollment share	1.022 (0.027)	0.964 (0.031)	0.913 (0.068)	1.101 (0.085)	1.058 (0.088)	0.998 (0.006)
%Δ in HHI	0.947 (0.072)	1.048 (0.038)	0.676 (0.325)	0.867 (0.149)	0.952 (0.117)	0.705 (0.363)
%Δ in number of nearby, out-district schools	0.914 (0.072)	0.994 (0.018)	1.028 (0.052)	0.953 (0.047)	0.944 (0.054)	1.021 (0.102)
%Δ in out-district enrollment share	0.868 (0.136)	1.027 (0.032)	1.025 (0.030)	1.002 (0.067)	0.961 (0.046)	0.981 (0.075)
Observations	8,814	8,814	8,814	13,181	13,181	13,181
School Controls	Yes	Yes	Yes	Yes	Yes	Yes
Neighborhood Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
District Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes

*** p<0.001, ** p<0.01, * p<0.05, .p<.1

These models come from estimating logit models. Clustered standard errors at the school level in parentheses. Estimates are odds-ratios: (>1 indicates a higher likelihood of event happening; <1 indicates a lower likelihood of event happening). District fixed effects include the six (now four) sub-districts for Los Angeles Unified: West, Northeast, Northwest, Central, South, and East, corresponding to the geographies of the district. See map in Appendix E for a detailed map. For analysis of all other districts in Los Angeles County, years are grouped into two-year increments, except for the year 2019-2022 increment, to avoid perfect separation. For Los Angeles Unified, years are standalone. See Tables F1 – F2 for full results.

For all other districts in Los Angeles County, I find few significant associations between competition and program founding. However, I do find a strong and significant association between TWDL program emergence and program founding. I find a decreased probability of TWDL emergence associated with each percentage increase in the number of nearby TWDL schools (*OR* = .008, *SE* = 0.599 at the 1-mile radius, *OR* = .738, *SE* = 0.110 at the 2-mile radius and *OR* = .825, *SE* = 0.066 at the 5-mile radius). For example, at the 1-mile radius, a one percentage point increase in the number of TWDL schools is associated with a 100% decreased likelihood of program founding. Other measures of competition (enrollment share and nearby schools) are not significant. Additionally, I find that enrollment and EL-classified enrollment increases are associated with decreased likelihood of program founding.

Examining Heterogeneous Effects

I examine a subset of the data to understand whether heterogeneous effects exist. I examine the subset of Spanish language programs, by newer programs (those founded after 2010) and by economic shifts in school neighborhoods.

By Language of Program

I examine the subset of schools that establish a Spanish language program versus all other languages in Tables 8 and 9 (with full regression outputs in Tables F3 – F4 of Appendix F). In LAUSD, as with before, I find a positive and significant relationship between an increase in the number of nearby schools, specifically TWDL schools. This occurs at the 2-mile radius but not 1- or 5-mile radius. Similarly, for all other districts in Los Angeles County, a negative and significant relationship exists between nearby TWDL schools and program founding.

Table 8 - *Regression Outputs, Spanish Programs*

	Los Angeles Unified			All Other Districts in Los Angeles County		
	1-mile	2-mile	5-mile	1-mile	2-mile	5-mile
%Δ in number of nearby schools	1.036 (0.033)	1.162 (0.066) *	0.889 (0.396)	0.993 (0.074)	0.687 (0.197).	0.764 (0.368)
%Δ in number of nearby TWDL	0.986 (0.026)	1.031 (0.016).	0.990 (0.015)	0.005 (0.611)** *	0.820 (0.115).	0.809 (0.082)* *
%Δ in number of nearby charters	1.007 (0.028)	1.007 (0.016)	1.034 (0.021)	1.039 (0.196)	0.903 (0.112)	1.067 (0.083)
%Δ in enrollment share	1.043 (0.020) *	0.964 (0.030)	0.940 (0.049)	1.084 (0.074)	1.023 (0.094)	0.998 (0.007)
%Δ in HHI	0.920 (0.076)	1.048 (0.042)	0.658 (0.347)	0.954 (0.137)	0.965 (0.123)	0.870 (0.268)
%Δ in number of nearby, out-district schools	0.927 (0.079)	0.993 (0.018)	1.025 (0.055)	0.922 (0.046).	0.916 (0.075)	0.973 (0.107)
%Δ in out-district enrollment share	0.923 (0.147)	1.029 (0.035)	1.033 (0.032)	0.992 (0.074)	0.966 (0.044)	0.946 (0.085)
Observations	8672	8672	8672	12869	12869	12869
School Controls	Yes	Yes	Yes	Yes	Yes	Yes
Neighborhood Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
District Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes

*** p<0.001, ** p<0.01, * p<0.05, .p<.1

Note: These models come from estimating logit models. Clustered standard errors at the school level in parentheses. Estimates are odds-ratios: (>1 = more likelihood of event (failure=becoming TWI) happening; <1 = less likelihood of event happening). District fixed effects include the six (now four) sub-districts for Los Angeles Unified: West, Northeast, Northwest, Central, South, and East, corresponding to the geographies of the district. See Appendix E for a

detailed map of the local districts. For analysis of all other districts in Los Angeles County, years are grouped into two-year increments, except for the year 2019-2022 increment, to avoid perfect separation. For Los Angeles Unified, years are standalone. See Tables F3 - F4 for full regression outputs.

Table 9 - Regression Outputs, All Other Language Programs

	Los Angeles Unified			All Other Districts in Los Angeles County		
	1-mile	2-mile	5-mile	1-mile	2-mile	5-mile
%Δ in number of nearby schools	0.920 (0.104)	1.095 (0.255)	0.621 (1.180)	0.916 (0.116)	0.722 (0.157)*	0.900 (0.369)
%Δ in number of nearby TWDL	1.029 (0.063)	0.966 (0.059)	0.933 (0.058)	0.016 (0.136) ***	0.459 (0.211)**	0.921 (0.100)
%Δ in number of nearby charters	1.018 (0.061)	0.961 (0.057)	1.066 (0.064)	1.408 (0.226)	1.173 (0.157)	1.058 (0.096)
%Δ in enrollment share	0.911 (0.166)	0.985 (0.046)	0.838 (0.137)	1.159 (0.303)	1.174 (0.189)	1.116 (0.188)
%Δ in HHI	1.126 (0.120)	1.029 (0.061)	1.122 (0.960)	0.596 (0.352)	1.012 (0.253)	0.889 (0.820)
%Δ in number of nearby, out-district schools	0.783 (0.120)*	1.008 (0.058)	1.215 (0.132)	1.012 (0.135)	0.989 (0.083)	1.035 (0.236)
%Δ in out-district enrollment share	0.562 (0.246)*	0.995 (0.100)	0.961 (0.044)	0.956 (0.302)	0.937 (0.171)	1.063 (0.059)
Observations	7013	7013	7013	12153	12153	12153
School Controls	Yes	Yes	Yes	Yes	Yes	Yes
Neighborhood Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
District Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes

*** p<0.001, ** p<0.01, * p<0.05, .p<.1

Note: These models come from estimating logit models. Clustered standard errors at the school level in parentheses. Estimates are odds-ratios: (>1 = more likelihood of event (failure=becoming TWI) happening; <1 = less likelihood of event happening). District fixed effects include the six (now four) sub-districts for Los Angeles Unified: West, Northeast, Northwest, Central, South, and East, corresponding to the geographies of the district. See Appendix E for a detailed map of the local districts. For analysis of all other districts in Los Angeles County, years are grouped into two-year increments, except for the

year 2019-2022 increment, to avoid perfect separation. For Los Angeles Unified, years are standalone. All other languages include Armenian, Arabic, French, German, Mandarin, Korean, and Japanese. See Tables F5 - F6 for full regression outputs.

By Newer Language Programs

Descriptive data of program founding years suggests that beginning in 2010, the rate of growth of dual language programs began to increase leading up to the passage of Proposition 58 in 2016. I find that for newer programs in LAUSD, competition from nearby schools and TWDL schools is significant at the 2-mile radius (See Table 10). In fact, a one percentage point cumulative increase in nearby schools is associated with a 24.6% higher likelihood of program founding (OR = 1.246, SE = 0.104), and a 4% higher likelihood with a nearby increase in the number of TWDL schools (OR = 1.038, SE = 0.018). I find a negative association between the share of enrollment (an increasing share of enrollment is associated with a decreased likelihood), though this is only significant at the 5-mile radius.

All other districts in Los Angeles County experience a negative association between the growth of nearby TWDL schools and program founding, as was found in prior estimations. For example, at the 5-mile radius, a 1% increase in the number of nearby TWDL schools is associated with a 16.7% lower likelihood of founding a program (OR = .833, SE = 0.072). Other measures of competition are not statistically significant at conventional levels.

Table 10 - *Regression Outputs, Programs Founded after 2010*

	Los Angeles Unified			All Other Districts in Los Angeles County		
	1-mile	2-mile	5-mile	1-mile	2-mile	5-mile
	OR (SE)	OR (SE)	OR (SE)	OR (SE)	OR (SE)	OR (SE)
%Δ in number of nearby schools	1.060 (0.045)	1.246 (0.104)*	0.840 (0.513)	0.991 (0.094)	0.689 (0.227)	1.172 (0.477)
%Δ in number of nearby TWDL	1.003 (0.026)	1.038 (0.018)*	1.010 (0.013)	0.026 (0.110)***	0.762 (0.108)*	0.833 (0.072)*
%Δ in number of nearby charters	1.007 (0.029)	1.004 (0.020)	1.022 (0.031)	1.042 (0.174)	0.959 (0.088)	1.019 (0.086)
%Δ in enrollment share	0.997 (0.034)	0.965 (0.035)	0.845 (0.086)*	1.105 (0.098)	1.034 (0.103)	0.997 (0.007)
%Δ in HHI	0.978 (0.092)	1.054 (0.038)	0.646 (0.413)	0.894 (0.168)	0.981 (0.133)	0.769 (0.385)
%Δ in number of nearby, out-district schools	0.924 (0.089)	1.009 (0.023)	0.879 (0.078).	0.961 (0.052)	0.957 (0.058)	1.050 (0.116)
%Δ in out-district enrollment share	0.895 (0.148)	1.024 (0.042)	0.986 (0.039)	0.995 (0.086)	0.953 (0.049)	1.034 (0.076)
Observations						
School Controls	Yes	Yes	Yes	Yes	Yes	Yes
Neighborhood Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
District Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes

*** p<0.001, ** p<0.01, * p<0.05, .p<.1

Note: These models come from estimating logit models. Clustered standard errors at the school level in parentheses. Estimates are odds-ratios: (>1 = more likelihood of event (failure=becoming TWDL) happening; <1 = less likelihood of event happening). District fixed effects include the six (now historical) sub-districts for Los Angeles Unified: West, Northeast, Northwest, Central, South, and East, corresponding to the geographies of the district. See map in

Appendix E for a detailed map of the local districts. For analysis, years are grouped into two-year increments, except for the year 2019-2022 increment, to avoid perfect separation. See Tables F7 – F8 for full regression outputs.

By Neighborhood Economic Change

Recent literature has suggested that gentrifying neighborhoods may play a role in TWDL program founding. This occurs when housing and neighborhood turnover coincide with increased school choice and public-school response to attract newer parents of higher wealth who might opt out of their neighborhood public school. While prior studies have conceptualized and used composite measures (or indexes) using data on educational attainment, housing and race, to show that cities like Los Angeles experienced gentrification (Urban Displacement Project, 2018), a central aspect of gentrification is housing related. I operationalize this using assessed home values of all single-family homes in Los Angeles County between 2001 and 2021, aggregated to school attendance zones. Los Angeles experienced dramatic increases in assessed home values (following sale prices), and some neighborhoods increased at much higher rates than the county median (See Appendix G for maps). I use Zillow home value assessed data from years 2001, 2010 and 2021, and calculate the percentage change in median home values (the assessed value of a home, which in California changes only when a home changes ownership, and otherwise may only increase by 2% a year).

Tables 11 and 12 show the regression outputs for program founding in neighborhoods that experienced greater than median increases and lower than median increases, by LAUSD and all other districts respectively. For LAUSD schools in neighborhoods that experienced greater than average housing values increases, I find that an increasing share of enrollment is associated with a 14% increased likelihood of program founding, though significant only at the 1-mile radius (OR = 1.144, SE = 0.061). By contrast, an increase cumulative percentage change in enrollment is associated with a decreased likelihood of program founding by about 15%, again significant only at the 1-mile radius.

In addition, an increasing Hispanic resident population in the neighborhood is associated with a lower likelihood of program founding, by about 2%, and this is significant at conventional levels for all distances. I find that cumulative percentage increase in the number of nearby TWDL programs is associated with an increased likelihood by about 4.5% (significant at the .05 level) but only at the 2-mile radius (*OR* =1.045, *SE* = 0.018). For neighborhoods having experienced a decreased share in their enrollment, I find that each percentage increase in enrollment share is associated with a decreased likelihood of program founding by 9% at the 2-mile radius (*OR* = .913, *SE* = .043), and about 20% at the 5-mile radius (*OR* = .767, *SE* = .116).

For districts other than LAUSD (Table 12), I find that schools located in neighborhoods having experienced a larger than average increase in housing values are less likely to found a program with each percentage point increase in the number of nearby charters, by about 20%. This is only significant at the 5-mile radius, however. In addition, an increasing number of TWDL schools nearby, no matter the distance, is associated with a decreased likelihood of program founding. This is significant for neighborhoods having experienced greater than average increases in housing values, but not for neighborhoods having experienced lower than average housing increases (except at the 1-mile radius).

Table 11 - *Regression Outputs, Neighborhood Economic Change, LAUSD*

	Los Angeles Unified					
	> County Median			< County Median		
	1-mile	2-mile	5-mile	1-mile	2-mile	5-mile
%Δ in number of nearby TWDL	1.031 (0.031)	1.045 (0.018)*	0.979 (0.021)	0.941 (0.042)	1.022 (0.027)	1.019 (0.023)
%Δ in number of nearby charters	0.996 (0.036)	1.017 (0.019)	1.026 (0.022)	1.012 (0.040)	1.020 (0.022)	1.024 (0.036)
%Δ in enrollment share	1.144 (0.061)*	1.008 (0.034)	0.974 (0.061)	0.969 (0.062)	0.913 (0.043)*	0.767 (0.116)*
%Δ in HHI	0.876 (0.078).	1.001 (0.065)	0.793 (0.214)	0.910 (0.101)	1.015 (0.049)	0.943 (0.239)
%Δ in number of nearby, out-district schools	0.824 (0.115).	0.925 (0.054)	1.010 (0.066)	0.938 (0.108)	1.002 (0.021)	1.096 (0.088)
%Δ in out-district enrollment share	0.888 (0.218)	0.864 (0.100)	1.027 (0.034)	0.830 (0.202)	1.054 (0.034)	1.016 (0.050)
Observations	5,320	5,320	5,320	3,416	3,416	3,416
School Controls	Yes	Yes	Yes	Yes	Yes	Yes
Neighborhood Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
District Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes

*** p<0.001, ** p<0.01, * p<0.05, .p<.1

Note: Regression estimates from estimating a logistic regression. Clustered standard errors at the school level in parentheses. Estimates are odds-ratios: (>1 = greater likelihood of event happening; <1 = lower likelihood of event happening). District fixed effects for the six sub districts in Los Angeles Unified. County median percentage change is calculated for all school zones in the county. The median percentage change for these zones between 2000 - 2010 was 29.3% and between 2010 - 2021 was 28.9%. See Table F9 for full regression outputs.

Table 12 - *Regression Outputs, Neighborhood Economic Change, All Other Districts in Los Angeles County*

	All Other Districts in Los Angeles County					
	> County Median			< County Median		
	1-mile	2-mile	5-mile	1-mile	2-mile	5-mile
%Δ in number of nearby TWDL	0.019 (0.108)***	0.513 (0.108)***	0.792 (0.091)*	0.003 (0.618)***	0.864 (0.136)	0.865 (0.104)
%Δ in number of nearby charters	0.983 (0.134)	0.868 (0.089)	0.791 (0.109)*	1.143 (0.154)	0.986 (0.115)	1.100 (0.070)
%Δ in enrollment share	1.177 (0.117)	1.101 (0.148)	1.115 (0.237)	1.005 (0.180)	1.036 (0.160)	1.082 (0.045).
%Δ in HHI	0.724 (0.215)	1.056 (0.124)	1.692 (0.447)	0.976 (0.161)	1.026 (0.148)	0.805 (0.262)
%Δ in number of nearby, out-district schools	0.904 (0.102)	0.910 (0.071)	1.414 (0.258)	0.932 (0.048)	0.954 (0.082)	0.987 (0.106)
%Δ in out-district enrollment share	0.855 (0.208)	0.887 (0.106)	0.978 (0.065)	1.062 (0.117)	0.954 (0.073)	1.000 (0.227)
Observations	5,940	5,940	5,940	7,026	7,026	7,026
School Controls	Yes	Yes	Yes	Yes	Yes	Yes
Neighborhood Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
District Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes

*** p<0.001, ** p<0.01, * p<0.05, .p<.1

Note: Regression estimates from estimating a logistic regression. Clustered standard errors at the school level in parentheses. Estimates are odds-ratios:

(>1 = greater likelihood of event happening; <1 = lower likelihood of event happening). County median percentage change is calculated for all school

zones in the county. The median percentage change for these zones between 2000 and 2010 was 29.3% and between 2010 and 2021 was 28.9%. See Table F9 for full outputs.

Discussion

This study sought to understand the relationship between competition and two-way dual language program (TWDL) founding in Los Angeles County, using a panel data set of school and neighborhood level data between the years 2000/2001 and 2022. A total of 260 elementary TWDL programs have been founded in the county, the vast majority housed in neighborhood public schools. I find that Los Angeles Unified presents a particular case within the broader county, being both the largest district and having experienced sharp enrollment decline and charter school increase over the last twenty years. For this reason, I analyzed the district separately. I found that controlling for school level variables (including enrollment decline), LAUSD schools experiencing increased competition from nearby TWDL or charter schools were more likely to found their own TWDL program, though this was limited to schools in a 2- and 5-mile radius respectively. I did not find this level of competition to be associated with program founding across other districts in Los Angeles County. Indeed, increased presence of TWDL schools was associated with a lower likelihood of program founding, after controlling for year, district effects and school and neighborhood variables. These findings provide a more nuanced understanding of the landscape of pressures in program founding by showing that districts responded differentially to competition. In LAUSD, increased competition, including from nearby TWDL schools were associated with greater likelihoods of TWDL program founding, suggesting that schools competed against one another. This suggests that LAUSD, a vastly larger district in terms of numbers of schools and resources, may have responded to enrollment decline by deploying district-wide policies such as TWDL expansion. This resulted in significant expansion in the numbers of programs, especially after 2016, in schools with high populations of EL classified students,

high poverty students which experienced steep enrollment declines in years prior. By contrast, other districts in the county, while motivated by enrollment decline, seemed to have adopted a policy of program 'monopoly', where TWDL programs are established in schools with few if any other TWDL options nearby so as to not compete with other programs in the districts. It may also be that other districts in the county are constrained in their deployment of resources to open TWDL, given that they are much smaller in size.

These findings provide a nuanced understanding of factors related to program founding by examining program founding across a number of districts exhibiting different histories, policies and contexts. For example, LAUSD experienced the highest level of charter and school choice expansion as compared to its neighboring districts. By virtue of this phenomenon, along with its high number of elementary schools and vast resources, the district may have adopted a strategy of expanding TWDL to boost enrollment in schools. Sub-district policies seem to matter as well, as local district east (the district encompassing East Los Angeles, the historically Hispanic/Latinx neighborhoods of Los Angeles and one that established the district's original bilingual programs), was more likely to establish TWDL programs than any other sub-district. Other districts in the county, with fewer schools and resources needed to open, may have adopted this strategy more parsimoniously, leading to fewer TWDL schools located nearby to one another. Nevertheless, across all districts, and especially for newer programs (those founded after 2010), enrollment decline was a driving factor of a school's likelihood of founding its program, suggesting that schools have at least in part responded to external pressures with specialized programs of choice.

These findings support prior literature, as well as the hypothesis that enrollment decline, whether or not it is associated with competition, may be a strong motivator for schools to implement organizational changes. It is indeed indicative that most schools with TWDL programs are neighborhood schools, which, unlike charters or magnets, are beholden to their neighborhood attendance zone. I found suggestive evidence that competition is related to program founding, and especially so in Los Angeles Unified. This may result from the fact that Los Angeles Unified is a denser district, and therefore principals and other leaders may see themselves in greater competition with their nearby peers owing to their proximity. I did not find evidence of competition being associated with program founding for districts outside of LAUSD, controlling for school and neighborhood factors. In fact, I found that increased numbers of TWDL schools nearby were associated with a lower likelihood of program founding. This strong negative relationship, significant at the 1- 2- and 5- mile radius suggests that competition is not at play, unless schools are actively avoiding founding programs near one another to maintain a 'niche' program.

Prior literature has highlighted how racially changing neighborhoods, specifically neighborhoods becoming more white and/or more Asian American might be more likely to establish a TWDL program. I did not find this to be the case across Los Angeles County, suggesting that schools opened TWDL programs in a variety of neighborhood contexts. In Los Angeles Unified, schools with an increasing share of EL-classified students were more likely to establish a TWDL program. This provides nuance to the literature that where programs are founded may be contextually dependent. It also points to the idea that competition and enrollment may be more related to program founding.

Limitations and Future Directions

By virtue of the case study design, it is hard to determine whether the patterns found in Los Angeles County are representative of other regions of the country. States have implemented various policies regarding bilingual instruction, have diverse histories and patterns of immigration, meaning that TWDL expansion, while concentrated in handful of states, may be different in different contexts. Future research should examine the growth of programs in other geographies and determine whether the findings here are consistent across the board. If they are being used to attract students, future studies should examine whether program founding is associated with enrollment increases, and for which subgroups of students. For example, the literature cites that TWDL programs may be advertising and marketing themselves to students they feel might be successful, which may lead to exclusionary behaviors and racially/ethnically stratified enrollment.

Appendix A

Figure A1 - *Example District Website with Transfer Information and Forms*

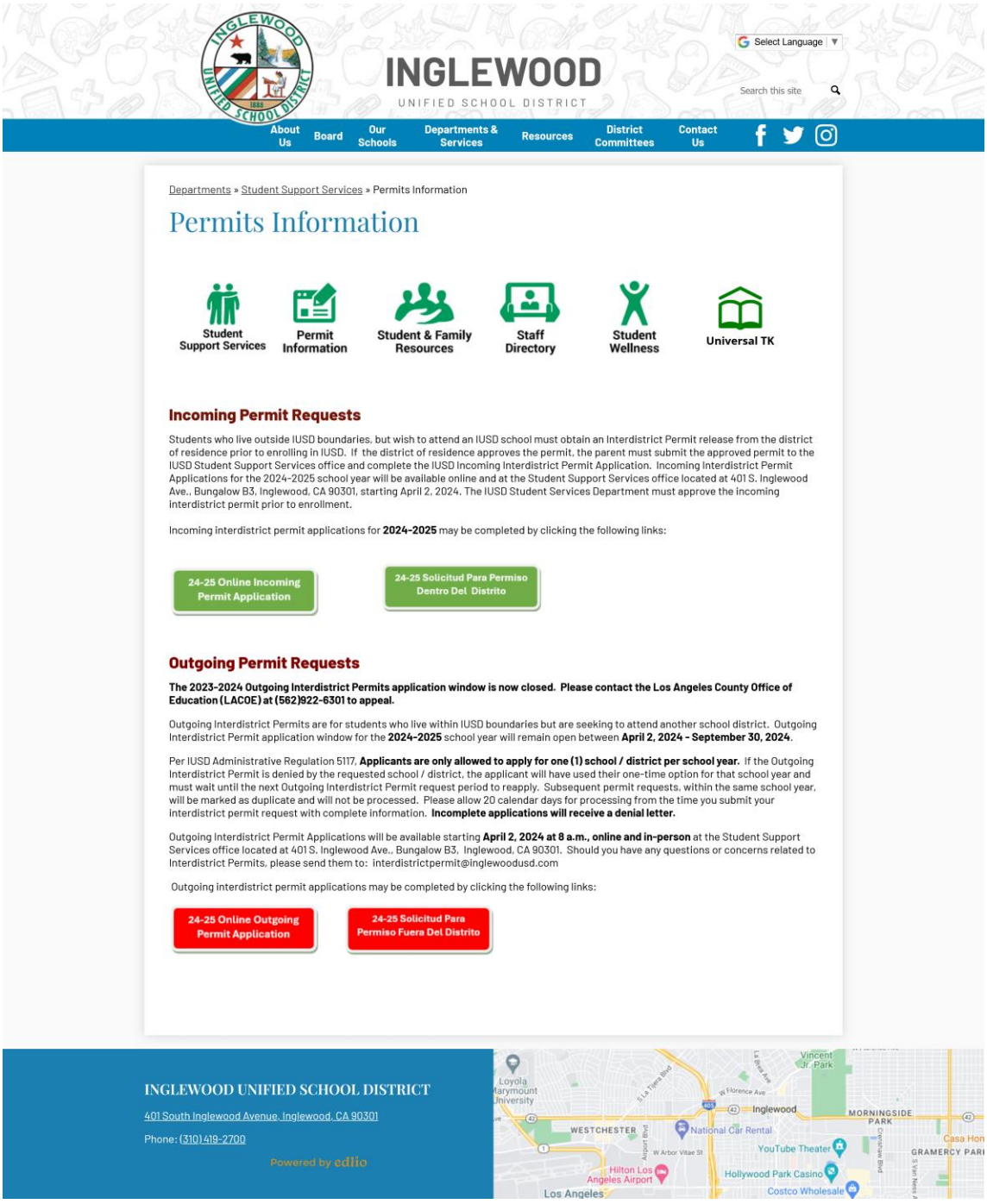


Figure A2 - *TWDL Choice Policies*

Priority	Priority to Siblings	30.8%
	Priority to In-Zone Students	23.1%
	No priority	5.1%
	Linguistic Balance	20.5%
Pre-Enrollment	Language Assessment/interview	30.8%
	Application	48.7%
	Apply during a window	7.7%
	Contact the school directly	7.7%
	Sign a contract	12.8%
	Attend a meeting or tour	23.1%
Mechanisms	Lottery	30.8%
	First come First serve	5.1%
	No information/unclear	7.7%

Note. Data was obtained from individual schools or district websites. Total traditional districts n = 39. Data is based upon what was explicitly mentioned on websites. Districts and schools may have additional rules and stipulations that were not mentioned. No information/unclear means that the website did not contain any information regarding applying, enrollment or priority enrollment of the dual language program.

Appendix B

Data Collection

School latitudes and longitudes

School placement is an important consideration for this study, therefore I gather data on schools' latitude, longitude, zip code, and address. For the 121 missing latitudes in this dataset, I utilize the R package *censusxy* (Prener, 2022) which uses school addresses to find corresponding geo-coordinates. Seven of the remaining nine schools are manually removed as they are not elementary traditional schools. The other two are coded manually using Google maps, which provides latitudes and longitudes when provided with an address.

Attendance Zones

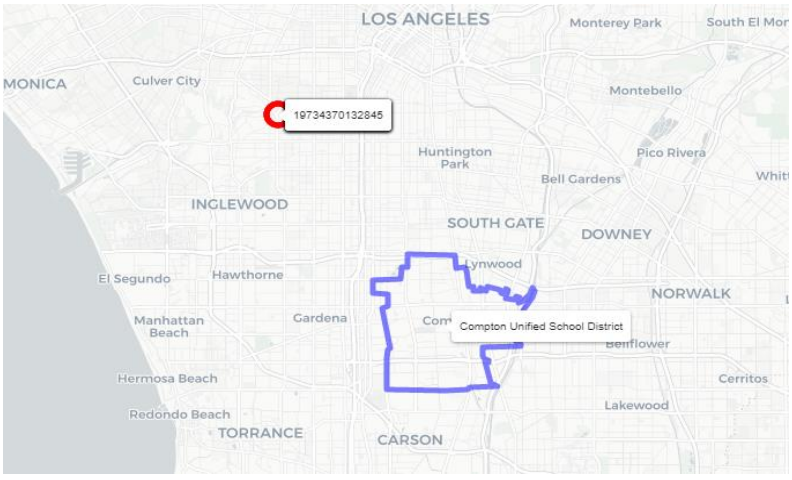
Missing districts in the 2015/2016 vintage include Compton, Culver City, Hacienda La Puente, Inglewood, Los Nietos, Montebello, Newhall, Paramount, and West Covina. Five of these exist in 2013/2014 (Culver City, Montebello, Newhall, Paramount, and West Covina). Inglewood Unified is identified in the 2010/11 vintage and Compton and Hacienda La Puente are identified in the 2009/10 vintage, leaving only Los Nietos omitted from all vintages. The district includes three elementary schools and no two-way schools. They are dropped from the analysis.

I use spatial joining from the sf package in R to geographically assign the 237 schools without an attendance zone to an attendance zone that already exists. Of those, 24 are in areas with overlapping zones. It is not uncommon for schools to serve geographically different areas for different grade levels offered. For those, I examine each school individually and manually choose a single attendance zone that best reflects – either by grade level enrollment or shape – the zone of the

school. A further 20 schools in seven districts have no zone, meaning that they are in areas for which there was no zone available in NCES.

Some schools belong to one district but physically located within the boundary of another district. Figure B1 shows a charter school (red circle) that is formally part of Compton Unified but physically located in the boundary of Los Angeles Unified School District. The school is assigned to LAUSD for the buffer analysis. There are a total of 8 elementary charters part of the Los Angeles County of Education located in Compton, Pasadena, LAUSD and Lynwood. There are a further eight schools that are charter schools operated by a public or charter district located within the confines of another district. These are assigned to the district in which they are physically located for the purposes of the buffer analysis.

Figure B1 - *Normalizing Charter Locations*



Note. School is defined by the small red circle, and its home district is defined by the blue outline. For the buffer analysis, the school is geographically assigned to the district in which it is physically located, not the home district.

Census data

Census data was downloaded directly from the Census API in R using the censusapi package (Recht, 2022) for years 2000, 2010 and 2020. The 1990 census data was downloaded manually from the National Historic Geographic Information Systems (NHGIS) website and read and cleaned in R. Data is interpolated using the package 'areal' (Prenner et al., 2019). Data uses extensive, meaning population count data, to allocate the weighted sum of the population to the larger geographic unit. The population interpolation method assumes that populations in blocks are distributed evenly across the block. A manual check found that some two- and three- attendance zones are a result of blocks being located within nested attendance zones rather than neighboring zones.

Table B2 - *Frequency of Blocks that Fit Within an Attendance Zone*

Num. of Zones	Pct. of Blocks		
	2000	2010	2020
1	91.7%	92.0%	92.3%
2	5.8%	6.0%	5.5%
3	2.4%	2.0%	2.2%

Zillow

Homes are typically reassessed only when they change ownership or are newly constructed, meaning that the assessed value contains some information about neighborhood change since big jumps in home valuations would only occur if a home has been sold or has been built. The ZTRAX file includes years between 2000 and 2015, with the years 2001, 2013, and 2016 - 2019 missing from the file. I remove all assessed values that are in the 99^{th} and $.01^{th}$ percentile for each year and adjust assessed values for inflation to 2022 dollars. The parcel shapefile was obtained from the LA Geohub filtered to keep only residential parcels (single family residences). This leaves 2,162,302 out of the total

2,420,846 residential parcels in Los Angeles County. I then calculate the median home value for each school attendance zone and year.

Neighborhood Change and Gentrification

Prior studies have utilized a combination of measures to construct an index of change. Studies have used racial (R. Freeman, 2000; Mordechay & Ayscue, 2020), income (Brueckner & Rosenthal, 2009; L. Freeman, 2009; Mordechay & Ayscue, 2020; Pearman, 2020), educational (Freeman, 2009; Pearman, 2020), rental and housing price (Pearman, 2020) change or dwelling redevelopment (Brueckner & Rosenthal, 2009) within a geographic unit such as the census tract or school attendance zone. For example, if a tract is in the bottom 40th percentile for housing prices and experiences an increase, it would be considered gentrifying. However, the decennial census variables only include counts by race/ethnicity and household and not income and educational attainment. Furthermore, interviews with participants revealed participants associated gentrification with housing.

Freeman's (2009) metric is composed of 1) median income below the 40th percentile of the metropolitan area, 2) % of housing built in the last 20 years that is below the 40th percentile of the metropolitan area, 3) increase in educational attainment and 4) increase in real housing prices. Los Angeles County is characterized by notoriously low and old housing stock and relatively large gains in educational attainment across all groups. The Urban Displacement Project (2018), which analyzed gentrification and displacement in Los Angeles defines gentrification by census tracts with 1) loss of low-income residents and 3) increases in the Zillow home or rental value in the 90th percentile of the region. In my interviews with district and school leadership, respondents described experiencing gentrification, largely driven by the racial, population and housing-related turnover. They mention the

change in housing such as decrease in school aged children, renovated homes, and decreased household sizes (multiple families or multi-generational families living in one single-family residence, to single generation families) as indicators of neighborhood change. Rosa Navarro, a dual language principal and participant, describes it this way:

> A lot of people started selling their homes, leaving, selling them for a lot of money, generations that had been here…[T]here are a lot of single-family homes and typically you can see when they're being remodeled and what characteristics they take on, and how much they sell for…So … you have newer families coming in. Those families don't have children yet, or we've gotten very few that come here to access the program.

Rosa's description, consistent with others I interviewed, highlights two main, measurable points, one of cost of housing because of flipping or changeover ("how much they sell for") and the resulting decline in the size of households ("those families don't have children yet"). For this reason, I calculate the extent to which a school attendance zone experiences an increase or decrease that is greater than the county and district average on measures of race and ethnicity, housing prices, household size, and the number of school-aged children. In another interview, Santiago Mateo, dual language principal located in a different district and different part of the county, described a similar phenomenon:

> The property prices have just gotten stupid, so what happens is, we have a lot of investors, we're right down the street from the stadium, so there's been a lot of speculation. They all go

> buy up properties and they'll rent them out to one family at an exorbitant amount. In the past, we used to have four families on a property or three families on a property, those days are gone.

Similarly to Rosa, Santiago describes the process of neighborhood change whereby housing and population decline is linked. However, the mark of population turnover also includes the moving in of new residents. In the case of Rosa and Santiago, their school's neighborhood has experienced the housing and population decline, but not the population turnover described by Janet Chang, a dual language principal who describes the phenomenon in this way:

> Then slowly with gentrification, and the gentrification started before I came, I could see it. Slowly, the old, beat-up bungalow houses became multimillion dollar designer buildings. And now people can't enter the neighborhood without three to $5 million for the home. And the families, a lot of people [work in] in business, in TV or film industry, a lot of people in technology, but these are young people with higher income. And, and now the neighborhood is extremely diverse, you see all different ethnicities, and you have these multimillion dollar homes, and in between them, there might be still the older bungalow houses…It became a group of newer, younger parents who sought out things like dual language education for their kids.

Again, we see here identifying gentrification with housing stock turnover ("old, beat-up bungalow houses became multimillion dollar designer buildings"), leading to higher home prices ("three to 5$ million dollars for the home") and a newer set of parents ("a group of newer, younger parents).

Appendix C

Measures of Competition

Like gentrification, little consensus exists in operationalizing and measuring competition for students between both neighborhood and charter schools. Studies attempting to measure the effect of competition have mostly relied on measures of proximity (Betts, 2009; Creed et al., 2021; Imberman, 2011; Jackson, 2012; Mordechay & Ayscue, 2020) or measures of market share (Arsen & Ni, 2012; Imberman, 2011). Jabbar (2015) warns that measures of proximity may be overly simplistic in how schools consider other schools as competitors. It is thus advised to utilize multiple measures or a combination thereof to determine whether findings are consistent across these measures (Jabbar, et al., 2022). Studies using geographic proximity differ on the size of the radius, but most include some combination of 1, 2, 5, and 10 – 20 miles. Imberman (2011) uses regression analysis to determine the "market area" of a charter school, calculates the share of charter enrollment in each radius and finds that the charter effect on a traditional public school's enrollment is negative and statistically significant within 2 miles, after which it ceases to have any effect.

The extent to which a school experiences competition is conceptualized as the presence of other, shared-grade elementary schools nearby and the share of enrollment that a focal school has compared to its neighboring schools. With access to longitudinal data, it is then possible to examine how each school's standing in its local marketplace changes over time. Thus, I define competition as 1) the number of schools within proximity that share at least one overlapping grade with the focal school and 2) the share of enrollment that each focal school has compared to its neighbors. Table 2 highlights this point. Focal school A is located near two other elementary schools. On average, School

A has about 30% of the total enrollment for all schools and has two fewer students than the ideal share of students were all students to be spread evenly across the three schools.

For this study, all schools share at least the third grade, and the vast majority also share 1st and 2nd grade (See Table B2). Since the measure takes the perspective of the focal school, I define measures of competition for each grade level offered by the focal school, such that some grades may have differing numbers of schools that compete. I define 'proximity' in multiple ways using the 1-, 2-, 5- mile radius around the school. For these measures of proximity, I calculate two sets of variables – one set that counts the number and type of schools located within proximity *and* that are part of the district (or a charter district located within the boundary of a public school district), and another set that counts type and number of schools located within distance *but not* within the focal district. The share of overlapping grades is in relation to the focal school, meaning that I only count grades that are in common with the focal school for each buffer. For example, focal School A may offer grades K through 6, while school B in the buffer may only offer grades K through 5, and school C may offer grades 1 through 6. Thus, school A would compete in kindergarten only with school B, and on 6th grade only with school C, but compete with both other schools on grades 1 through 5 (See Table 2 for calculation).

For the first conceptualization of competition – the number of schools that share at least one grade within proximity – I perform a simple count of the number and type (charter only, magnet only, TWDL only, TWDL-charter, TWDL-magnet, and charter-magnet) of school within proximity and at each time point.

For the second conceptualization – the share of enrollment – I calculate the total same-grade enrollment for all schools in each buffer and the share of total enrollment that the focal school has at each time point. I begin with a count of enrollment for all shared grades of all schools in the buffer. From this I calculate the ideal share of enrollment that each school would have if students were equally distributed among all schools within the buffer and calculate the distance that each school has from that ideal at each time point. I examine the percentage change over time, to examine whether schools experience trends of losing or gaining enrollment relative to their neighbors. I calculate these measures of competition for in-district schools.

I then calculate the Herfindahl-Hirschman index (HHI) which measures market concentration and is an important determinant of competition (Rhoades, 1993). It is calculated by squaring the market shares of all 'firms', or in this case shared grades among schools within proximity, in the 'market' or neighborhood, and then summing the squares (Rhoades, 1993), such that:

$$HHI = \sum_{s=1}^{n} (MS_{school})^2$$

Where MS represents the market share of school '*s*' with '*n*' schools in the neighborhood. I only use school enrollment for grades that are shared by all schools in the neighborhood and calculate the HHI for each individual shared grade and for all shared grades in the buffer. The largest possible value of the HHI is 10,000 (100 squared) if a school has total market share (100 percent of students attend the school) and takes on a value approaching zero if many schools share an equal number of students. Thus, a smaller HHI would indicate a high degree of competition in the neighborhood, and

a very large value nearing 10,000 would indicate a lower degree of competition or no competition at all if the value is equal to 10,000.

Appendix D

Table D1 - *Cumulative Percentage Change in Enrollment for Pre-Founding and Never-TWDL Schools, 2002 - 2021*

	LAUSD				All Other Districts in Los Angeles County			
	Never-TWDL	Pre-founding TWDL			Never-TWDL	Pre-founding TWDL		
year	M (SD)	M (SD)	statistic	p.value	M (SD)	M (SD)	statistic	p.value
2002	0.11 (2.57)	-0.12 (1.79)	1.06	0.29	0.18 (3.48)	-0.53 (2.90)	2.02	0.05
2003	-0.15 (2.44)	-0.11 (1.71)	-0.16	0.87	-0.08 (4.72)	-0.57 (2.65)	1.38	0.17
2004	-0.06 (4.06)	-0.61 (1.52)	2.03	0.04	-0.29 (4.34)	-0.80 (3.27)	1.25	0.21
2005	0.03 (10.53)	-0.90 (5.32)	1.14	0.26	-0.54 (3.79)	-1.11 (2.73)	1.68	0.10
2006	-0.70 (7.87)	-1.72 (4.70)	1.65	0.10	-0.86 (3.58)	-1.09 (3.98)	0.50	0.62
2007	-0.40 (7.13)	-1.14 (6.02)	1.09	0.28	-0.89 (3.92)	-1.30 (3.20)	1.04	0.30
2008	-0.55 (6.31)	-1.85 (4.64)	2.37	0.02	0.05 (24.77)	-1.42 (2.86)	1.40	0.16
2009	-0.16 (7.11)	-1.95 (4.13)	3.29	0.00	-0.24 (16.78)	-1.43 (2.59)	1.61	0.11
2010	0.57 (8.89)	-1.97 (3.88)	4.27	0.00	-0.25 (12.95)	-0.72 (5.89)	0.52	0.60
2011	0.63 (8.19)	-2.03 (3.84)	4.81	0.00	-0.25 (10.19)	-0.89 (4.18)	0.99	0.32
2012	0.77 (8.17)	-1.89 (3.61)	4.88	0.00	-0.10 (8.94)	-0.72 (3.37)	1.11	0.27
2013	0.98 (8.35)	-1.92 (3.37)	5.47	0.00	0.10 (8.49)	-0.93 (2.95)	2.02	0.04
2014	1.03 (8.04)	-2.41 (2.22)	7.46	0.00	0.22 (8.34)	-0.97 (2.68)	2.43	0.02
2015	0.89 (7.04)	-2.50 (2.02)	8.35	0.00	0.17 (7.46)	-0.99 (2.55)	2.51	0.01
2016	1.34 (9.70)	-2.50 (1.98)	7.32	0.00	0.06 (6.87)	-1.03 (2.23)	2.52	0.01

2017	1.08 (7.89)	-2.46 (1.91)	8.00	0.00	-0.09 (6.01)	-1.00 (2.14)	2.06	0.04
2018	0.53 (6.45)	-2.63 (1.91)	8.15	0.00	-0.27 (5.57)	-1.43 (1.30)	3.43	0.00
2019	0.23 (5.77)	-3.08 (2.02)	7.73	0.00	-0.33 (5.06)	-1.54 (1.08)	3.92	0.00
2020	0.25 (6.84)	-3.28 (2.30)	5.04	0.00	-0.24 (5.19)	-1.37 (1.20)	2.25	0.05
2021	-0.06 (6.13)	-2.99 (1.99)	3.61	0.01	-0.43 (6.71)	-1.19 (1.25)	1.23	0.26

Note. Calculations are means of the average percentage change over time, representing the school-wide enrollment trend. In any given year, pre-founding TWDL are schools that have yet to establish their program but will in the future. Never-TWDL schools are those that never found a program within the time span. Data for 2001 is at 0 as this is the first year of data availability for enrollment. Data for pre-founding TWDL stops in 2021 as there are no more pre-founding schools in 2022. Test of significance assumes unequal variance.

Table D2 - *Enrollment Trends of Asian American Students in Pre-Founding and Never-TWDL Schools, by District, 2000 - 2022*

	Asian American							
	LAUSD				All Other Districts in Los Angeles County			
	Never-TWDL	Pre-founding TWDL			Never-TWDL	Pre-founding TWDL		
year	M (SD)	M (SD)	statistic	p.value	M (SD)	M (SD)	statistic	p.value
2002	0.69 (24.95)	-1.79 (32.31)	0.75	0.45	1.99 (34.14)	0.78 (18.83)	0.48	0.63
2003	1.04 (23.38)	-2.31 (23.82)	1.30	0.20	1.80 (25.10)	-0.64 (16.03)	1.18	0.24
2004	0.38 (18.90)	-2.34 (21.46)	1.19	0.23	0.63 (23.12)	-1.41 (15.09)	1.05	0.29
2005	-0.28 (15.94)	-3.11 (18.72)	1.44	0.15	1.44 (20.33)	0.40 (14.30)	0.58	0.56
2006	-0.04 (15.82)	-3.14 (18.25)	1.63	0.10	1.68 (18.96)	0.60 (11.52)	0.73	0.47
2007	-0.91 (14.63)	0.08 (21.78)	-0.46	0.65	1.42 (17.60)	1.99 (13.75)	-0.34	0.74
2008	-0.31 (14.41)	-1.28 (18.60)	0.51	0.61	1.64 (16.35)	0.94 (12.98)	0.44	0.66
2009	0.39 (12.95)	-1.24 (18.77)	0.87	0.39	1.76 (15.80)	0.87 (11.77)	0.60	0.55
2010	1.45 (15.77)	-0.43 (18.82)	0.97	0.34	1.84 (14.02)	2.08 (11.13)	-0.17	0.87
2011	1.82 (13.99)	-0.33 (16.61)	1.27	0.21	1.93 (14.00)	0.78 (10.06)	0.86	0.39
2012	2.92 (15.26)	1.10 (18.59)	0.94	0.35	5.76 (72.80)	19.39 (152.32)	-0.71	0.48
2013	3.37 (16.56)	0.85 (16.82)	1.40	0.16	5.49 (67.06)	18.12 (142.85)	-0.69	0.49
2014	2.78 (15.94)	0.10 (15.42)	1.55	0.12	5.21 (62.30)	18.00 (138.26)	-0.70	0.49
2015	1.94 (14.68)	-0.95 (14.01)	1.82	0.07	4.95 (58.00)	18.85 (134.87)	-0.74	0.46
2016	2.28 (18.46)	-1.01 (13.63)	1.99	0.05	4.83 (54.41)	22.17 (135.45)	-0.86	0.39
2017	1.66 (15.21)	-1.64 (13.47)	2.05	0.04	4.46 (51.36)	27.67 (147.88)	-0.91	0.37
2018	1.19 (12.92)	-1.49 (13.61)	1.61	0.11	4.48 (48.44)	30.76 (156.89)	-0.87	0.39
2019	1.37 (12.35)	-2.39 (12.37)	1.84	0.07	4.45 (46.03)	37.17 (164.22)	-0.93	0.36
2020	0.32 (10.47)	-3.95 (8.49)	1.84	0.09	4.44 (44.12)	3.12 (8.86)	0.35	0.74
2021	0.01 (10.26)	-6.00 (4.21)	3.60	0.01	4.26 (42.04)	5.11 (9.51)	-0.18	0.86

Note. Calculations are means of the average percentage change over time, representing the school-wide enrollment trend. In any given year, pre-founding TWDL are schools that have yet to establish their program but will in the future. Never-TWDL schools are those that never found a program within the time span. Data for 2001 is at 0 as this is the first year of data availability for enrollment. Data for pre-founding TWDL stops in 2021 as there are no more pre-founding schools in 2022. Test of significance assumes unequal variance.

Table D3 - *Enrollment Trends of Black/African American Students in Pre-Founding and Never-TWDL Schools, by District, 2000 - 2022*

	Black/African American							
	LAUSD				All Other Districts in Los Angeles County			
	Never-TWDL	Pre-founding TWDL			Never-TWDL	Pre-founding TWDL		
year	M (SD)	M (SD)	statistic	p.value	M (SD)	M (SD)	statistic	p.value
2002	-1.22 (13.76)	1.84 (32.26)	-0.99	0.32	1.37 (21.95)	0.78 (28.61)	0.18	0.86
2003	2.11 (26.49)	-0.27 (21.40)	0.95	0.34	4.45 (38.29)	0.50 (23.10)	1.31	0.19
2004	2.65 (22.58)	1.25 (20.76)	0.60	0.55	2.82 (29.05)	2.96 (27.92)	-0.04	0.97
2005	1.96 (18.83)	0.03 (15.62)	1.07	0.29	1.99 (24.23)	2.06 (22.12)	-0.03	0.98
2006	0.97 (15.05)	-0.89 (13.26)	1.25	0.21	2.04 (23.19)	1.24 (20.55)	0.33	0.74
2007	1.16 (17.80)	1.48 (19.74)	-0.16	0.88	1.60 (20.22)	-0.50 (17.30)	1.00	0.32
2008	0.92 (15.48)	0.45 (14.10)	0.30	0.76	0.90 (18.09)	-0.63 (15.70)	0.80	0.43
2009	4.67 (65.02)	-0.12 (12.65)	1.30	0.19	1.11 (17.72)	-0.84 (13.98)	1.13	0.26
2010	3.60 (46.48)	-0.40 (11.84)	1.48	0.14	1.47 (16.70)	-1.15 (15.09)	1.36	0.18
2011	3.44 (35.42)	0.40 (13.14)	1.38	0.17	1.32 (15.37)	-0.33 (13.42)	0.95	0.34
2012	2.02 (16.67)	1.21 (11.80)	0.57	0.57	1.69 (14.47)	-0.80 (13.24)	1.42	0.16
2013	1.57 (15.12)	1.15 (11.92)	0.31	0.76	1.67 (13.57)	0.71 (14.26)	0.51	0.61
2014	2.44 (15.84)	1.12 (11.09)	0.97	0.33	2.04 (15.01)	0.93 (13.84)	0.57	0.57
2015	1.90 (14.88)	0.46 (10.78)	1.10	0.27	1.81 (13.17)	1.41 (11.68)	0.23	0.82
2016	1.64 (14.81)	0.43 (10.42)	0.94	0.35	1.56 (11.99)	1.41 (12.07)	0.08	0.93
2017	1.88 (14.09)	0.34 (9.88)	1.22	0.22	1.44 (11.51)	1.46 (11.53)	-0.01	0.99
2018	2.00 (15.10)	0.03 (8.49)	1.61	0.11	1.42 (11.06)	2.06 (11.40)	-0.28	0.78
2019	2.87 (13.56)	0.50 (8.94)	1.51	0.14	1.44 (10.55)	1.16 (11.30)	0.11	0.91
2020	1.95 (13.05)	-2.75 (9.08)	1.87	0.08	1.89 (11.87)	1.54 (3.56)	0.24	0.82
2021	1.68 (11.92)	-4.92 (3.43)	4.64	0.00	1.73 (10.87)	1.49 (4.60)	0.11	0.92

Note. Calculations are means of the average percentage change over time, representing the school-wide enrollment trend. In any given year, pre-founding TWDL are schools that have yet to establish their program but will in the future. Never-TWDL schools are those that never found a program within the time span. Data for 2001 is at 0 as this is the first year of data availability for enrollment. Data for pre-founding TWDL stops in 2021 as there are no more pre-founding schools in 2022. Test of significance assumes unequal variance.

Table D4 - *Enrollment Trends of Hispanic/Latinx Students in Pre-Founding and Never-TWDL Schools, by District, 2000 - 2022*

	Hispanic/Latinx							
	LAUSD				All Other Districts in Los Angeles County			
	Never-TWDL	Pre-founding TWDL			Never-TWDL	Pre-founding TWDL		
year	M (SD)	M (SD)	statistic	p.value	M (SD)	M (SD)	statistic	p.value
2002	1.11 (5.17)	0.25 (2.30)	2.35	0.02	1.58 (6.35)	0.76 (10.17)	0.70	0.48
2003	0.57 (4.02)	0.19 (2.38)	1.17	0.24	1.76 (7.03)	0.44 (7.94)	1.42	0.16
2004	1.18 (9.01)	-0.27 (2.42)	2.60	0.01	1.64 (7.17)	1.10 (8.60)	0.53	0.60
2005	1.02 (13.51)	-0.51 (5.82)	1.64	0.10	1.55 (7.02)	0.45 (7.47)	1.26	0.21
2006	0.16 (10.11)	-1.31 (5.14)	2.01	0.05	1.10 (6.90)	0.72 (7.88)	0.42	0.68
2007	0.44 (9.15)	-0.84 (6.09)	1.70	0.09	1.36 (8.69)	0.31 (7.06)	1.21	0.23
2008	0.23 (10.07)	-1.57 (4.87)	2.54	0.01	1.25 (10.86)	0.03 (6.45)	1.44	0.15
2009	0.80 (13.64)	-1.63 (4.35)	2.91	0.00	0.96 (8.37)	-0.13 (5.83)	1.48	0.14
2010	2.52 (16.55)	-1.58 (4.21)	4.26	0.00	3.12 (16.11)	1.08 (7.27)	1.86	0.06
2011	2.39 (14.56)	-1.79 (3.89)	4.99	0.00	2.85 (14.28)	0.85 (6.08)	2.14	0.03
2012	2.10 (13.62)	-1.82 (3.76)	4.97	0.00	7.19 (65.82)	1.36 (5.29)	2.10	0.04
2013	2.14 (12.14)	-1.75 (3.54)	5.54	0.00	8.25 (65.11)	1.18 (4.95)	2.58	0.01
2014	2.22 (11.37)	-2.14 (2.44)	6.99	0.00	7.90 (60.58)	1.06 (4.75)	2.68	0.01
2015	2.22 (10.50)	-2.26 (2.24)	7.84	0.00	7.54 (56.62)	1.04 (4.65)	2.71	0.01
2016	3.15 (17.29)	-2.27 (2.23)	6.07	0.00	6.96 (53.04)	0.47 (2.93)	2.94	0.00
2017	2.73 (12.86)	-2.18 (2.10)	7.22	0.00	6.45 (49.93)	0.39 (2.66)	2.90	0.00
2018	2.13 (10.68)	-2.43 (2.00)	7.87	0.00	5.88 (47.12)	-0.18 (2.27)	3.07	0.00
2019	1.63 (9.37)	-2.89 (2.01)	8.05	0.00	5.42 (44.72)	-0.16 (2.34)	2.94	0.00
2020	1.30 (7.58)	-3.05 (2.38)	5.90	0.00	5.26 (42.64)	-0.72 (1.43)	3.27	0.00

2021	0.99 (7.32)	-2.68 (2.09)	4.24	0.00	4.89 (40.90)	-0.43 (1.37)	2.98	0.00

Note. Calculations are means of the average percentage change over time, representing the school-wide enrollment trend. In any given year, pre-founding TWDL are schools that have yet to establish their program but will in the future. Never-TWDL schools are those that never found a program within the time span. Data for 2001 is at 0 as this is the first year of data availability for enrollment. Data for pre-founding TWDL stops in 2021 as there are no more pre-founding schools in 2022. Test of significance assumes unequal variance.

Table D5 - *Enrollment Trends of White Students in Pre-Founding and Never-TWDL Schools, by District, 2000 - 2022*

	White							
	LAUSD				All Other Districts in Los Angeles County			
	Never-TWDL	Pre-founding TWDL			Never-TWDL	Pre-founding TWDL		
year	M (SD)	M (SD)	statistic	p.value	M (SD)	M (SD)	statistic	p.value
2002	-1.90 (24.49)	1.03 (31.82)	-0.90	0.37	-1.85 (23.96)	-2.00 (14.71)	0.08	0.94
2003	-1.14 (20.82)	2.12 (27.97)	-1.14	0.26	-2.20 (19.52)	0.99 (20.96)	-1.29	0.20
2004	-1.64 (18.73)	0.53 (23.83)	-0.88	0.38	-2.79 (17.74)	-1.61 (14.54)	-0.66	0.51
2005	-1.32 (18.94)	-0.44 (20.93)	-0.40	0.69	-3.12 (16.21)	-2.55 (13.01)	-0.36	0.72
2006	-1.96 (16.61)	-0.32 (17.89)	-0.87	0.39	-2.99 (17.30)	-2.83 (12.25)	-0.11	0.92
2007	-0.62 (17.54)	4.11 (30.37)	-1.60	0.11	-2.98 (15.78)	-3.16 (11.19)	0.13	0.90
2008	-0.51 (15.95)	2.02 (25.64)	-0.99	0.32	-2.80 (25.20)	-3.45 (9.89)	0.43	0.67
2009	0.06 (17.29)	2.63 (22.40)	-1.12	0.26	-2.73 (19.25)	-3.64 (8.20)	0.75	0.45
2010	1.94 (28.54)	1.35 (19.31)	0.25	0.80	-1.93 (16.99)	-3.18 (11.13)	0.83	0.41
2011	0.93 (21.80)	1.85 (18.60)	-0.45	0.66	-1.94 (15.45)	-2.89 (9.23)	0.74	0.46
2012	7.63 (25.42)	16.49 (36.88)	-2.37	0.02	-1.61 (14.22)	-2.65 (9.62)	0.78	0.43
2013	4.79 (21.84)	9.86 (30.97)	-1.62	0.11	-0.62 (26.10)	-2.35 (8.82)	1.12	0.26
2014	5.57 (22.16)	8.56 (26.52)	-1.05	0.30	-0.94 (19.93)	-2.64 (8.20)	1.26	0.21
2015	11.20 (31.84)	17.12 (30.27)	-1.73	0.09	-0.81 (16.38)	-2.22 (7.75)	1.13	0.26
2016	12.79 (36.91)	19.07 (29.20)	-1.81	0.07	-0.81 (14.23)	-3.51 (7.02)	2.28	0.03
2017	12.58 (33.73)	18.85 (27.45)	-1.87	0.06	-0.66 (13.17)	-3.32 (6.15)	2.24	0.03
2018	11.94 (33.29)	18.21 (26.22)	-1.84	0.07	-0.70 (12.42)	-3.47 (5.97)	2.21	0.03
2019	11.62 (29.58)	15.44 (21.78)	-1.02	0.31	-0.85 (11.72)	-3.61 (5.33)	2.23	0.03
2020	10.81 (27.63)	14.09 (17.96)	-0.66	0.52	-0.74 (11.07)	-1.20 (4.62)	0.25	0.81
2021	9.54 (25.87)	5.96 (8.09)	1.08	0.31	-0.40 (17.77)	-1.74 (4.34)	0.65	0.55

Note. Calculations are means of the average percentage change over time, representing the school-wide enrollment trend. In any given year, pre-founding TWDL are schools that have yet to establish their program but will in the future. Never-TWDL schools are those that never found a program within the time span. Data for 2001 is at 0 as this is the first year of data availability for enrollment. Data for pre-founding TWDL stops in 2021 as there are no more pre-founding schools in 2022. Test of significance assumes unequal variance.

Table D6 - *Charter School Percent Change for Pre-Founding TWDL and Never-TWDL at 5-Miles, by District, 2000 - 2022*

	Charters							
	LAUSD				All Other Districts in Los Angeles County			
	Never-TWDL	Pre-founding TWDL			Never-TWDL	Pre-founding TWDL		
year	M (SD)	M (SD)	statistic	p.value	M (SD)	M (SD)	statistic	p.value
2002	0.54 (1.65)	0.16 (0.77)	3.23	0.00	0.00 (0.00)	0.00 (0.00)	NaN	NaN
2003	2.22 (6.72)	2.57 (7.27)	-0.46	0.65	0.00 (0.00)	0.00 (0.00)	NaN	NaN
2004	5.73 (10.90)	7.20 (11.50)	-1.18	0.24	0.41 (3.18)	0.63 (3.95)	-0.48	0.63
2005	7.97 (11.63)	11.88 (12.35)	-2.94	0.00	0.33 (2.53)	0.48 (3.09)	-0.44	0.66
2006	9.73 (12.46)	12.27 (12.57)	-1.88	0.06	0.27 (2.10)	0.41 (2.59)	-0.46	0.64
2007	10.36 (11.04)	13.52 (10.44)	-2.78	0.01	0.54 (2.73)	0.89 (3.48)	-0.88	0.38
2008	9.97 (10.44)	13.80 (11.23)	-3.21	0.00	0.70 (2.91)	1.27 (3.80)	-1.28	0.20
2009	10.07 (10.42)	13.62 (10.64)	-3.11	0.00	0.63 (2.60)	1.13 (3.37)	-1.25	0.21
2010	10.02 (9.58)	13.91 (9.74)	-3.74	0.00	1.05 (4.14)	1.43 (4.52)	-0.66	0.51
2011	10.07 (9.37)	13.79 (9.66)	-3.68	0.00	1.01 (3.99)	1.38 (4.41)	-0.67	0.51
2012	11.02 (9.29)	15.03 (9.63)	-3.89	0.00	0.89 (3.57)	1.35 (4.16)	-0.86	0.39
2013	10.01 (8.67)	13.82 (8.98)	-3.98	0.00	1.10 (4.16)	1.41 (3.99)	-0.59	0.56
2014	9.84 (8.50)	14.37 (8.87)	-4.62	0.00	0.96 (3.49)	1.43 (3.84)	-0.88	0.38
2015	9.77 (8.04)	13.76 (8.17)	-4.38	0.00	0.88 (3.12)	1.32 (3.65)	-0.86	0.39
2016	8.79 (7.38)	12.81 (7.52)	-4.77	0.00	0.23 (3.51)	0.36 (3.11)	-0.27	0.79
2017	8.21 (6.93)	12.32 (7.02)	-5.03	0.00	0.22 (3.24)	0.03 (2.89)	0.36	0.72
2018	7.65 (6.52)	11.56 (6.85)	-4.65	0.00	0.57 (3.35)	0.15 (3.01)	0.70	0.49
2019	7.63 (6.21)	12.26 (5.93)	-4.70	0.00	0.49 (3.51)	-0.06 (2.84)	0.89	0.38

2020	7.17 (5.87)	11.98 (5.39)	-3.27	0.01	0.71 (3.90)	-0.89 (2.36)	1.77	0.12
2021	7.16 (5.69)	11.65 (4.79)	-2.45	0.05	0.58 (3.43)	-1.18 (2.63)	1.48	0.21

Note. Calculations are means of the average percentage change over time, representing competition trends at the 5-mile radius. In any given year, pre-founding TWDL are schools that have yet to establish their program but will in the future. Never-TWDL schools are those that never found a program within the time span. Data for 2001 is at 0 as this is the first year of data availability for competition figures. Data for pre-founding TWDL stops in 2021 as there are no more pre-founding schools in 2022.

Table D7 – *Enrollment Share Percent Change for Pre-Founding TWDL and Never-TWDL at 5-Miles, by District, 2000 - 2022*

	Enrollment Share							
	LAUSD				All Other Districts in Los Angeles County			
	Never-TWDL	Pre-founding TWDL			Never-TWDL	Pre-founding TWDL		
year	M (SD)	M (SD)	statistic	p.value	M (SD)	M (SD)	statistic	p.value
2002	0.15 (3.41)	0.03 (1.97)	0.43	0.67	0.23 (3.69)	0.37 (6.37)	-0.19	0.85
2003	-0.05 (2.68)	0.15 (1.96)	-0.82	0.41	0.15 (5.23)	0.33 (4.48)	-0.32	0.75
2004	0.33 (3.67)	-0.11 (1.75)	1.68	0.09	0.02 (4.01)	0.59 (6.97)	-0.71	0.48
2005	0.48 (7.42)	-0.09 (3.28)	1.11	0.27	0.06 (3.47)	0.32 (5.04)	-0.46	0.65
2006	0.48 (6.57)	-0.23 (3.15)	1.52	0.13	0.07 (3.01)	0.53 (4.90)	-0.83	0.41
2007	0.98 (7.25)	0.38 (5.43)	0.94	0.35	0.27 (3.42)	0.55 (4.18)	-0.56	0.57
2008	1.06 (6.44)	-0.00 (4.46)	1.96	0.05	1.26 (23.71)	0.32 (3.70)	0.90	0.37
2009	1.22 (6.70)	-0.19 (3.95)	2.73	0.01	1.02 (16.12)	0.28 (3.44)	0.97	0.33
2010	1.68 (7.75)	-0.38 (3.51)	3.91	0.00	0.96 (12.43)	1.21 (7.08)	-0.25	0.80
2011	2.10 (12.93)	-0.33 (5.72)	2.86	0.00	0.86 (9.85)	0.99 (5.78)	-0.16	0.87
2012	1.55 (7.84)	-0.51 (3.63)	3.87	0.00	1.58 (17.45)	1.07 (5.15)	0.53	0.60
2013	1.57 (7.80)	-0.50 (3.27)	4.11	0.00	1.59 (15.65)	0.71 (4.74)	1.01	0.32
2014	1.92 (10.91)	-1.15 (2.20)	5.18	0.00	1.61 (14.05)	0.68 (4.46)	1.13	0.26
2015	1.78 (9.06)	-1.29 (2.09)	6.15	0.00	1.51 (12.59)	0.63 (4.17)	1.14	0.26
2016	2.20 (11.44)	-1.23 (1.93)	5.68	0.00	1.42 (11.98)	0.67 (4.22)	0.95	0.35
2017	1.86 (8.81)	-1.29 (1.76)	6.59	0.00	1.21 (10.54)	1.02 (4.48)	0.22	0.83
2018	1.58 (7.35)	-1.30 (1.79)	6.85	0.00	1.06 (9.58)	0.86 (4.40)	0.22	0.83
2019	1.42 (6.69)	-1.62 (1.96)	6.69	0.00	0.99 (8.77)	0.82 (4.57)	0.17	0.87
2020	1.46 (9.08)	-1.34 (1.83)	4.22	0.00	0.97 (8.13)	0.34 (1.63)	0.91	0.39

2021	1.60 (7.98)	-1.09 (1.45)	3.99	0.00	0.83 (7.58)	0.64 (1.70)	0.22	0.83

Note. Calculations are means of the average percentage change over time, representing competition trends at the 5-mile radius. In any given year, pre-founding TWDL are schools that have yet to establish their program but will in the future. Never-TWDL schools are those that never found a program within the time span. Data for 2001 is at 0 as this is the first year of data availability for competition figures. Data for pre-founding TWDL stops in 2021 as there are no more pre-founding schools in 2022.

Table D8 – *TWDL School Percent Change for Pre-Founding TWDL and Never-TWDL at 5-Miles, by District, 2000 - 2022*

	TWDL Schools							
	LAUSD				All Other Districts in Los Angeles County			
	Never-TWDL	Pre-founding TWDL			Never-TWDL	Pre-founding TWDL		
year	M (SD)	M (SD)	statistic	p.value	M (SD)	M (SD)	statistic	p.value
2002	5.30 (12.47)	6.05 (12.93)	-0.55	0.59	0.00 (0.00)	0.00 (0.00)	NaN	NaN
2003	5.80 (11.18)	6.16 (11.39)	-0.29	0.77	0.11 (0.96)	0.00 (0.00)	2.85	0.00
2004	5.07 (9.03)	5.26 (9.18)	-0.19	0.85	0.08 (0.71)	0.00 (0.00)	2.84	0.00
2005	7.69 (10.18)	11.16 (11.91)	-2.77	0.01	0.07 (0.57)	0.00 (0.00)	2.84	0.00
2006	12.63 (15.06)	18.23 (15.78)	-3.33	0.00	0.05 (0.47)	0.00 (0.00)	2.84	0.00
2007	12.36 (14.32)	17.77 (14.52)	-3.48	0.00	0.05 (0.40)	0.00 (0.00)	2.84	0.00
2008	11.88 (13.60)	17.29 (13.21)	-3.76	0.00	0.04 (0.35)	0.00 (0.00)	2.84	0.00
2009	10.64 (12.30)	15.19 (11.98)	-3.49	0.00	0.04 (0.32)	0.00 (0.00)	2.84	0.00
2010	9.35 (10.88)	13.46 (10.81)	-3.54	0.00	0.09 (0.77)	0.00 (0.00)	2.69	0.01
2011	7.98 (9.73)	11.78 (9.92)	-3.65	0.00	0.70 (3.27)	0.92 (3.54)	-0.49	0.62
2012	10.10 (10.24)	14.68 (10.97)	-3.92	0.00	0.68 (3.19)	0.64 (2.68)	0.12	0.91
2013	9.38 (9.48)	13.42 (9.98)	-3.81	0.00	0.63 (2.95)	0.61 (2.51)	0.06	0.95
2014	11.40 (9.68)	14.45 (9.21)	-2.93	0.00	0.96 (3.66)	0.49 (2.63)	1.25	0.21
2015	10.33 (8.78)	13.61 (8.73)	-3.35	0.00	1.14 (4.17)	0.38 (2.03)	2.35	0.02
2016	9.79 (8.26)	12.91 (8.17)	-3.38	0.00	1.40 (4.15)	0.41 (2.04)	2.88	0.01
2017	10.19 (7.90)	13.48 (7.77)	-3.62	0.00	1.74 (4.00)	0.95 (2.58)	1.67	0.10
2018	10.86 (7.70)	14.13 (7.39)	-3.55	0.00	1.85 (3.91)	1.23 (2.81)	1.09	0.28
2019	16.98 (18.85)	17.48 (5.32)	-0.39	0.70	1.93 (3.89)	1.20 (2.78)	1.20	0.24
2020	17.76 (14.40)	19.12 (2.87)	-1.30	0.20	2.58 (4.47)	0.45 (1.18)	4.41	0.00

2021	16.60 (11.56)	18.45 (1.89)	-2.03	0.06	2.58 (4.13)	0.59 (1.32)	3.25	0.02

Note. Calculations are means of the average percentage change over time, representing competition trends at the 5-mile radius. In any given year, pre-founding TWDL are schools that have yet to establish their program but will in the future. Never-TWDL schools are those that never found a program within the time span. Data for 2001 is at 0 as this is the first year of data availability for competition figures. Data for pre-founding TWDL stops in 2021 as there are no more pre-founding schools in 2022.

Table D9 - *Charter School Percent Change for Pre-Founding TWDL and Never-TWDL at 1-Miles, by District, 2000 - 2022*

	Charters							
	LAUSD				All Other Districts in Los Angeles County			
	Never-TWDL	Pre-founding TWDL			Never-TWDL	Pre-founding TWDL		
year	M (SD)	M (SD)	statistic	p.value	M (SD)	M (SD)	statistic	p.value
2002	0.00 (0.00)	0.00 (0.00)	NaN	NaN	0.00 (0.00)	0.00 (0.00)	NaN	NaN
2003	0.00 (0.00)	0.00 (0.00)	NaN	NaN	0.00 (0.00)	0.00 (0.00)	NaN	NaN
2004	0.40 (3.72)	0.22 (2.34)	0.59	0.56	0.04 (1.01)	0.00 (0.00)	1.00	0.32
2005	0.44 (3.34)	0.88 (4.90)	-0.88	0.38	0.03 (0.81)	0.00 (0.00)	1.00	0.32
2006	0.53 (3.79)	1.00 (4.53)	-0.99	0.32	-0.03 (1.16)	0.00 (0.00)	-0.58	0.56
2007	0.61 (3.88)	1.55 (5.35)	-1.74	0.08	0.00 (1.15)	0.00 (0.00)	0.00	1.00
2008	0.50 (5.07)	1.72 (6.09)	-1.93	0.06	0.00 (1.01)	0.00 (0.00)	0.00	1.00
2009	0.80 (5.03)	1.71 (5.60)	-1.54	0.13	0.00 (0.90)	0.00 (0.00)	0.00	1.00
2010	1.16 (5.82)	1.66 (5.30)	-0.86	0.39	0.02 (0.93)	0.00 (0.00)	0.45	0.66
2011	1.21 (4.79)	1.53 (4.79)	-0.64	0.52	0.02 (1.12)	0.13 (1.09)	-0.84	0.41
2012	0.90 (4.95)	1.87 (6.71)	-1.41	0.16	0.01 (1.03)	0.13 (1.03)	-0.85	0.40
2013	1.12 (5.12)	1.84 (5.71)	-1.21	0.23	0.03 (1.00)	0.12 (0.97)	-0.74	0.46
2014	1.02 (4.57)	2.08 (6.19)	-1.61	0.11	0.02 (0.93)	0.12 (0.94)	-0.76	0.45
2015	1.28 (4.61)	2.23 (5.84)	-1.51	0.13	0.00 (0.95)	0.13 (0.92)	-0.95	0.35
2016	1.30 (4.72)	2.12 (5.56)	-1.35	0.18	-0.14 (1.45)	-0.14 (0.92)	-0.01	0.99
2017	1.24 (4.27)	2.08 (5.23)	-1.41	0.16	-0.13 (1.31)	-0.17 (1.01)	0.26	0.79
2018	1.10 (4.05)	1.68 (4.71)	-1.02	0.31	-0.12 (1.21)	0.00 (1.54)	-0.38	0.70
2019	1.30 (4.35)	2.40 (5.17)	-1.30	0.20	-0.12 (1.17)	0.00 (1.62)	-0.35	0.73
2020	1.09 (4.08)	2.86 (5.67)	-1.16	0.27	-0.14 (1.30)	0.00 (0.00)	-2.69	0.01

2021	1.33 (3.91)	2.81 (4.28)	-0.91	0.40	-0.15 (1.13)	0.00 (0.00)	-3.22	0.00

Note. Calculations are means of the average percentage change over time, representing competition trends at the 1-mile radius. In any given year, pre-founding TWDL are schools that have yet to establish their program but will in the future. Never-TWDL schools are those that never found a program within the time span. Data for 2001 is at 0 as this is the first year of data availability for competition figures. Data for pre-founding TWDL stops in 2021 as there are no more pre-founding schools in 2022.

Table D10 – *Enrollment Share Percent Change for Pre-Founding TWDL and Never-TWDL at 1-Miles, by District, 2000 - 2022*

	Enrollment Share							
	LAUSD				All Other Districts in Los Angeles County			
	Never-TWDL	Pre-founding TWDL			Never-TWDL	Pre-founding TWDL		
year	M (SD)	M (SD)	statistic	p.value	M (SD)	M (SD)	statistic	p.value
2002	-0.16 (3.20)	-0.23 (1.60)	0.32	0.75	0.09 (2.57)	0.42 (4.62)	-0.64	0.53
2003	-0.19 (3.10)	-0.22 (1.50)	0.13	0.89	0.17 (3.62)	0.42 (2.39)	-0.80	0.42
2004	0.06 (3.18)	0.00 (2.18)	0.22	0.83	0.20 (3.36)	0.24 (2.23)	-0.14	0.89
2005	2.46 (39.18)	0.01 (4.09)	1.10	0.27	0.18 (2.95)	0.16 (2.22)	0.08	0.94
2006	1.67 (26.01)	-0.03 (3.88)	1.15	0.25	0.12 (2.54)	0.51 (3.13)	-1.06	0.29
2007	1.34 (19.57)	0.59 (5.21)	0.64	0.52	0.23 (2.53)	0.51 (2.80)	-0.86	0.39
2008	1.22 (15.74)	0.21 (4.08)	1.08	0.28	1.14 (20.98)	0.44 (2.60)	0.79	0.43
2009	2.54 (20.13)	0.03 (3.71)	2.22	0.03	0.94 (14.29)	0.44 (2.29)	0.79	0.43
2010	2.37 (15.86)	0.04 (3.54)	2.56	0.01	0.96 (11.05)	1.14 (5.79)	-0.21	0.83
2011	2.06 (12.98)	0.12 (5.83)	2.25	0.02	0.90 (8.65)	1.13 (4.24)	-0.37	0.71
2012	1.91 (11.33)	0.07 (4.53)	2.54	0.01	1.05 (8.13)	1.11 (3.52)	-0.11	0.91
2013	1.79 (9.87)	-0.23 (3.79)	3.27	0.00	1.12 (7.66)	0.90 (3.04)	0.44	0.66
2014	1.63 (8.83)	-0.87 (2.38)	4.95	0.00	1.84 (16.71)	0.86 (2.69)	1.27	0.21
2015	1.42 (7.84)	-1.04 (2.23)	5.44	0.00	1.67 (13.76)	0.77 (2.50)	1.37	0.17
2016	1.46 (7.25)	-1.13 (2.14)	6.13	0.00	1.87 (20.86)	0.85 (2.42)	1.10	0.27
2017	1.29 (6.66)	-1.02 (2.20)	5.68	0.00	1.63 (18.57)	0.93 (2.43)	0.81	0.42
2018	1.01 (5.82)	-1.01 (2.16)	5.33	0.00	1.51 (17.12)	0.54 (1.77)	1.25	0.21
2019	0.86 (5.48)	-1.33 (2.33)	4.80	0.00	0.81 (5.44)	0.41 (1.58)	1.00	0.32
2020	1.16 (8.38)	-0.76 (2.81)	2.24	0.04	0.84 (5.18)	0.34 (1.56)	0.79	0.46

2021	1.16 (7.32)	-1.03 (2.23)	2.38	0.04	0.85 (6.58)	0.81 (1.30)	0.05	0.96

Note. Calculations are means of the average percentage change over time, representing competition trends at the 1-mile radius. In any given year, pre-founding TWDL are schools that have yet to establish their program but will in the future. Never-TWDL schools are those that never found a program within the time span. Data for 2001 is at 0 as this is the first year of data availability for competition figures. Data for pre-founding TWDL stops in 2021 as there are no more pre-founding schools in 2022.

Table D11 - *TWDL School Percent Change for Pre-Founding TWDL and Never-TWDL at 1-Miles, by District, 2000 - 2022*

	TWDL Schools							
	LAUSD				All Other Districts in Los Angeles County			
	Never-TWDL	Pre-founding TWDL			Never-TWDL	Pre-founding TWDL		
year	M (SD)	M (SD)	statistic	p.value	M (SD)	M (SD)	statistic	p.value
2002	0.00 (0.00)	0.00 (0.00)	NaN	NaN	0.00 (0.00)	0.00 (0.00)	NaN	NaN
2003	0.00 (0.00)	0.00 (0.00)	NaN	NaN	0.08 (1.52)	0.00 (0.00)	1.34	0.18
2004	0.00 (0.00)	0.00 (0.00)	NaN	NaN	0.06 (1.13)	0.00 (0.00)	1.34	0.18
2005	0.06 (1.12)	0.35 (2.64)	-1.13	0.26	0.05 (0.90)	0.00 (0.00)	1.34	0.18
2006	0.30 (2.82)	0.57 (3.04)	-0.82	0.41	0.04 (0.75)	0.00 (0.00)	1.34	0.18
2007	0.33 (2.59)	0.98 (5.46)	-1.22	0.22	0.03 (0.64)	0.00 (0.00)	1.34	0.18
2008	0.36 (2.41)	1.24 (5.34)	-1.71	0.09	0.03 (0.56)	0.00 (0.00)	1.34	0.18
2009	0.31 (2.12)	1.02 (4.27)	-1.71	0.09	0.03 (0.50)	0.00 (0.00)	1.34	0.18
2010	0.45 (3.29)	1.04 (3.78)	-1.52	0.13	0.03 (0.46)	0.00 (0.00)	1.34	0.18
2011	0.40 (2.59)	1.02 (3.86)	-1.64	0.10	0.05 (0.67)	0.00 (0.00)	1.95	0.05
2012	0.73 (4.01)	1.06 (3.61)	-0.82	0.41	0.08 (0.78)	0.00 (0.00)	2.41	0.02
2013	1.04 (5.03)	1.02 (3.30)	0.04	0.97	0.07 (0.72)	0.00 (0.00)	2.41	0.02
2014	1.53 (5.51)	1.61 (3.93)	-0.17	0.87	0.07 (0.67)	0.00 (0.00)	2.41	0.02
2015	1.40 (4.70)	1.64 (3.71)	-0.54	0.59	0.08 (0.73)	0.00 (0.00)	2.80	0.01
2016	1.31 (4.35)	1.73 (3.88)	-0.93	0.35	0.08 (0.68)	0.00 (0.00)	2.80	0.01
2017	1.48 (4.22)	1.69 (3.68)	-0.46	0.65	0.07 (0.64)	0.00 (0.00)	2.80	0.01
2018	1.62 (4.16)	1.99 (3.64)	-0.79	0.43	0.07 (0.61)	0.00 (0.00)	2.80	0.01
2019	2.35 (4.97)	3.77 (4.84)	-1.77	0.08	0.14 (1.75)	0.00 (0.00)	1.99	0.05
2020	3.25 (5.89)	4.37 (4.87)	-0.84	0.42	0.17 (1.84)	0.00 (0.00)	2.30	0.02

2021	3.15 (5.46)	4.04 (5.82)	-0.40	0.70	0.17 (1.59)	0.00 (0.00)	2.59	0.01

Note. Calculations are means of the average percentage change over time, representing competition trends at the 1-mile radius. In any given year, pre-founding TWDL are schools that have yet to establish their program but will in the future. Never-TWDL schools are those that never found a program within the time span. Data for 2001 is at 0 as this is the first year of data availability for competition figures. Data for pre-founding TWDL stops in 2021 as there are no more pre-founding schools in 2022.

Table D12 - *Charter School Percent Change for Pre-Founding TWDL and Never-TWDL at 2-Miles, by District, 2000 - 2022*

	Charters							
	LAUSD				All Other Districts in Los Angeles County			
	Never-TWDL	Pre-founding TWDL			Never-TWDL	Pre-founding TWDL		
year	M (SD)	M (SD)	statistic	p.value	M (SD)	M (SD)	statistic	p.value
2002	1.13 (6.15)	1.28 (7.94)	-0.19	0.85	0.00 (0.00)	0.00 (0.00)	NaN	NaN
2003	1.07 (5.19)	0.87 (5.34)	0.35	0.73	0.00 (0.00)	0.00 (0.00)	NaN	NaN
2004	2.55 (8.49)	3.07 (9.49)	-0.52	0.61	0.16 (2.02)	0.32 (2.81)	-0.46	0.64
2005	3.57 (9.60)	4.44 (11.26)	-0.74	0.46	0.13 (1.61)	0.24 (2.20)	-0.44	0.66
2006	4.23 (9.83)	6.03 (11.22)	-1.53	0.13	0.05 (1.64)	0.20 (1.84)	-0.70	0.49
2007	4.87 (10.31)	5.76 (10.35)	-0.81	0.42	0.19 (1.99)	0.18 (1.60)	0.03	0.97
2008	4.65 (9.79)	6.67 (10.67)	-1.79	0.08	0.18 (1.81)	0.32 (1.98)	-0.57	0.57
2009	5.27 (9.59)	6.72 (10.09)	-1.35	0.18	0.16 (1.62)	0.28 (1.76)	-0.56	0.58
2010	5.34 (8.90)	6.92 (9.32)	-1.59	0.11	0.33 (2.30)	0.36 (2.14)	-0.12	0.91
2011	5.85 (8.87)	8.05 (9.48)	-2.24	0.03	0.28 (2.21)	0.40 (2.02)	-0.45	0.65
2012	6.68 (13.19)	8.00 (9.78)	-1.15	0.25	0.22 (1.98)	0.38 (1.91)	-0.65	0.52
2013	6.04 (10.42)	7.99 (9.17)	-1.92	0.06	0.33 (2.02)	0.50 (2.05)	-0.64	0.53
2014	6.43 (10.52)	8.26 (9.08)	-1.75	0.08	0.32 (1.95)	0.50 (1.98)	-0.68	0.50
2015	6.40 (9.46)	8.79 (8.75)	-2.40	0.02	0.24 (1.86)	0.25 (1.94)	-0.04	0.96
2016	5.73 (8.58)	8.39 (8.18)	-2.85	0.00	-0.11 (2.47)	-0.25 (2.27)	0.40	0.69
2017	5.39 (7.70)	7.85 (7.41)	-2.82	0.01	-0.07 (2.23)	-0.14 (2.28)	0.17	0.86
2018	4.99 (7.12)	7.42 (6.96)	-2.81	0.01	0.04 (2.19)	-0.06 (2.35)	0.22	0.83
2019	5.15 (6.81)	8.69 (6.86)	-3.11	0.00	-0.01 (2.30)	-0.30 (2.70)	0.50	0.62
2020	4.91 (6.39)	8.85 (6.97)	-2.08	0.06	-0.01 (2.38)	-0.89 (2.36)	0.99	0.36

2021	5.13 (6.68)	5.25 (6.34)	-0.05	0.96	-0.03 (2.14)	-1.18 (2.63)	0.98	0.38

Note. Calculations are means of the average percentage change over time, representing competition trends at the 2-mile radius. In any given year, pre-founding TWDL are schools that have yet to establish their program but will in the future. Never-TWDL schools are those that never found a program within the time span. Data for 2001 is at 0 as this is the first year of data availability for competition figures. Data for pre-founding TWDL stops in 2021 as there are no more pre-founding schools in 2022.

Table D13 – *Enrollment Share Percent Change for Pre-Founding TWDL and Never-TWDL at 2-Miles, by District, 2000 - 2022*

	Enrollment Share							
	LAUSD				All Other Districts in Los Angeles County			
	Never-TWDL	Pre-founding TWDL			Never-TWDL	Pre-founding TWDL		
year	M (SD)	M (SD)	statistic	p.value	M (SD)	M (SD)	statistic	p.value
2002	0.29 (8.68)	-0.18 (1.82)	0.90	0.37	0.11 (3.02)	0.40 (5.31)	-0.47	0.64
2003	0.15 (7.09)	-0.03 (1.70)	0.41	0.68	1.11 (23.57)	0.27 (2.88)	0.83	0.41
2004	0.48 (6.27)	0.25 (4.23)	0.44	0.66	0.82 (16.85)	0.11 (2.91)	0.94	0.35
2005	5.31 (64.28)	0.22 (5.02)	1.40	0.16	0.20 (4.06)	0.18 (3.25)	0.04	0.97
2006	3.83 (41.64)	0.06 (4.23)	1.61	0.11	0.12 (3.38)	0.57 (3.96)	-0.98	0.33
2007	3.05 (31.06)	1.08 (6.52)	1.10	0.27	0.27 (3.29)	0.66 (3.43)	-0.97	0.33
2008	2.75 (24.96)	0.57 (5.19)	1.52	0.13	1.20 (20.65)	0.59 (3.28)	0.66	0.51
2009	6.76 (62.27)	0.29 (4.60)	1.92	0.06	1.02 (14.11)	0.60 (2.88)	0.65	0.52
2010	5.57 (43.17)	0.19 (4.19)	2.31	0.02	1.08 (10.95)	1.14 (6.17)	-0.07	0.94
2011	4.60 (32.14)	0.25 (6.79)	2.44	0.02	1.03 (8.68)	0.95 (4.48)	0.13	0.90
2012	4.13 (26.42)	0.33 (5.03)	2.63	0.01	1.10 (7.79)	1.01 (3.64)	0.16	0.87
2013	3.71 (21.35)	-0.04 (4.11)	3.25	0.00	1.20 (7.48)	0.75 (3.19)	0.90	0.37
2014	3.03 (16.09)	-0.65 (2.78)	4.29	0.00	2.09 (20.89)	0.65 (2.87)	1.54	0.12
2015	2.67 (13.51)	-0.81 (2.69)	4.77	0.00	1.89 (17.47)	0.60 (2.71)	1.60	0.11
2016	2.85 (13.30)	-0.98 (2.17)	5.48	0.00	2.22 (27.85)	0.63 (2.59)	1.33	0.18
2017	2.48 (11.51)	-0.94 (2.02)	5.58	0.00	1.96 (24.82)	0.84 (2.38)	1.03	0.30
2018	2.08 (10.09)	-0.95 (2.01)	5.48	0.00	1.78 (22.58)	0.47 (1.66)	1.35	0.18
2019	1.88 (9.30)	-1.39 (1.90)	5.95	0.00	0.86 (5.28)	0.42 (1.79)	0.99	0.33
2020	1.88 (10.05)	-0.81 (2.90)	2.91	0.01	0.88 (5.02)	0.40 (1.73)	0.71	0.50

2021	1.87 (9.15)	-1.01 (1.61)	3.82	0.00	0.89 (6.82)	0.87 (1.51)	0.03	0.98

Note. Calculations are means of the average percentage change over time, representing competition trends at the 2-mile radius. In any given year, pre-founding TWDL are schools that have yet to establish their program but will in the future. Never-TWDL schools are those that never found a program within the time span. Data for 2001 is at 0 as this is the first year of data availability for competition figures. Data for pre-founding TWDL stops in 2021 as there are no more pre-founding schools in 2022.

Table D14 – *TWDL School Percent Change for Pre-Founding TWDL and Never-TWDL at 2-Miles, by District, 2000 - 2022*

TWDL Schools

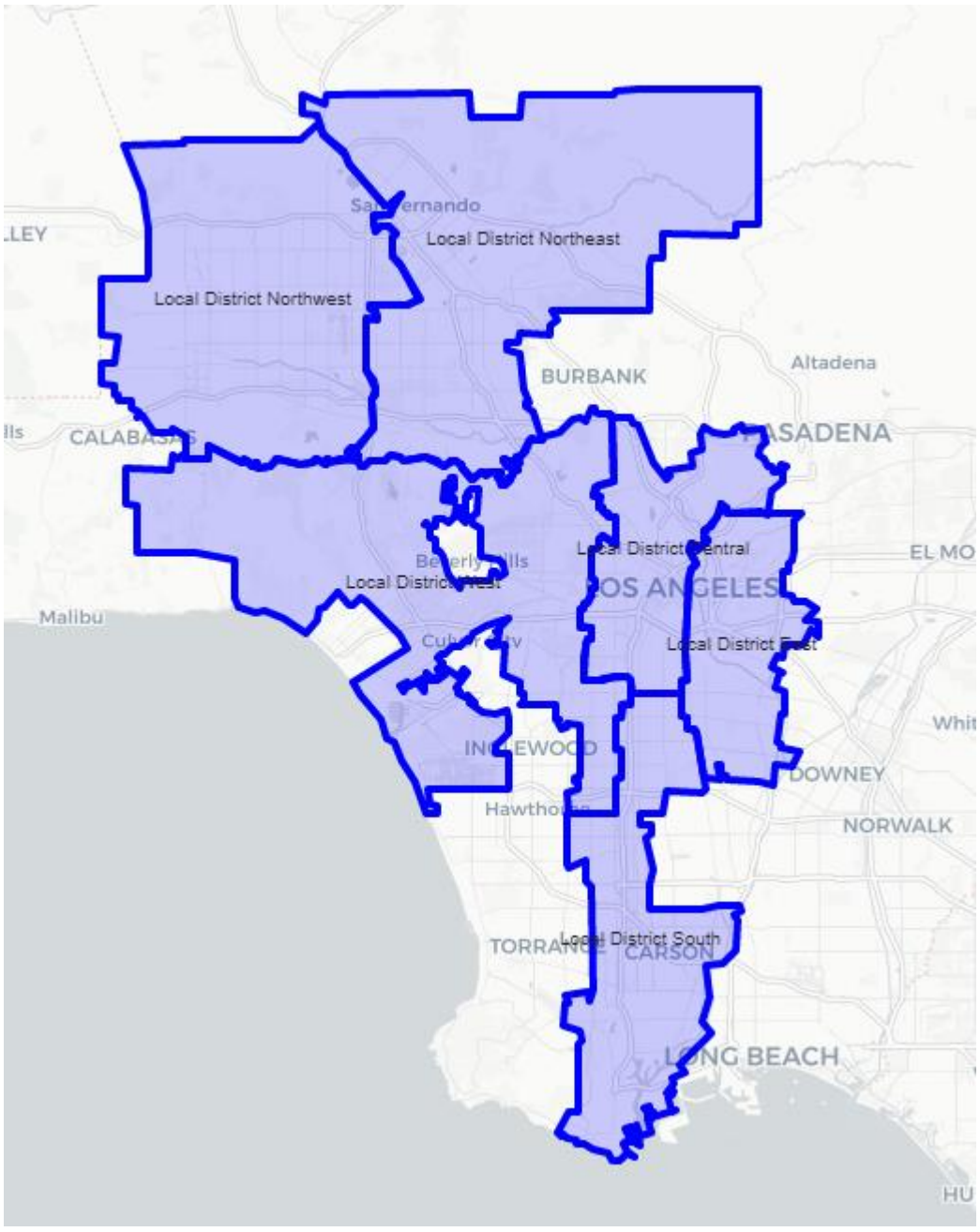
	LAUSD				All Other Districts in Los Angeles County			
	Never-TWDL	Pre-founding TWDL			Never-TWDL	Pre-founding TWDL		
year	M (SD)	M (SD)	statistic	p.value	M (SD)	M (SD)	statistic	p.value
2002	0.40 (4.25)	1.07 (6.88)	-0.98	0.33	0.00 (0.00)	0.00 (0.00)	NaN	NaN
2003	0.27 (2.83)	0.72 (4.63)	-0.99	0.32	0.10 (1.02)	0.00 (0.00)	2.34	0.02
2004	0.20 (2.11)	0.55 (3.48)	-1.01	0.32	0.07 (0.76)	0.00 (0.00)	2.34	0.02
2005	0.53 (3.18)	0.96 (4.20)	-1.00	0.32	0.06 (0.60)	0.00 (0.00)	2.34	0.02
2006	1.82 (6.47)	2.28 (6.53)	-0.65	0.51	0.05 (0.50)	0.00 (0.00)	2.34	0.02
2007	2.24 (7.10)	2.10 (5.82)	0.21	0.84	0.04 (0.43)	0.00 (0.00)	2.34	0.02
2008	2.44 (6.43)	3.18 (6.61)	-1.05	0.30	0.04 (0.38)	0.00 (0.00)	2.34	0.02
2009	2.21 (5.73)	2.83 (5.87)	-0.98	0.33	0.03 (0.34)	0.00 (0.00)	2.34	0.02
2010	1.96 (5.08)	2.50 (5.19)	-0.98	0.33	0.06 (0.66)	0.00 (0.00)	2.35	0.02
2011	1.69 (4.49)	2.18 (4.61)	-1.02	0.31	0.13 (1.02)	0.00 (0.00)	3.21	0.00
2012	3.57 (7.94)	4.30 (7.33)	-0.90	0.37	0.16 (1.09)	0.00 (0.00)	3.54	0.00
2013	3.50 (6.91)	4.03 (6.22)	-0.78	0.44	0.14 (1.00)	0.00 (0.00)	3.54	0.00
2014	4.09 (7.37)	5.40 (6.75)	-1.70	0.09	0.24 (1.36)	0.00 (0.00)	4.35	0.00
2015	3.71 (6.53)	5.19 (6.26)	-2.10	0.04	0.30 (1.44)	0.00 (0.00)	5.14	0.00
2016	3.44 (5.87)	4.89 (5.81)	-2.21	0.03	0.30 (1.40)	0.00 (0.00)	5.35	0.00
2017	3.88 (6.01)	5.60 (6.01)	-2.46	0.02	0.43 (1.61)	0.35 (1.40)	0.33	0.74
2018	4.44 (6.43)	6.44 (6.46)	-2.50	0.01	0.47 (1.67)	0.41 (1.48)	0.20	0.84

2019	6.23 (8.03)	9.37 (5.75)	-3.17	0.00	0.63 (2.19)	0.48 (1.55)	0.45	0.65
2020	7.90 (8.92)	11.51 (6.05)	-2.16	0.05	0.93 (2.90)	0.00 (0.00)	7.79	0.00
2021	7.56 (8.32)	9.76 (5.01)	-1.14	0.30	0.88 (2.81)	0.00 (0.00)	7.67	0.00

Note. Calculations are means of the average percentage change over time, representing competition trends at the 2-mile radius. In any given year, pre-founding TWDL are schools that have yet to establish their program but will in the future. Never-TWDL schools are those that never found a program within the time span. Data for 2001 is at 0 as this is the first year of data availability for competition figures. Data for pre-founding TWDL stops in 2021 as there are no more pre-founding schools in 2022.

Appendix E

Local Districts of LAUSD



Appendix F

Table F1 - *Full Regression Outputs, LAUSD*

	LAUSD		
	1-Mile	2-Mile	5-Mile
(Intercept)	0.004 (0.858)***	0.004 (0.903)***	0.004 (0.853)***
%Δ in number of nearby schools	1.030 (0.032)	1.152 (0.066)*	0.837 (0.375)
%Δ in number of nearby TWDL	0.990 (0.025)	1.027 (0.015).	0.985 (0.015)
%Δ in number of nearby charters	1.011 (0.026)	1.003 (0.016)	1.036 (0.020).
%Δ in enrollment share	1.022 (0.027)	0.964 (0.031)	0.913 (0.068)
%Δ in HHI	0.947 (0.072)	1.048 (0.038)	0.676 (0.325)
%Δ in number of nearby, out-district schools	0.914 (0.072)	0.994 (0.018)	1.028 (0.052)
%Δ in out-district enrollment share	0.868 (0.136)	1.027 (0.032)	1.025 (0.030)
%Δ School-Wide Enrollment	0.903 (0.052).	0.935 (0.045)	0.967 (0.087)
%Δ EL Enrollment	1.011 (0.006).	1.012 (0.006).	1.012 (0.006)*
%Δ FRPM Enrollment	0.936 (0.037).	0.924 (0.036)*	0.928 (0.036)*
%Δ Share of Hispanic Residents	0.989 (0.007)	1.000 (0.000)	1.000 (0.000)
%Δ Share of Black/African American Residents	1.000 (0.000)	0.989 (0.007)	0.990 (0.007)
%Δ Share of White Residents	1.000 (0.002)	0.999 (0.002)	0.998 (0.002)
%Δ Assessed Home Value (in 2022 dollars)	0.982 (0.018)	0.982 (0.019)	0.979 (0.018)
Year 3 (2003)	1.100 (1.084)	1.179 (1.094)	0.982 (1.097)
Year 4 (2004)	1.066 (1.100)	1.188 (1.125)	0.810 (1.136)
Year 5 (2005)	0.522 (1.324)	0.558 (1.339)	0.326 (1.241)
Year 6 (2006)	1.436 (1.060)	1.413 (1.074)	0.915 (1.050)
Year 7 (2007)	0.937 (1.149)	0.884 (1.147)	0.557 (1.182)
Year 8 (2008)	0.860 (1.161)	0.809 (1.171)	0.550 (1.174)
Year 9 (2009)	0.489 (1.350)	0.478 (1.362)	0.320 (1.334)
Year 10 (2010)	0.000 (1.048)***	0.000 (1.052)***	0.000 (1.049)***
Year 11 (2011)	0.824 (1.240)	0.749 (1.238)	0.428 (1.191)
Year 12 (2012)	2.553 (0.975)	2.353 (0.992)	1.364 (1.017)
Year 13 (2013)	0.419 (1.341)	0.385 (1.329)	0.219 (1.367)

Year 14 (2014)	3.052 (0.986)	2.670 (0.994)	1.631 (1.014)
Year 15 (2015)	0.436 (1.327)	0.386 (1.335)	0.238 (1.309)
Year 16 (2016)	0.907 (1.132)	0.827 (1.140)	0.514 (1.176)
Year 17 (2017)	3.280 (0.960)	2.993 (0.976)	1.979 (0.996)
Year 18 (2018)	5.999 (0.941).	5.473 (0.954).	3.920 (0.949)
Year 19 (2019)	20.828 (0.911)***	18.001 (0.922)**	14.675 (0.917)**
Year 20 (2020	14.109 (0.915)**	12.075 (0.927)**	10.841 (0.925)*
Year 21 (2021)	6.706 (1.109).	5.941 (1.116)	5.977 (1.101)
Year 22 (2022)	3.457 (0.973)	2.978 (0.985)	2.955 (0.986)
Local District East	1.858 (0.303)*	1.788 (0.300).	1.544 (0.313)
Local District Northeast	0.672 (0.400)	0.784 (0.395)	0.930 (0.416)
Local District Northwest	0.626 (0.505)	0.728 (0.495)	0.675 (0.527)
Local District South	1.630 (0.373)	1.698 (0.354)	1.810 (0.371)
Local District West	0.993 (0.378)	1.022 (0.353)	0.903 (0.369)
Observations	8814	8814	8814
Year Fixed Effects	Yes	Yes	Yes
District Fixed Effects	Yes	Yes	Yes
Max VIF	2.34	1.86	7.07
McFadden's R2	0.181	0.186	0.187
AIC	1182	1175.4	1173.7
BIC	1465.3	1458.8	1457.1

*** p<0.001, ** p<0.01, * p<0.05, .p<.1

Note: These models come from estimating logit models. Clustered standard errors at the school level in parentheses. Estimates are odds-ratios: (>1 = more likelihood of event (failure=becoming TWI) happening; <1 = less likelihood of event happening). District fixed effects include the six (now four) sub-districts for Los Angeles Unified: West, Northeast, Northwest, Central, South, and East, corresponding to the geographies of the district. See Appendix E for a detailed map of the local districts.

Table F2 - *Full Regression Outputs, All Other Districts in Los Angeles County*

	All Other Districts in Los Angeles County		
	1-Mile	2-Mile	5-Mile
(Intercept)	0.000 (1.243)***	0.000 (1.259)***	0.000 (1.334)***
%Δ in number of nearby schools	0.967 (0.081)	0.703 (0.166)*	0.809 (0.393)
%Δ in number of nearby TWDL	0.008 (0.599)***	0.738 (0.110)**	0.825 (0.066)**
%Δ in number of nearby charters	1.058 (0.163)	0.978 (0.086)	1.067 (0.074)
%Δ in enrollment share	1.101 (0.085)	1.058 (0.088)	0.998 (0.006)
%Δ in HHI	0.867 (0.149)	0.952 (0.117)	0.705 (0.363)
%Δ in number of nearby, out-district schools	0.953 (0.047)	0.944 (0.054)	1.021 (0.102)
%Δ in out-district enrollment share	1.002 (0.067)	0.961 (0.046)	0.981 (0.075)
%Δ School-Wide Enrollment	0.857 (0.090).	0.871 (0.083).	0.957 (0.088)
%Δ EL Enrollment	0.914 (0.025)***	0.909 (0.027)***	0.910 (0.027)***
%Δ FRPM Enrollment	1.023 (0.030)	1.029 (0.030)	1.019 (0.034)
%Δ Share of Hispanic Residents	1.000 (0.000)***	1.000 (0.000)***	1.000 (0.000)***
%Δ Share of Black/African American Residents	1.000 (0.002)	1.001 (0.002)	0.998 (0.003)
%Δ Share of White Residents	0.999 (0.003)	0.999 (0.003)	0.999 (0.002)
%Δ Assessed Home Value (in 2022 dollars)	0.991 (0.012)	0.990 (0.012)	0.985 (0.013)
Year Group 2004 - 2005	0.784 (1.408)	0.810 (1.412)	0.771 (1.422)
Year Group 2006 - 2007	2.358 (1.151)	2.368 (1.162)	2.460 (1.166)
Year Group 2008 - 2009	1.822 (1.213)	1.750 (1.226)	1.861 (1.246)
Year Group 2010 - 2011	12.366 (1.039)*	11.713 (1.054)*	19.387 (1.113)**
Year Group 2012 - 2013	7.606 (1.106).	7.062 (1.123).	12.989 (1.177)*
Year Group 2014 - 2015	15.817 (1.066)**	15.341 (1.089)*	28.473 (1.156)**
Year Group 2016 - 2017	26.112 (1.048)**	26.110 (1.070)**	52.637 (1.166)***
Year Group 2018 - 2019	18.497 (1.063)**	19.660 (1.077)**	43.271 (1.200)**
Year Group 2020 - 2022	24.099 (1.070)**	28.832 (1.089)**	64.477 (1.226)***
Acton-Agua Dulce Unified	0.000 (1.176)***	0.000 (1.181)***	0.000 (1.218)***
Alhambra Unified	2.274 (0.896)	2.249 (0.924)	1.809 (0.933)
Antelope Valley Union High	0.000 (2.289)***	0.000 (2.431)***	0.000 (2.379)***

Arcadia Unified	0.000 (0.784)***	0.000 (0.789)***	0.000 (0.790)***
Azusa Unified	1.089 (1.019)	1.088 (1.029)	1.304 (1.019)
Baldwin Park Unified	0.817 (1.388)	0.743 (1.409)	0.743 (1.364)
Bassett Unified	1.765 (1.166)	1.016 (1.207)	1.811 (1.239)
Bellflower Unified	1.870 (1.020)	2.099 (1.033)	3.693 (1.046)
Beverly Hills Unified	0.000 (0.900)***	0.000 (0.933)***	0.000 (1.017)***
Bonita Unified	0.000 (0.798)***	0.000 (0.810)***	0.000 (0.807)***
Burbank Unified	1.506 (1.021)	2.295 (1.059)	2.453 (1.047)
Castaic Union	0.000 (0.915)***	0.000 (1.005)***	0.000 (2.373)***
Charter Oak Unified	0.000 (0.835)***	0.000 (0.845)***	0.000 (1.017)***
Claremont Unified	0.000 (0.787)***	0.000 (0.796)***	0.000 (0.817)***
Compton Unified	1.154 (0.924)	2.206 (0.927)	1.592 (0.913)
Covina-Valley Unified	1.999 (0.938)	1.149 (1.002)	2.806 (0.957)
Culver City Unified	3.042 (1.380)	6.034 (1.424)	5.964 (1.413)
Downey Unified	0.000 (0.774)***	0.000 (48.602)	0.000 (0.836)***
Duarte Unified	1.074 (1.230)	1.407 (1.388)	1.514 (1.249)
East Whittier City Elementary	0.715 (1.160)	0.735 (1.183)	0.601 (1.174)
Eastside Union Elementary	0.000 (1.029)***	0.000 (1.112)***	0.000 (1.207)***
El Monte City	0.990 (1.000)	0.810 (1.006)	1.066 (1.055)
El Rancho Unified	1.125 (1.269)	0.518 (1.307)	1.290 (1.306)
El Segundo Unified	0.000 (1.016)***	0.000 (1.031)***	0.000 (1.047)***
Garvey Elementary	2.348 (1.049)	1.432 (1.096)	2.172 (1.168)
Glendale Unified	8.298 (0.818)**	9.629 (0.846)**	21.649 (0.926)***
Glendora Unified	0.000 (0.843)***	0.000 (0.982)***	0.000 (0.882)***
Gorman Joint	0.000 (1.326)***	0.000 (1.335)***	0.000 (1.420)***
Hacienda la Puente Unified	1.706 (0.896)	2.203 (0.898)	9.134 (0.995)*
Hawthorne	0.000 (0.841)***	0.000 (0.862)***	0.000 (0.863)***
Hughes-Elizabeth Lakes Union Elementary	0.000 (1.250)***	0.000 (1.229)***	0.000 (1.276)***
Inglewood Unified	0.570 (1.230)	1.687 (1.346)	0.222 (1.621)
Keppel Union Elementary	0.000 (0.909)***	0.000 (0.995)***	0.000 (0.970)***
La Canada Unified	0.000 (1.029)***	0.000 (1.038)***	0.000 (1.101)***
Lancaster Elementary	1.033 (1.303)	2.141 (1.186)	0.500 (1.349)
Las Virgenes Unified	1.787 (1.297)	1.772 (1.312)	1.663 (1.393)
Lawndale Elementary	1.817 (1.340)	1.778 (1.322)	1.392 (1.229)
Lennox	3.399 (1.156)	4.078 (1.154)	3.088 (1.186)

Little Lake City Elementary	0.000 (0.823)***	0.000 (0.835)***	0.000 (0.835)***
Long Beach Unified	0.228 (1.025)	0.203 (1.028)	0.281 (1.008)
Los Angeles County Office of Education	0.000 (1.253)***	0.000 (1.506)***	0.000 (1.654)***
Lynwood Unified	0.555 (1.309)	1.397 (1.325)	0.518 (1.394)
Manhattan Beach Unified	0.000 (0.924)***	0.000 (0.951)***	0.000 (0.957)***
Monrovia Unified	6.916 (0.869)*	14.920 (0.857)**	11.130 (1.112)*
Montebello Unified	0.554 (1.229)	0.679 (1.202)	0.522 (1.222)
Mountain View Elementary	0.543 (1.220)	0.546 (1.222)	0.536 (1.215)
Newhall	1.001 (1.216)	1.754 (1.237)	0.976 (1.412)
Norwalk-La Mirada Unified	0.000 (0.752)***	0.000 (0.783)***	0.000 (0.788)***
Palmdale Elementary	2.061 (1.041)	2.132 (0.988)	2.990 (1.367)
Palos Verdes Peninsula Unified	0.000 (0.840)***	0.000 (0.834)***	0.000 (0.917)***
Paramount Unified	0.000 (0.797)***	0.000 (0.839)***	0.000 (0.867)***
Pasadena Unified	2.858 (0.842)	2.684 (0.875)	3.263 (1.025)
Pomona Unified	0.709 (0.965)	0.922 (0.962)	1.478 (0.986)
Redondo Beach Unified	1.508 (1.290)	1.770 (1.313)	1.254 (1.558)
Rosemead Elementary	2.259 (1.228)	2.352 (1.238)	1.884 (1.239)
Rowland Unified	2.207 (0.963)	2.930 (0.954)	5.117 (1.004)
San Gabriel Unified	4.369 (1.008)	5.855 (1.013).	3.573 (0.999)
San Marino Unified	0.000 (1.294)***	0.000 (1.306)***	0.000 (1.342)***
Santa Monica-Malibu Unified	0.000 (0.768)***	0.000 (0.775)***	0.000 (0.787)***
Saugus Union	1.633 (1.219)	1.611 (1.279)	1.753 (1.271)
SBE - Today's Fresh Start Charter	0.000 (1.305)***	0.000 (1.580)***	0.000 (2.116)***
South Pasadena Unified	22.713 (1.083)***	49.648 (1.060)***	21.742 (1.041)**
South Whittier Elementary	3.588 (1.075)	2.154 (1.137)	3.494 (1.293)
Sulphur Springs Union	0.000 (0.795)***	0.000 (0.833)***	0.000 (0.884)***
Temple City Unified	0.000 (0.920)***	0.000 (0.935)***	0.000 (0.967)***
Torrance Unified	1.322 (0.939)	1.388 (0.959)	1.129 (0.957)
Valle Lindo Elementary	0.000 (1.236)***	0.000 (1.236)***	0.000 (1.238)***
Walnut Valley Unified	1.945 (1.229)	2.168 (1.229)	1.544 (1.265)
West Covina Unified	2.320 (0.997)	2.138 (1.015)	2.981 (0.996)
Westside Union Elementary	0.000 (0.873)***	0.000 (0.906)***	0.000 (2.477)***
Whittier City Elementary	2.137 (0.993)	1.335 (1.018)	2.421 (1.034)
William S. Hart Union High	0.000 (1.488)***	0.000 (1.541)***	0.000 (1.654)***
Wilsona Elementary	0.000 (1.194)***	0.000 (1.579)***	0.000 (1.655)***

Observations	13181	13181	13181
Year Fixed Effects	Yes	Yes	Yes
District Fixed Effects	Yes	Yes	Yes
Max VIF	6.89	6.63	6.69
McFadden's R2	0.17	0.18	0.178
AIC	1046.8	1036.3	1038.1
BIC	1773	1762.5	1764.3

*** p<0.001, ** p<0.01, * p<0.05, .p<.1

Note: These models come from estimating logit models. Clustered standard errors at the school level in parentheses. Estimates are odds-ratios: (>1 = more likelihood of event (failure=becoming TWI) happening; <1 = less likelihood of event happening). Years are grouped to avoid perfect separation.

Table F3 - *Regression Outputs, Spanish Language Programs, LAUSD*

	Los Angeles Unified		
	1-mile	2-mile	5-mile
	OR(SE)	OR(SE)	OR(SE)
(Intercept)	0.002 (1.043)***	0.002 (1.089)***	0.002 (1.071)***
%Δ in number of nearby schools	1.036 (0.033)	1.162 (0.066)*	0.889 (0.396)
%Δ in number of nearby TWDL	0.986 (0.026)	1.031 (0.016).	0.990 (0.015)
%Δ in number of nearby charters	1.007 (0.028)	1.007 (0.016)	1.034 (0.021)
%Δ in enrollment share	1.043 (0.020)*	0.964 (0.030)	0.940 (0.049)
%Δ in HHI	0.920 (0.076)	1.048 (0.042)	0.658 (0.347)
%Δ in number of nearby, out-district schools	0.927 (0.079)	0.993 (0.018)	1.025 (0.055)
%Δ in out-district enrollment share	0.923 (0.147)	1.029 (0.035)	1.033 (0.032)
%Δ School-Wide Enrollment	0.870 (0.053)**	0.918 (0.045).	0.921 (0.073)
%Δ EL Enrollment	1.006 (0.007)	1.008 (0.006)	1.008 (0.006)
%Δ FRPM Enrollment	0.935 (0.041).	0.924 (0.040)*	0.929 (0.041).
%Δ Share of Hispanic Residents	1.000 (0.000)	1.000 (0.000)	1.000 (0.000)
%Δ Share of Black/African American Residents	0.991 (0.008)	0.990 (0.008)	0.990 (0.008)
%Δ Share of White Residents	0.999 (0.002)	0.998 (0.002)	0.998 (0.002)
%Δ Assessed Home Value (in 2022 dollars)	0.985 (0.019)	0.983 (0.019)	0.979 (0.019)
Year 3 (2003)	1.987 (1.241)	2.173 (1.255)	1.820 (1.277)
Year 4 (2004)	1.863 (1.241)	2.115 (1.271)	1.447 (1.307)
Year 5 (2005)	0.866 (1.437)	0.954 (1.456)	0.548 (1.388)
Year 6 (2006)	2.221 (1.191)	2.266 (1.212)	1.307 (1.210)
Year 7 (2007)	1.424 (1.269)	1.394 (1.276)	0.767 (1.320)
Year 8 (2008)	0.649 (1.460)	0.634 (1.476)	0.375 (1.476)
Year 9 (2009)	0.748 (1.450)	0.759 (1.467)	0.446 (1.456)
Year 10 (2010)	0.000 (1.183)***	0.000 (1.201)***	0.000 (1.212)***
Year 11 (2011)	0.648 (1.435)	0.608 (1.461)	0.317 (1.520)
Year 12 (2012)	3.303 (1.122)	3.102 (1.155)	1.581 (1.205)
Year 13 (2013)	0.647 (1.439)	0.611 (1.436)	0.299 (1.501)
Year 14 (2014)	4.788 (1.130)	4.218 (1.151)	2.204 (1.202)
Year 15 (2015)	0.684 (1.433)	0.606 (1.446)	0.323 (1.447)
Year 16 (2016)	0.711 (1.435)	0.654 (1.457)	0.355 (1.487)

Year 17 (2017)	3.673 (1.124)	3.376 (1.148)	1.960 (1.189)
Year 18 (2018)	8.598 (1.087)*	7.932 (1.108).	5.004 (1.129)
Year 19 (2019)	31.869 (1.055)**	27.557 (1.076)**	19.591 (1.090)**
Year 20 (2020	21.939 (1.057)**	18.628 (1.076)**	14.579 (1.087)*
Year 21 (2021)	10.044 (1.238).	8.968 (1.253).	8.094 (1.252).
Year 22 (2022)	4.804 (1.118)	4.107 (1.138)	3.529 (1.139)
Local District East	2.005 (0.318)*	1.899 (0.320)*	1.667 (0.333)
Local District Northeast	0.595 (0.426)	0.743 (0.427)	0.918 (0.457)
Local District Northwest	0.694 (0.514)	0.847 (0.509)	0.838 (0.544)
Local District South	1.770 (0.384)	1.870 (0.371).	2.051 (0.395).
Local District West	0.927 (0.404)	0.951 (0.379)	0.884 (0.389)
Observations	8672	8672	8672
Max VIF	2.78	1.86	7.04
McFadden's R2	0.198	0.204	0.204
AIC	1081.6	1074.1	1074.2
BIC	1364.3	1356.8	1356.9

*** p<0.001, ** p<0.01, * p<0.05, .p<.1

Note: These models come from estimating logit models. Clustered standard errors at the school level in parentheses. Estimates are odds-ratios: (>1 = more likelihood of event (failure=becoming TWDL) happening; <1 = less likelihood of event happening). District fixed effects include the six (now four) sub-districts for Los Angeles Unified: West, Northeast, Northwest, Central, South, and East, corresponding to the geographies of the district. See Appendix E for a detailed map of the local districts.

Table F4 - *Regression Outputs, Spanish Language Programs, All Other Districts in Los Angeles County*

	All Other Districts in Los Angeles County		
	1-mile	2-mile	5-mile
	OR(SE)	OR(SE)	OR(SE)
(Intercept)	0.000 (1.193)***	0.000 (1.208)***	0.000 (1.223)***
%Δ in number of nearby schools	0.993 (0.074)	0.687 (0.197).	0.764 (0.368)
%Δ in number of nearby TWDL	0.005 (0.611)***	0.820 (0.115).	0.809 (0.082)**
%Δ in number of nearby charters	1.039 (0.196)	0.903 (0.112)	1.067 (0.083)
%Δ in enrollment share	1.084 (0.074)	1.023 (0.094)	0.998 (0.007)
%Δ in HHI	0.954 (0.137)	0.965 (0.123)	0.870 (0.268)
%Δ in number of nearby, out-district schools	0.922 (0.046).	0.916 (0.075)	0.973 (0.107)
%Δ in out-district enrollment share	0.992 (0.074)	0.966 (0.044)	0.946 (0.085)
%Δ School-Wide Enrollment	0.872 (0.097)	0.900 (0.095)	0.975 (0.098)
%Δ EL Enrollment	0.923 (0.023)***	0.915 (0.024)***	0.918 (0.027)**
%Δ FRPM Enrollment	0.980 (0.036)	0.985 (0.037)	0.975 (0.037)
%Δ Share of Hispanic Residents	1.000 (0.000)**	1.000 (0.000)*	1.000 (0.000)**
%Δ Share of Black/African American Residents	0.998 (0.003)	0.999 (0.003)	0.996 (0.003)
%Δ Share of White Residents	1.000 (0.002)	1.000 (0.002)	1.001 (0.002)
%Δ Assessed Home Value (in 2022 dollars)	0.992 (0.017)	0.992 (0.017)	0.994 (0.017)
Year Group 2006 - 2010	2.520 (0.792)	2.570 (0.794)	2.530 (0.817)
Year Group 2011 - 2016	8.141 (0.766)**	7.967 (0.802)**	11.283 (0.806)**
Year Group 2017 - 2022	16.259 (0.758)***	17.675 (0.781)***	32.776 (0.870)***
Acton-Agua Dulce Unified	0.000 (1.349)***	0.000 (1.356)***	0.000 (1.377)***
Alhambra Unified	2.704 (1.211)	2.652 (1.228)	1.923 (1.228)
Antelope Valley Union High	0.000 (2.278)***	0.000 (2.627)***	0.000 (2.543)***
Arcadia Unified	0.000 (1.033)***	0.000 (1.034)***	0.000 (1.044)***
Azusa Unified	1.747 (1.234)	1.836 (1.251)	1.889 (1.239)
Baldwin Park Unified	1.492 (1.558)	1.291 (1.597)	1.291 (1.543)
Bassett Unified	3.036 (1.347)	2.037 (1.426)	2.458 (1.413)
Bellflower Unified	3.324 (1.224)	3.980 (1.257)	7.257 (1.264)
Beverly Hills Unified	0.000 (1.144)***	0.000 (1.181)***	0.000 (1.225)***
Bonita Unified	0.000 (1.043)***	0.000 (1.048)***	0.000 (1.047)***
Burbank Unified	2.366 (1.215)	3.483 (1.233)	4.150 (1.239)
Castaic Union	0.000 (1.144)***	0.000 (1.214)***	0.000 (2.250)***
Charter Oak Unified	0.000 (1.078)***	0.000 (1.086)***	0.000 (1.237)***
Claremont Unified	0.000 (1.035)***	0.000 (1.036)***	0.000 (1.061)***

Compton Unified	1.762 (1.159)	3.844 (1.146)	3.400 (1.163)
Covina-Valley Unified	1.905 (1.379)	1.284 (1.469)	2.351 (1.381)
Culver City Unified	4.852 (1.527)	7.640 (1.529)	9.373 (1.522)
Downey Unified	0.000 (1.020)***	0.000 (44.554)	0.000 (1.069)***
Duarte Unified	1.226 (1.488)	1.912 (1.775)	2.241 (1.422)
East Whittier City Elementary	1.372 (1.334)	1.398 (1.360)	1.177 (1.365)
Eastside Union Elementary	0.000 (1.251)***	0.000 (1.297)***	0.000 (1.357)***
El Monte City	0.848 (1.407)	0.724 (1.425)	0.700 (1.470)
El Rancho Unified	1.643 (1.434)	0.859 (1.480)	1.134 (1.452)
El Segundo Unified	0.000 (1.204)***	0.000 (1.212)***	0.000 (1.231)***
Garvey Elementary	1.648 (1.443)	1.252 (1.488)	1.094 (1.521)
Glendale Unified	3.234 (1.223)	3.411 (1.238)	9.226 (1.283).
Glendora Unified	0.000 (1.072)***	0.000 (1.246)***	0.000 (1.113)***
Gorman Joint	0.000 (1.511)***	0.000 (1.539)***	0.000 (1.631)***
Hacienda la Puente Unified	2.214 (1.160)	2.618 (1.154)	11.759 (1.199)*
Hawthorne	0.000 (1.077)***	0.000 (1.093)***	0.000 (1.097)***
Hughes-Elizabeth Lakes Union Elementary	0.000 (1.409)***	0.000 (1.391)***	0.000 (1.538)***
Inglewood Unified	1.164 (1.388)	4.414 (1.479)	0.663 (1.812)
Keppel Union Elementary	0.000 (1.164)***	0.000 (1.442)***	0.000 (1.167)***
La Canada Unified	0.000 (1.219)***	0.000 (1.237)***	0.000 (1.253)***
Lancaster Elementary	1.907 (1.470)	4.926 (1.343)	1.443 (1.489)
Las Virgenes Unified	4.888 (1.435)	5.363 (1.447)	4.752 (1.524)
Lawndale Elementary	2.805 (1.502)	3.283 (1.477)	1.964 (1.345)
Lennox	5.838 (1.357)	7.375 (1.338)	5.417 (1.379)
Little Lake City Elementary	0.000 (1.065)***	0.000 (1.071)***	0.000 (1.076)***
Long Beach Unified	0.382 (1.232)	0.314 (1.229)	0.434 (1.216)
Los Angeles County Office of Education	0.000 (1.396)***	0.000 (1.651)***	0.000 (1.937)***
Lynwood Unified	1.074 (1.490)	2.822 (1.486)	1.676 (1.559)
Manhattan Beach Unified	0.000 (1.115)***	0.000 (1.131)***	0.000 (1.146)***
Monrovia Unified	8.606 (1.147).	22.643 (1.213)*	15.133 (1.322)*
Montebello Unified	0.000 (3.507)***	0.000 (3.049)***	0.000 (3.506)***
Mountain View Elementary	1.158 (1.393)	1.199 (1.398)	1.018 (1.399)
Newhall	2.366 (1.398)	3.806 (1.426)	3.874 (1.584)
Norwalk-La Mirada Unified	0.000 (1.017)***	0.000 (1.046)***	0.000 (1.036)***
Palmdale Elementary	4.908 (1.219)	5.740 (1.239)	7.869 (1.469)
Palos Verdes Peninsula Unified	0.000 (1.112)***	0.000 (1.146)***	0.000 (1.157)***
Paramount Unified	0.000 (1.045)***	0.000 (1.086)***	0.000 (1.087)***
Pasadena Unified	2.877 (1.112)	2.944 (1.128)	3.165 (1.289)
Pomona Unified	0.933 (1.229)	1.247 (1.219)	1.975 (1.262)

Redondo Beach Unified	2.356 (1.458)	2.670 (1.466)	2.591 (1.607)
Rosemead Elementary	0.000 (1.160)***	0.000 (1.164)***	0.000 (1.173)***
Rowland Unified	2.355 (1.220)	2.622 (1.257)	4.957 (1.245)
San Gabriel Unified	4.738 (1.453)	6.924 (1.507)	3.967 (1.460)
San Marino Unified	0.000 (1.305)***	0.000 (1.311)***	0.000 (1.338)***
Santa Monica-Malibu Unified	0.000 (1.034)***	0.000 (1.040)***	0.000 (1.055)***
Saugus Union	3.693 (1.399)	3.849 (1.433)	4.456 (1.519)
SBE - Today's Fresh Start Charter	0.000 (1.438)***	0.000 (1.807)***	0.000 (2.163)***
South Pasadena Unified	23.580 (1.569)*	49.435 (1.538)*	31.009 (1.529)*
South Whittier Elementary	6.032 (1.280)	3.771 (1.373)	3.988 (1.512)
Sulphur Springs Union	0.000 (1.060)***	0.000 (1.074)***	0.000 (1.119)***
Temple City Unified	0.000 (1.131)***	0.000 (1.148)***	0.000 (1.177)***
Torrance Unified	2.402 (1.159)	2.637 (1.173)	2.044 (1.178)
Valle Lindo Elementary	0.000 (1.401)***	0.000 (1.399)***	0.000 (1.410)***
Walnut Valley Unified	0.000 (1.027)***	0.000 (1.033)***	0.000 (1.027)***
West Covina Unified	3.938 (1.203)	3.831 (1.225)	5.057 (1.210)
Westside Union Elementary	0.000 (1.089)***	0.000 (1.095)***	0.000 (1.114)***
Whittier City Elementary	3.481 (1.193)	2.158 (1.228)	3.053 (1.222)
William S. Hart Union High	0.000 (1.594)***	0.000 (1.636)***	0.000 (1.636)***
Wilsona Elementary	0.000 (1.323)***	0.000 (1.843)***	0.000 (1.863)***
Observations	12869	12869	12869
Max VIF	7.06	6.63	6.7
McFadden's R2	0.153	0.164	0.163
AIC	847.1	838.2	839.5
BIC	1526.2	1517.3	1518.6

*** p<0.001, ** p<0.01, * p<0.05, .p<.1

Note: These models come from estimating logit models. Clustered standard errors at the school level in parentheses. Estimates are odds-ratios: (>1 = more likelihood of event (failure=becoming TWDL) happening; <1 = less likelihood of event happening). Years are grouped into three groups to avoid perfect separation.

Table F5 - *Full Regression Outputs, All Other Language Programs, LAUSD*

	Los Angeles Unified		
	1-mile	2-mile	5-mile
%Δ in number of nearby schools	0.920 (0.104)	1.095 (0.255)	0.621 (1.180)
%Δ in number of nearby TWDL	1.029 (0.063)	0.966 (0.059)	0.933 (0.058)
%Δ in number of nearby charters	1.018 (0.061)	0.961 (0.057)	1.066 (0.064)
%Δ in enrollment share	0.911 (0.166)	0.985 (0.046)	0.838 (0.137)
%Δ in HHI	1.126 (0.120)	1.029 (0.061)	1.122 (0.960)
%Δ in number of nearby, out-district schools	0.783 (0.120)*	1.008 (0.058)	1.215 (0.132)
%Δ in out-district enrollment share	0.562 (0.246)*	0.995 (0.100)	0.961 (0.044)
%Δ School-Wide Enrollment	1.068 (0.112)	1.009 (0.084)	1.156 (0.135)
%Δ EL Enrollment	1.015 (0.006)*	1.015 (0.007)*	1.020 (0.009)*
%Δ FRPM Enrollment	0.950 (0.069)	0.944 (0.068)	0.930 (0.074)
%Δ Share of Hispanic Residents	1.002 (0.008)	1.002 (0.007)	1.001 (0.007)
%Δ Share of Black/African American Residents	0.982 (0.013)	0.981 (0.012)	0.982 (0.014)
%Δ Share of White Residents	1.004 (0.004)	1.004 (0.003)	1.004 (0.003)
%Δ Assessed Home Value (in 2022 dollars)	0.988 (0.010)	0.990 (0.011)	0.987 (0.010)
Year 3 (2003)	0.000 (1.587)***	0.000 (1.466)***	0.000 (1.386)***
Year 4 (2004)	0.000 (1.648)***	0.000 (1.564)***	0.000 (1.492)***
Year 5 (2005)	0.000 (1.710)***	0.000 (1.607)***	0.000 (1.475)***
Year 6 (2006)	0.000 (1.749)***	0.000 (1.622)***	0.000 (1.432)***
Year 7 (2007)	0.000 (1.763)***	0.000 (1.639)***	0.000 (1.571)***
Year 8 (2008)	2.101 (2.037)	1.833 (2.017)	2.069 (1.943)
Year 9 (2009)	0.000 (1.770)***	0.000 (1.668)***	0.000 (1.564)***
Year 10 (2010)	0.000 (1.741)***	0.000 (1.576)***	0.000 (1.450)***
Year 11 (2011)	1.493 (1.884)	1.322 (1.859)	1.190 (1.569)
Year 12 (2012)	1.796 (2.052)	1.611 (1.930)	1.729 (1.881)
Year 13 (2013)	0.000 (1.750)***	0.000 (1.611)***	0.000 (1.582)***
Year 14 (2014)	0.000 (1.713)***	0.000 (1.603)***	0.000 (1.585)***

Year 15 (2015)	0.000 (1.731)***	0.000 (1.604)***	0.000 (1.565)***
Year 16 (2016)	1.802 (1.986)	1.672 (1.912)	2.216 (1.948)
Year 17 (2017)	3.658 (1.897)	3.441 (1.762)	4.772 (1.826)
Year 18 (2018)	1.902 (1.990)	1.813 (1.874)	2.632 (1.778)
Year 19 (2019)	1.821 (2.029)	1.886 (1.871)	3.437 (1.932)
Year 20 (2020	1.340 (2.081)	1.489 (1.933)	2.930 (1.845)
Year 21 (2021)	0.000 (1.741)***	0.000 (1.592)***	0.000 (1.558)***
Year 22 (2022)	1.050 (2.107)	1.214 (1.943)	2.622 (2.005)
Local District East	0.513 (1.813)	0.720 (1.647)	0.320 (1.949)
Local District Northeast	1.729 (1.190)	1.155 (1.000)	1.231 (1.103)
Local District Northwest	0.000 (1.217)***	0.000 (0.972)***	0.000 (1.194)***
Local District South	1.177 (1.268)	1.123 (1.206)	1.248 (1.349)
Local District West	1.926 (1.076)	1.840 (0.981)	1.341 (1.010)
Observations	7013	7013	7013
Max VIF	2.74	1.79	6.64
McFadden's R2	0.186	0.171	0.195
AIC	213.5	215.9	212.1
BIC	487.7	490.1	486.3

*** p<0.001, ** p<0.01, * p<0.05, .p<.1

Note: These models come from estimating logit models. Clustered standard errors at the school level in parentheses. Estimates are odds-ratios: (>1 = more likelihood of event (failure=becoming TWI) happening; <1 = less likelihood of event happening). District fixed effects include the six (now four) sub-districts for Los Angeles Unified: West, Northeast, Northwest, Central, South, and East, corresponding to the geographies of the district. See Appendix E for a detailed map of the local districts. For analysis of all other districts in Los Angeles County, years are grouped into two-year increments, except for the year 2019-2022 increment, to avoid perfect separation. For Los Angeles Unified, years are standalone. All other languages include Armenian, Arabic, French, German, Mandarin, Korean, and Japanese.

Table F6 - *Full Regression Outputs, All Other Language Programs, All Other Districts in Los Angeles County*

	All Other Districts in Los Angeles County		
	1-mile	2-mile	5-mile
	OR (SE)	OR (SE)	OR (SE)
(Intercept)	0.001 (1.743)***	0.000 (2.067)***	0.000 (1.837)***
%Δ in number of nearby schools	0.919 (0.103)	0.722 (0.157)*	0.900 (0.369)
%Δ in number of nearby TWDL	0.017 (0.126)**	0.459 (0.211)**	0.921 (0.100)
%Δ in number of nearby charters	1.293 (0.190)	1.173 (0.157)	1.058 (0.096)
%Δ in enrollment share	1.084 (0.240)	1.174 (0.189)	1.116 (0.188)
%Δ in HHI	0.677 (0.278)	1.012 (0.253)	0.889 (0.820)
%Δ in number of nearby, out-district schools	1.005 (0.135)	0.989 (0.083)	1.035 (0.236)
%Δ in out-district enrollment share	0.961 (0.315)	0.937 (0.171)	1.063 (0.059)
%Δ School-Wide Enrollment	0.843 (0.216)	0.812 (0.129)	0.764 (0.177)
%Δ EL Enrollment	0.958 (0.046)	0.964 (0.052)	0.967 (0.049)
%Δ FRPM Enrollment	1.075 (0.031)*	1.083 (0.035)*	1.078 (0.033)*
%Δ Share of Hispanic Residents	1.000 (0.000)***	1.000 (0.000)***	1.000 (0.000)***
%Δ Share of Black/African American Residents	1.010 (0.006).	1.017 (0.009).	1.011 (0.007)
%Δ Share of White Residents	0.999 (0.007)	0.994 (0.012)	0.997 (0.009)
%Δ Assessed Home Value (in 2022 dollars)	1.022 (0.018)	1.022 (0.017)	1.019 (0.017)
Year Group 2017 - 2022	3.147 (0.521)**	5.460 (0.651)***	3.755 (0.756).
Acton-Agua Dulce Unified	0.000 (2.035)***	0.000 (2.100)***	0.000 (2.070)***
Alhambra Unified	5.011 (2.105)	5.190 (2.301)	5.348 (2.295)
Antelope Valley Union High	0.000 (5.965)***	0.000 (5.449)***	0.000 (5.948)***
Arcadia Unified	0.000 (1.740)***	0.000 (1.887)***	0.000 (1.850)***
Azusa Unified	0.000 (1.911)***	0.000 (2.098)***	0.000 (2.104)***
Baldwin Park Unified	0.000 (1.940)***	0.000 (2.235)***	0.000 (2.079)***
Bassett Unified	0.000 (1.954)***	0.000 (2.162)***	0.000 (2.228)***

Bellflower Unified	0.000 (2.020)***	0.000 (2.087)***	0.000 (2.098)***
Beverly Hills Unified	0.000 (2.313)***	0.000 (3.644)***	0.000 (2.755)***
Bonita Unified	0.000 (1.817)***	0.000 (1.952)***	0.000 (1.921)***
Burbank Unified	0.000 (1.843)***	0.000 (2.121)***	0.000 (1.971)***
Castaic Union	0.000 (9.778)***	0.000 (16.638)*	0.000 (12.552)*
Charter Oak Unified	0.000 (1.900)***	0.000 (2.001)***	0.000 (2.089)***
Claremont Unified	0.000 (1.798)***	0.000 (1.968)***	0.000 (1.952)***
Compton Unified	0.000 (1.960)***	0.000 (2.131)***	0.000 (68.176)
Covina-Valley Unified	3.117 (2.050)	1.288 (2.187)	2.836 (2.144)
Culver City Unified	0.000 (2.056)***	0.000 (2.406)***	0.000 (2.138)***
Downey Unified	0.000 (1.931)***	0.000 (103.345)	0.000 (2.004)***
Duarte Unified	0.000 (1.898)***	0.000 (2.088)***	0.000 (2.050)***
East Whittier City Elementary	0.000 (1.787)***	0.000 (1.956)***	0.000 (1.899)***
Eastside Union Elementary	0.000 (2.232)***	0.000 (2.938)***	0.000 (2.536)***
El Monte City	2.278 (2.104)	2.022 (2.241)	2.249 (2.246)
El Rancho Unified	0.000 (1.805)***	0.000 (2.124)***	0.000 (2.341)***
El Segundo Unified	0.000 (1.940)***	0.000 (2.150)***	0.000 (2.103)***
Garvey Elementary	7.913 (2.095)	3.165 (2.346)	5.425 (2.465)
Glendale Unified	18.456 (1.806)	36.549 (2.042).	24.443 (1.896).
Glendora Unified	0.000 (1.872)***	0.000 (2.108)***	0.000 (1.973)***
Gorman Joint	0.000 (2.199)***	0.000 (2.268)***	0.000 (2.215)***
Hacienda la Puente Unified	1.595 (2.206)	2.404 (2.343)	2.569 (2.308)
Hawthorne	0.000 (1.998)***	0.000 (2.101)***	0.000 (2.087)***
Hughes-Elizabeth Lakes Union Elementary	0.000 (1.991)***	0.000 (2.164)***	0.000 (2.150)***

Inglewood Unified	0.000 (3.611)***	0.000 (2.124)***	0.000 (2.434)***
Keppel Union Elementary	0.000 (1.989)***	0.000 (2.027)***	0.000 (2.123)***
La Canada Unified	0.000 (1.480)***	0.000 (1.534)***	0.000 (1.568)***
Lancaster Elementary	0.000 (2.117)***	0.000 (2.540)***	0.000 (2.333)***
Las Virgenes Unified	0.000 (1.444)***	0.000 (1.513)***	0.000 (1.512)***
Lawndale Elementary	0.000 (1.892)***	0.000 (2.170)***	0.000 (2.096)***
Lennox	0.000 (1.921)***	0.000 (2.100)***	0.000 (2.074)***
Little Lake City Elementary	0.000 (1.928)***	0.000 (2.130)***	0.000 (2.074)***
Long Beach Unified	0.000 (1.933)***	0.000 (9.382)*	0.000 (13.006)
Los Angeles County Office of Education	0.000 (2.163)***	0.000 (4.029)***	0.000 (2.769)***
Lynwood Unified	0.000 (2.062)***	0.000 (2.125)***	0.000 (2.130)***
Manhattan Beach Unified	0.000 (1.988)***	0.000 (2.101)***	0.000 (2.083)***
Monrovia Unified	10.149 (2.067)	26.507 (2.125)	16.050 (2.347)
Montebello Unified	2.477 (2.120)	2.632 (2.257)	2.378 (2.167)
Mountain View Elementary	0.000 (1.901)***	0.000 (2.007)***	0.000 (1.986)***
Newhall	0.000 (3.514)***	0.000 (3.808)***	0.000 (3.356)***
Norwalk-La Mirada Unified	0.000 (1.895)***	0.000 (2.127)***	0.000 (2.089)***
Palmdale Elementary	0.000 (3.064)***	0.000 (4.522)***	0.000 (3.996)***
Palos Verdes Peninsula Unified	0.000 (1.523)***	0.000 (1.886)***	0.000 (1.679)***
Paramount Unified	0.000 (1.946)***	0.000 (2.226)***	0.000 (2.178)***
Pasadena Unified	0.854 (2.061)	0.217 (2.652)	0.863 (2.356)
Pomona Unified	0.692 (2.432)	0.834 (2.540)	1.013 (2.532)
Redondo Beach Unified	0.000 (1.878)***	0.000 (2.128)***	0.000 (2.563)***
Rosemead Elementary	9.738 (2.101)	11.040 (2.226)	9.904 (2.216)

Rowland Unified	3.828 (2.180)	6.215 (2.254)	4.088 (2.298)
San Gabriel Unified	7.396 (2.107)	12.241 (2.207)	9.115 (2.167)
San Marino Unified	0.000 (1.557)***	0.000 (1.581)***	0.000 (1.656)***
Santa Monica-Malibu Unified	0.000 (1.540)***	0.000 (2.055)***	0.000 (1.750)***
Saugus Union	0.000 (26.208)***	0.000 (43.618)	0.000 (33.166).
SBE - Today's Fresh Start Charter	0.000 (2.161)***	0.000 (2.902)***	0.000 (4.570)***
South Pasadena Unified	31.427 (2.210)	83.099 (2.224)*	38.900 (2.178).
South Whittier Elementary	0.000 (2.068)***	0.000 (2.124)***	0.000 (2.127)***
Sulphur Springs Union	0.000 (2.196)***	0.000 (2.192)***	0.000 (2.086)***
Temple City Unified	0.000 (1.957)***	0.000 (2.053)***	0.000 (2.011)***
Torrance Unified	0.000 (1.770)***	0.000 (1.927)***	0.000 (1.925)***
Valle Lindo Elementary	0.000 (2.190)***	0.000 (2.284)***	0.000 (2.199)***
Walnut Valley Unified	4.621 (1.930)	5.123 (2.009)	4.339 (2.048)
West Covina Unified	0.000 (1.858)***	0.000 (2.027)***	0.000 (2.038)***
Westside Union Elementary	0.000 (9.112)***	0.000 (16.204)***	0.000 (10.576)***
Whittier City Elementary	0.000 (1.862)***	0.000 (2.019)***	0.000 (2.131)***
William S. Hart Union High	0.000 (2.343)***	0.000 (2.470)***	0.000 (3.070)***
Wilsona Elementary	0.000 (1.626)***	0.000 (2.364)***	0.000 (2.992)***
Observations	12153	12153	12153
Max VIF	7.11	6.75	6.8
McFadden's R2	0.274	0.302	0.266
AIC	420.8	411.5	423.5
BIC	1079.8	1070.6	1082.6

*** p<0.001, ** p<0.01, * p<0.05, .p<.1

Note: These models come from estimating logit models. Clustered standard errors at the school level in parentheses. Estimates are odds-ratios: (>1 = more likelihood of event (failure=becoming TWI) happening; <1 = less likelihood of event happening). Years are grouped into two groups consisting of pre-2017 and post-2017. All other languages include Armenian, Arabic, French, German, Mandarin, Korean, and Japanese.

Table F7 - *Regression Outputs, Programs Founded after 2010, LAUSD*

	Los Angeles Unified		
	1-mile	2-mile	5-mile
	OR (SE)	OR (SE)	OR (SE)
Intercept	0.002 (0.789)***	0.001 (0.843)***	0.001 (0.973)***
%Δ in number of nearby schools	1.060 (0.045)	1.246 (0.104)*	0.840 (0.513)
%Δ in number of nearby TWDL	1.003 (0.026)	1.038 (0.018)*	1.010 (0.013)
%Δ in number of nearby charters	1.007 (0.029)	1.004 (0.020)	1.022 (0.031)
%Δ in enrollment share	0.997 (0.034)	0.965 (0.035)	0.845 (0.086)*
%Δ in HHI	0.978 (0.092)	1.054 (0.038)	0.646 (0.413)
%Δ in number of nearby, out-district schools	0.924 (0.089)	1.009 (0.023)	0.879 (0.078).
%Δ in out-district enrollment share	0.895 (0.148)	1.024 (0.042)	0.986 (0.039)
%Δ School-Wide Enrollment	0.877 (0.044)**	0.883 (0.043)**	1.015 (0.082)
%Δ EL Enrollment	1.033 (0.013)**	1.038 (0.010)***	1.029 (0.008)***
%Δ FRPM Enrollment	0.909 (0.046)*	0.887 (0.046)**	0.890 (0.048)*
%Δ Share of Hispanic Residents	1.002 (0.002)	1.002 (0.002)	1.002 (0.002)
%Δ Share of Black/African American Residents	0.988 (0.009)	0.987 (0.010)	0.988 (0.009)
%Δ Share of White Residents	1.000 (0.002)	0.999 (0.002)	0.999 (0.002)
%Δ Assessed Home Value (in 2022 dollars)	0.974 (0.013)*	0.974 (0.013)*	0.973 (0.013)*
2012 - 2013	3.288 (0.791)	3.550 (0.807)	3.306 (0.855)
2014 - 2015	3.839 (0.806).	4.008 (0.832).	3.641 (0.870)
2016 - 2017	4.625 (0.767)*	5.182 (0.795)*	4.775 (0.848).
2018 - 2019	29.615 (0.719)***	32.729 (0.751)***	33.008 (0.795)***
2020 - 2022	17.723 (0.715)***	18.708 (0.745)***	22.323 (0.792)***
Local District East	1.500 (0.346)	1.504 (0.361)	1.722 (0.381)
Local District Northeast	0.785 (0.412)	1.099 (0.415)	1.152 (0.455)
Local District Northwest	0.778 (0.522)	1.211 (0.544)	0.918 (0.576)
Local District South	1.767 (0.390)	2.216 (0.395)*	2.260 (0.413)*
Local District West	1.088 (0.403)	1.347 (0.393)	1.069 (0.394)

Observations	5494	5494	5494
Max VIF	2.74	1.97	10.15
McFadden's R2	0.138	0.15	0.148
AIC	1005.9	992.4	995.5
BIC	1171.2	1157.7	1160.7

*** p<0.001, ** p<0.01, * p<0.05, .p<.1

Note: These models come from estimating logit models. Clustered standard errors at the school level in parentheses. Estimates are odds-ratios: (>1 = more likelihood of event (failure=becoming TWDL) happening; <1 = less likelihood of event happening). District fixed effects include the six (now historical) sub-districts for Los Angeles Unified: West, Northeast, Northwest, Central, South, and East, corresponding to the geographies of the district. See map in Appendix E for a detailed map of the local districts. For analysis, years are grouped into two-year increments, except for the year 2019-2022 increment, to avoid perfect separation.

Table F8 - *Regression Outputs, Programs Founded after 2010, All Other Districts in Los Angeles County*

	All Other Districts in Los Angeles County		
	1-mile	2-mile	5-mile
	OR (SE)	OR (SE)	OR (SE)
Intercept	0.005 (0.731)***	0.004 (0.742)***	0.004 (0.784)***
%Δ in number of nearby schools	0.991 (0.094)	0.689 (0.227)	1.172 (0.477)
%Δ in number of nearby TWDL	0.026 (0.110)**	0.762 (0.108)*	0.833 (0.072)*
%Δ in number of nearby charters	1.042 (0.174)	0.959 (0.088)	1.019 (0.086)
%Δ in enrollment share	1.105 (0.098)	1.034 (0.103)	0.997 (0.007)
%Δ in HHI	0.894 (0.168)	0.981 (0.133)	0.769 (0.385)
%Δ in number of nearby, out-district schools	0.961 (0.052)	0.957 (0.058)	1.050 (0.116)
%Δ in out-district enrollment share	0.995 (0.086)	0.953 (0.049)	1.034 (0.076)
%Δ School-Wide Enrollment	0.831 (0.108).	0.859 (0.099)	0.899 (0.098)
%Δ EL Enrollment	0.906 (0.029)***	0.895 (0.032)***	0.898 (0.030)***
%Δ FRPM Enrollment	1.034 (0.031)	1.039 (0.033)	1.033 (0.034)
%Δ Share of Black/African American Residents	1.000 (0.000)***	1.000 (0.000)***	1.000 (0.000)***
%Δ Share of Hispanic Residents	1.000 (0.003)	1.001 (0.002)	0.998 (0.003)
%Δ Share of White Residents	0.998 (0.003)	0.998 (0.003)	0.999 (0.002)
%Δ Assessed Home Value (in 2022 dollars)	0.991 (0.012)	0.989 (0.011)	0.987 (0.013)
2012 - 2013	0.613 (0.519)	0.590 (0.514)	0.694 (0.531)
2014 - 2015	1.267 (0.423)	1.276 (0.427)	1.486 (0.483)
2016 - 2017	2.072 (0.381).	2.140 (0.371)*	2.703 (0.499)*
2018 - 2019	1.466 (0.411)	1.612 (0.424)	2.254 (0.560)
2020 - 2022	1.872 (0.364).	2.332 (0.359)*	3.193 (0.553)*
Acton-Agua Dulce Unified	0.000 (1.240)***	0.000 (1.241)***	0.000 (1.257)***
Alhambra Unified	2.184 (0.903)	2.114 (0.933)	1.932 (0.962)
Arcadia Unified	0.000 (0.790)***	0.000 (0.794)***	0.000 (0.803)***

Azusa Unified	1.086 (1.046)	1.070 (1.059)	1.422 (1.047)
Baldwin Park Unified	0.000 (0.909)**	0.000 (0.923)**	0.000 (0.908)***
Bassett Unified	1.763 (1.194)	0.971 (1.271)	3.069 (1.349)
Bellflower Unified	2.073 (1.044)	2.264 (1.067)	5.047 (1.101)
Beverly Hills Unified	0.000 (0.908)**	0.000 (0.946)**	0.000 (1.251)***
Bonita Unified	0.000 (0.814)**	0.000 (0.829)**	0.000 (0.838)***
Burbank Unified	1.597 (1.040)	2.397 (1.087)	2.506 (1.087)
Castaic Union	0.000 (0.922)**	0.000 (1.065)**	0.000 (3.974)***
Charter Oak Unified	0.000 (0.848)**	0.000 (0.857)**	0.000 (1.088)***
Claremont Unified	0.000 (0.802)**	0.000 (0.809)**	0.000 (0.841)***
Compton Unified	1.158 (0.960)	2.297 (0.973)	1.453 (0.959)
Covina-Valley Unified	2.059 (0.953)	1.083 (1.056)	4.329 (1.041)
Culver City Unified	3.642 (1.436)	7.162 (1.532)	7.139 (1.520)
Downey Unified	0.000 (0.791)**	0.000 (0.834)**	0.000 (0.916)***
Duarte Unified	1.182 (1.243)	1.510 (1.371)	1.671 (1.277)
East Whittier City Elementary	0.753 (1.162)	0.766 (1.181)	0.647 (1.186)
Eastside Union Elementary	0.000 (1.070)**	0.000 (1.148)**	0.000 (1.429)***
El Monte City	1.024 (1.013)	0.789 (1.035)	1.626 (1.128)
El Rancho Unified	1.186 (1.294)	0.487 (1.379)	2.561 (1.417)
El Segundo Unified	0.000 (1.034)**	0.000 (1.051)**	0.000 (1.085)***
Garvey Elementary	2.441 (1.074)	1.327 (1.166)	4.263 (1.288)
Glendale Unified	5.353 (0.901).	5.789 (0.952).	15.650 (1.016)**
Glendora Unified	0.000 (0.875)**	0.000 (1.121)**	0.000 (0.966)***
Gorman Joint	0.000 (1.382)**	0.000 (1.396)**	0.000 (1.448)***
Hacienda la Puente Unified	1.743 (0.920)	2.137 (0.930)	10.954 (1.102)*
Hawthorne	0.000 (0.862)**	0.000 (0.889)**	0.000 (0.896)***
Hughes-Elizabeth Lakes Union Elementary	0.000 (1.310)**	0.000 (1.258)**	0.000 (1.227)***

Inglewood Unified	0.548 (1.258)	2.016 (1.383)	0.211 (1.786)
Keppel Union Elementary	0.000 (0.938)***	0.000 (1.047)***	0.000 (1.028)***
La Canada Unified	0.000 (1.085)***	0.000 (1.106)***	0.000 (1.129)***
Lancaster Elementary	1.062 (1.332)	2.610 (1.223)	0.493 (1.447)
Las Virgenes Unified	1.724 (1.335)	1.783 (1.350)	1.743 (1.416)
Lawndale Elementary	0.000 (0.870)***	0.000 (0.907)***	0.000 (0.979)***
Lennox	3.471 (1.201)	4.072 (1.209)	3.249 (1.230)
Little Lake City Elementary	0.000 (0.842)***	0.000 (0.855)***	0.000 (0.867)***
Long Beach Unified	0.234 (1.043)	0.191 (1.055)	0.306 (1.045)
Los Angeles County Office of Education	0.000 (1.989)***	0.000 (2.206)***	0.000 (2.450)***
Lynwood Unified	0.543 (1.345)	1.462 (1.348)	0.242 (1.426)
Manhattan Beach Unified	0.000 (0.980)***	0.000 (1.009)***	0.000 (1.001)***
Monrovia Unified	7.041 (0.884)***	15.810 (0.903)***	6.376 (1.270)
Montebello Unified	0.561 (1.238)	0.671 (1.204)	0.535 (1.247)
Mountain View Elementary	0.512 (1.238)	0.520 (1.240)	0.551 (1.237)
Newhall	1.016 (1.219)	1.740 (1.267)	0.433 (1.613)
Norwalk-La Mirada Unified	0.000 (0.768)***	0.000 (0.813)***	0.000 (0.824)***
Palmdale Elementary	2.260 (1.100)	2.261 (1.028)	4.212 (1.435)
Palos Verdes Peninsula Unified	0.000 (0.877)***	0.000 (0.878)***	0.000 (0.941)***
Paramount Unified	0.000 (0.815)***	0.000 (0.891)***	0.000 (0.932)***
Pasadena Unified	3.703 (0.916)	3.203 (0.942)	6.701 (1.198)
Pomona Unified	0.679 (0.988)	0.902 (0.991)	1.359 (1.016)
Redondo Beach Unified	1.766 (1.323)	1.968 (1.351)	0.894 (1.950)
Rosemead Elementary	2.265 (1.249)	2.436 (1.262)	2.158 (1.267)
Rowland Unified	1.391 (1.036)	1.810 (1.027)	3.759 (1.109)
San Gabriel Unified	4.403 (1.038)	5.675 (1.061)	4.023 (1.032)
San Marino Unified	0.000 (1.400)***	0.000 (1.446)***	0.000 (1.457)***
Santa Monica-Malibu Unified	0.000 (0.782)***	0.000 (0.789)***	0.000 (0.811)***

Saugus Union	1.716 (1.228)	1.742 (1.287)	1.620 (1.326)
SBE - Today's Fresh Start Charter	0.000 (1.348)***	0.000 (1.695)***	0.000 (2.455)***
South Pasadena Unified	28.418 (1.132)**	59.471 (1.094)***	26.587 (1.097)**
South Whittier Elementary	3.866 (1.109)	2.109 (1.250)	7.457 (1.396)
Sulphur Springs Union	0.000 (0.811)***	0.000 (0.861)***	0.000 (0.983)***
Temple City Unified	0.000 (0.927)***	0.000 (0.963)***	0.000 (1.036)***
Torrance Unified	1.389 (0.944)	1.470 (0.966)	1.263 (0.973)
Valle Lindo Elementary	0.000 (1.252)***	0.000 (1.248)***	0.000 (1.262)***
Walnut Valley Unified	2.088 (1.250)	2.398 (1.251)	1.721 (1.282)
West Covina Unified	2.407 (1.019)	2.131 (1.057)	3.822 (1.046)
Westside Union Elementary	0.000 (0.949)***	0.000 (1.004)***	0.000 (7.285)*
Whittier City Elementary	2.287 (1.007)	1.331 (1.080)	3.871 (1.099)
William S. Hart Union High	0.000 (1.545)***	0.000 (1.651)***	0.000 (1.702)***
Wilsona Elementary	0.000 (1.243)***	0.000 (1.928)***	0.000 (2.140)***
Observations	7947	7947	7947
Max VIF	6.89	6.63	6.69
McFadden's R2	0.134	0.146	0.142
AIC	943.4	932.6	936.2
BIC	1585.6	1574.8	1578.4

*** p<0.001, ** p<0.01, * p<0.05, .p<.1

Note: These models come from estimating logit models. Clustered standard errors at the school level in parentheses. Estimates are odds-ratios: (>1 = more likelihood of event (failure=becoming TWDL) happening; <1 = less likelihood of event happening). For analysis, years are grouped into two-year increments, except for the year 2019-2022 increment, to avoid perfect separation.

Table F9 - *Regression Outputs, Neighborhood Economic Change*

	All Other Districts in Los Angeles County					
	> County Median			< County Median		
	1-mile	2-mile	5-mile	1-mile	2-mile	5-mile
Intercept	0.001 (1.543)***	0.001 (1.536)***	0.001 (1.494)***	0.000 (1.455)**	0.000 (1.443)**	0.000 (1.616)**
%Δ in number of nearby TWDL	0.019 (0.108)***	0.513 (0.108)***	0.792 (0.091)*	0.003 (0.618)**	0.864 (0.136)	0.865 (0.104)
%Δ in number of nearby charters	0.983 (0.134)	0.868 (0.089)	0.791 (0.109)*	1.143 (0.154)	0.986 (0.115)	1.100 (0.070)
%Δ in enrollment share	1.177 (0.117)	1.101 (0.148)	1.115 (0.237)	1.005 (0.180)	1.036 (0.160)	1.082 (0.045).
%Δ in HHI	0.724 (0.215)	1.056 (0.124)	1.692 (0.447)	0.976 (0.161)	1.026 (0.148)	0.805 (0.262)
%Δ in number of nearby, out-district schools	0.904 (0.102)	0.910 (0.071)	1.414 (0.258)	0.932 (0.048)	0.954 (0.082)	0.987 (0.106)
%Δ in out-district enrollment share	0.855 (0.208)	0.887 (0.106)	0.978 (0.065)	1.062 (0.117)	0.954 (0.073)	1.000 (0.227)
%Δ School-Wide Enrollment	0.748 (0.100)**	0.752 (0.114)*	0.724 (0.167).	1.068 (0.179)	1.074 (0.177)	1.019 (0.234)
%Δ EL Enrollment	0.893 (0.031)***	0.877 (0.033)***	0.876 (0.055)*	0.902 (0.047)*	0.901 (0.047)*	0.890 (0.049)*
%Δ FRPM Enrollment	1.196 (0.059)**	1.211 (0.047)***	1.228 (0.058)***	0.988 (0.052)	0.987 (0.055)	0.989 (0.055)
%Δ Share of Black/African American Residents	1.000 (0.000)***	1.000 (0.000)***	1.000 (0.000)***	1.006 (0.002)*	1.006 (0.002)*	1.006 (0.003)*
%Δ Share of Hispanic Residents	1.000 (0.004)	1.005 (0.003)	1.000 (0.004)	0.997 (0.005)	0.996 (0.005)	0.995 (0.005)
%Δ Share of White Residents	1.008 (0.006)	1.007 (0.005)	1.014 (0.007)*	0.978 (0.009)*	0.981 (0.008)*	0.982 (0.009)*

Year Group 2006 - 2010	5.049 (1.074)	5.716 (1.123)	4.366 (1.140)	4.372 (1.117)	4.578 (1.119)	3.752 (1.176)
Year Group 2011 - 2016	8.220 (1.081).)	10.587 (1.123)*	12.590 (1.138)*	24.658 (1.047)**	23.454 (1.082)**	30.082 (1.198)**
Year Group 2017 - 2022	18.103 (1.060)**	27.541 (1.110)**	36.257 (1.205)**	55.527 (1.053)***	55.995 (1.096)***	83.621 (1.291)***
Acton-Agua Dulce Unified				0.000 (1.575)**	0.000 (1.590)**	0.000 (1.588)**
Alhambra Unified	0.971 (1.512)	0.985 (1.451)	0.499 (1.536)	2.574 (1.334)	2.283 (1.342)	2.254 (1.388)
Arcadia Unified	0.000 (1.370)***	0.000 (1.311)***	0.000 (1.418)***	0.000 (1.436)**	0.000 (1.439)**	0.000 (1.468)**
Azusa Unified	0.000 (1.259)***	0.000 (1.262)***	0.000 (1.355)***	2.342 (1.423)	2.490 (1.389)	2.443 (1.345)
Baldwin Park Unified	0.000 (1.486)***	0.000 (1.509)***	0.000 (1.605)***	2.095 (1.695)	1.383 (1.733)	1.195 (1.709)
Bassett Unified	0.000 (1.326)***	0.000 (1.376)***	0.000 (1.641)***	7.430 (1.479)	5.939 (1.430)	5.655 (1.421)
Bellflower Unified	0.000 (1.181)***	0.000 (1.232)***	0.000 (1.289)***	4.786 (1.373)	8.318 (1.322)	9.819 (1.395)
Beverly Hills Unified	0.000 (1.401)***	0.000 (1.375)***	0.000 (1.833)***			
Bonita Unified	0.000 (1.496)***	0.000 (1.494)***	0.000 (1.497)***	0.000 (1.150)**	0.000 (1.145)**	0.000 (1.159)**
Burbank Unified	0.594 (1.330)	0.875 (1.379)	0.523 (1.463)	0.000 (1.261)**	0.000 (1.288)**	0.000 (1.268)**
Castaic Union	0.000 (1.608)***	0.000 (1.518)***	0.000 (2.300)***	0.000 (1.197)**	0.000 (1.191)**	0.000 (1.484)**
Charter Oak Unified	0.000 (1.279)***	0.000 (1.291)***	0.000 (1.363)***	0.000 (1.169)**	0.000 (1.158)**	0.000 (2.448)**
Claremont Unified	0.000 (1.552)***	0.000 (1.494)***	0.000 (1.571)***	0.000 (1.106)**	0.000 (1.096)**	0.000 (1.202)**

Compton Unified	0.000 (1.243)***	0.000 (1.275)***	0.000 (86.101)	4.573 (1.350)	6.859 (1.290)	4.438 (1.280)
Covina-Valley Unified	0.000 (1.281)***	0.000 (1.251)***	0.000 (1.509)***	3.005 (1.271)	2.724 (1.250)	4.402 (1.290)
Culver City Unified	1.019 (1.576)	2.350 (1.585)	0.913 (1.692)			
Downey Unified	0.000 (1.222)***	0.000 (1.211)***	0.000 (1.331)***	0.000 (1.151)***	0.000 (1.118)***	0.000 (1.143)***
Duarte Unified	0.000 (2.120)***	0.000 (1.445)***	0.000 (1.408)***	3.960 (1.463)	4.075 (1.840)	4.482 (1.563)
East Whittier City Elementary	0.000 (1.603)***	0.000 (1.686)***	0.000 (2.133)***	1.086 (1.423)	1.214 (1.426)	1.104 (1.426)
Eastside Union Elementary	0.000 (1.456)***	0.000 (1.403)***	0.000 (1.516)***	0.000 (1.597)***	0.000 (1.448)***	0.000 (1.439)***
El Monte City	0.000 (1.189)***	0.000 (1.187)***	0.000 (1.450)***	1.353 (1.373)	1.496 (1.323)	1.645 (1.372)
El Rancho Unified	1.071 (1.572)	0.751 (1.531)	0.170 (1.959)	0.000 (1.264)***	0.000 (1.281)***	0.000 (1.427)***
El Segundo Unified	0.000 (1.343)***	0.000 (1.340)***	0.000 (1.432)***			
Garvey Elementary	2.263 (1.425)	1.740 (1.367)	0.313 (1.729)	0.000 (1.358)***	0.000 (1.460)***	0.000 (1.512)***
Glendale Unified	1.489 (1.293)	2.187 (1.244)	2.274 (1.536)	26.323 (1.391)*	18.342 (1.370)*	49.335 (1.346)**
Glendora Unified	0.000 (1.215)***	0.000 (1.215)***	0.000 (1.314)***	0.000 (1.484)***	0.000 (1.471)***	0.000 (1.499)***
Gorman Joint				0.000 (55.867)**	0.000 (55.701)**	0.000 (59.418)*
Hacienda la Puente Unified	2.653 (1.312)	2.500 (1.339)	9.000 (1.390)	1.306 (1.406)	1.913 (1.337)	5.389 (1.503)
Hawthorne	0.000 (1.212)***	0.000 (1.220)***	0.000 (1.334)***	0.000 (1.284)***	0.000 (1.266)***	0.000 (1.275)***

Hughes-Elizabeth Lakes Union Elementary				0.000 (2.216)***	0.000 (2.287)***	0.000 (2.782)***
Inglewood Unified	0.000 (1.670)***	0.000 (1.630)***	0.000 (1.874)***	0.890 (1.590)	2.262 (1.755)	0.227 (2.264)
Keppel Union Elementary				0.000 (1.271)***	0.000 (1.275)***	0.000 (1.237)***
La Canada Unified	0.000 (2.390)***	0.000 (2.008)***	0.000 (2.422)***			
Lancaster Elementary	0.000 (1.127)***	0.000 (1.151)***	0.000 (1.644)***	4.875 (1.561)	4.378 (1.604)	2.787 (1.794)
Las Virgenes Unified	0.000 (1.664)***	0.000 (1.530)***	0.000 (1.717)***	10.112 (1.581)	9.667 (1.603)	8.881 (1.733)
Lawndale Elementary	0.000 (1.343)***	0.000 (1.327)***	0.000 (1.459)***	3.621 (1.636)	3.405 (1.570)	2.961 (1.441)
Lennox				4.337 (1.561)	4.978 (1.478)	3.777 (1.498)
Little Lake City Elementary	0.000 (1.358)***	0.000 (1.349)***	0.000 (1.394)***	0.000 (1.236)***	0.000 (1.182)***	0.000 (1.229)***
Long Beach Unified	0.152 (1.356)	0.114 (1.361)	0.035 (1.575)*	0.000 (1.225)***	0.000 (1.182)***	0.000 (1.174)***
Los Angeles County Office of Education	0.000 (1.664)***	0.000 (1.936)***	0.000 (1.517)***			
Lynwood Unified	0.185 (1.643)	0.470 (1.756)	0.239 (1.728)			
Manhattan Beach Unified	0.000 (1.393)***	0.000 (1.329)***	0.000 (1.447)***	0.000 (1.546)***	0.000 (1.566)***	0.000 (1.591)***
Monrovia Unified	2.629 (1.179)	3.896 (1.146)	3.066 (1.216)			
Montebello Unified	0.581 (1.450)	0.635 (1.375)	0.291 (1.496)	0.000 (1.329)***	0.000 (1.377)***	0.000 (1.340)***
Mountain View Elementary	0.000 (1.221)***	0.000 (1.195)***	0.000 (1.311)***	1.394 (1.513)	1.344 (1.472)	1.108 (1.458)
Newhall	0.000 (2.734)***	0.000 (3.005)***	0.000 (2.813)***	2.226 (1.465)	2.174 (1.442)	1.964 (1.540)

Norwalk-La Mirada Unified	0.000 (1.288)***	0.000 (1.240)***	0.000 (1.365)***	0.000 (1.206)**	0.000 (1.203)**	0.000 (1.229)**
Palmdale Elementary	0.000 (1.169)***	0.000 (1.173)***	0.000 (2.219)***	5.395 (1.403)	6.244 (1.410)	5.547 (1.872)
Palos Verdes Peninsula Unified	0.000 (2.436)***	0.000 (2.263)***	0.000 (2.729)***	0.000 (1.216)**	0.000 (1.212)**	0.000 (1.248)**
Paramount Unified	0.000 (1.263)***	0.000 (1.312)***	0.000 (1.631)***	0.000 (1.226)**	0.000 (1.244)**	0.000 (1.433)**
Pasadena Unified	0.217 (1.352)	0.099 (1.535)	0.233 (1.614)			
Pomona Unified	0.248 (1.513)	0.321 (1.453)	0.420 (1.531)	1.260 (1.458)	1.295 (1.396)	1.674 (1.530)
Redondo Beach Unified	1.038 (1.444)	1.482 (1.575)	0.980 (1.671)	0.000 (1.191)**	0.000 (1.213)**	0.000 (3.138)**
Rosemead Elementary	0.000 (1.308)***	0.000 (1.284)***	0.000 (1.400)***	3.225 (1.550)	3.094 (1.533)	2.678 (1.558)
Rowland Unified	1.122 (1.231)	0.801 (1.284)	0.536 (1.500)	3.493 (1.431)	3.990 (1.410)	6.780 (1.542)
San Gabriel Unified	1.987 (1.342)	3.083 (1.324)	1.149 (1.489)			
San Marino Unified	0.000 (5.019)***	0.000 (3.999)***	0.000 (5.156)***			
Santa Monica-Malibu Unified	0.000 (3.573)***	0.000 (2.927)***	0.000 (3.810)***	0.000 (1.593)**	0.000 (1.580)**	0.000 (1.554)**
Saugus Union	0.000 (1.312)***	0.000 (1.342)***	0.000 (2.696)***	5.370 (1.508)	5.263 (1.520)	6.538 (1.620)
South Pasadena Unified	16.220 (1.347)*	55.380 (1.348)**	9.321 (1.398)	6.466 (1.444)	5.921 (1.415)	4.078 (1.629)
Sulphur Springs Union	0.000 (1.288)***	0.000 (1.330)***	0.000 (1.434)***	0.000 (1.346)**	0.000 (1.299)**	0.000 (1.400)**
Temple City Unified	0.000 (1.218)***	0.000 (1.206)***	0.000 (1.341)***			

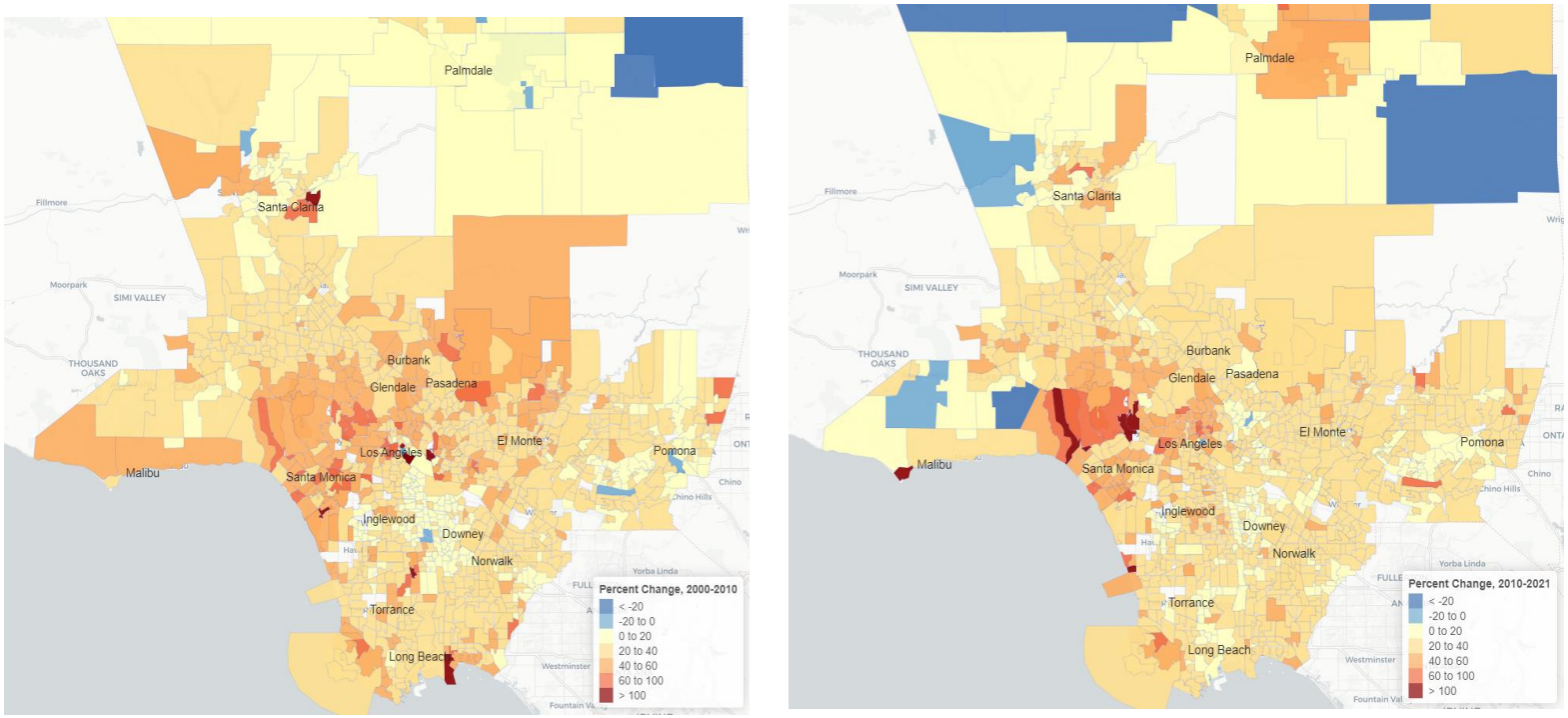
Torrance Unified	0.000 (1.176)***	0.000 (1.149)***	0.000 (1.244)***	2.835 (1.235)	2.863 (1.236)	2.681 (1.276)
Valle Lindo Elementary	0.000 (1.517)***	0.000 (1.477)***	0.000 (1.508)***			
Walnut Valley Unified	0.000 (1.480)***	0.000 (1.437)***	0.000 (1.533)***	3.380 (1.480)	3.478 (1.456)	3.135 (1.499)
West Covina Unified	0.000 (1.389)***	0.000 (1.482)***	0.000 (1.509)***	3.034 (1.303)	3.462 (1.316)	4.002 (1.321)
Westside Union Elementary	0.000 (6.313)**	0.000 (6.974)***	0.000 (26.517).	0.000 (1.162)***	0.000 (1.151)***	0.000 (1.725)***
Whittier City Elementary	4.038 (1.192)	4.077 (1.296)	1.674 (1.342)	1.169 (1.450)	1.186 (1.459)	1.467 (1.503)
William S. Hart Union High				0.000 (1.910)***	0.000 (1.868)***	0.000 (2.030)***
Wilsona Elementary	0.000 (1.680)***	0.000 (1.675)***	0.000 (2.821)***	0.000 (1.559)***	0.000 (1.625)***	0.000 (2.198)***
Observations	5940	5940	5940	7026	7026	7026
Max VIF	14.95	14.66	3.33	12.08	11.97	12.08
McFadden's R2	0.249	0.279	0.274	0.19	0.186	0.192
AIC	497.5	484.2	486.3	613.3	615.3	612.2
BIC	1032.7	1019.4	1021.4	1120.7	1122.8	1119.6

*** p<0.001, ** p<0.01, * p<0.05, .p<.1

Note: Regression estimates from estimating a logistic regression. Clustered standard errors at the school level in parentheses. Estimates are odds-ratios: (>1 = greater likelihood of event happening; <1 = lower likelihood of event happening). County median percentage change is calculated for all school zones in the county. The median percentage change for these zones between 2000 and 2010 was 29.3% and between 2010 and 2021 was 28.9%.

Appendix G

Figure G1 - *Percentage Change in Median Assessed Home Values, 2000 - 2021*



Note. Assessed values are calculated from the historical Zillow ZTRAX dataset for years 2000, 2010 and 2021. Home values are for all assessed single-family homes. Per Proposition 13 (passed in 1978) which froze property taxes to their 1976 values, capped annual increases to 2% a year and reassessed homes only when a property underwent a sale or new construction. Assessed values are at the parcel level, and geographically assigned to elementary attendance zones (the unit of analysis shown here).

Study 2: Leadership Perspectives of School Choice, Program Purpose and Enrollment in Two Way Dual Immersion Programs: A Case Study of Greater Los Angeles

Abstract

This study investigates the founding and implementation of two-way dual language (TWDL) programs across schools and districts in Greater Los Angeles. Through interviews with 30 school and district leaders, the research explores how factors such as enrollment decline, competition, and school choice influence TWDL program adoption and framing. Conceptual frameworks including market-based competition, social constructions of target populations and social justice leadership guide the analysis of this study. Key findings reveal that many programs are founded in response to enrollment decline and competition from other schools, with school choice playing a vital role in program purpose and enrollment. The study also highlights how leaders' personal experiences and beliefs about language learning significantly influence program framing and target population construction. Additionally, the lasting impact of past language policies, particularly Proposition 227, on current program enrollment and parental attitudes is clear. The study identifies both promising practices and concerning trends in TWDL expansion, emphasizing the need for careful consideration of equity and access in program founding and enrollment. It concludes with recommendations for school leaders and policymakers to ensure TWDL programs serve their intended diverse student populations, while acknowledging the considerable variation in how leaders conceptualize and respond to the linguistic diversity within their student bodies.

This paper examines the role that school choice plays in TWDL founding by focusing on leaders' perceptions and their role in making decisions around dual language programs. Typically, the school choice literature has focused on the myriad options available to school and district leaders when faced with increased school choice, examining the choices they end up making given constraints and pressures. This paper examines district leaders who have already made the choice of opening a dual language program, and working backwards to examine why and how these programs were founded. Since school choice in California was enacted in the 1990s, all programs documented were founded within the landscape of school choice. In addition, it explores variations that leadership beliefs, backgrounds and school/district contexts may engender and attempts to connect these with current enrollment and access for various subgroups of students. It follows a qualitative case study approach and uses interviews with 30 participants involved in TWDL across districts and schools in Greater Los Angeles. These interviews are retrospective, asking participants to recall what motivated their school to establish a program. Los Angeles is a particularly important region to situate this study, with a long history of bilingual education, a large share of multilingual student populations from various linguistic communities including Spanish (the largest), Korean, Mandarin, and Armenian, among others. Additionally, the county has experienced dramatic though highly concentrated (in LAUSD) increase in the number of charter schools and school choice options, making it an ideal place to comparatively examine school choice. Ultimately, I seek to understand the stated purpose of these programs, the potential impact on enrollment and the implications for whether TWDL can achieve its intended goals.

The importance of School and District Leadership

Principals and district administrators are instrumental in school performance and change in part because they have control in hiring, providing staff professional development and protecting planning time, managing partnerships and community connections, overseeing program implementation and leading the vision and mission of the school (Waters et al., 2003). District leaders, with their bird's-eye-view perspective and control over principal hires, can equally create opportunities and support for programs like TWDL across an entire district (DeMatthews & Izquierdo, 2020). Leadership in specialized programs like TWDL is crucial as these leaders must themselves be well-versed in best practices and frameworks needed to run a successful program and must manage expectations and potential pushback from teachers, parents and other community who may not agree with the suitability and appropriateness of the program for students (Calderon & Carreon, 2000). Given that TWDL are programs of choice, school and district leaders are responsible for putting in place and managing enrollment systems that ultimately advertise and enroll prospective parents. Website and document analysis (See Appendix A of Study 1) suggests that programs have considerable leeway in setting enrollment criteria, such as setting priorities for enrollment, assessments for gaining entry, and limits on who can enter after which grade. In some cases, decisions are made at the district level, others at the school level. These findings point to the importance of principals and district leadership in setting and carrying out localized schooling policy for choice programs.

The role of School and District Leadership in Navigating School Choice

School choice, or the ability for parents to choose a public school through charter applications, inter and intra district transfers, has dramatically expanded in the last few decades. While much research has explored the impact of school choice on academic outcomes, on the general school market,

and on parental choices, another line of research (and one that is explored here) has sought to understand how principals and leaders of public institutions understand and respond to choice. Individual school and district leadership response to perceived competition is varied and generally involves choosing from a set of possible options, ranging from marketing and outreach, curricular and programmatic transformation and organizational changes (Jabbar, 2015; Lubienski, 2005). In addition, response to choice may be impacted by where schools 'see' themselves relative to their competitors (Jabbar, 2015). Schools with higher status that experience more demand than available spots may be less inclined and schools designated as failing or underperforming less able to respond to competition (Holme et al., 2013). Within those schools that do respond to competition, they may see and push for creating 'niche' programs that sets them apart from surrounding competitors. These include expanding Gifted and Talented options, increasing the number of Advanced Placement (AP) courses, or developing a theme or focus on arts, STEM or language immersion. District administration, in turn, may encourage this specialization to develop a diverse 'portfolio' of options and keep parents from exiting the district.

Leadership Role in Dual Language Programs

In addition to responding to choice, school leaders have an important role in setting the language policy of their school. This is particularly relevant for dual language programs, which require principals to understand a little bit about language to effectively implement. For example, dual language programs require an understanding of and decisions to be made regarding language development, time and subjects to be taught and in which languages, and the kind and amount of resources and supports needed for TWDL teachers.

History indicates that principals and local leadership can significantly alter the language policies of schools. Proposition 227, a legislation passed in 1998 in California that heavily restricted bilingual instruction led to a wide variety of applications, largely dependent on leadership beliefs about language. For example, Gandara et al. (2000) and others (E. E. García & Curry-Rodríguez, 2000) found that the level of experience, the extent to which the school's or district's climate permitted it, and prior instructional decisions and beliefs led to great variety in how schools and teachers implemented the provisions of 227. In some instances, schools did not provide parents with the needed waivers to be instructed bilingually, while in others, teachers continued to provide instruction bilingually. Including in bilingual classrooms, some found that English instruction remained, where teachers either continued to provide instruction in the home language but progressively diminished the amount of time dedicated to second language instruction in order to prepare students for English-only classrooms or simply did not provide much instruction in Spanish for lack of certificated staff (Orellana et al., 1999; Revilla & Asato, 2002). For example, schools that were committed to keeping bilingual instruction informed parents of their rights and collected signatures, while schools that were committed to providing instruction in English delayed information or access to waiver forms, requested parents come to school to sign the waiver, or mis-translated aspects of the waiver to nudge one way or another.

More recently, qualitative studies have examined how discourse around dual language may lead to divergent framing around the purpose and goal of dual language. For example, a recent study of principals in Arizona and California found that principals of schools with similar demographics of students (majority Latinx) to frame their school's dual language program differently (Bernstein et al.,

2020). They found that some principals framed their programs within a school choice, instrumentalist perspective, and that these programs tended to be founded top down and framed their program within an 'enrichment' framework that presupposed exclusivity. Programs were framed as competing with one another (for example competing with STEM) and providing an 'edge' to students. By contrast, they found that principals who framed their program in equity/social justice orientation spoke about more than language acquisition. In addition, these principals exhibited an understanding of past injustices and viewed dual language as a way to 'counter existing deficit narratives and past discriminatory experiences'(Bernstein et al., 2020, p. 667). These principals also constructed the purpose of TWDL for Latinx or Spanish speaking students. They found instances where instrumentalist-framing principals in Arizona (where greater restrictions were placed on EL-classified students) did not always take steps to include English Learner-classified students in their programs.

How Leadership Decisions Impact Enrollment

In addition to changing market, curricular or organizational elements, choice may lead school and district leaders to engage in practices that may lead to exclusion of student groups, or on the flipside promote their engagement and enrollment in programs.

They point to instances in which charter schools impose non-monetary costs like parental contracts, symbolic but effective entrance procedures, and/or school placement, to affect the types of students who enroll. Enrichment programs housed within public schools may adopt some of these same exclusionary practices, thereby limiting who can enroll (Henderson, 2019). While this may allow them to compete effectively by boosting their status in the marketplace, increase

enrollment, and improve efficiency as indicated by test scores, it may do little, or worse yet actively work against, addressing long existing disparities in access to schools and programs. One such policy is for leaders to engage in 'skimming' or attracting students they feel will be the most likely to succeed (Howe et al., 2001) through application processes and subtle forms of deterrence or encouragement even if this means circumventing district policy (Jennings, 2010). In dual language programs, some programs may require assessments in English and the partner language, while others enroll on a rolling basis. In Arizona, for example, dual language program enrollment required passing English Learner classified assessments, making enrollment in these programs virtually inaccessible to populations who would have clearly benefitted from them.

Selection processes may result in racial and socioeconomic stratification and sorting within programs and the schools that host them. For example, school, district, and state level policies, aimed to please these interests to keep students enrolled in school, may cater to interests of monolingual parents. Chaparro (2021) and Menken (2023) found that TWDL programs opened and marketed themselves to the incoming gentrifying (and largely white, higher SES parents), and that the result was that these programs enrolled predominantly those students, while the host school (the part of the school that does not have dual language) remained populated with the largely minority student population. Other examples include advertising programs solely to monolingual students (Burns, 2017; Chávez-Moreno, 2021; Delavan et al., 2017), limiting TWDL to students who score proficient on English standardized tests (Kaveh et al., 2021) or relying on teacher assessments or recommendations which may bias how students are placed into - or removed from - programs (Chávez-Moreno, 2021). One ethnographic study found that Black parent experienced 'racial battle fatigue'

following fellow mothers' "sneaky" behavior in limiting access to the PTA and the TWDL program of the school (Blanton et al., 2021). Thus, while it may seem on the surface that some TWDL programs 'integrate' a diverse group of students, they engage, overtly and at times covertly, in practices that limit or outright exclude enrollment of minoritized students. Importantly, findings from these studies show the importance of leadership in allowing and managing selection processes.

Leadership may also resist outside pressures to conform in ways that they feel purposefully benefit specific sub-groups of students, such as language minoritized students. This is the case, for example, for a small elementary school that risked losing state funding to implement a 90:10 (90% Spanish, 10% English) model, which they felt better suited the needs of language minoritized students (Freire et al., 2021). This meant, however, that the school was not included in the state directory of TWDL programs, and had to react by using teacher, alumni networks to spread the news as well as using Spanish language media to advertise the program. In another instance, a principal ensured that Mexican American families held roles of leadership and that their contributions to school volunteering was seen and acknowledged by the white mothers of the school (Burns, 2017). Finally, the superintendent of El Paso schools pushed for dual language programs to specifically serve English Learner classified students by capitalizing on the recent growth of TWDL in a wealthier, whiter part of town (DeMatthews & Izquierdo, 2019). These examples demonstrate the potential, though difficult to implement and sustain, in providing for social justice within TWDL. More importantly, these examples highlight the power in leadership, whatever level, to initiate programs that are focused on historically minoritized populations.

Conceptual Framework

Market-Based Competition and Response to Competition

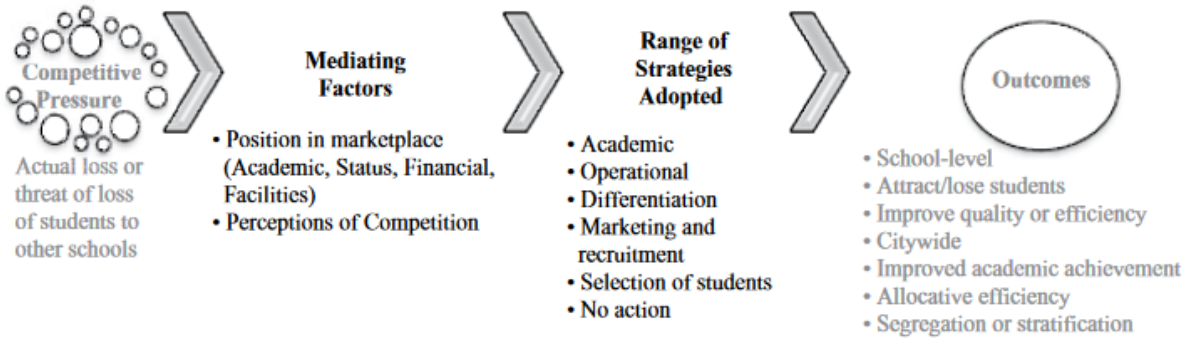
Economic theory has long posited (Chubb & Moe, 1988; Friedman, 1955, 1997) that introducing competition in a school system will induce monopolistic entities (public schools) to innovate and change in order to hold on to their market share (in this case, students) (Hoxby, 2003). The argument follows from criticism that the reason schools fail to effectively educate students, especially subgroups of students traditionally marginalized in school, is because they may not have the incentives to satisfy parent demands given that there are typically the only provider of mandatory K-12 education. By introducing choice, schools must compete with one another to improve or suffer the consequences. The theoretical underpinnings of choice-induced competition posit that schools and districts undergoing competition face a loss or threat of loss of students as parents are no longer tied to their neighborhood (and potentially underperforming) school, which represents an existential threat since student enrollment is directly tied to funding. Schools and district thus adopt responses that will lead to uniformly effective behaviors that improves school productivity (Hoxby, 2003), following from the notion that schools that fail to adequately respond will lose students until they are replaced by more productive schools or enact necessary changes to bring students back. These institutional responses to school choice include changes to resource allocation, hiring practices, or curriculum and instruction (Hoxby, 2003).

In order to document and understand these institutional responses, scholars have sought to document and survey response to choice at the individual school level rather than the market level (Lubienski et al., 2009). For example, Jabbar (2015) provides a framework for examining *how*

and why actors facing competition respond by focusing on context and individual sensemaking to understand why responses might vary significantly from school to school. I use Jabbar's flowchart below (Figure 11) that represents how the path from competition to outcomes is mediated both by contextual factors and the range of strategies available to schools.

Jabbar argues that competition involves the process by which initial perception is mediated by factors like the likelihood of losing students to competing schools, a school's standing in the market hierarchy, and/or where the school attributes the source of competition (Kasman & Loeb, 2013). Local and state policy contexts as well as organizational cultures of schools (Maranto et al., 2010) and districts, leadership characteristics may also play important roles. Jabbar (2015) finds that schools thus may focus their resources on marketing strategies without any impact to their efficiency, others may strategically shape their student population (Jennings, 2010), and others still may develop a niche to carve out a piece of the market and avoid direct competition altogether. Lubienski et al. (2009) further argues that decisions made in response to competition may result in schools engaging in exclusionary behaviors to improve their market position, and potentially undermine equity effects that school choice is supposed to engender.

Figure 11 - *Competition as process*



Note. Figure available in Jabbar (2015).

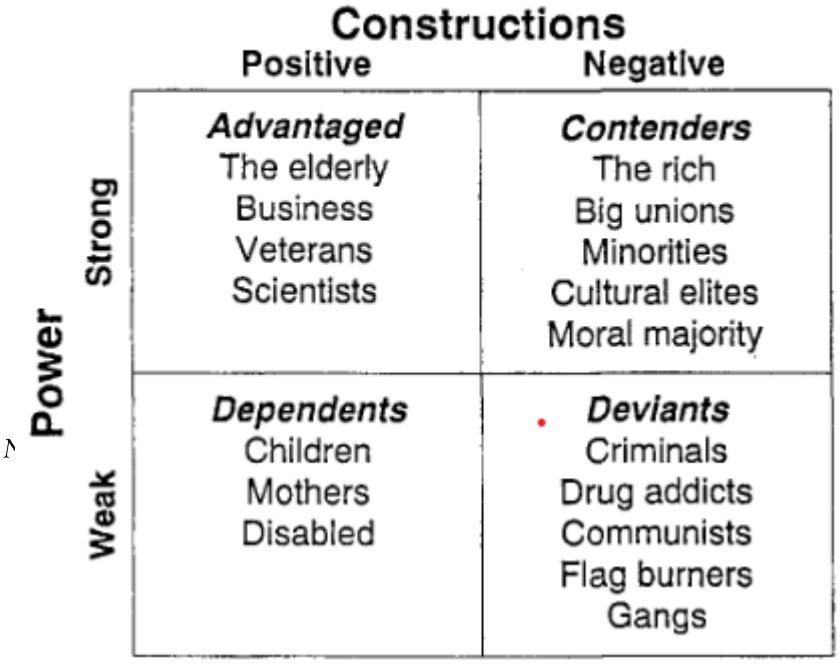
Social Constructions of Target Populations

The concept of competition as a process is useful in explaining how school decisions are mediated by contextual factors. Leader thus differentially perceive, and respond to the pressures brought about by the loss or threat of loss of students. Yet a missing piece of this framework is to consider the place of students and their parents in decision making, not as agents (though they certainly are) but as constructed recipients of policy. This is to say that decision makers like principals may think about subgroups of students and parents differentially, and that these constructions may change the type of policy that is enacted. The theory of social construction of target populations is useful in this because it explains how policy makers (in this case school and district leaders) construct social identities of their target populations (Schneider & Ingram, 1993). This follows from a constructivist approach in which meaning is made from one's subjective and relative position (See Figure 12). When decisions and policies are constructed, a target population or recipient of this decision or policy is imagined. This population is defined as a group with shared characteristics that are socially meaningful and value laden. Constructions may be stereotype based, such as assuming an English Learner classified student struggles with content understanding rather than language demands. Leaders may not have incentives to respond to these parents' needs as this might require additional resources or teachers supports. Others stem from very real material differences such as wealth and resources that parents bring to schools. For example, high income parents may be financially able to provide after-school tutoring to their child, volunteer their time at school or donate money to extra-curricular organizations like Parent Teacher Associations in ways that will directly and materially benefit the school. Resulting

stereotypes like the notion that these parents might 'care more' or be more 'invested' in their child's education may then be derived from these material differences in ways that reinforce how policies are created. On the flip side, a designation such as English Learner, special education or high poverty may also have material consequences to the school which then allocate increased resources in the form of coaches, specialists, counselors and the like. Thus, social constructions may arise out of stereotyping as much as material differences between populations. These characteristics are neither absolute nor unchanging, but they do impact the extent to which the policy enacted will be beneficial or punitive in nature. Schneider and Ingram (1993) attribute these differences to systematic differences in how policy makers view their target population. They propose a quadrant that organizes target populations by a combination of their power and their perception.

Figure 12 - *Social Construction of Target Populations*

Social Constructions and Political Power: Types of Target Populations



Thus, "advantaged" groups are defined as those that are both powerful and perceived positively while on the opposite extreme constructed populations are both powerless and viewed negatively. Policies directed at advantaged populations in mind are overly beneficial to that group, while policies directed at deviants are overly burdensome. Thus, because of the status of the target population, the resulting policy was burdensome to the recipient group who were unable to access bilingual education programs.

Jabbar (2022) builds on this by adding that social construction theory should also include how the endemic nature of race and racism pervades these social construction and impact the nature of policies. For example, state-level policy makers engage in social construction of the audience of choice by systematically identifying white parents as more positive, able to make "better" decisions for their children, and ultimately providing more resources and advancement for schools. However, these families could also be construed as negative if they were identified as unfairly benefiting from a system not set up for them, as was the case of the voucher system, or as manipulative of the system which they knew how to game, also known as opportunity hoarding (Sattin-Bajaj & Roda, 2020). Extending the notion of race to language, and specifically 'standard' English monolingualism, critical language scholars have pointed to the dominance of monolingualism in schooling contexts and its tie to Whiteness to function as its own form of property that can be commanded to the detriment of non-monolinguals. The status conferred upon English is enshrined in its status as official language in many states (Schildkraut, 2001) and regulated by the federal education code as the purpose of schooling for those designated as learning English (ESSA, TITLE III, 2015). Furthermore, the social hierarchy of language intersects with race in ways that positions the dialect of

English spoken by whites, as "standard" and all others as non-standard and sometimes in need of additional supports (Flores & Rosa, 2015). These structures are not without real consequence, as they ensure that those labeled as monolinguals or standard English speakers have access to privileged curriculum (Flores et al., 2015). Students not possessing of standard monolingualism are labeled deficient and resigned to remedial educational options through the use of language assessment and classification schemes (Wiley & Lukes, 1996). Palmer (2010), for example, explains how a dual language schoolteacher described the English monolingual Black students of the school as being "deficient" and requiring language support and therefore "not ready" for participating in dual language education.

Social construction theory is ideal to the application to TWDL, which has a defined set of populations premised on their linguistic assets. Furthermore, given that TWDL is a program of choice and that it brings together potentially diverse (racially, linguistically and economically) populations of students, it presents an interesting case to examine how parents (and students) are constructed depending on context. For example, scholars have found much differentiation in how leaders and teachers in TWDL construct English-only (for example as white and middle class) and English-Learner (Hispanic, working class, foreign) which has deep implications for how policy of curriculum is implemented. Moreover, scholars have examined how the label of English-learner obfuscates the wide heterogeneity in students' experiences with language. In Los Angeles, for example, most students labelled as English Learners are U.S. born and have learned to speak two languages simultaneously, making the label of English Learner much more nuanced than its label assumes. For those interested in issues of access to programs for historically marginalized

populations, the construction of students is an important part in understanding how programs may in turn encourage or limit who accesses the TWDL program. Thus, a program that sees middle class, English-only parents as an integral part of a program's existence, derived from notions of how much care and resources these parents might bring to the school, might overwhelmingly favor those students in entering the program. An example of the policy implication of this is instituting a first-come-first-served enrollment policy to TWDL programs, benefitting parents who can take off of work and potentially wait in line (for highly sought after programs). Another important factor in Jabbar's findings is that these categories are neither static nor immutable and, though she did not find a clear causal connection to social constructions and policy enactments, she did find that these categories could change.

Social justice leadership

Examples from the field have shown that individual and organizational leaders can and do resist and actively work against what they perceive to be unjust decisions and policies, and actively promote and put in place social justice policies that explicitly serve minoritized populations. Given the outsized importance and influence of leadership in setting the direction for programs, allocating resources, hiring new staff and managing relationships with various stakeholders, school and district leaders are uniquely placed to enact social justice policies that result in improved outcomes and experiences for marginalized students. Social justice leadership sees the need for equity in redistribution, recognition, and representation requiring the reversal of systematic/institutional injustice (Wang, 2018). This is the case for principals who explicitly voice their concern in providing all students with education and do not engage in tactics to filter, counsel away or weed out students

(Jennings, 2010). Social justice leadership aims to identify powerful groups and critically assess how they have come to have that power and undeserved access to certain goods and services and will work within their bounds to restrict or redistribute that power. Leaders in TWDL programs might do this by prioritizing language minoritized students in enrollment, curriculum, and experiences (Theoharis & O'Toole, 2011) and by acknowledging that power differentials exist that lead to preconceived notions about who can participate in dual language and who can access programs (DeMatthews & Izquierdo, 2016). This is what Cervantes Soon et al. (2017) refer to as critical consciousness and the way in which actors engaged in TWDL programs "can take part and take action only to the extent that they problematize the history, culture and societal configurations that brought them together" (p 419). However, these possibilities only occur to the extent that teachers and schools position themselves to engage with these ideas and reflect on their positions. Indeed, critical reflection is a key component of the process that leads to action (Brown, 2004). Social justice-oriented leaders have goals to achieve high academic achievement for all students and develop critical citizens in their students (McKenzie et al., 2008). Social justice leaders address issues of race, class, gender, disability and other forms of inequitable schooling conditions (Theoharis, 2007).

Scholars argue that two forms of social justice exist, one that is distributive and includes the fair distribution of resources (Gewirtz, 1998). Within this distributive justice includes both weak and strong forms, with weak meaning the equality of opportunity and strong meaning equality of outcome. The other includes relational justice, which includes not only the redistribution of responsibilities and obligations but also of power relations in society (Gerwitz, 1998). As it relates to leadership in schools, leaders who are social justice minded attempt to achieve both forms of justice through the real

allocation of resources, the attention of student outcomes of different groups as well as making sure that all groups have a seat at the table. This means that social justice leadership rejects racially neutral narratives and engages in uncomfortable conversations around notions of privilege, bias and oppression that occurs on a daily and casual basis within schools. These uncomfortable situations occur and may lead to tensions or conflict among the various stakeholders of schools who may not agree or feel that they are part of the problem.

Study Purpose and Research Questions

Taken together, prior literature suggests that in the context of increased school choice, there is a need to examine how school and district leadership responds, and how this response may or may not benefit historically marginalized populations of students. Examining leadership decision-making and school choice in the context of TWDL programs is particularly important given the recent growth in programs, as well as the goals to provide language services for English Learner classified students, and the reality that programs are designed to integrated diverse populations of students. The following questions guide this study:

RQ1: What motivates principals and district leaders to establish a TWDL program in their school/s?

RQ2: How do they conceptualize the purpose and target populations of these programs? How does program purpose and enrollment reflect the motivations for founding?

Methods

Institutional Approval

I submitted IRB to UCLA office and to districts requiring it. To do this, I searched through all districts with dual language programs to determine whether a separate, district-specific, approval process for conducting research was needed. I submitted approval requests for Palmdale, Glendale, Culver City, Long Beach Unified, and Los Angeles Unified. I was accepted to conduct research in one of these districts requiring a separate approval process.

Outreach

I obtained a list of administrators of record from the California Department of Education downloadable data files, which includes their first and last name, email address and phone number. Once obtained I checked 5% of the sample (15 schools) through the school finder on CDE's website to ensure that the names were concurrent with principals' names. I compiled principal names and used the application "Yet Another Mail Merge" using GMAIL to send emails to all emails in the addresses (See Figure H1). Yet another mail merge records whether the recipient has opened, responded or if the email has bounced, allowing me to record how emails were being received. When emails bounced, I manually checked the school's website and either this was because the administrator was no longer on record from a later date than the CDE list, or because the school used a system that prevented direct emailing.

Interviews

Interviews were conducted between January of 2023 and January of 2024. Interviews lasted between 30 minutes to two hours, with the majority lasting 50 minutes in length. I gave participants

the option to conduct the interview in person, virtually on zoom or by phone, with all but two choosing to elect either zoom or phone interviews. I recorded interviews on zoom or using my phone recording application software and used Rev.com to transcribe the interviews. I then revised interview transcripts to update participant names and places that could be used to identify them. Transcripts were given a random three-digit number, and participants were given a pseudonym. The key to connect participant pseudonyms and names was stored in a secure file.

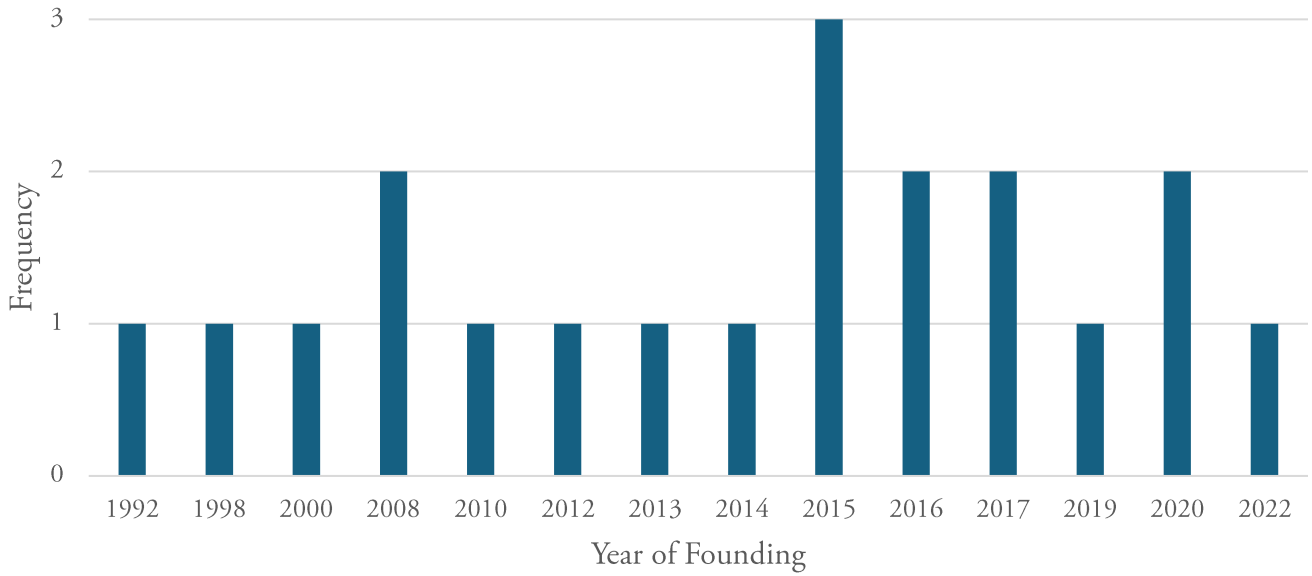
The interview protocol was based on Seidman's modified three-part interview which typically involves three 90-minute interviews and Cerda's (2023) modified interview (see Figure H2). Cognizant of participants' time, the protocol was shortened to be about 50 minutes. During the interview, I followed the order of the questions in order to have consistency across respondents and would ask participants for clarification when appropriate. If some questions did not directly apply (for example, in one instance the school had transitioned the dual language program to a whole-school program instead of a strand) then I modified the questions as needed.

The Sample

Thirty participants were interviewed (N = 30), with 29 recordings available (I used notes and followed up in email for key questions with the participant whose recording was missing). These participants worked in 16 different districts in Los Angeles County out of the 46 total districts with TWDL schools. One district was a charter district, while all others were non-charter public school districts. A total of seven district-level participants were interviewed, and a total of 23 principals were interviewed. Two programs were world language immersion, and one was a one-way immersion that functionally enrolled students as a two-way dual language program, while three other two-way dual

language programs were school-wide programs, meaning that the entire school was a dual language program. All others were 'strands' within their school. Participants worked in schools with programs that were founded between 1992 and 2022 (See Table 13).

Table 13 - *Frequency of Program Founding Years (N = 30)*



Note. One school founded in 2022 was displaced from another school but given that it was that school's and principal's first year, it is listed as being founded in 2022.

Roughly a third (n = 11) were founders of their school's program or participated in the initiation of at least one dual language program in their district (See Table 14). District level participants were coordinators or directors, or teachers on special assignment. Directors held such titles as director of English Learner services, director of Educational Equity, Language Assessment Development, Administrative Coordinator, or Multilingual and Categorical programs. In addition, five participants worked in the same district but at different levels (school and district). This allowed for triangulation of the data. Most participants were Latinx (~60%), and most were bilingual or second language learners. Only two participants were monolingual English speakers. Similarly, most participants (~80%) had a professional background teaching bilingually and/or being principal of a dual language program. Many of the participants had exclusively taught in southern California, and most had pursued a higher education degree beyond a bachelor's and teaching credential.

Table 14 - *Demographic Characteristics of Participants*

Role	Founder	Years in current role	Total Years	Race/Ethnicity	Language Experience	Prior Experience
District		12	20+	White	Spanish language learner	Dual language principal
Principal		1	20+	Asian-American	Korean bilingual	Dual language teacher
District	Yes	2	20+	Hispanic/Latinx	Spanish bilingual	Dual language teacher and principal
Principal		2	20+	Hispanic/Latinx	Spanish bilingual	Bilingual teacher
Principal		8	30	Hispanic/Latinx	Spanish bilingual	Bilingual teacher
Principal		4	20+	Hispanic/Latinx	Spanish bilingual	STEM teacher
Principal		1	20+	African American	Spanish language learner	Dual language principal
District	Yes	1	11	White	Spanish language learner	Dual language teacher
Principal		2	30+	Hispanic/Latinx	Spanish bilingual	Dual language teacher
District	Yes	7	20+	Hispanic/Latinx	Spanish bilingual	Bilingual teacher
Principal	Yes	9	11	White	Monolingual	Teacher
Principal		5	30+	White	Spanish language learner	Bilingual teacher
District	Yes	10	20+	Hispanic/Latinx & White	Spanish heritage	Bilingual teacher
Principal		15	20+	Hispanic/Latinx	Spanish bilingual	Bilingual teacher
Principal		1	20+	Hispanic/Latinx	Spanish bilingual	Dual language teacher and principal
District		3	20+	Hispanic/Latinx	Spanish bilingual	Principal
Principal	Yes	13	20+	Asian American	Mandarin bilingual	Teacher

Principal		4	20+	White	Monolingual	Teacher and principal
Principal		2	20+	Asian-American	Mandarin bilingual	Foreign language teacher
Principal		6	15	White	Spanish language learner	Foreign language teacher
Principal		8	20+	Hispanic/Latinx	Spanish bilingual	Bilingual teacher
Principal		5	30	Hispanic/Latinx	Spanish bilingual	Bilingual teacher
Principal	Yes	6	30+	Hispanic/Latinx	Spanish bilingual	Bilingual teacher
Principal	Yes	8	16	Hispanic/Latinx	Basque heritage	Dual language principal
Principal		2	20+	Hispanic/Latinx	Spanish bilingual	Teacher
Principal	Yes	8	20+	Hispanic/Latinx	Spanish bilingual	Bilingual teacher
Principal	Yes	3	30 +	Hispanic/Latinx	Spanish bilingual	Bilingual teacher
Principal		2	18	Hispanic/Latinx	Spanish bilingual	Teacher
Principal	Yes	11	20+	Hispanic/Latinx	Spanish heritage	EL Teacher
District		2	20+	Hispanic/Latinx	Spanish bilingual	Dual language principal

Individual schools interviewed experienced varying levels of enrollment. Many of the schools experienced sustained loss of enrollment between 2001 and 2020. Schools presented a variety of demographic characteristics, ranging from diverse to highly segregated school settings. In Table 15, I present demographic enrollment either by school or as an average across all TWDL schools if the participant was at the district level. These were obtained from publicly available school-level files from the California Department of Education. Most schools or districts experienced sustained enrollment decline between 2001 and 2022, and aside from a few exceptions, Hispanic/Latinx students made up the majority of student enrollment, including in schools with no Spanish language program (see for example school #6). Most programs interviewed offered Spanish, with other languages including Korean, Japanese, Mandarin and Hebrew. Two schools offered two language strands within the same school, and all but three programs were a strand within their school.

Table 15 - *Student Demographics of Schools/Districts Interviewed*

School Principal	Founded	District	Language	Asian American		Black/African American		Hispanic/Latinx		White	
				2001	2022	2001	2022	2001	2022	2001	2022
1	1992	Delta Unified	Spanish	86	28	49	30	387	513	74	16
2	1998	Bray Unified	Spanish	36	11	161	89	449	603	80	30
3	2000	Colina Unified	Spanish	35	6	2	0	646	617	59	7
4	2000	Colina Unified	Spanish	0	0	0	0	714	392	3	1
5	2005	City Unified**	Spanish	47	4	1	0	653	255	2	3
6	2008	City Unified**	Other	14	34	5	3	523	315	0	10
7	2010	Elm Unified	Spanish	0	2	36	15	1319	650	11	4
8	2012	Gracia Unified	Spanish	31	6	10	5	74	163	559	119
9	2013	Barton Unified**	Spanish	17	12	17	16	318	216	121	84
10	2010	City Unified**	Multiple	11	142	66	27	337	121	12	67
11	2014	County District	Other		3		25		275		211
12	2014	City Unified**	Multiple		26		8		256		6
13	2015	Chestnut Unified	Spanish	11	3	35	2	605	331	72	3
14	2015	Augusta Unified	Spanish	1	9	11	1	859	431	4	3
15	2016	Cardinal Unified	Spanish	165	171	15	10	65	173	144	109
16	2016	Chestnut Unified	Other		230		6		140		18

District											
17	2017	Sabica Unified**	Spanish		95		7		428		19
18	2019	City Unified**	Spanish	43	31	133	46	280	169	155	185
19	2019	City Unified**	Spanish	1	4	90	74	508	179	3	9
20	2019	City Unified**	Spanish	0	0	1	1	1272	384	10	7
21	2020	City Unified**	Spanish	17	3	22	4	611	149	21	5
22	2020	City Unified**	Spanish	7	1	12	4	1089	279	3	19
23	2022*	Sawson Unified**	Spanish	5	3	17	2	521	431	41	16
24	2010	Issuu Unified	Multiple	7.4	54.8	195	40.25	363	237	46	67.5
25	2007	Orlando District	Multiple	75	48	69	30	235	394	131	52
26	2017	Sabica Unified	Multiple		235		5		345		13.7
27	2016	Holm Unified	Spanish	0.25	0.25	196	61.25	681	517	2	1.75
28	2017	Sawson Unified	Spanish	6	4.5	17.5	4.5	450	476	68.5	23.5
29	2013	Barton Unified	Spanish	17	14	15.5	13.5	321	219	164	105
30	1992	City Unified	Multiple	35.52	15.7	97.3	29.69	839	368	26.7	22.2

Note. District enrollments represent average enrollment across all programs. Number of programs per district is not included to as to preserve anonymity. Date of founding provided is for the earliest program founded in the district. Multiple includes Spanish and another language including but not limited to Mandarin, Korean, French etc. Other language not provided to preserve anonymity.

*Program was moved from another school, first year in this school

**Also interviewed district-level personnel

Analytic Approach

I examined how school and district leadership understood the role that choice and competition played in dual language founding. In addition, I was interested in drawing connections to how their perception of students and their parents affected the founding, the stated purpose and eventual enrollment in the dual language programs. I used market-based competition and social construction of target populations, as well as social justice leadership to guide the coding process. I read through the interviews multiple times to identify chunks – the text or paragraph response to an interview question – that pertained to the school program founding, the perception of competition and its connection to program founding, and how students and parents were talked about and conceptualized.

As a coding strategy, I began with the research questions, which guided the chunking process. I used Nvivo, a coding software, to code interviews, which is appropriate for the analysis of unstructured text. Before coding, I first identified segments or chunks from each interview that pertained to the three areas covered by the research questions, that of 1) what factors have led to the development of the dual language program/programs, 2) what role does choice and competition play in program founding, 3) who does the dual language program serve and 4) how arestudents portrayed. The chunks in these categories differed in length and were chunked to encompass one idea related to the category. Once I had identified these four main chunking mechanisms, I coded these chunks to identify in greater detail. I used a combination of inductive and deductive coding, as well as thematic analysis (Saldaña, 2013). Chunk categories were guided by the research question, however sometimes participants mentioned some aspect of program founding later on in the interview. This relevant chunk

would then be added to the category of program founding. Further coding occurred within the category of "reasons for program founding", including codes like *general loss of enrollment, loss of enrollment to a nearby school, community push, district push* etc. I then constructed matrices to examine how aspects like motivation, program founding, purpose might be related to one another, following Jabbar's approach (Jabbar et al., 2019).

An important aspect of the analysis was understanding how participants referred to parents, stakeholders, and students. For example, participants often used the "English only" to refer to students who enrolled in the program with little to no background in the partner language. I found that the term took on varied and multiple meanings around language, race and socioeconomic status that depended largely on the context. For example, in one district the term referred to majority White, high socio-economic status children who used permits to enroll in the dual language program. In other districts, the term referred to second generation Latino children of parents who had experienced language loss and wanted to reclaim their language. This variation is explored in sections two and three.

Findings

Findings are organized into three sections. The first section explores what motivates program founding, and how this might differ by year of founding and context. Section 2 explores factors that mediate the stated purpose of the program, with a particular focus on how founding motivation, school demographics and participant experiences may affect the stated purpose of the dual language program. I also examine how participants define linguistic groups and whether differences exist across participants. Finally, section 3 explores factors that mediate program participation and enrollment. I examine the extent to which choice, available student populations, program language, and participant

beliefs and experiences mediate who ultimately enrolls in the program. This qualitative assessment of student enrollment in programs is particularly important as there is no existing publicly available data of student enrollment in dual language, and so reliance on participant interviews is crucial to understanding the extent to which dual language programs serve the populations that might most benefit from such a program.

Section 1: Precursors to program founding

I found that enrollment decline, competition, an effort to improve English Learner outcomes, and transitioning from pre-existing bilingual programs were most commonly cited reasons for program founding.

Enrollment loss as impetus for program founding

Enrollment decline was an important factor in TWDL schools across the county. Of the 30 schools and districts I interviewed, 19 experienced sustained enrollment decline prior to their program being founded, and only 5 experienced enrollment growth. Fourteen participants explicitly described that enrollment decline was directly related to program founding. In some instances, respondents described a generalized decline in enrollment. Barbara, principal, described how her "school specifically was a poor performance school…the school really wanted to help with enrollment because there was declining enrollment". In other instances, principals or district personnel (n = 3) connected the school's enrollment loss to some external force going on in the neighborhood, and specifically to gentrification. They identified that the neighborhood turnover occurred when homes were bought – flipped – and sold (a key feature of gentrification), leading to declining numbers of families and declining numbers

of school-aged children. Santiago, a principal, described it as how "investors…buy up properties and they'll rent them out to one family" leading to fewer families and fewer school-aged children. Rosa, a principal, also described changes in single family homes that once housed "four…or three families on a property" transitioned to housing a single couple with no children. In some cases, efforts to establish a dual language program were years in the making, but it was enrollment loss that provided the spark, or impetus, for the district to establish the program. This was the case for Gwen, a district employee involved in the program's founding, who explained how the enrollment loss experienced by the schools provided the needed impetus for the superintendent to take interest. She recounted how "there was this opportune moment ... It was the time to strike when there was all these stars aligned", referring to the long standing support among teachers and staff in support of dual language that came to fruition only when it became financially viable among district administration. In other cases (n = 3), dual language was cited as one of multiple possible options that the school could have opened. For example, Janet, a founding principal, explained how she initially "knew nothing about dual language" and considered multiple options, such that her school "could have been a computer magnet, it could have been a school for Advanced Studies" to increase enrollment. Janet recounted how district administration encouraged her to think of ways to boost enrollment, and she settled on dual language as means to that end.

Competition as Impetus for Program Founding

A sub-theme to enrollment decline was the presence of competition. Nearly a third of participants (n = 8) tied their program's founding to increased competition, with most of these participants also citing enrollment loss (n = 7). Competition was heavily related to enrollment because

it either presented a threat to enrollment loss or because it engendered actual enrollment loss. When participants referred to general competition, they referred to increased choice and increased numbers of charter schools as a source of competition. For example, Daniel, a founding principal, reasoned that "if we're not adjusting at schools what we're providing, then they're going to go somewhere else", referring to nearby charter schools. Thus, Daniel's description could be understood as a perceived threat of enrollment loss, with the potential for students to choose another school that school choice created. His statement highlights a general environment of competition driving the decision to open a dual language program. In other cases, participants described experiencing competition specifically from other dual language programs in nearby districts as a reason to establish their program. In this sense, competition was felt through the exercising of waivers, of which participants were keenly aware. Josephine, a principal, described "losing students to surrounding district[s] who had a Mandarin program". Similarly, Ivan, district administrator, described being in "huge competition with our neighbor private schools as well as charter schools…and one of those offerings that these schools have is dual language". Participants came to see transfers and permits as a tool to engage with competition. Barbara, principal of a Spanish dual language school, felt that "competition is becoming a little bit more fierce" as students struggle "to get a release[d] from their districts because [the districts are] like, "no we have a program." By founding a dual language program, districts could prevent the use of inter-district transfer, which would traditionally be granted to parents to attend a specialized program in another district if their home district did not already provide one. Violeta, a principal, expressed this when she said "why would you need a permit if your neighborhood in your district, in your boundaries [is a dual language school]?". On the flip side, permits allowing the movement of parents to dual

language schools caused friction among schools in the same district, as Violeta, again, described schools in the district pushing to create their own programs to counter the effects of losing students to the dual language program. Rosa described founding the program in large part as a response to having previously releasing students to a nearby dual language school. Post-program founding, she contended that sometimes getting "permits for students to go to an elementary school that's focused on STEM". Juliette, expressing frustration, described how she had recently been made aware of another language program opening nearby, exclaiming "really? You want me to fight [the principal]? Is that what it is? We're just fighting each other to get kids. Is that what you want?". Isabel, the principal of a long-standing dual language school, described how she felt that for another school in the district "it's not in their best interest to advertise this program and lose their students." Charlotte echoed the use of inter-district permits to siphon students. One of a recently opened dual language school in her district had recently been zoned out of a neighborhood through "the powers that be", leaving the school with dramatically fewer students. She described how they had already wanted to open a dual language program on that side of the district, but selecting the specific school site was a strategic move. Indeed, Charlotte details how "[the nearby school] did not have dual immersion, and they still don't have dual immersion, [and the hope was that] those families would then opt to bring their kids, to permit their kids back into [Orlando Elementary School District]." While typically a permit is a form that must be filled out and signed by the parent as well as by the exiting and receiving school or district, Charlotte describes how her district modified the transfer form for the dual language program to create a "school transfer permit specific to Dual Immersion, and any family that wants school transfer, and I have a

spot for them in Dual Immersion through the random selection, they're granted the transfer, no questions asked."

Leadership and Community Drive for Program Founding

Not all respondents cited declining enrollment or competition as a motivation for program founding, though their schools or districts did experience declining enrollment (obtained from publicly available data from the California Department of Education). Thirteen participants who did not cite enrollment or competition pressures fell into one of two categories: those whose program was founded through a leadership drive (n = 9), and those who were founded out of community drive for dual language (n = 4). Offering language programming was the defining purpose of program founding. I define leadership drive as an effort to develop a dual language program stemming from a teacher, principal or administrator. To be clear, this does not preclude community interest, as typically founders will seek support from the community. However, leadership drive means that the direction of the effort comes predominantly from leadership. By contrast, community drive means that parents of the school are the ones who initiated and advocated for the program and subsequently sought approval from administration. For example, Ada, a district employee, recalled that there was "an informal movement years ago" to host a dual language program founded by "a group of teachers that knew the value" of bilingualism. Subsequently the district hired a superintendent that "came from a district with a solid foundation in dual language" who chose the two schools in which dual language was placed. Ada described that this superintendent sought to place the program in the school with prior experience with the program, and the second program to offer dual language in the southernmost part of the district in a school with high numbers of English Learners. Thus, this would be considered

leadership drive. In other instances, the leadership drive came out of a desire to transition to, or bring back, bilingual instruction that had faded away because of the passage of Proposition 227. Diana, director at Holm Unified, described the first dual language program founded in the district "there was a time when we had bilingual education and then they did it away with [it]". She described how a founding principal wanted to "bring it back". For Isabel, a founding teacher and current principal of a dual language program, explained that the program was founded as a response to Proposition 227 to safeguard bilingual instruction. She recounted the "uproar of bilingual teachers really trying to get dual language program started" in a district that already offered "a lot of bilingual classes". The program was founded at the school site *because* of its "stable student population", rather than one with declining student population.

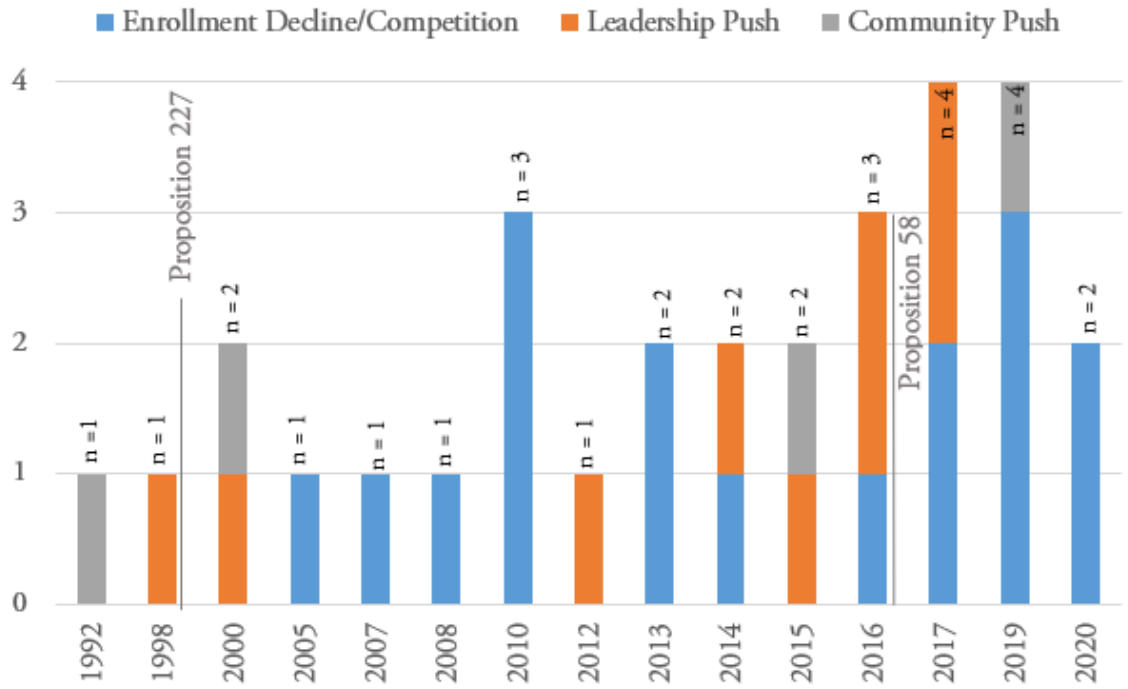
Other programs were founded because of a community push (n = 4) to provide instruction in two languages. The provisions of both Proposition 227 and Proposition 58 included an element whereby parents could request the development of bilingual instruction or the development of a dual language program with enough community interest. In two cases, the programs had been founded by parents desiring bilingual instruction and transition from bilingual education programs. In Lorena's case, founding principal of a dual language program, the push came from parents who resisted a district effort to "eliminate the [existing transitional] program" and wanted "their children to be able to be proficient in two languages […]be proud of where they came from, [… and] communicate with parents and grandparents". In Gloria's case, the dual language program was founded predominantly by heritage speaking but monolingual parents seeking bilingual programming for their children. It is

possible that these programs were also motivated by enrollment decline, as schools experienced decline prior to founding, but they did not mention this as a reason for founding.

Differences Across Program Founding Dates

Given the prominence of state legislation in participants' interviews, I examined differences in program founding reasons by date of program founding in Figure 13. Leadership and community drive are found across all time points, however they are the only reasons cited for programs founded prior to the passage of Proposition 227 and immediately after its passage in 1998. For example, Niahm, principal of a dual language program founded in the year 2000, cited that it was "the community request and received full support from the district". Similarly, Hannah, principal of TWDL program founded in 1991, described how the program was founded to meet to needs of the "significant population of Hispanic students that spoke Spanish". Beginning in the mid-2000's onward, programs that were founded cited enrollment decline or competition as a reason for founding. This coincides with enrollment decline observed across dual language schools.

Figure 13 - *Frequency of Program Founding Reasons*

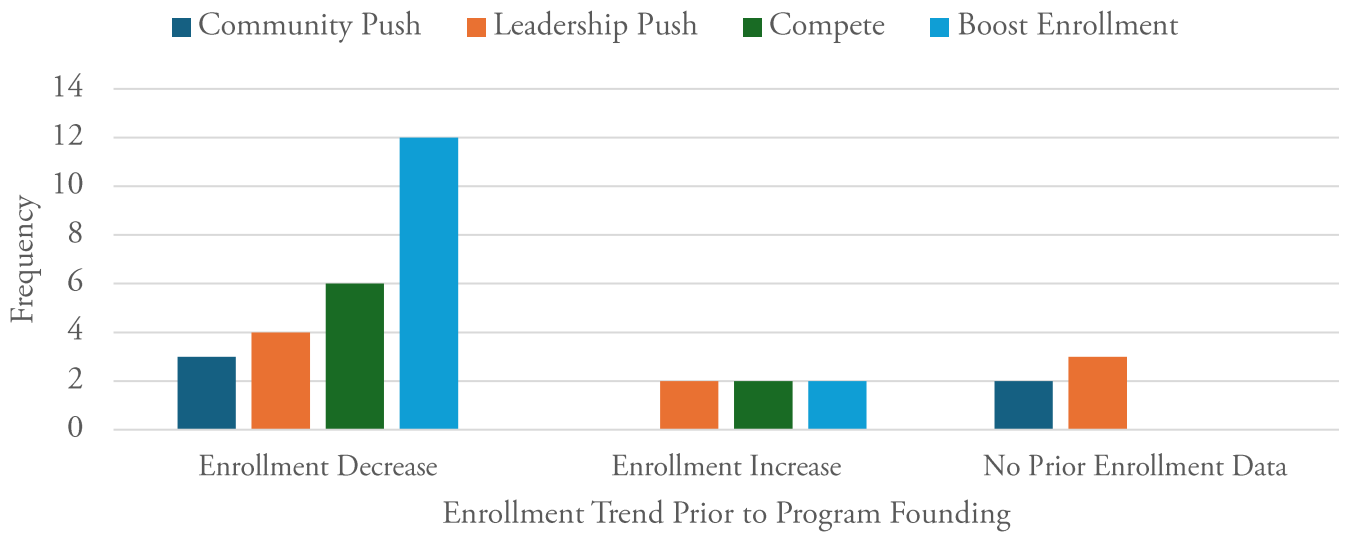


Note. Participants include both district and principals. There are three instances of principals/district leaders located in the same district. In all instances, the district founded multiple TWDL programs and the programs referred to by the principal were more recent than the first program founded. In addition, for district personnel, I coded reasons for program opening for the other DL programs and triangulated reasons for program opening for the TWDL program for whom I also had data from the principal.

Differences Across Pre-Founding Enrollment Trends

I next examine differences in program founding motivation compared to pre-founding enrollment in Figure 14. As noted earlier, using publicly available enrollment data, I constructed a panel of school level enrollment data for each of the 30 participants from 2000 to 2022. Of the thirty participants in this sample, six (n = 6) experienced enrollment increase prior to program founding, and five (n = 5) were founded before publicly available data on enrollment was available or were founded as TWDL schools. The other 19 (n = 19) participants' schools experienced enrollment loss prior to program founding. Not surprisingly, 12 of the participants cited enrollment as a program founding reason.

Figure 14 - *Program Founding Reason and School/District Enrollment Trends Prior to Founding*



Note. Enrollment data is obtained at the school level and is calculated for all years available prior to the program being founded. Five schools either founded their programs prior to available enrollment data from CDE or were founded as TWDL programs and do not have prior enrollment data. Categories for compete/boost enrollment are not mutually exclusive.

Section 2 – Factors Mediating Program Purpose

Participants described the purpose of their program ranging from linguistic development (language reclamation/preservation, serving English Learners or developing bilingualism) and non-linguistic considerations stemming from program development motivations, including developing a niche program, revitalizing a school, or boosting enrollment. Table 16 presents a table of codes used and their definition. Linguistic purposes include providing language reclamation and preservation, geared toward second and third generation children whose cultural identity was tied to the language but who themselves had not acquired the language. For many partner language speakers, and especially Spanish speakers growing up in the 1990s in California, restrictions imposed on bilingual education meant that many students had not received bilingual instruction and had experienced monolingual English schooling environment. Another stated purpose of the dual language program is serving English learner students. For example, Hannah describes how her school had a "significant amount of Hispanic students that spoke Spanish" and for whom language services would be beneficial. Participants cited the benefits of providing home language services to English Learner classified students. Participants also cited the desire to develop bilingualism in more general terms, as it could apply to heritage, English Learners or monolingual English speakers but participants did not specify which, or they specified both groups.

Table 16 - *Program Purpose Codes and Definitions*

Stated Purpose	Definition	Exemplar
Language reclamation / preservation	Serve heritage language learners and bilingual students who are interested in preserving their language	*"The parents that didn't get that bilingual foundation, were now able to have their children in the programs, and almost like bridging the gap between grandparent, child and parents. " (Rosa Navarro)*
Serving ELs	Serve newcomer and partner language speakers who are acquiring English	*"this is truly an initiative that we're doing to support our English learners and our newcomers" (Ada Nielsen)*
Develop Bilingualism	Develop bilingualism and biliteracy. Target population is not clear in the purpose.	*"I think that the families understand the research about bilingualism and brain development and want that for their child." (Gloria Darien)*
21st Century Skills	Develop 21st century skills, global economy	*"You want 21st century learner. That is someone who, once they become a graduate, they have learned at least another language" (Ivan Gomez)*
Develop a Niche	Present the program as a niche program that attracts students	*"We have engineering, we have dual language, and we have programs that try to keep our students here." (Santiago Mateo)*
Revitalize a School	Revitalize an underperforming school	*"Though I do know that this school specifically was a poor performance school […] I believe that if they didn't have a dual language program, I don't know how the school would have remained." (Barbara Flores)*
Boost Enrollment	Increase enrollment in the school	*"I would say having that declining in enrollment in the district and losing a lot of families to charter schools and private schools. The district I think needed to put something in place that got those families to come or not leave." (Ivan Gomez)*

Note. Program descriptors are codes in the category of "program purpose". Multiple reasons were cited for most participants.

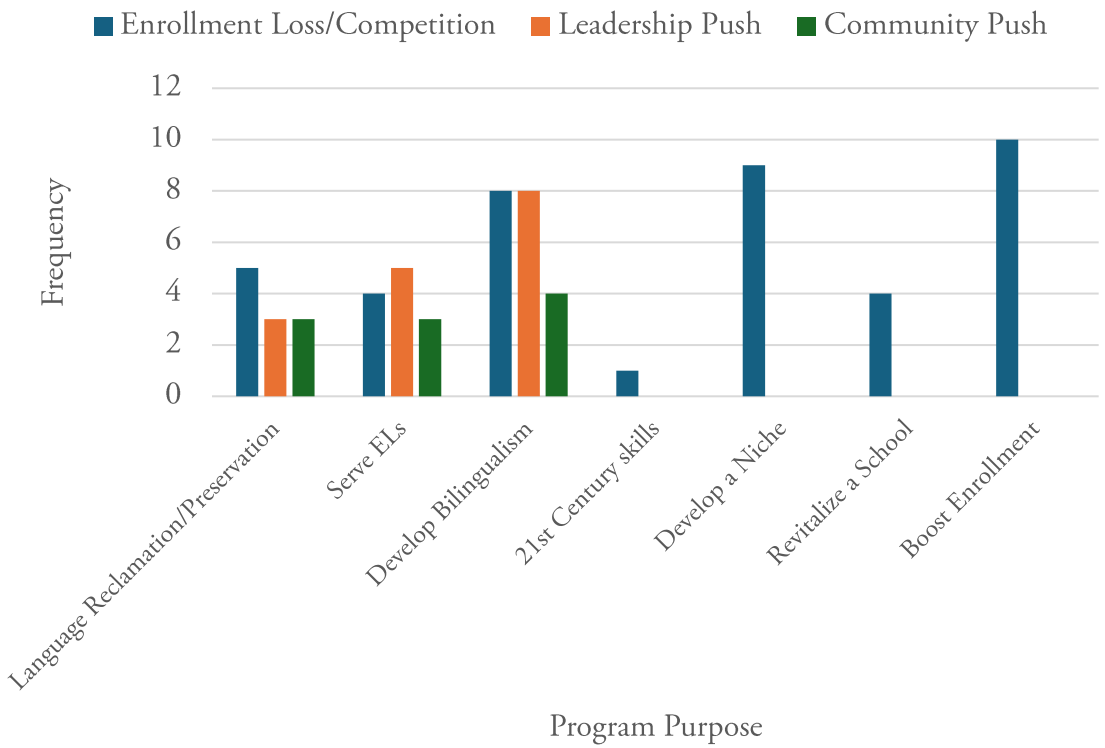
The Purpose of the Program was Mediated by its Reason for Being Founded

There were differences in the stated purposes of programs based on the factors that motivated the program to be founded in the first place (see Figure 15). For example, I found that participants whose dual language program was founded by leadership or community push framed the purpose of their program in linguistic terms, meaning in terms of what linguistic outcomes they wished to see achieved. This was the case for Aurelia, principal of a dual language program which was "chosen" by district administration because of the large Spanish speaking population at the school. She framed the program's purpose in how parents were excited for their children to "speak Spanish, to be biliterate in Spanish and of course in English". Thus, the purpose of the program was framed entirely by its ability to develop bilingual individuals, and Aurelia included a whole range of student linguistic experiences.

By contrast, participants who cited enrollment loss or increased competition as a motivation for program founding tended to frame their program in both linguistic and non-linguistic terms. This means that these participants tended to describe the purpose of their program as needing to attract parents, boost enrollment, or revitalize a school. For example, Daniel, a dual language principal, explained how the founding of the program at his school "was one model to use to attract our families.", thereby demonstrating that one purpose of the program was to attract students. In addition, Daniel also explained how the community valued bilingualism and that parents wanted their "kids to learn two languages […] they want their kids to be bilingual". One principal, Sean, described the purpose of his program to provide a niche, explaining that "you got to rebrand yourself, you got to think in the future. So there was a push to have dual languages, that way you have something other

than a basic school." Without further elaborating, Sean framed the purpose of the program purely in non-linguistic terms.

Figure 15 - *Program Purpose by Reason for Program Founding*



School Choice is Central to Program Purpose

School choice – in the form of inter/intra district permits and open enrollment – was central to dual language programs. In several instances, the districts that participants worked in had implemented a systematized online application process for all of their choice options, including but not limited to TWDL. A total of 24 participants described school choice allowing the program to enroll from outside of the zone or district, and a subset of those described using school choice purposefully. The uses of school choice depended on specific contexts, as some participants viewed choice as vital to ensuring linguistically balanced populations of students, others saw school choice as vital to competition and enrollment, while others yet framed school choice as an important equity enhancing mechanism.

A subset of the 24 participants who described the presence of school choice (n = 3) described using permits to achieve the "ideal" balance of language profiles. For example, they described using choice to specifically bring in more English Learner students, or to bring in more English-speaking students. Victoria, dual language principal, described how she "had to open up our permit process to bring in fluent speakers almost every year". In some cases, this process bypassed the lottery system of the dual language program of her school to be "able to draw from out of district kids on permits." These participants' understanding of school choice was that it provided, in effect, an opportunity to structure their dual language programs in ways that promoted fidelity to the dual language program structure laid out in popular manuals (Howard et al., 2007) and suggested by state-policy (California Department of Education, 2019). As populations of schools changed over time, these principals

leveraged permits to continue achieving population balance even if the students no longer resided in the school zone.

Participants also framed school choice as a key mechanism of their dual language program to out-compete neighboring schools and boost enrollment. Daniel expressed this link between school competition, school choice and dual language in describing working to reclaim parents from "neighboring schools that were taking away our kids". The ability to target a larger pool of students inclusive of the one that already existed in the school was commonly stated, even if it did not always work as intended. Nahia explained how the program was not successful in boosting enrollment because it had "only 5 to 7% of the kids that came from another area". In another instance Ada, district employee, described the increasing difficulty for districts to receive students on intra-district transfer, owing to "funding and declining enrollment" and that districts did not want to release kids [on permit]". While participants predominantly enrolled students from their school and used school choice to supplement the existing population, others framed school choice as enrolling a set of parents that were not already enrolled in the program and who differed along racial and economic lines (n = 3). This is exemplified in Janet, principal of a Mandarin dual language program. In a move that uncannily resembled population re-engineering documented by Chaparro (2021) in Philadelphia and Menken (2023) in New York, Janet responded to gentrifying parents "calling the school saying […] if you're a true immersion program, we will come". She explained that despite not knowing "anything about dual language", her "motivation to get enrollment" resulted in her opening a Mandarin dual language program that enrolled primarily students from out of the neighborhood zone (whether by design or not). Janet recalled that existing parents, who were predominantly Latinx and Black/African American,

had pushed back against the development of the program while incoming parents, who were majority White, Asian American and well-to-do, advocated for it. The ability to choose a program not necessarily in one's home school was framed as providing the ability to compete with a population of parents that already exercised considerable choice out of schools. These programs, though few in number exemplified a type of exercise of choice that explicitly targeted, and ultimately enrolled, a population of students that differed significantly from the school or district demographics.

Lastly, two participants (n = 2) framed school choice (the ability to choose between neighborhood public schools in and out of one's home district) as a mechanism to achieve equity in dual language. Charlotte, a district-level participant, described using intra-districts permits to dismantle the enrollment process of a dual language program that had previously been placed in a wealthy enclave of the city. She described that, prior to her intervention, the program's enrollment was opaque and had resulted in enrollment of students that differed demographically from the rest of the district. Citing these concerns, she transformed the dual language program into a 'district' program, meaning that the school zone would no longer provide enrollment priority. Her decision allowed students from the entire district to enroll in order to make it more equitable and "more like a[District] classroom" referring to the considerable disparity in dual language enrollment demographics that existed before. A long-time proponent of dual language, she also capitalized on declining enrollment to push for a program on the other side of the district and expand the number and geographic availability of dual language. Anahita, a district-level employee in City Unified, described changing the choice enrollment application process in her district so that students could apply to dual language anytime during the year. By enacting this expanded school choice policy, Anahita worked to expand

access to newcomer students who typically arrived during mid- year and might otherwise miss the enrollment window. These participants showed that, as much as school choice could be leveraged to bypass a local school population, it could be used to bypass an inequitable system of enrollment.

Construction of Linguistic Groups

In general, participants referred to programs as serving multiple linguistic groups of students. These were typically framed in binary terms like native/non-native, partner language/English, fluent/non-fluent, English Learner/English-only. Gwen, a district administrator, exemplifies these categories when she described her program's "need to have part of the class be *native Spanish speakers* and part of the class be *native English speakers*" (author's emphasis), echoing this common definition of program participation language populations. This follows from foundational books and documents around dual language education, such as Lindholm-Leary's (2001), Christian et al.'s (2000), and Howard et al.'s guiding principles (2007) who defined two-way dual language program populations in this way.

However, the labels of English Learner and English-only were much more heterogeneous and led to variation in how participants imagined their program's target populations. It was notable that these labels took on new meanings depending on context. They took on these various meanings because 1) at least in some instances parents filled out the home language survey form differentially depending on their expected/desired outcome and 2) the linguistic experiences of students were not well captured by the form. The labels of English Learner/English-only stem from a home language survey form that a parent fills out upon enrolling their child in school. If a parent indicates that the

child's first or most commonly used language is other than English, or that a language other than English is spoken in the home, then the child is flagged for language service testing (California Department of Education, 2020). Depending on the results, the child may then be classified as English-learner or initial English proficient. Rosa, a dual language principal in a predominantly Latinx school noticed how parents had become "more sophisticated about what they need to write" on the form, suggesting that parents were aware of the consequences of their answers and adjusting accordingly. In Rosa's case, parents from Spanish backgrounds understood that indicating Spanish spoken in the house would lead their child to be flagged for services which would impact programming in later grades. As it pertains to dual language, a similar type of behavior seemed to be true. Ada, for example, described that parents had a "perception that they can't get into [TWDL], without saying that they're an English Learner". She explained how parents were listing a language other than English spoken in the home (typically a grandparent) but that they were not "true English Learners" because the child themselves already spoke English fluently. In a similar, though more egregious vein, Ivan recalled white, monolingual parents indicating a language other than English on the form and later confirming that it was the "nanny [or] gardener" speaking a language other than English. He admitted that these parents "just want to get into [TWDL] because they're competitive [programs]" suggesting that this was not an isolated event. Given that Ivan admitted that the TWDL program in his district predominantly enrolled white, monolingual families, it is unclear what steps he took to rectify these behaviors which were rational from the parent perspective but otherwise exclusionary, reminiscent of opportunity hoarding found in other contexts (Sattin-Bajaj & Roda, 2020).

Secondly, the classification system stemming from the home language survey did not convey the variability in students' language experiences. Rosa explains this when she described the lived reality of filling out the form for a parent:

> When they enroll and they ask that question on the home language [survey]. There's always that challenge like: 'Well, grandma speaks Spanish.' Your parents can speak, maybe not so fluent in Spanish, but like, which [language]? Why do you have to pick one? And which one do you pick? It's almost like a trick question. Does anybody in the home speak anything other than English? What language was the child's first words in? If you're around grandma, it might be 'abuela'. And so that automatically makes you an EL, but you also know, 'Mom', you also know, 'brother', 'sister', because you have a blend of both.

Thus, over time, the classification had come to signify many different linguistic proficiencies, which impacts TWDL programs that have traditionally defined students in non-overlapping terms. Participants conveyed this in interviews. For example, Hannah, a principal, explained that while the population of English Learner-classified students at her school remained steady over the years, she had seen a change in language proficiency where students were "definitely English learners because [their] parents speak Spanish" but without "a strong dominance of the Spanish language" owing to being second, or third generation. Some, like Victoria, a principal, struggled to reconcile these students' placement in dual language who in her opinion would "not necessarily" qualify as "[Spanish] fluent kids" while also not being English-only. She explained that these heritage language students had in the past "struggled the most" linguistically – and therefore also academically - in the program. Though she identified that a heritage language program – arguably a better fit - might work best, the popularity of

the dual language program (who she identified as monolingual, English-only parents) combined with the hostile attitude of some of the school's English-only teachers and lack of "political will" from district administration to see it through made it difficult for her to implement. She thus did not imagine these students as being a good fit for the program and instead described opening the permit process to enroll 'true' English Learners from out of the district. In other instances, heritage English-only students were framed as solely English-only, and participants simply referred to them as the English-only students. Nevertheless, they did not expand on these students' potential skills in the partner language.

Other participants, like principal Lucia, framed this change differently. She, like the others, also witnessed the school population of Spanish speaking students diminish over time, leaving fewer students coming in with Spanish proficiency. Despite this, Lucia described a new paradigm of "a third, a third, a third. A third monolingual English, Spanish speaking, and bilingual." Since for her, DLI was tied to a "validation of…culture" and ensuring that students exhibited "pride to be bilingual" by "recapturing the language", she did not seem bothered by the change in population. Rosa, a bilingual dual language principal, also constructed her population of students in a more nuanced way. For example, she described realizing that her current (heritage) students were the children of the students she had taught during Proposition 227. She understood that "just because you're in dual [language] doesn't mean that you don't have some of the same cultural aspects in the residential [non-dual language program]." As a result, she employed translanguaging as a tool to validate students' bilingualism and so "that students don't need to leave part of their identity somewhere else and they can coexist." She witnessed how the culture of the school changed in ways that affirmed students' language, citing increased students' use of multiple languages throughout the school building.

Section 3: Factors mediating enrollment in the program

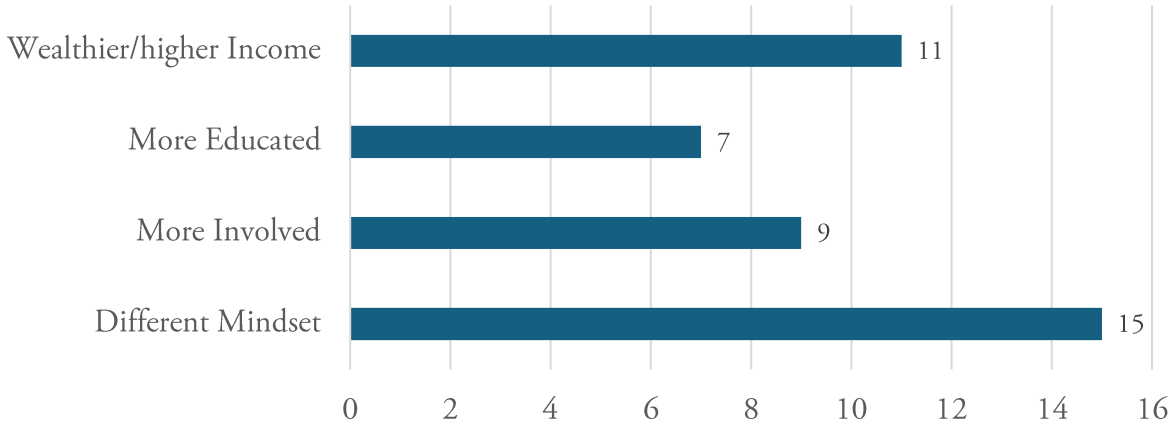
I examined how participants described enrollment in their dual language program, how they described the parents and students, and how that might differ from the non-dual language program of their school. This section applies to the 27 programs which were not whole-school programs. Nearly all participants (n = 25) noted differences in enrollment between their TWDL program and the host school, arising from the fact that TWDL programs are programs of choice. School choice engendered differences along geographic lines stemming from the fact that many parents came on permit because they did not live within the neighborhood zone of the school. The other major difference was in parental behavior, as participants cited that dual language parents were 'more involved', owing to parents having to apply to enroll. I examine these differences in greater detail below.

Differences Across Parents

Of the 27 participants whose program was a strand within the school, 25 noted some difference in parents between their program and the host school (See Figure 16). Most of these participants (n = 15, or about 60%) described parents having a mindset difference, meaning that they were described as understanding the 'value' of being bilingual and wanting/seeking out this program for their child. Gwen, district coordinator, and Cassandra, principal in Barton Unified, described the dual language parents as "more involved", which Gwen referred to as the people coming from a wealthier neighborhood ('million-dollar houses') of the city. In a couple of cases, participants referred to parents as 'entitled', expressing the neediness of parents in the dual language program. About 40% of participants (n = 11) noted that parents in the program differed along class-lines and were wealthier than those in the host school, and nearly 30% (n = 7) noted that parents tended to be more educated.

For example, Santiago, a bilingual dual language principal, explained how parents of his program "tend to be more educated generally, even if they're not educated in the states", referring to parents having been educated in Mexico.

Figure 16 - *Program-Host School Parental Differences*

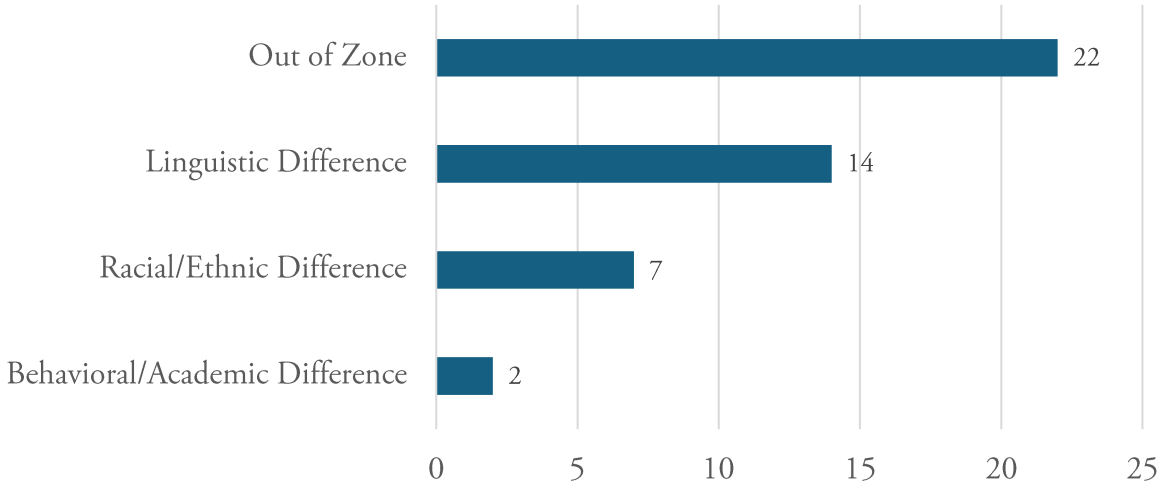


Note. Differences apply to the n = 25 schools that were not whole-school programs and that mentioned a difference in the number of programs. Differences are not mutually exclusive. 'Involved' refers to parents who might be part of the PTA, volunteer their time at school, donate to the school, or come to parent-teacher conferences. 'Different mindset' refers to 'understanding' the value of bilingualism.

Differences Across Students

In Figure 17, I report frequencies of participant mention of differences among students enrolled in the program and those not. I found that the most notable difference in enrollment owed to the zone of origin, where 22 of the 25 participants (nearly 90%) described that a greater share of students came from outside the zone to enroll in the TWDL program than the neighborhood school. Again, this is unsurprising given that TWDL programs are choice programs that require an application for admittance. I also found that students differed along linguistic lines. Most participants described higher demand among English-speaking parents (including heritage English-only parents) than partner language dominant parents, though there were a couple of participants who noted struggling to find English-only parents to enroll in the program. Roughly a third of participants (n = 7) described some racial or ethnic difference between the program and the host school. Ivan, a district administrator, for example described his TWDL programs enrolling "mainly white families" who were learning a second language, and that "Latino and Latina parents" were the "families that we would like to be in our programs".

Figure 17 - *Program-Host School Enrollment Differences*



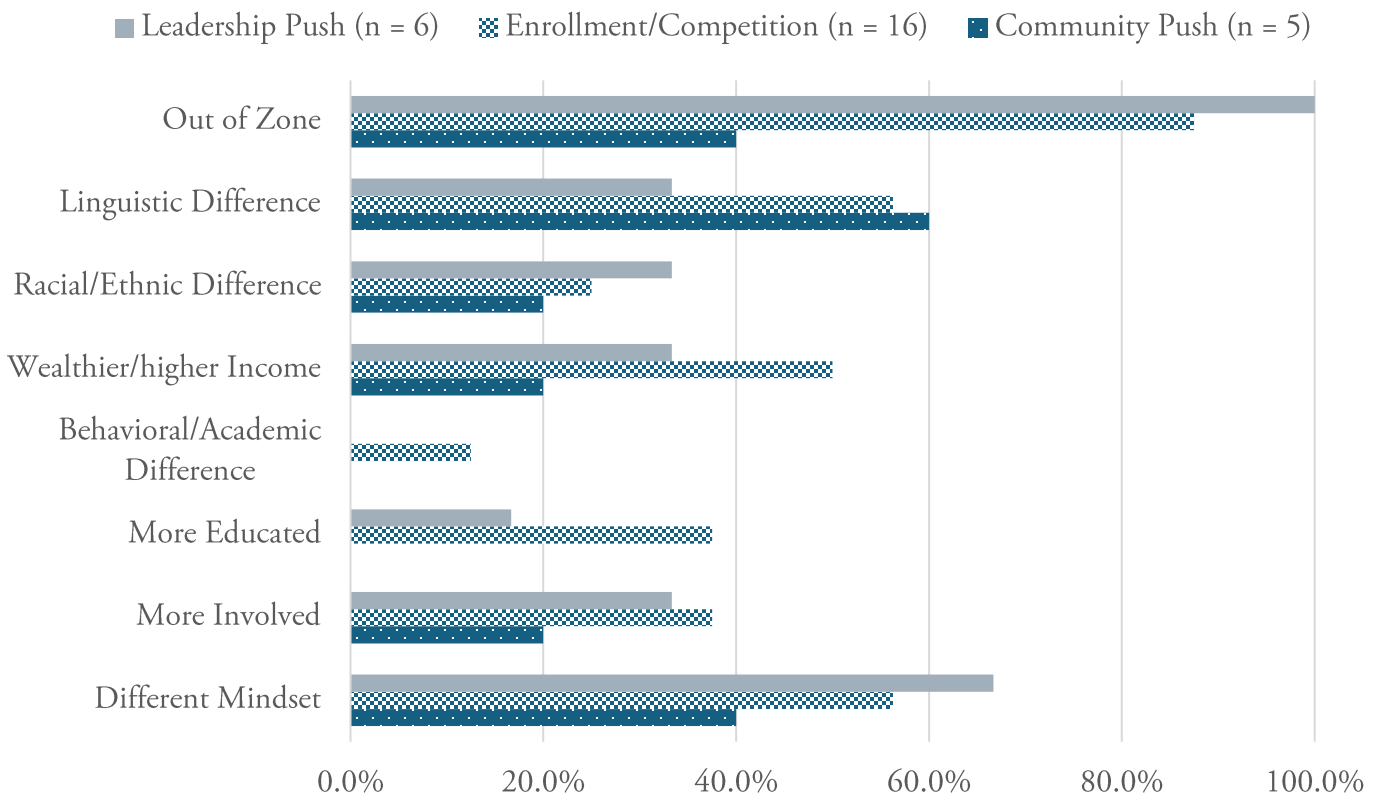
Note. Differences apply to the n = 25 schools that were not whole-school programs and that mentioned a difference in the number of programs. Differences are not mutually exclusive. 'Out of zone' refers to a student whose assigned school is the not the TWDL school. Linguistic difference means that either the program has more English-only students or more English learner students. Behavioral/academic differences indicates that students in the program have higher attendance, perform better on academic assessments, have fewer behavioral programs.

Differences Across Reasons for Program Founding

I also examined differences by program founding reasons (see Figure 18). I found that rather than the program motivation (for example whether the program was founded in response to enrollment decline, or as a community push), it was the founding principal of administrator's construct of who the program was geared toward that guided who ultimately enrolled in the program. Three examples highlight this finding. Ivan, who was previously quoted as founding dual language programs to retain families opting for private and charter options (wealthier, whiter), acknowledged that low-income and families of color did not enroll in the program despite making up a large share of the public-school enrollment. Similarly, Gwen a district administrator described how the TWDL program had a waiting list for the monolingual English-only students. She further explained that the dual language schools were not placed in "traditionally more Latino" neighborhoods, suggesting that there was indeed enough language minority students to enroll in the program but that these programs remained out of reach for this predominantly working class group. Gwen's recounting of the founding of the programs suggested that this was done intentionally. For example, she cited that the district's city was formerly a "sundown town", that the city didn't "support speaking Spanish", and that the school board and parents had once opposed bilingual education because it favored Spanish speaking children. When the dual language programs were founded to stave off enrollment decline, Gwen was advised to "not put the [dual language] school in a predominantly Hispanic neighborhood" to get parents to "really buy into the program". It was thus not surprising that fewer Latino, and language minority parents had access to and enrolled in the programs in Ivan and Gwen's TWDL schools. By contrast, Rosa, principal of a school with declining enrollment and high levels of competition, sought

to open a TWDL program to 'give something back to the families that had lost back in 1997" referring to the passage of restrictive language policies of Proposition 227. As a result, her school's program enrolled a significant number of Latino, heritage, English-only students whose parents had been educated during a time of restrictive language policies. Thus, school choice, and the existence of TWDL as a strand within a school led to variations in who ended up enrolling in the program across schools with similar founding reasons and demographics.

Figure 18 - *Program Enrollment Differences by Reason for Program Founding*



Note. Differences apply to the n = 25 schools that were not whole-school programs and that mentioned a difference in the number of programs. Differences are not mutually exclusive. 'Out of zone' refers to a student whose assigned school is not the TWDL school. Linguistic difference means that either the program has more English-only students or more English learner students. Behavioral/academic differences indicates that students in the program have higher attendance, perform better on academic assessments, have fewer behavioral programs.

Past Policies Mediate Current Program Enrollment

Bilingual respondents – and especially Hispanic/Latinx respondents having grown up or taught in California - explained the passage of Proposition 227 (passed in 1998), and Proposition 187 (passed in 1994 but ultimately struck down by the courts) as having a dramatic – if not traumatic - impact on them. One of the ways that it impacted participants was in fomenting their desire to see the vision of bilingual education carried out. Participants that began their careers as bilingual teachers – and primarily worked with Latinx, Spanish speaking students - and those that taught prior to 1998 remembered the abrupt shift in educational context. As was documented in Gandara et al. (1998) Rosa, a bilingual teacher at the time, recalled a moment where "they came in, and they literally took all the books that we were using [in the bilingual classroom]". She recalls the 1990's as "a lot of other policies as well, where it was anti people of color, really, and anti-bilingual anything." These participants described the opportunity in bringing bilingual education back. In some cases, participants were critical of bilingual education of prior years, as remedial and lacking support for teachers and preferred two-way dual language immersion. This was the case for Nahia, who felt that bilingual education "didn't do anything for the kids. In fact, they didn't learn either English or Spanish the way they should" though she described dual language, and the possibility of becoming bilingual, positively and spent considerable amount of energy and time convincing parents of the benefits of dual language.

Proposition 227 had the lasting impact that it diminished the number of students enrolled in bilingual education, and thus the number of people who maintained their heritage language (as Rosa described). As these students became adults and had children of their own, they enrolled their children with lower proficiency in the home language. Thus, what participants saw as the generational shifts

and language experiences in current elementary schoolers stemmed from these children's parents having been schooled during restrictive policies. Another lasting impact of proposition 227 was in the way that it - and participants - constructed Hispanic/Latinx parents. Participants used various explanations for why they felt that parents might not be enrolling in dual language programs. Some, as Janet and Ivan, framed parents' decision stemming from wanting to learn English, or not understanding the "value" of bilingualism in school. Gwen, for example, explained how "parents, especially if they're immigrants or […] second generation where they're like, "Oh, no, no, it's fine. My kid knows Spanish. I taught my kids Spanish." She expressed her frustration in saying, referring to these parents that "Oh my God, you don't get it." Their dual language schools, as a result, enrolled fewer EL students. Others, like Diana and Violeta, tied these feelings to the historical context. For example, Diana, a bilingual district administrator, critically described parents' reticence to enroll their child in TWDL as stemming from "students at one point historically weren't even able to speak their own language." Thus, Diana connected parents' decision to the socio-historical context. Violeta, for her part, described this more directly, citing the "historical trauma" of past policies. Participants (n = 10) described that this impacted enrollment in the dual language program, where Spanish speaking parents were reticent to enroll their child, or that they struggled to enroll English Learner classified students despite efforts on the part of participants. Ada, founding district employee recalled a conversation with a Spanish speaking parent and saying "Senora, it's gonna work, it's gonna work. It is a program of patience." We try really hard to share that with our families." Thus, some participants acknowledged the difficulty in convincing Spanish-speaking parents and actively attempted to convince and recruit Spanish speaking parents. Thus, while prior legislation certainly impacted the

level to which Latinx parents enrolled their children in dual language, leadership framing of parents varied – from justifying parents lack of interest in dual language to making efforts to outreach and educate Latinx parents about dual language – resulted in varying levels of outreach to Latinx communities, which certainly impacted their enrollment in TWDL.

Discussion and recommendations

Renewed interest in multilingual education has meant that districts are increasingly promoting and expanding bilingual education programs, predominantly in the form of two-way dual language (TWDL) which provide content instruction in two languages to linguistically diverse groups of students. Recent estimates factor the number of programs at nearly 4000 across the United States. California, both as a function of its large school-aged population and long history with bilingual education, enrolls thousands of students in hundreds of TWDL programs. Recent grant funds made available by the state legislature means schools can apply for TWDL grants to help found programs (Thurmond, 2022). However, as research has found, increasing interest has not always translated into increasing access. Given that historically marginalized populations of students benefit the most from specialized programs like TWDL, there is a need to understand 1) why programs are being adopted and 2) how they are framed, to advocate for policies that may counteract the effects of opportunity hoarding and other mechanisms of exclusion. To date, few studies have examined TWDL expansion across schools and districts to know if linguistically minoritized populations have equitable access. Fewer still in the context of neighborhood change and competitive effects brought about by school choice. This is important as schools make decisions with keen awareness of their neighborhoods and changes that may be going on around them. If it is the case that schools and districts are making

organizational and curricular decisions in ways that predominantly grant access to advantaged students, then the goals of TWDL to promote bilingualism and integration will be reserved for the select few.

I examined the extent to which school choice and competition played a role in program founding, and how principals and district leaders talked about the stated purpose and goals of DLI, and who they imagined the program was for. I found that most principals and district leaders founded their programs in response to enrollment decline, and that school choice came to make up a large part of school's purpose. For example, programs were founded to boost enrollment, and participants (at the school and district level) saw choice as a mechanism to ensure enough students could enroll. The result of this motivating factor (corroborated quantitatively in Study 1 means that schools located in a variety of contexts opened TWDL programs, including those serving high proportions of language minority students. Though participants drew on their background teaching bilingually, and were informed by their school's community when founding programs, I found a concerning instance in which one principal had no idea of TWDL and founded it to boost enrollment, even if this meant going against the local community wishes. This recalled what Bernstein et al. (2021) found of using TWDL has one of many possible options to choose from and suggests that close attention should be paid when programs are founded. Even though this principal had ample support from what she called the incoming 'gentrifyers', the existing community of parents (predominantly Latinx and Black/African American) opposed the Mandarin language program, and this had an immediate impact on program enrollment (the program makeup was predominantly Asian American and white, versus the rest of the school which was Latinx and Black/African American) and a lasting impact on relations among parents

and staff. I also found, as prior literature has uncovered, evidence of school choice and enrollment decline leading some leaders to engage in exclusionary behaviors. These behaviors included placing programs further away from minority populations, rationalizing students of color reason for not enrolling in programs, opening programs whose language did not match the language of the existing population, and counseling out 'struggling' students. These examples resulted in racially/ethnically and linguistically stratified programs. In other cases, programs housed in racially and socioeconomically homogenous schools ended up being considerably more diverse than their host school. However, this did not come without concerns. For example, participants spoke of tensions among dual language and non-dual language teachers who perceived the dual language program to be favored (fewer total students, fewer students with IEPs and behavioral issues, students of higher socioeconomic class, teachers less likely to be displaced). Several participants wished they could transform their TWDL strand into a whole-school program, and this is perhaps the more advisable path for future TWDL programs. These racially stratified programs were few in number, and I also found promising practices on the part of leadership who leveraged their own experiences as bilingual teachers, or simply framed heritage and bilingual students in such a way to respond to enrollment decline and competition while also ensuring access to language minority speakers. These participants framed TWDL in ways that included heritage, bilingual and English-Learner classified students and sought to bring bilingual education back to those populations.

School choice mediated how participants framed their program's purpose insofar as it created a significant level of variety across programs, driven by schools' contexts and participants' experiences. In some instances, this was tied to former policies aimed at restricting language usage. For example,

the passage of Proposition 227 had lasting impacts on Spanish-speaking families' participation in bilingual programs, who were framed as 'not wanting' or 'not understanding' the value of dual language. By contrast, some participants framed this in a positive light and actively engaged parents to convince them of the benefits of dual language rather than accept parents' beliefs as static and unchanging. For principals, it is recommended that assumptions about why parents choose (or not) to enroll in a program should be examined closely. Assumptions made about parents, as being more "involved" or having better "understanding" may run the risk of exacerbating existing disparities in program enrollment. I found that some participants justified these disparities, while others questioned and held critical views, and attempted to rectify these differences through explicit outreach and breaking down of stereotypes for parents.

Generally, participants used binary terms to refer to the populations of students' linguistic categories (English-only/English learner). I found, however, that generational shifts in students mediated how participants viewed students who did not neatly fit in these categories. For example, participants found that English Learners did not have high proficiency in Spanish and struggled to reconcile their place in a dual language program. For some participants, they readily adopted the notion of 'third-third-third', some of which included heritage language speakers and bilingual English Learners, while others acknowledged the generational shifts of parents wanting to 'reclaim' the language they had lost. These students were framed as 'English-only' but very clearly brought language skills that differed from non-heritage English-only students. Based on the level of variety between how participants talked about students, guidance is needed for dual language programs regarding how to 'balance' populations of students whose linguistic experiences lie on a spectrum of proficiency. Two-

way dual language programs could borrow from the long history of heritage language programs as a guide to teaching students who may have receptive or heritage skills in the partner language but less proficiency than a newcomer student. What these participants indicate is that despite programs being placed in seemingly racially, or socioeconomically homogenous schools, there is considerable linguistic heterogeneity within two-way programs that merits further exploration.

Limitations

Conducting this research in the wake of the Covid pandemic meant that I was invited to school campuses very few times, and thus my interactions with participants were performed almost exclusively over zoom or phone. I was unable to extensively document such things as interactions among staff, and the level of partner language used on the school premises. These observations would have lent a greater depth to this study, to understand how programs were being implemented. In one of the few schools I visited for the interview, for example, I noticed that very few signs were in the partner language, and I did not hear the partner language spoken until the principal walked me to a dual language classroom. I later discovered in the interview that there were considerable tensions among the dual and non-dual staff over the existence of the dual language program that the principal had had to deal with. My observations on the school grounds during our interview corroborated this. Similarly, without talking to students and parents or teachers, I gathered only a single viewpoint, that of the principal. It was clear in interviews that some principals had much more in-depth knowledge of curriculum and bilingual instruction (having been dual language teachers themselves) and spoke extensively on working with teachers to ensure language proficiency standards. However, without classroom observations, it was not possible to determine classroom dynamics among students and staff.

Without a close examination of curriculum, it was not possible to determine how varieties of languages were validated. Finally, the perspectives of students and parents, on their understanding and decision to enroll (or not) would have provided an important glimpse into the decision making of parents faced with choice options both within their home school and within their district.

Nevertheless, this study provides an important examination of motivations for TWDL program founding at a time of extensive program growth across the state to shed light on why and how TWDL programs are established, how they are framed and who they ultimately serve.

Appendix H

Figure H1 - *Copy of the email sent to principals*

My name is Clémence Darriet, a doctoral student in the School of Education at UCLA. Before coming to LA to pursue my PhD, I was a bilingual and language teacher in the Midwest. For my dissertation, I am exploring dual language programs across Los Angeles.

I found your name researching schools in the area that offer a dual language program at the elementary level and was wondering if you would be interested in being interviewed to talk about how your dual language program was founded and general aspects of the program? It would be amazing to collect your thoughts on how you feel the program supports multilingual learners. I appreciate your consideration and look forward to hearing from you.

Hope you have a wonderful rest of your day,

Figure H2 - *Interview Protocol*

Personal experience, Program founding and community	Recruitment, enrollment, retention	Program vision & goals, staff, parental involvement	Assessment, curriculum, language status, retention
How have your personal and professional experiences informed your leadership at a dual language school? *How has that changed over time?* **Why did the school decide to open a dual language program?** *Who were major stakeholders? How was the district involved?* **In what ways have district, local, or state policies impacted the program's founding and/or development?** **How would you describe the school's surrounding neighborhood in terms of demographics, socioeconomics, and school choice options?** *How has it changed over time and/or impacted the school's decision to open a dual language program, if at all?*	**How do families find out about the program?** **Why do you feel families choose to enroll their child in the program?** *Do students exit the program? If so, why might that be?* **How would you describe the program's makeup and enrollment in terms of race, socioeconomic status, EL status, zone of attendance?** *How has this changed over time, if at all?* **What language learning options exist for students <u>not</u> enrolled in the program?** *For English learners?*	**In what ways has the program been successful in meeting its vision and goals?** **In what ways have you or the school managed programmatic and/or instructional obstacles?** **How would you describe the teachers of the program in terms of language, background, and experience?** *How do you recruit them?* **How would you describe the parents of students enrolled in the program and their level of involvement?** *How does this differ from parents not enrolled in the program, if at all?*	**Does your program follow a particular policy for language of instruction?** *How did you arrive at that decision?* **How would you describe students' use of each of the languages?** *To what degree is the non-English language used by students for natural social interactions, e.g. in the playground, cafeteria, etc.* **How do you know that students are making progress in their multilingual development?** *How do you support struggling students?* **In what ways does the program emphasize culturally responsive curriculum?** *How do you account for student diversity (racial, linguistic, immigration status, neurodiversity)?* **What do you consider when selecting curriculum and instructional materials for the program?** *Does this differ by language? If so, how?* **If you could change one thing about the program, what would that be?**

Study 3: Two-Way Dual Language Programs as Policy for Enrollment: A Case Study of Greater Los Angeles (2002-2021)

Abstract

This study examines the relationship between two-way dual language (TWDL) program founding and subsequent enrollment and competition in Los Angeles County elementary schools from 2002 to 2021. Using school- and neighborhood-level panel data for 235 schools that founded TWDL programs during this period, the study employs mixed-effects models to analyze changes in kindergarten enrollment and enrollment share associated with program adoption. Findings indicate that TWDL program founding is associated with a significant average increase of about seven kindergarten students per year, with heterogeneous effects by race, ethnicity, and program language. Asian American and white kindergarten enrollment increases more than Black and Hispanic enrollment. Mandarin and less common language programs see larger enrollment boosts compared to Spanish programs. The relationship between program founding and enrollment share is positive but not always significant, suggesting these programs may not substantially increase a school's market share relative to nearby schools. Effects vary between Los Angeles Unified School District and other districts, with larger enrollment increases seen outside of LAUSD. Newer programs founded after 2017 show similar enrollment gains to older programs. Overall, the results suggest TWDL programs are successful in boosting enrollment, though not equally for all student groups and grade levels.

Research focused on the founding of dual language programs has examined the purpose and outcomes of founding dual language programs. Studies focused on schools that opened in gentrifying areas found that schools were more likely to adopt programs and enroll higher wealth, and often white/Asian American students to the exclusion of language/racial minority students. In Roda and Menken's (2023) New York City based study, four schools with dual language programs were studied after they opened their dual language program. The authors found that the schools, located in gentrifying communities, became "Whiter and wealthier as a result of the new programs while the enrollment of Latinx students and emergent bilinguals remained the same or declined in each of the schools". Others found that catering to white families increased the level of involvement and "political clout" of the program, which resulted in the program enrolling greater numbers of white students while subsequently not attending to the achievement disparity and resource needs of Latinx and EL students (Chávez-Moreno, 2021). White family interest was seen as an integral component of garnering support for the dual language program, which ensured that these groups were predominantly enrolled. Chaparro's (2021) ethnographic work in one neighborhood dual language school in Philadelphia also found that the program was founded with gentrifying parents in mind. In fact, she found that the program "became a way […] to attract more families and thus keep enrollment not only steady but increasing", and that "this new demographic of parents meant the ability to obtain greater resources and advocacy for the school". Dorner et al. (2011) multi-state study also found that "strong" demand from white, English-speaking families "made the program possible", and that district policies led to higher enrollment of English-speaking students. In another instance, Burns (2017) found that following the school's program founding, white student enrollment increased while Latino

enrollment decreased by nearly the same amount. Bernstein et al.'s (2021) multi-state study found that in "Arizona principals explained that a high percentage of open enrollment students in their schools served as an indicator that they were doing their job well". Not all schools experienced enrollment increases after establishing their program. Duarte (2022), in an ethnographic study of one Texas dual language program, found that the establishment of the program stemming from increased competition did not result in meaningful enrollment change.

These studies suggest that TWDL programs have, in some instances, been founded as a strategy to increase enrollment, and that this has had varying levels of success. For example, communities that experienced gentrification (neighborhood turnover) experienced increased enrollment, but of students who differed socio-economically, linguistically and racially from the existing neighborhood school students. To date, however, few studies have examine enrollment trends post-program founding across multiple schools and districts to understand whether the extent to which TWDL is used as enrollment policy (Domínguez-Fret & Oberto, 2022; Valdez et al., 2016).

Study Aims

This study systematically examines the relationship between TWDL program founding and subsequent enrollment and competition across nearly two decades (2002 to 2021) of school- and neighborhood-level factors related to TWDL founding for elementary public schools (including charter, magnet, and neighborhood) in Los Angeles County. The following question guides this study:

RQ: What is the relationship between TWDL adoption and post-founding enrollment and competition?

Context

This study builds upon the two prior studies. Study 1 explored differences across all elementary TWDL and never-TWDL schools and factors related to school founding, while Study 2 examined principal and district leadership understanding of the purpose of the founding of their dual language program, and their understanding of choice in this context. This study builds on these and examines those elementary schools that founded a TWDL program within the time span of the study, between 2002 and 2021. It focuses on kindergarten enrollment and competition after program founding and uses the data from Study 1, with some important differences. This study considers only those schools which found their program after 2001 (dropping 18 schools that found their program in 2001 or earlier), and schools that consistently have a kindergarten class (dropping seven schools that do not). A total of 235 schools remains out of the 260 initial population of elementary TWDL schools.

Data

Data for this study include school and neighborhood level data obtained from the California Department of Education, the US Census and Zillow Ztrax (Zillow, Inc., 2022). School level data include enrollment by race and ethnicity, English Learner (EL) status and free and reduced priced meal (FRPM) for years 2002 to 2021. Neighborhood-level data from the US Census and Zillow Ztrax include population counts by race and ethnicity in the years 2000, 2010 and 2020 (spread to years 2002 and 2021) at the census block and interpolated to school attendance zones (Saporito et al., 2007). School attendance zones are provided by the National Center for Education Statistics from a combination of years including 2011, 2012 and 2015 (see Study 1). Charter schools and other non-zoned schools are assigned to a school zone using their latitude and longitude. The zone is considered

a proxy for a school's neighborhood. Zillow Ztrax data takes single family residence assessed values for years 2000, 2010 and 2021, and adjusted to 2022 dollars for all parcels in Los Angeles county. Parcels are assigned to school attendance zones. Prior literature has found that neighborhood change, such as gentrification, provides a favorable environment for dual language program founding. This is attributed to an incoming population of parents who are higher resourced, both in income and time, making them attractive to schools looking to boost enrollment. The mechanism of gentrification is characterized by older housing stock that is renovated and sold at a significantly higher price than its current value, leading to population shifts, typically racially and educationally different from the existing population. These incoming households tend to be smaller in size and have fewer children, leading to population decline in schools. One strong indicator of gentrification is to track the change in the value of single-family houses, (the majority of homes in Los Angeles) and compare this change to the county median. Using the neighborhood metric that calculates the median value of all homes in a school's neighborhood (using its attendance zone), I calculate the median county change from 2001 to 2010, and again from 2010 to 2020. I spread the values to all years in between. The percentage change in median home values between 2000 and 2010, and 2010 and 2021, and the percentage change in the share of residents is calculated for the school neighborhoods. The county median percent change is calculated and used to create a binary variable of neighborhoods that fall above and below. For example, between 2000 and 2010, assessed homes values in all of Los Angeles County experienced a 29.3% percent increase, and a 28.9% percent increase between 2010 and 2021.

Estimation Strategy

I examine the relationship between TWDL program founding and outcomes variables related to enrollment and competition. I focus on kindergarten enrollment because programs are typically founded in Kinder (and first grade as a check) and grow a grade each subsequent year, meaning that any change in enrollment will first occur in kindergarten, with additional checks using first grade, since TWDL schools typically allow enrollment to programs in K and 1st grade. I focus on a school's share of enrollment as the outcome of interest for competition. The hypothesis is that program founding may be positively related to enrollment and competition (meaning an increase in a school's share of enrollment), as the TWDL program may help draw in students to the school and therefore lead to an increase in the school's enrollment share relative to neighboring schools. I model a fixed effects regression incorporating both year and school fixed effects (Allison, 2009; Woolridge, 2010) with robust standard errors (Abadie et al., 2017). This estimation strategy leverages both temporal and cross-sectional variation, and is expressed in equation 1:

$$Y_{it} = X'_{it}\beta + \alpha_i + \gamma_t + \varepsilon_{it} \quad (1)$$

where Y_{it} is the dependent variable, in this case either kindergarten enrollment, kindergarten enrollment by race/ethnic group, the number of nearby schools, or the share of enrollment for school *i* in year *t*. X'_{it} is a vector of independent variables for school *i* in year *t* and β is a vector of coefficients. These school characteristics include the binary treatment variable indicating whether a school has a program in year *t*, as well as the cumulative percentage change in enrollment to account for past enrollment trends, the number of classrooms in the school to account for school size, the percentage of EL and FRPM students in the school. Other characteristics are at the neighborhood level and

include the share of residents in the school's neighborhood, and rescaled median home values. α_i represents the school fixed effects for each school in the sample, while γ_t represents the year fixed effects. The error term, ε_{it}, is composed of both unobserved school characteristics and a random error component.

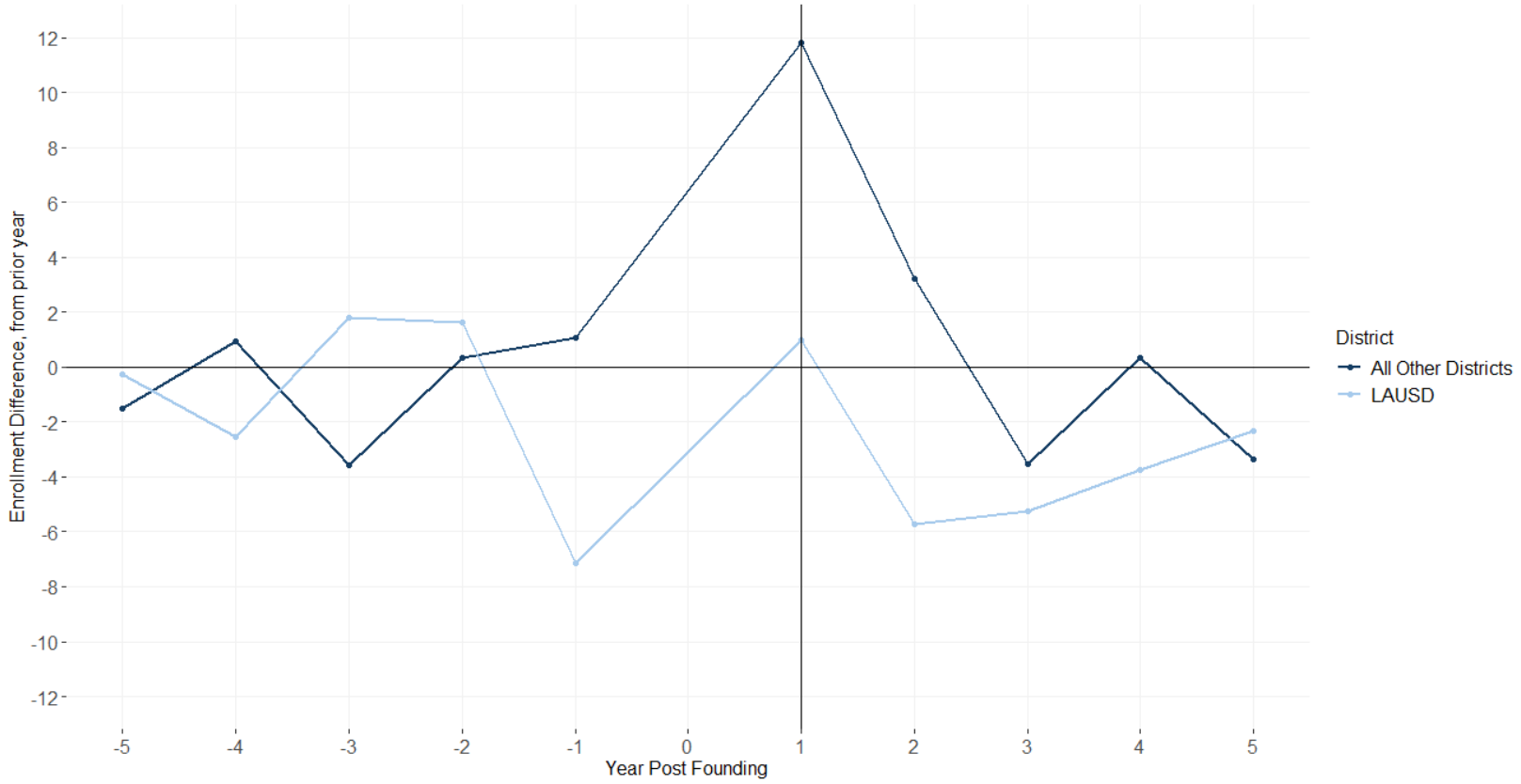
A source of bias for this strategy lies in if the error is due to unobserved school or neighborhood characteristics, then the estimate of program founding on enrollment could be biased if the unobserved affects both the treatment (the program's founding) and the outcome (enrollment). For example, a neighborhood may experience gentrification, and decide to open a TWDL program in hopes of attracting prospective families to the school. However, this very gentrification also leads to an increase in the number of students attending the school, which would have happened regardless of the program opening. In this case, the estimated effect of the treatment on the outcome would be biased upwards. Since enrollment is likely to be related to program founding, as are neighborhood characteristics, I include both as controls. Sources of endogeneity bias, that school and district unobserved characteristics correlated with both enrollment, competition, and program founding, are addressed by including significant school and neighborhood variables that might lead to TWDL founding *and* increased kindergarten enrollment.

Findings

The research question asks whether the opening of a TWDL program is associated with kinder enrollment by race and ethnicity, enrollment by program type, and characteristics of competition like enrollment share. I examine the 235 TWDL programs which were founded after 2001. This constitutes the majority of the TWDL elementary schools in the sample. Figure 19 shows the average enrollment

difference from the prior year for each year post program founding and compares LAUSD and all other districts in the county. The figure combines all programs across all years, so it includes programs founded in 2001 alongside programs founded in 2021. On average, both LAUSD and all other districts experience an increase of an average of one to 11 students in the first year of a program's founding (Year = 1). The increase continues in the second year of program founding for non-LAUSD schools, though does not seem to sustain in the third and fourth year of program founding.

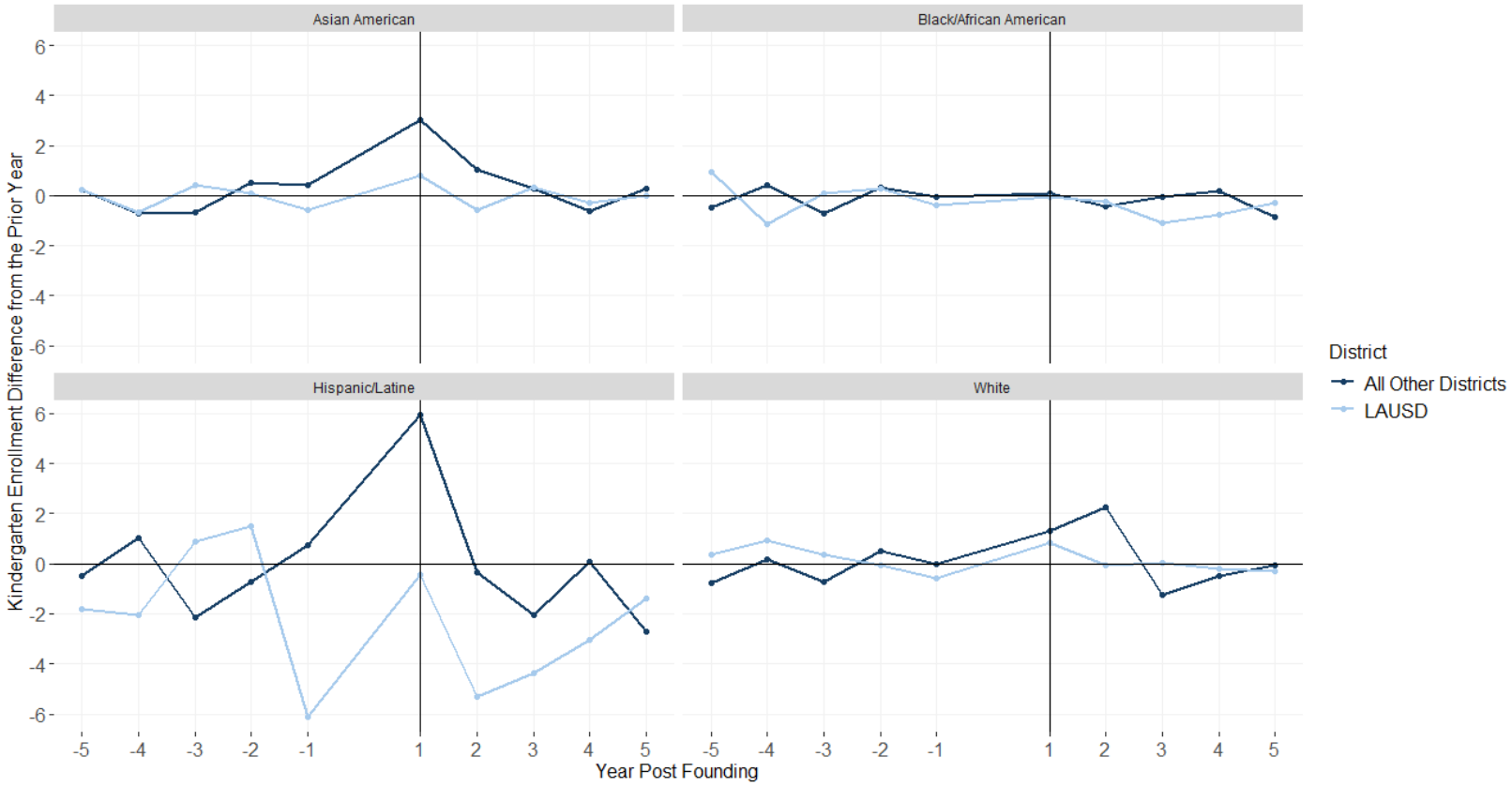
Figure 19 - *Kindergarten Enrollment Difference from Prior Year, Pre- and Post- TWDL Founding, by District*



Note. The year pre-founding is represented as -1 and the year immediate of founding as 1. There is no year = 0. The kindergarten enrollment difference is calculated as the arithmetic difference from one year to the next. Sample includes only TWDL elementary schools whose program was founded after 2002 and which has kindergarten enrollment. See Appendix I1 for full table.

Next, I disaggregate kindergarten enrollment differences from the year prior by race and ethnicity in Figure 20. Asian American kindergarten enrollment experiences a change from an average increase of one kindergarten student to an average increase of three students in the year of program adoption. In addition, there is a slight pre-founding trend upwards, especially in other districts in Los Angeles County. In LAUSD, the jump in Asian American student enrollment from the year prior to the year of founding is positive but small, going from an average loss of one kinder student to an average gain of one student post-program founding. Black/African American kinder student enrollment experiences a modest shift upwards between the pre and post founding years, though the change in kinder enrollment is near zero. In other districts in Los Angeles County there is a slight increase in Black/African American student enrollment at the third year, while there is a decline in LAUSD schools. For Hispanic/Latinx kinder student enrollment, again there is a slight upward pre-founding trend for other districts in Los Angeles County, and an increase of about one student to an average of six kinder students. An increase is also seen in LAUSD schools, though Hispanic/Latinx student enrollment continues to decline on average. In the year pre-founding, there is an average decline of about six students, while in the year of founding, there is no average change in kinder student enrollment. Finally, non-Hispanic white kindergarten student enrollment experiences an average enrollment decline in pre-founding years, with an average increase in the year of program founding for LAUSD schools. In non-LAUSD schools, we see more variability in school enrollment pre founding, with an average increase of about two students in the year of program founding.

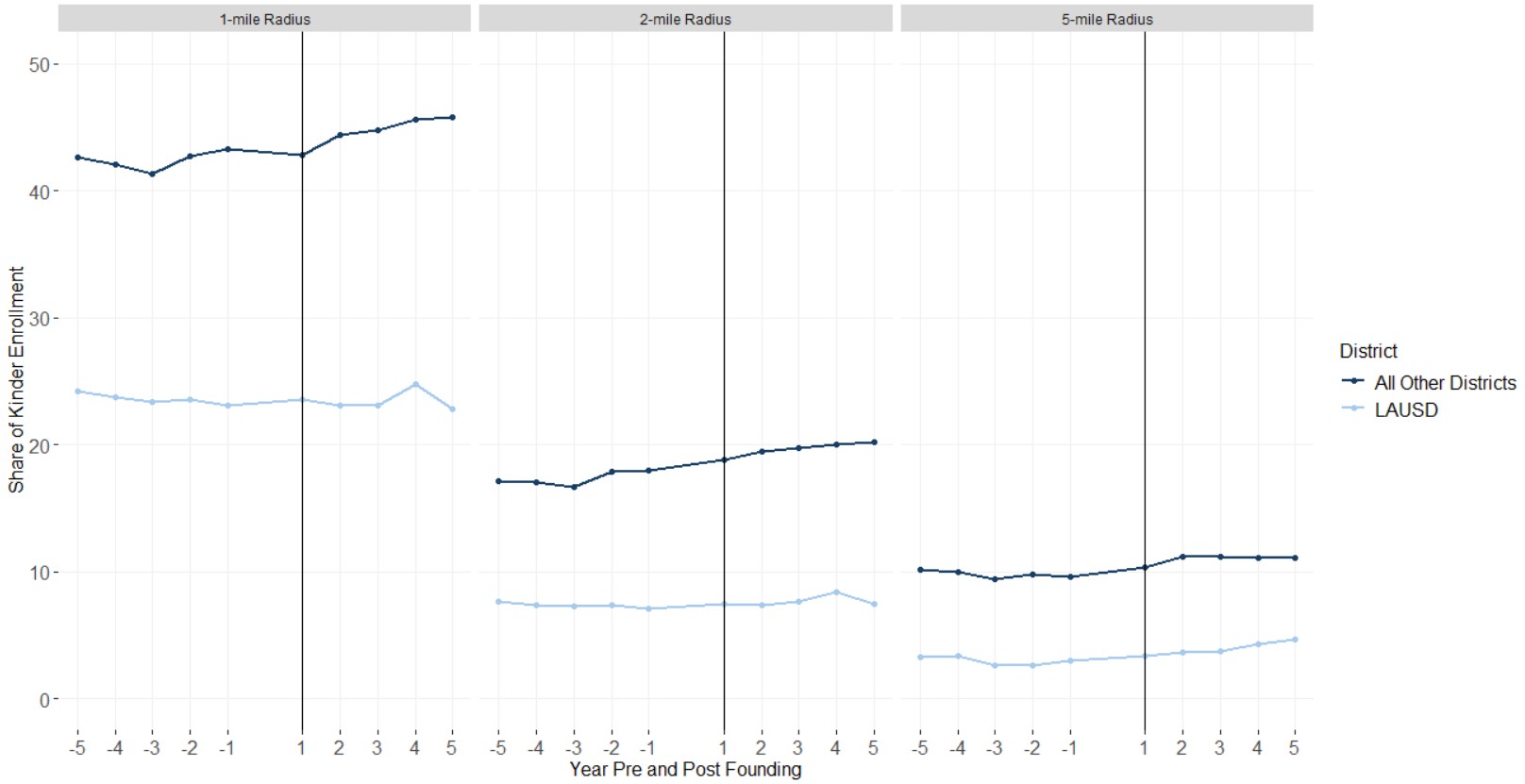
Figure 20 - *Enrollment Difference by Race/Ethnicity of Pre and Post Founding TWDL Schools, by District*



Note. The year pre-founding is represented as -1 and the year immediate of founding as 1. There is no year = 0. The kindergarten enrollment difference is calculated as the arithmetic difference from one year to the next. Sample includes only TWDL elementary schools whose program was founded after 2002 and which has kindergarten enrollment. See Appendix I2 – I3 for full tables.

Finally, I examine competition in Figure 21, which shows trends in the kindergarten enrollment share. Enrollment share is calculated by taking the total number of kinder students in a 1-, 2- and 5-mile radius and dividing by the number of elementary schools that offer kindergarten. A school that experiences an increase in enrollment share could be understood as being "stronger" in its educational market. For LAUSD schools (in blue), there does not appear to be a meaningful change in the enrollment share before and after program founding, except at a 5-mile radius, there is a slight trend upwards. Nevertheless, this trend exists prior to program founding. Non-LAUSD schools seem to experience both a slight trend upwards in their kinder enrollment share, especially at the 1- and 2-mile radius, and a continued trend upwards in the years post program founding. In sum, examining kindergarten enrollment and share of enrollment pre and post founding shows that there might be some relationship between program founding and enrollment.

Figure 21 - *Enrollment Share by Radius and District, Pre and Post TWDL Founding*

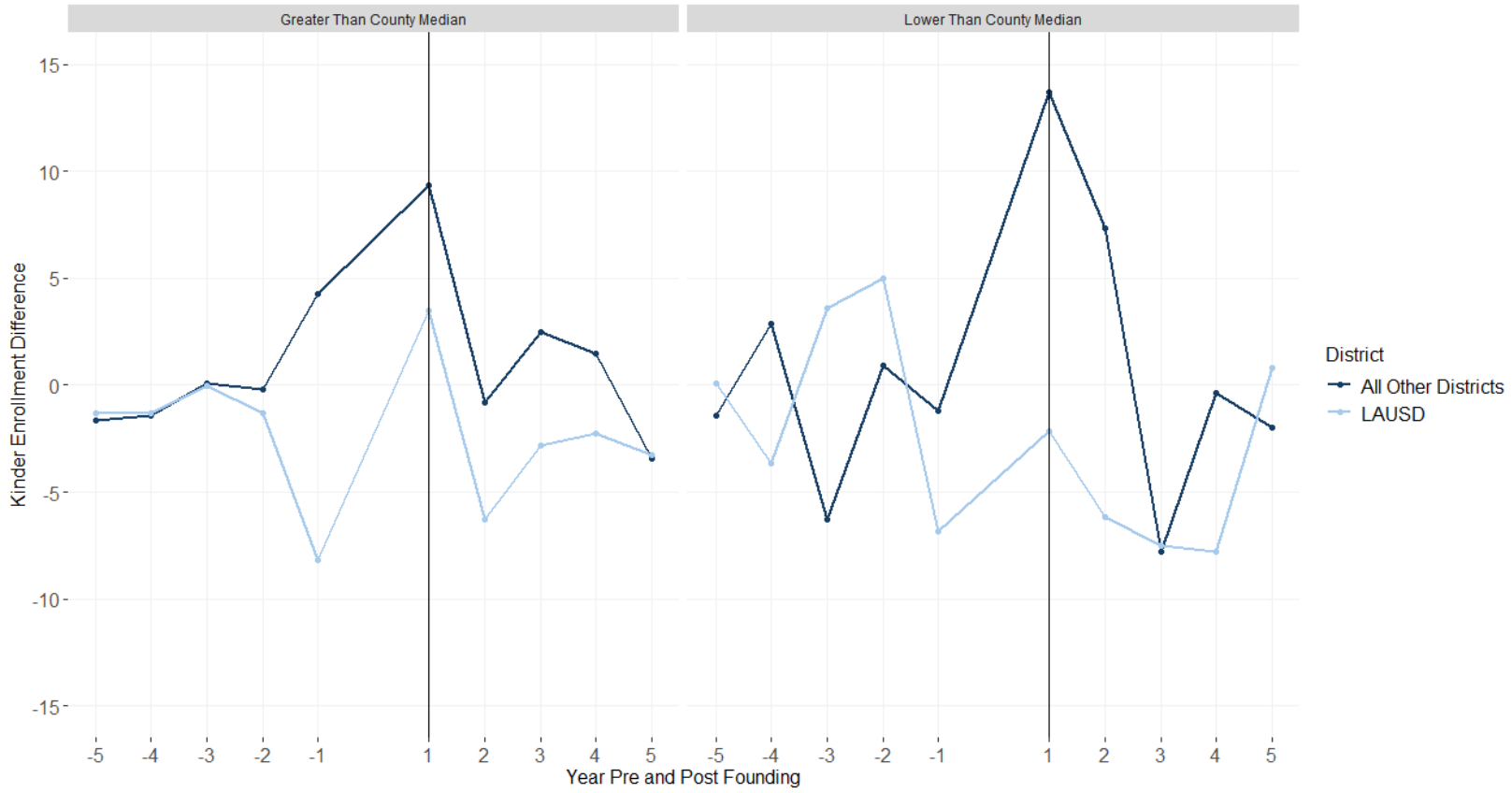


Note. The year pre-founding is represented as -1 and the year immediate of founding as 1. There is no year = 0. The enrollment share is calculated at the 1-, 2- and 5- mile radius for all schools that share a kindergarten grade. Sample includes only TWDL elementary schools whose program was founded after 2002 and which has kindergarten enrollment. See Appendix I4 for full table.

Neighborhood Change and Gentrification

I examine TWDL school enrollment pre and post founding comparing neighborhoods that experienced greater increase in the price of housing than the county median with those that did not. To be clear, neighborhoods across Los Angeles experienced dramatic increases in housing values since 2001, a phenomenon that has characterized the region and led to headline worthy home prices. For example, the median home price in Los Angeles County is 1.3 million dollars. The assessed value of homes in Los Angeles County neighborhoods increased by 29.3% between 2001 and 2010, and by 28.9% between 2010 and 2021. Figure 22 shows the pre-founding kinder enrollment for schools in neighborhoods having experienced higher than median home value percentage change in 2010 and/or 2021. For example in LAUSD, Asian American and White kinder enrollment increase post program founding in neighborhoods that experience higher increases in home values. In non-LAUSD districts, Hispanic/Latinx student enrollment change after program founding is largest in neighborhoods that have experienced lower home value increases compared to the county median.

Figure 22 - *Enrollment Difference by Neighborhood Economic Change, by District and Pre- and Post- Founding TWDL*



Note. The year pre-founding is represented as -1 and the year immediate of founding as 1. There is no year = 0. The Kindergarten enrollment difference is calculated as the arithmetic difference from one year to the next. Sample includes only TWDL elementary schools whose program was founded after 2002 and

which has kindergarten enrollment. Greater than county median refers to schools located in neighborhoods whose median percentage change in assessed home values increased more than the county median (of 29.3% in 2010 and 28.9% in 2021). See Appendix I5 for full table.

I estimate the marginal change in kindergarten enrollment and enrollment share (at the 1-mile radius) associated with program founding in Table 17 (see Appendix I6 for model comparisons). The table shows the coefficient on the binary variable signaling a school's adoption of a TWDL program, as well as the enrollment trend. Findings suggest that the founding of a TWDL program is associated with an average increase of seven kinder students significant at conventional levels, and average increase of about 1.4 percent in the school's share of enrollment at the 1-mile radius (See Appendix I7 for regression models for Grade 1 enrollment, and for enrollment share at the 2- and 5- mile radius).

Table 17 - *Fixed Effects Regression Results*

	Kinder Enrollment		Enrollment Share (1-mi)	
	Model 1	Model 2	Model 1	Model 2
Variable	Coefficient (se)	Coefficient (se)	Coefficient (se)	Coefficient (se)
TWDL Program	6.960 (0.577)***	6.752 (0.594)***	1.445 (0.213)***	1.393 (0.223)***
Prior Enrollment Trend	0.186 (0.038)***	0.631 (0.117)***	0.080 (0.019)***	0.241 (0.049)***
School	Yes	Yes	Yes	Yes
Neighborhood	No	Yes	No	Yes
Years	Yes	Yes	Yes	Yes
Observations	22,040	20,557	21,742	20,294
Schools	1,386	1,386	1,386	1,386
Years	2001 - 2022	2001 - 2022	2001 - 2022	2001 - 2022
R-Squared	0.8778	0.8776	0.9619	0.9618
F-Statistic	106.2	102.3	370.7	356.1

*** p<0.001, ** p<0.01, * p<0.05, .p<.1

Note. Results from estimating a year and school fixed effects model, including the year which has been transformed. School variables include the cumulative percentage change in school-wide enrollment, the school student population, the percentage of EL students and FRPM. Neighborhood characteristics include census percentage of Hispanic and white residents, as well as the Zillow assessment value in dollars that has been rescaled. See Appendix I8 for full table results.

In Table 18, I estimate the relationship between kindergarten enrollment by race and ethnicity and program founding. I find that there are heterogenous effects by these student groups. For example, a one unit change in program founding is associated with about three Asian American kindergarten students (b = 2.636, SE = 0.268, p < 0.001) and two white kinder students (b = 2.265, SE = 0.243, p < 0.001). Meanwhile, a one unit increase in program founding is associated with an average increase of about one Hispanic/Latinx student, controlling for school and neighborhood factors (b = 0.751, SE = 0.578, p = 0.193). The result is lower (less than one student) for Black/African American students (b = 0.646, SE = 0.176, p < 0.001). I estimate Grade 1 enrollment by student subgroup in Table I8. Interestingly, while Grade 1 enrollment largely mirrors kindergarten enrollment for Asian American, Black/African and white students, for Hispanic students, the coefficient on TWDL program (of a school adopting a program) is negative (b = -1.77, SE = 0.55, p = 0.000), suggesting that the marginal change in Hispanic students in first grade when a school opens a TWDL a program is nearly two fewer students.

Table 18 - *Fixed Effects Results by Race/Ethnic Subgroup*

	Asian American	**Black/African American**	**Hispanic/Latinx**	**White**
	Model 1	Model 2	Model 3	Model 4
Variable	Coefficient (se)	Coefficient (se)	Coefficient (se)	Coefficient (se)
TWDL Program	2.636 (0.268)***	0.646 (0.176)***	0.751 (0.577)	2.266 (0.244)***
Prior Enrollment Trend	0.122 (0.020)***	0.090 (0.030)**	0.153 (0.054)**	0.192 (0.056)***
School	Yes	Yes	Yes	Yes
Neighborhood	Yes	Yes	Yes	Yes
Years	Yes	Yes	Yes	Yes
Observations	20,557	20,557	20,557	20,557
Schools	1,386	1,386	1,386	1,386
Years	2001 - 2022	2001 - 2022	2001 - 2022	2001 - 2022
R-Squared	0.895	0.891	0.921	0.921
F-Statistic	122.274	116.613	166.011	165.95

*** p<0.001, ** p<0.01, * p<0.05, .p<.1

Note. Results from estimating a year and school fixed effects model, including the year which has been transformed. School variables include the cumulative percentage change in school-wide enrollment, the school student population, the percentage of EL students and FRPM. Neighborhood characteristics include census percentage of Hispanic and white residents, as well as the Zillow assessment value in dollars that has been rescaled.

Given the sheer number of programs, and the reality that program language could have heterogeneous differences on enrollment, I examine the relationship between program founding and kinder enrollment for programs that offer Spanish (the majority of programs in the county), Mandarin (the second largest number of programs) and a combination of all other languages offered (including Arabic, French, German, Hebrew, Japanese, and Korean). Results are shown in Table 19. Spanish language programs experience an average marginal increase of six kindergarten students (b = 5.595, SE = 0.651, $p < 0.001$), while Mandarin language programs experience an average increase in about 14 kinder students (b = 14.23, SE = 1.65, $p < 0.001$). All other languages experience an average increase of about ten students (b = 10.26, SE = 2.14, $p < 0.001$).

Table 19 - *Fixed Effects Results by Program Language*

	Kindergarten Enrollment		
Variable	Spanish Coefficient (se)	Mandarin Coefficient (se)	All Other Coefficient (se)
TWDL Program	5.595 (0.651)***	14.234 (1.647)***	10.260 (2.144)***
Prior Enrollment Trend	0.619 (0.117)***	0.586 (0.120)***	0.577 (0.117)***
School	Yes	Yes	Yes
Neighborhood	Yes	Yes	Yes
Years	Yes	Yes	Yes
Observations	19,834	16,565	16,588
Schools	1,336	1,140	1,148
Years	2001 - 2022	2001 - 2022	2001 - 2022
R-Squared	0.878	0.866	0.867
F-Statistic	102.203	90.728	91.371

*** p<0.001, ** p<0.01, * p<0.05, .p<.1

Note. Results from estimating a year and school fixed effects model. School variables include the cumulative percentage change in school-wide enrollment, the number of classrooms as a proxy for school size, and the percentage of EL students and FRPM. Neighborhood characteristics include census percentage of Hispanic and white residents, as well as the Zillow assessment value in dollars, that has been rescaled. All other languages include Arabic, Armenian, French, German, Hebrew, Korean and Japanese. The category also includes programs with multiple languages. See Appendix I10 for full table.

Study 1 showed that differences exist between LAUSD, the largest district in the county, and all other districts. For one, LAUSD is the densest district, and with a particular history of desegregation, school choice, and recently, TWDL program growth. Indeed, about half of all TWDL programs in the county have opened in LAUSD. Thus, I examine differences in Kinder enrollment between LAUSD and all other districts in Table 20 (with the corresponding full regression table in Table I11). I find that kinder enrollment in LAUSD schools with program founding is positive and associated with an average increase of about three kindergarten students (b = 2.98, SE = 0.832, $p < 0.001$), while that number is about 11 students in all other districts in the county (b = 10.825, SE = 0.892, $p < 0.001$).

Table 20 - *Fixed Effects Results by District*

	Kindergarten Enrollment	
	LAUSD	All Other Districts in Los Angeles County
Variable	Coefficient (se)	Coefficient (se)
TWDL Program	2.981 (0.832)***	10.825 (0.892)***
Prior Enrollment Trend	0.998 (0.144)***	0.493 (0.129)***
School	Yes	Yes
Neighborhood	Yes	Yes
Years	Yes	Yes
Observations	8,530	12,027
Schools	601	785
Years	2001 - 2022	2001 - 2022
R-Squared	0.891	0.864
F-Statistic	107.633	92.755

*** p<0.001, ** p<0.01, * p<0.05, .p<.1

Note. Results from estimating a year and school fixed effects model. School variables include the cumulative percentage change in school-wide enrollment, the number of classrooms as a proxy for school size, and the percentage of EL students and FRPM. Neighborhood characteristics include census percentage of Hispanic and white residents, as well as the Zillow assessment value in dollars, that has been rescaled. See Table I11 for full results.

Interviews conducted with participants suggest that older programs (programs founded prior to 2017) were different in nature and may not have responded to the same pressures as later programs, particularly because they were founded during restrictive policies geared toward English-Learner classified students. For example, three participants described opening their program in the early 2000s in response to the passage of Proposition 227 to safeguard bilingual instruction for English Learners. By the mid-2000s, the increase in school choice options exerted considerable pressure on schools as they saw their enrollment dwindle, particularly in Los Angeles Unified. Furthermore, the passage of Proposition 58 in 2016 (and implemented by schools in 2017) made funds available for schools and districts to start their own TWDL program, as well as dropped restrictions on English Learner students to learn in two languages. The growth of programs after 2017 was notable, with nearly half of all programs were founded after this time. I thus examine two groups of programs, those founded prior to 2017 and those founded in 2017 or later. In Table 21, I find that kindergarten enrollment associated with program founding increases by about six students for older programs ($b = 6.44$, $SE = 0.919$, $p < 0.001$), and by about seven students for newer programs ($b = 6.94$, $SE = 0.75$, $p < 0.001$). Both sets of coefficients are significant at conventional levels.

Table 21 - *Fixed Effects Results by Year of Founding*

	Kindergarten Enrollment	
	Pre-2017	Post-2017
Variable	Coefficient (se)	Coefficient (se)
TWDL Program	6.438 (0.919)***	6.944 (0.746)***
Prior Enrollment Trend	0.590 (0.119)***	0.618 (0.118)***
School	Yes	Yes
Neighborhood	Yes	Yes
Years	Yes	Yes
Observations	18,055	18,807
Schools	1,238	1,272
Years	2001 - 2022	2001 - 2022
R-Squared	0.874	0.873
F-Statistic	97.054	97.593

*** p<0.001, ** p<0.01, * p<0.05, .p<.1

Note. Results from estimating a year and school fixed effects model. School variables include the cumulative percentage change in school-wide enrollment, the number of classrooms as a proxy for school size, and the percentage of EL students and FRPM. Neighborhood characteristics include census percentage of Hispanic and white residents, as well as the Zillow assessment value in dollars, that has been rescaled. See Table I12 for full results.

Finally, I examine the relationship between program founding and enrollment for schools located in neighborhoods with high economic change (greater than the county median) versus all other neighborhoods. While the entire region experienced a dramatic increase in home prices, some neighborhoods experienced stark jumps in the assessed value of homes owing to mechanisms of gentrification. I explore this in relation to TWDL program founding in Table 22. I find that the marginal change in Kinder enrollment for schools located in neighborhoods having experienced greater than average change in their home values is of an increase in about seven students (b = 6.74 , SE = 0.875, p < 0.001), which is roughly the same as for schools located in all other types of neighborhoods (b = 7.30, SE = 0.909, p < 0.001).

Table 22 - *Fixed Effects Results by Neighborhood Economic Change*

	Kindergarten Enrollment	
	Below County Median	Above County Median
Variable	Coefficient (se)	Coefficient (se)
TWDL Program	6.742 (0.875)***	7.303 (0.909)***
Prior Enrollment Trend	0.831 (0.153)***	0.526 (0.142)***
School	Yes	Yes
Neighborhood	Yes	Yes
Years	Yes	Yes
Observations	9,726	10,423
Schools	751	774
Years	2001 - 2022	2001 - 2022
R-Squared	0.885	0.871
F-Statistic	89.105	81.383

*** p<0.001, ** p<0.01, * p<0.05, .p<.1

Note. Results from estimating a year and school fixed effects model. School variables include the cumulative percentage change in school-wide enrollment, the number of classrooms as a proxy for school size, and the percentage of EL students and FRPM. Neighborhood characteristics include census percentage of Hispanic and white residents, as well as the Zillow assessment value in dollars, that has been rescaled. County Median percentage increase is 29.3% increase between 2000 and 2010 and 28.9% increase between 2010 and 2021. See Table I13 for full results.

Discussion

This study examined the relationship between two-way dual language (TWDL) program founding and subsequent enrollment and competition in Los Angeles County elementary schools from 2002 to 2021. Findings suggest that establishing a TWDL program is associated with a significant average increase of kindergarten students (consistent for first grade enrollment) per year, with heterogeneous effects by race, ethnicity, and program language. Asian American and white kindergarten enrollment increased more than Black and Hispanic enrollment, while Mandarin and less common language programs experienced larger increases as compared to Spanish programs. Newer TWDL programs saw greater enrollment boosts than older ones, possibly because these were fewer in number. For example, in 2017, when Proposition 58 passed lifting restrictions on English Learner classified students, some 20 programs were founded. A further 19 others opened the following year. The relationship between TWDL program founding and enrollment share is positive but not always significant, indicating that these programs may not substantially increase a school's market share relative to nearby schools, especially in the more localized school market that is in 1-mile radius.

The language of the TWDL program appears to influence enrollment, with Mandarin and other less common language programs (e.g., Japanese, Korean, Armenian, Arabic, and French) associated with larger increases compared to Spanish language programs. This suggests that the novelty or perceived value of certain language programs may play a role in attracting families. In addition, because these programs are fewer in number and thus further apart, they may benefit from being "the only game in town" as Janet, a Mandarin language principal described (see Study 2). By contrast,

Spanish language programs, representing some 80% of all languages of TWDL programs, may experience greater competition with one another.

As a policy to boost enrollment, these findings suggest that dual language programs have been successful in doing this, though not equally for all groups and all grade levels. For example, while Hispanic enrollment at the kinder level is positively associated with program founding, it is negative at the first grade level, suggesting that the benefit in attracting students may not persist through later grades. Enrollment decline has been largely driven by declining Hispanic student enrollment, and so it may be that programs are staving off enrollment decline but not completely succeeding in reversing the negative enrollment trend. Multiple factors not possible to explore at this granularity of analysis remain to be understood. For example, focusing on increasing enrollment may obfuscate important aspects of program development needed to ensure success to language minority children, including hiring well-qualified staff, ensuring two languages are being developed rigorously, and meeting the wide array of linguistic and socio-emotional needs of student enrolled. The findings from Study 2 suggest that principals and to a lesser extent, district leadership have a role to play in setting the tone, establishing rigor within the program, and in recruiting teachers, parents and students. It may be that even within a context of wanting to boost enrollments, programs might still frame their purpose differently, leading to various levels of inclusivity. Study 2, for example, found that some principals framed parents of students differently depending on their language and education backgrounds.

In conclusion, this study provides evidence that TWDL program founding is associated with increased kindergarten enrollment in Los Angeles County elementary schools, with varying effects depending on the program's language and the school's neighborhood characteristics. These findings

contribute to the growing literature on the role of dual language programs in shaping school enrollment and competition, while also highlighting the need for further research and careful consideration of the equity implications of these programs.

Appendix I

Table I1 - *Enrollment Difference, by Pre- and Post Founding and District*

	LAUSD		All Other Districts in Los Angeles County	
Years pre/post founding	M	SD	M	SD
-5	-0.25	21.51	-1.51	15.17
-4	-2.54	17.25	0.94	16.09
-3	1.79	18.04	-3.56	13.11
-2	1.64	17.95	0.33	18.02
-1	-7.14	15.88	1.06	15.82
1	0.97	16.10	11.83	21.93
2	-5.72	16.43	3.23	42.61
3	-5.26	16.41	-3.51	38.57
4	-3.73	15.90	0.35	17.53
5	-2.32	15.99	-3.38	15.98

Note. The year pre-founding is represented as -1 and the year immediate of founding as 1. There is no year = 0. The kindergarten enrollment difference is calculated as the arithmetic difference from one year to the next. Sample includes only TWDL elementary schools whose program was founded after 2002 and which has kindergarten enrollment.

Table I2 - *Enrollment Difference by Race/Ethnicity, Pre and Post Founding TWDL*

	LAUSD							
	Asian American		Black/African American		Hispanic/Latinx		White	
Years pre/post founding	M	SD	M	SD	M	SD	M	SD
-5	0.24	2.38	0.94	4.53	-1.82	20.81	0.34	2.65
-4	-0.67	2.42	-1.14	4.23	-2.07	17.17	0.93	3.72
-3	0.43	3.13	0.07	3.13	0.90	16.67	0.36	4.21
-2	0.10	2.87	0.26	3.73	1.50	16.55	-0.05	5.27
-1	-0.55	5.29	-0.40	4.41	-6.13	15.53	-0.61	3.78
1	0.78	4.47	-0.04	4.93	-0.44	14.06	0.81	3.80
2	-0.59	4.01	-0.24	3.69	-5.32	15.82	-0.08	4.39
3	0.33	3.60	-1.10	4.52	-4.36	14.39	0.05	5.02
4	-0.29	2.93	-0.75	4.77	-3.05	12.99	-0.22	4.43
5	0.00	3.98	-0.27	3.83	-1.38	15.38	-0.31	4.95

Note. The year pre-founding is represented as -1 and the year immediate of founding as 1. There is no year = 0. The kindergarten enrollment difference is calculated as the arithmetic difference from one year to the next. Sample includes only TWDL elementary schools whose program was founded after 2002 and which has kindergarten enrollment.

Table 13 - *Enrollment Difference by Race/Ethnicity, Pre and Post Founding TWDL*

	All Other Districts in Los Angeles County							
	Asian American		Black/African American		Hispanic/Latinx		White	
Years pre/post founding	M	SD	M	SD	M	SD	M	SD
-5	0.22	4.59	-0.49	3.24	-0.49	11.43	-0.79	3.99
-4	-0.73	3.88	0.42	3.83	1.02	12.86	0.19	5.71
-3	-0.68	4.06	-0.69	2.93	-2.13	9.83	-0.71	5.17
-2	0.52	3.67	0.31	3.00	-0.71	14.09	0.48	5.88
-1	0.41	4.57	-0.05	3.74	0.76	12.48	-0.01	5.04
1	3.03	8.33	0.07	3.64	5.92	15.14	1.32	5.34
2	1.04	8.46	-0.41	4.00	-0.36	18.76	2.27	10.63
3	0.29	7.79	-0.07	3.47	-2.05	16.04	-1.26	10.33
4	-0.62	6.44	0.20	3.50	0.09	12.75	-0.47	6.22
5	0.30	3.90	-0.84	4.02	-2.70	11.83	-0.07	6.91

Note. The year pre-founding is represented as -1 and the year immediate of founding as 1. There is no year = 0. The kindergarten enrollment difference is calculated as the arithmetic difference from one year to the next. Sample includes only TWDL elementary schools whose program was founded after 2002 and which has kindergarten enrollment.

Table I4 - *Enrollment Share by Radius, District, and Pre and Post Founding TWDL*

	LAUSD						All Other Districts in Los Angeles County					
	1-mile		2-mile		5-mile		1-mile		2-mile		5-mile	
Years pre/post founding	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
-5	24.25	18.03	7.61	10.19	3.29	4.04	42.66	27.49	17.18	12.25	10.17	7.91
-4	23.71	17.91	7.37	9.96	3.38	4.35	42.05	27.17	17.02	12.14	9.96	7.64
-3	23.35	17.68	7.24	9.70	2.61	2.27	41.35	27.52	16.63	12.62	9.39	7.47
-2	23.53	18.42	7.32	9.93	2.63	3.58	42.76	28.33	17.89	15.69	9.78	7.98
-1	23.07	19.43	7.11	9.94	3.03	4.35	43.33	27.90	18.00	15.55	9.63	7.63
1	23.55	19.75	7.49	10.17	3.40	4.66	42.79	26.24	18.80	14.98	10.34	7.89
2	23.07	19.55	7.39	10.15	3.60	4.90	44.40	26.63	19.44	15.35	11.19	8.15
3	23.09	19.27	7.60	10.61	3.72	4.98	44.74	26.85	19.71	15.38	11.21	7.91
4	24.72	20.39	8.38	12.06	4.25	5.64	45.60	25.69	20.05	15.55	11.07	7.94
5	22.83	18.54	7.45	8.96	4.67	7.27	45.80	25.78	20.24	15.93	11.09	7.66

Note. The year pre-founding is represented as -1 and the year immediate of founding as 1. There is no year = 0. The enrollment share is calculated at the 1-, 2- and 5- mile radius for all schools that share a kindergarten grade. Sample includes only TWDL elementary schools whose program was founded after 2002 and which has kindergarten enrollment.

Table 15 - *Enrollment Difference by Neighborhood Economic Change and District, Pre and Post Founding TWDL*

	LAUSD				All Other Districts in Los Angeles County			
	Greater than County Median		Lower than County Median		Greater than County Median		Lower than County Median	
Years pre/post founding	M	SD	M	SD	M	SD	M	SD
-5	-1.33	26.50	0.07	14.68	-1.66	14.35	-1.40	16.10
-4	-1.31	16.42	-3.68	18.32	-1.42	12.95	2.89	18.16
-3	-0.02	18.87	3.58	16.51	0.08	11.51	-6.30	13.83
-2	-1.30	17.74	5.00	17.74	-0.22	17.68	0.91	18.62
-1	-8.17	15.86	-6.82	16.12	4.25	14.96	-1.22	15.84
1	3.46	15.42	-2.17	16.20	9.38	18.55	13.69	24.36
2	-6.28	16.46	-6.16	16.82	-0.80	15.99	7.33	58.29
3	-2.83	17.21	-7.50	15.59	2.46	18.91	-7.78	49.79
4	-2.26	16.36	-7.77	15.17	1.48	15.35	-0.34	19.51
5	-3.25	16.07	0.80	16.44	-3.45	15.92	-1.97	15.31

Note. The year pre-founding is represented as -1 and the year immediate of founding as 1. There is no year = 0. The kindergarten enrollment difference is calculated as the arithmetic difference from one year to the next. Sample includes only TWDL elementary schools whose program was founded after 2002 and which has kindergarten enrollment. Greater than county median refers to schools located in neighborhoods whose median percentage change in assessed home values increased more than the county median (of 29.3% in 2010 and 28.9% in 2021).

Table I6 - *Model Comparison for Kindergarten Outcome*

	Kindergarten Enrollment								
	OLS			Year Fixed Effects			Mixed Effect		
	Estimate	se	p value	Estimate	se	p value	Estimate	se	p value
Intercept	-19.20	1.34	0.00				-14.61	2.58	0.00
Year post founding	11.92	0.53	0.00	9.69	1.14	0.00	6.95	0.59	0.00
Pre Founding Enrollment Trend	0.14	0.04	0.00	0.15	0.00	0.00	0.30	0.05	0.00
District FE	N			N			Y		
Year FE	N			Y			Y		
School Controls	Y			Y			Y		
Neighborhood Controls	Y			Y			Y		
N	20,557			20,557			20,557		

Note. Results from estimating OLS, Year fixed effects, mixed effects model. School variables include the cumulative percentage change in school-wide enrollment, the school student population, the percentage of EL students and FRPM. Neighborhood characteristics include census percentage of Hispanic and white residents, as well as the Zillow assessment value in dollars that has been rescaled. Year post founding is a binary variable equal to 1 the year a school adopts a program, and 0 otherwise.

Table I7 - Full Results

	Kinder Enrollment		Enrollment Share (1-mi)	
	Model 1	Model 2	Model 1	Model 2
Variable	Coefficient (se)	Coefficient (se)	Coefficient (se)	Coefficient (se)
TWDL Program	6.960 (0.577)***	6.752 (0.594)***	1.445 (0.213)***	1.393 (0.223)***
Prior Enrollment Trend	0.186 (0.038)***	0.631 (0.117)***	0.080 (0.019)***	0.241 (0.049)***
Classrooms	4.340 (0.060)***	4.362 (0.071)***	0.714 (0.018)***	0.711 (0.023)***
% English Learner	0.104 (0.021)***	0.084 (0.024)***	0.005 (0.007)	0.014 (0.009).
% Free and Reduced Meals	0.004 (0.015)	0.007 (0.017)	-0.000 (0.006)	-0.003 (0.007)
% Hispanic residents		0.137 (0.047)**		0.080 (0.019)***
% White residents		0.018 (0.042)		0.028 (0.018)
Ztrax (rescaled)		0.375 (0.234)		-0.430 (0.238).
Years	Yes	Yes	Yes	Yes
Observations	22,040	20,557	21,742	20,294
Schools	1,386	1,386	1,386	1,386
Years	2001 - 2022	2001 - 2022	2001 - 2022	2001 - 2022
R-Squared	0.8778	0.8776	0.9619	0.9618
F-Statistic	106.2	102.3	370.7	356.1

*** p<0.001, ** p<0.01, * p<0.05, .p<.1

Note. Results from estimating a year and school fixed effects model, including the year which has been transformed.

Table I8 – *Results for First Grade Enrollment, and Enrollment Share at the 2- and 5- Mile Radius*

	Grade 1 Enr.	Mi-2 Enr. Share	Mi-5 Enr. Share
Variable	Coefficient (se)	Coefficient (se)	Coefficient (se)
TWDL Program	3.806 (0.494)***	1.501 (0.113)***	0.935 (0.096)***
Prior Enrollment Trend	0.002 (0.051)	0.141 (0.030)***	0.074 (0.020)***
Classrooms	4.989 (0.045)***	0.349 (0.012)***	0.262 (0.011)***
% English Learner	0.179 (0.017)***	-0.004 (0.004)	0.001 (0.004)
% Free and Reduced Meals	-0.035 (0.013)**	-0.005 (0.004)	0.008 (0.005)
% Hispanic residents	-0.085 (0.039)*	0.044 (0.010)***	0.048 (0.013)***
% White residents	-0.176 (0.033)***	0.015 (0.009).	0.040 (0.009)***
Ztrax (rescaled)	0.954 (0.171)***	0.092 (0.145)	0.193 (0.169)
Years	Yes	Yes	Yes
Observations	20,557	20,294	14,255
Schools	1,386	1,386	1,386
Years	2001 - 2022	2001 - 2022	2001 - 2022
R-Squared	0.919	0.973	0.976
F-Statistic	161.849	502.054	496.121

*** p<0.001, ** p<0.01, * p<0.05, .p<.1

Note. Results from estimating a year and school fixed effects model.

Table I9 - *Fixed Effects Regression Results by Race and Ethnicity, First Grade Enrollment*

	Asian American	**Black/African American**	**Hispanic/Latinx**	**White**
	Model 1	Model 2	Model 3	Model 4
Variable	Coefficient (se)	Coefficient (se)	Coefficient (se)	Coefficient (se)
TWDL Program	2.137 (0.235)***	0.624 (0.167)***	-1.773 (0.546)**	2.276 (0.229)***
Prior Enrollment Trend	0.099 (0.020)***	0.041 (0.028)	-0.364 (0.141)**	0.164 (0.054)**
School	Yes	Yes	Yes	Yes
Neighborhood	Yes	Yes	Yes	Yes
Years	Yes	Yes	Yes	Yes
Observations	20,557	20,557	20,557	20,557
Schools	1,386	1,386	1,386	1,386
Years	2001 - 2022	2001 - 2022	2001 - 2022	2001 - 2022
R-Squared	0.916	0.883	0.938	0.923
F-Statistic	155.73	107.752	216.712	172.07

*** p<0.001, ** p<0.01, * p<0.05, .p<.1

Note. Results from estimating a year and school fixed effects model, including the year which has been transformed. School variables include the cumulative percentage change in school-wide enrollment, the school student population, the percentage of EL students and FRPM. Neighborhood characteristics include census percentage of Hispanic and white residents, as well as the Zillow assessment value in dollars that has been rescaled.

Table I10 - *Fixed Effects Regression Results by Language of Program*

	Kindergarten Enrollment		
	Spanish	Mandarin	All Other
Variable	Coefficient (se)	Coefficient (se)	Coefficient (se)
TWDL Program	5.595 (0.651)***	14.234 (1.647)***	10.260 (2.144)***
Prior Enrollment Trend	0.619 (0.117)***	0.586 (0.120)***	0.577 (0.117)***
Classrooms	4.342 (0.074)***	4.231 (0.094)***	4.255 (0.091)***
% English Learner	0.083 (0.025)***	0.095 (0.028)***	0.093 (0.028)***
% Free and Reduced Meals	0.006 (0.018)	0.021 (0.019)	0.027 (0.019)
% Hispanic residents	0.116 (0.048)*	0.025 (0.050)	0.040 (0.050)
% White residents	0.009 (0.044)	-0.060 (0.047)	-0.031 (0.047)
Ztrax (rescaled)	0.252 (0.230)	0.079 (0.239)	0.129 (0.244)
Years	Yes	Yes	Yes
Observations	19,834	16,565	16,588
Schools	1,336	1,140	1,148
Years	2001 - 2022	2001 - 2022	2001 - 2022
R-Squared	0.878	0.866	0.867
F-Statistic	102.203	90.728	91.371

*** p<0.001, ** p<0.01, * p<0.05, .p<.1

Note. Results from estimating a year and school fixed effects model. School variables include the cumulative percentage change in school-wide enrollment, the number of classrooms as a proxy for school size, and the percentage of EL students and FRPM. Neighborhood characteristics include census percentage of Hispanic and white residents, as well as the Zillow assessment value in dollars, that has been rescaled.

Table I11 - *Fixed Effects Results by District*

	Kindergarten Enrollment	
	LAUSD	All Other Districts in Los Angeles County
Variable	Coefficient (se)	Coefficient (se)
TWDL Program	2.981 (0.832)***	10.825 (0.892)***
Prior Enrollment Trend	0.998 (0.144)***	0.493 (0.129)***
Classrooms	4.562 (0.112)***	4.326 (0.068)***
% English Learner	-0.004 (0.041)	0.268 (0.028)***
% Free and Reduced Meals	-0.018 (0.032)	0.023 (0.020)
% Hispanic residents	0.178 (0.094).	0.097 (0.048)*
% White residents	-0.009 (0.075)	-0.137 (0.051)**
Ztrax (rescaled)	-0.178 (0.358)	-0.052 (0.325)
Years	Yes	Yes
Observations	8,530	12,027
Schools	601	785
Years	2001 - 2022	2001 - 2022
R-Squared	0.891	0.864
F-Statistic	107.633	92.755

*** p<0.001, ** p<0.01, * p<0.05,
.p<.1

Note. Results from estimating a year and school fixed effects model. School variables include the cumulative percentage change in school-wide enrollment, the number of classrooms as a proxy for school size, and the percentage of EL students and FRPM. Neighborhood characteristics include census percentage of Hispanic and white residents, as well as the Zillow assessment value in dollars, that has been rescaled.

Table I12 - *Fixed Effects Results by Year of Founding*

	Kindergarten Enrollment	
Variable	Pre-2017 Coefficient (se)	Post-2017 Coefficient (se)
TWDL Program	6.438 (0.919)***	6.944 (0.746)***
Prior Enrollment Trend	0.590 (0.119)***	0.618 (0.118)***
Classrooms	4.289 (0.081)***	4.335 (0.080)***
% English Learner	0.077 (0.026)**	0.098 (0.025)***
% Free and Reduced Meals	0.020 (0.018)	0.005 (0.018)
% Hispanic residents	0.033 (0.048)	0.132 (0.049)**
% White residents	-0.030 (0.045)	-0.001 (0.045)
Ztrax (rescaled)	0.334 (0.239)	0.107 (0.234)
Years	Yes	Yes
Observations	18,055	18,807
Schools	1,238	1,272
Years	2001 - 2022	2001 - 2022
R-Squared	0.874	0.873
F-Statistic	97.054	97.593

*** p<0.001, ** p<0.01, * p<0.05, .p<.1

Note. Results from estimating a year and school fixed effects model. School variables include the cumulative percentage change in school-wide enrollment, the number of classrooms as a proxy for school size, and the percentage of EL students and FRPM.

Neighborhood characteristics include census percentage of Hispanic and white residents, as well as the Zillow assessment value in dollars, that has been rescaled.

Table I13 - *Fixed Effects Results by Neighborhood Change*

	Kindergarten Enrollment	
	Below County Median	Above County Median
Variable	Coefficient (se)	Coefficient (se)
TWDL Program	6.742 (0.875)***	7.303 (0.909)***
Prior Enrollment Trend	0.831 (0.153)***	0.526 (0.142)***
Classrooms	4.475 (0.109)***	4.170 (0.096)***
% English Learner	0.073 (0.039).	0.112 (0.032)***
% Free and Reduced Meals	0.004 (0.027)	-0.008 (0.024)
% Hispanic residents	0.328 (0.082)***	0.052 (0.065)
% White residents	0.123 (0.078)	0.034 (0.054)
Ztrax (rescaled)	1.311 (0.972)	-0.047 (0.295)
Years	Yes	Yes
Observations	9,726	10,423
Schools	751	774
Years	2001 - 2022	2001 - 2022
R-Squared	0.885	0.871
F-Statistic	89.105	81.383

*** p<0.001, ** p<0.01, * p<0.05, .p<.1

Note. Results from estimating a year and school fixed effects model. School variables include the cumulative percentage change in school-wide enrollment, the number of classrooms as a proxy for school size, and the percentage of EL students and FRPM. Neighborhood characteristics include census percentage of Hispanic and white residents, as well as the Zillow assessment value in dollars, that has been rescaled. County Median percentage increase is 29.3% increase between 2000 and 2010 and 28.9% increase between 2010 and 2021.

Conclusion

This dissertation examined the founding and implementation of two-way dual language (TWDL) programs in Greater Los Angeles between 2000-2022, a period of significant TWDL program growth alongside increased school choice options. Through quantitative analysis of school- and neighborhood-level data, interviews with school and district leaders, and longitudinal analysis of enrollment trends, this research explored the factors motivating TWDL program adoption, how programs are framed and implemented, and their association with school enrollment and competition. This constitutes an important contribution to the field of bilingual education and school choice to understand how the increase of school choice has been related to access to TWDL programs for language minority students.

The study found that enrollment decline and competition from nearby schools were key factors driving TWDL program founding, particularly in Los Angeles Unified School District. School leaders viewed TWDL programs as a strategy to boost declining enrollment and compete for students in an environment of expanded school choice. These patterns mirror findings from other contexts around the country (C. Cervantes-Soon et al., 2020; Chaparro, 2021; Duarte, 2022; Kim, 2022; Menken et al., 2023). In LAUSD, schools responded to declining enrollment and nearby TWDL and charter growth, and each percentage change of those variables was associated with an increased likelihood of program founding. In other districts around the county – which are smaller and less urban - enrollment decline was also associated with an increased likelihood of program founding. Competition manifested in other ways, as the growth of nearby charters and TWDL was not associated with increased likelihood. Rather, it seems that districts adopted a 'niche program' policy approach, establishing

TWDL as unique programs in the area. The increase in the number of nearby TWDL was associated with a decreased likelihood of program founding, including at the 5-mile radius. It may also be that these smaller districts, which make up most other districts in Los Angeles County have fewer schools and smaller numbers of bilingually trained staff (as is required by state law). They may simply not have the resources to open multiple programs.

Study 2 explored how motivations for program founding and leadership conceptualizations impacted how programs were defined and who ultimately enrolled, using the conceptual frameworks of market-based competition, social constructions of target populations and social justice leadership. Most of the 30 respondents cited enrollment and competition as motivating factors, yet how they defined their program differed based on community demographics, school and district considerations as well as their own personal experiences and beliefs. As a result, some defined their program in ways that framed language minority students as key participants of TWDL, including heritage and bilingual students not classified as English Learners, a group that has traditionally not been well defined within the context of TWDL. They defined their programs as made up of 'thirds', referring to the linguistic categories of English-learner classified, bilingual, and monolingual/heritage language learners. Others, however – representing a small minority of participants interviewed – defined their target population in exclusionary terms with material impacts to enrollment. For example, they founded programs whose language did not match that of the community, recounted placing programs further away from language minority communities, or explicitly targeted monolingual English or high SES parents to enroll in TWDL. This resulted in considerable differences between program and host school enrollment, representing a troubling outcome of school choice within the context of TWDL – that of

racial and socioeconomic stratification. Others, by contrast, described explicitly developing policies to counter exclusionary practices. These practices leveraged school choice but did so in a way that promoted inclusion of minoritized student groups. For example, participants described reserving spots in the program for language minority students, removing the zone priority (a common characteristic of TWDL) for enrollment, shifting from a first-come, first-served enrollment process to a randomized lottery, and expanding the enrollment period to allow for newcomer students to enroll mid-year. These practices provide evidence that social justice minded leadership can meaningfully alter the course of exclusionary practices. These findings reinforce the notion that school and district leadership are key local policy makers, holding considerable sway in program framing and development. An important finding in this is that the external demands faced by neighborhood schools – enrollment decline and increased competition from nearby schools – did not preclude leadership from viewing TWDL as a way to achieve two goals of boosting enrollment or staving off enrollment decline and of providing language services to EL classified and heritage language students.

The findings from Studies 1 and 2 establish a connection between enrollment decline and competition as drivers of school TWDL founding, especially beginning in 2010 as charter expansion and enrollment decline increased external pressures on schools. In some respects, this validates the school choice ideals that increased competition (resulting in real or the threat of enrollment loss) leads to organizational changes. Indeed, TWDL programs have been shown to improve academic and socio-emotional outcomes for students, especially if they stay enrolled. TWDL program founding was associated with significant, albeit small, increases in kindergarten enrollment, averaging around seven extra students per year. Effects varied by student demographics, with larger enrollment boosts seen for

Asian American and white students compared to Hispanic and Black students. Mandarin and less common language programs saw greater enrollment gains than Spanish programs, though this is likely due to the fact that Mandarin and less common language programs are fewer in number and may effectively operate as 'the only game in town' (Janet, a Mandarin TWDL program principal). In addition, schools with high shares of Hispanic/Latinx and Black/African Americans experienced more dramatic enrollment decline and greater competition, and so it may be that the enrollment increases resulting from TWDL programs may be more mitigated than with other languages and other student subgroups. The small effect on Black/African American students is notable, and is consistent with prior literature that has found that monolingual English speaking Black students are not always considered as appropriate language models for TWDL (Blanton et al., 2021; Palmer, 2010). Across all TWDL schools in all districts in Los Angeles County, Black/African American student enrollment made up a smaller share than non-TWDL schools. It may be that Black/African American students, who make up a minority of total school enrollment in the county and are often highly segregated within schools or highly dispersed across schools, attend schools with too few partner language speakers to motivate opening a TWDL program, or may themselves be a small minority in schools. However, the fact that this trend is not shared with non-Hispanic white student enrollment increases in TWDL suggests otherwise. Findings from this study provide evidence that TWDL expansion in Los Angeles County resulted in increased enrollment, implying that TWDL as a policy for addressing enrollment decline is successful. In addition, given that enrollment decline has occurred in a variety of schooling contexts, access to these programs for language minority populations (Asian American and Hispanic/Latinx populations who are likelier to have a background in the language) has increased. Nevertheless,

qualitative interviews revealed that leaders of schools and districts may not consider all language minority subgroups the same, including from the same racial/ethnic backgrounds. For example, English-Learner classified students were considered ideal candidates to enroll in TWDL, while heritage language students less so. Finally, the minor increase in the number of Black/African American students after program founding suggests that monolingual English speakers enrolling in TWDL are still largely white.

Given that this study used grade- and school- level enrollments, there was a limitation in not having access to student-level and program level enrollment data for TWDL schools. Examining kindergarten and first grade enrollment post-program founding provides suggestive evidence of enrollment shifts, but does not show which students who were already enrolled in the school are enrolled in the program. Qualitative findings suggest that even within larger racial/ethnic subgroups, students may be stratified along linguistic and class lines, an area of research that merits further exploration. For example, participants spoke of TWDL parents as 'more educated' and 'understanding' the value of bilingual education, suggesting class differences among parents of TWDL and non-TWDL within the same school. Without student-level longitudinal data, it is impossible to gauge student growth on measures of achievement, including test scores, grades, classwork beyond elementary, and socio-emotional outcomes. Future research should attempt to examine these outcomes and compare with non-TWDL students within the same schools. Other aspects of TWDL program decision making, though important, were left unexplored. For example, participants referred to the importance of teacher support and training, and the difficulty at times in maintaining staff relationships across the TWDL and non-TWDL program. As a program of choice, students more

often exit TWDL than they join, especially in later grades. As a result, TWDL programs tend to enroll fewer students, as well as fewer students with disabilities and behavioral issues. This results in classrooms that are typically smaller in size, and student performance and attendance is higher. In addition, participants cited teacher language proficiency as an area of need, citing that bilingual teachers raised and trained in California lacked the confidence and skills to teach the partner language despite being able to speak it fluently. Thus, future research should explore how leadership can work to sustain TWDL programs with teachers in mind. One participant cited that his TWDL program was originally founded 'in name only', with little to no instruction in the partner language until his arrival as principal. Qualitatively examining how programs founded as a policy response could shed light on whether response to choice leads to meaningful changes or not. Finally, participants often spoke about differences in parents enrolled and not enrolled in TWDL. It was thus a limitation of this study that student and parent perspectives were not observed to examine how parents understood and navigated school choice and home language policy (their decision to place their child in TWDL or not).

Nevertheless, this study provides an important contribution to the field of bilingual education policy by examining TWDL program growth over time in a large county in the southwestern United States. In addition, it contributes to the literature on school choice by examining how leaders of public neighborhood schools respond to school choice using TWDL. The findings support prior research findings, mostly ethnographic in nature, that has found that TWDL programs have been established in response to declining enrollment and increased competition but found that this also led programs to be founded in a wide variety of school and neighborhood contexts with increased access to language

and racial/ethnic minoritized student populations, which represents a positive first step. It remains to be seen how successful these programs will be in meeting their purported goals.

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