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Locating the Possibilities for Upward Mobility: Educating English Learners in a Segmented Opportunity Structure

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Dedicated to Michael, Tessa, and Oliver.

ABSTRACT OF DISSERTATION

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Immigrant families often view education as the pathway for upward mobility in the U.S. However, the location of schooling for children impacts the quality of the education they receive and their subsequent opportunities for assimilation and upward mobility. The segmented assimilation model does not explain assimilation fully because it ignores the impact of education for English Learning (EL) children. This dissertation integrates opportunity structure literature into the segmented assimilation framework by focusing on the education available to ELs in the location of settlement to examine possibilities for EL assimilation in a more holistic manner. The first study looks at how ELs have historically navigated repressive linguistic policies in their local schools. The second study provides a regional school district analysis of the opportunity structure in place for ELs in a new immigrant destination. The last study examines how place influences the opportunities available to Hispanic and EL students to access the STEM coursework and requirements necessary for college admission in Arizona within their local school districts. All three studies in the dissertation demonstrate that the location of schooling for

EL students impacts their potential for assimilation and upward mobility. The final chapter of the dissertation discusses the connections among the three studies and considers the implications for educators, policy makers, and future research.

Chapter 1: Introduction

> Rather than equalizing opportunities for those who come from disadvantaged backgrounds…the educational system, through formal means such as tracking, and informal means such as rewarding certain cultural practices, places students on a pathway to replicate the class status of their family. According to this view, immigrants who come to the United States seeking better educational opportunities for their children may be disappointed by the realities of limited social mobility. (Feliciano, 2005, p. 94).

Immigrants and their children, many of whom are English Learners (ELs)[1], drive the majority of U.S. population growth (Cohn, 2015). Immigrant families often view education as the pathway for upward mobility in the U.S. Despite immigrants viewing American schools as one of the most approachable institutions (Bean, Brown, & Bachmeier, 2015), access to quality education for children of color and ELs varies (Massey, 2008; Samson & Lesaux, 2015). The location of schooling for ELs impacts the quality of the education they receive and their subsequent opportunities for assimilation[2] and upward mobility. As Feliciano suggests, immigrant parents that settle in less upwardly mobile locations may be disappointed by the education their children receive. Therefore, this dissertation uses a multiple methods approach to provide an analysis of the relationship between the context of settlement for ELs in American school systems and possibilities for upward mobility.

1.1 Introduction

The ability to speak English proficiently constitutes a critical component of successful assimilation for immigrants and their children in the U.S. Often social scientists use English

[1] The student population designated as "Limited English Proficient" (LEP) by their local school have historically been referred to as "English Language Learners" (ELLs). However the Every Student Succeeds Act (ESSA, 2015) begun to refer to such students as "English Learners" (ELs). In recognition of this shift in language, I use ELs throughout the dissertation, excepting the paper published in 2016.

[2] A glossary of key terms can be found in the Appendix of the dissertation.

ability upon settlement in the U.S. to predict future economic outcomes for immigrants and their children (Akresh, Massey, & Frank, 2014; Portes & Rumbaut, 2014). Immigrants also bring other forms of cultural and social capital (Bourdieu, 1986) that they can exchange in the U.S. Policy decisions that impacts EL access to dominant cultural and social capital in the U.S. also affect their education quality (Burstein, 2003; Schildkraut, 2005). Children of color and EL children face limited upward mobility due to unequal access to quality education by geographic location (Massey, 2008; Samson & Lesaux, 2015; Schultz, 2014). Akresh et al. (2014) argue social scientists must examine EL assimilation in a manner that takes into account the context of EL language experiences and access to cultural and social resources, in addition to their current linguistic abilities.

ELs do not assimilate into a neutral climate. Theories such as segmented assimilation acknowledge the impact pre-migration factors such as ethnicity and English ability have in determining location of settlement for immigrants (Portes & Zhou, 1993). However, segmented assimilation does not account for the education EL children receive in American schools. Social science scholars focus on a combination of factors such as segregation, socioeconomic inequality, family structure, social capital, and school quality as vital components to the local opportunity structure that shapes academic and later life success in America (Chetty, Hendren, Kline, & Saez, 2014; Galster & Sharkey, 2017; Portes & Rumbaut, 2014; Putnam, 2015). Recent research also shows that children experience heightened segregation, particularly when accounting for school district boundaries (Owens, 2017). Therefore, place matters when examining the opportunities available to EL children through their local education systems.

1.2 Theoretical Framework[3]

1.2.1 Segmented Assimilation

Segmented assimilation represents one of the most prevalent theories of immigrant and EL assimilation (Portes and Zhou, 1993). Segmented assimilation argues that immigrants and their children are able to assimilate into the dominant culture based on their color/race, location of settlement, and the mobility structure that surrounds them. Their ability to assimilate socially, however, may be hampered if they are a person of color, live in urban areas, face occupational segmentation, and have poor parental resources. Segmented assimilation represents the first major theory of immigrant assimilation to recognize that the ability to access certain resources and capital promotes upward mobility for ELs. In addition, this theory argues that it is harder for modern children of immigrants to integrate as quickly as previous generations. Portes and Zhou (1993) argue that one of the most important resources for immigrants is the support network found through their co-ethnic community. The lack of proper support networks makes it difficult for ELs to circumvent the scarcity of resources and the increasingly restrictive mobility structure within the U.S. While EL children exhibit linguistic assimilation at the same rate as previous immigrant groups (Portes & Rumbaut, 2014), the second and third articles in this dissertation will show that the local contexts into which immigrants attempt to integrate into can vary, and the geographic location of education becomes highly important.

Portes and Rumbaut (2014) amended the Portes and Zhou (1993) segmented assimilation model to acknowledge the expanding role of capital and created a model of mobility pathways for immigrants and their EL children. As seen in Figure 1.1, human capital, family structure, and modes of incorporation act as initial background factors that establish the pathway for mobility.

[3] A description of this theoretical framework is repeated in the second study of the dissertation.

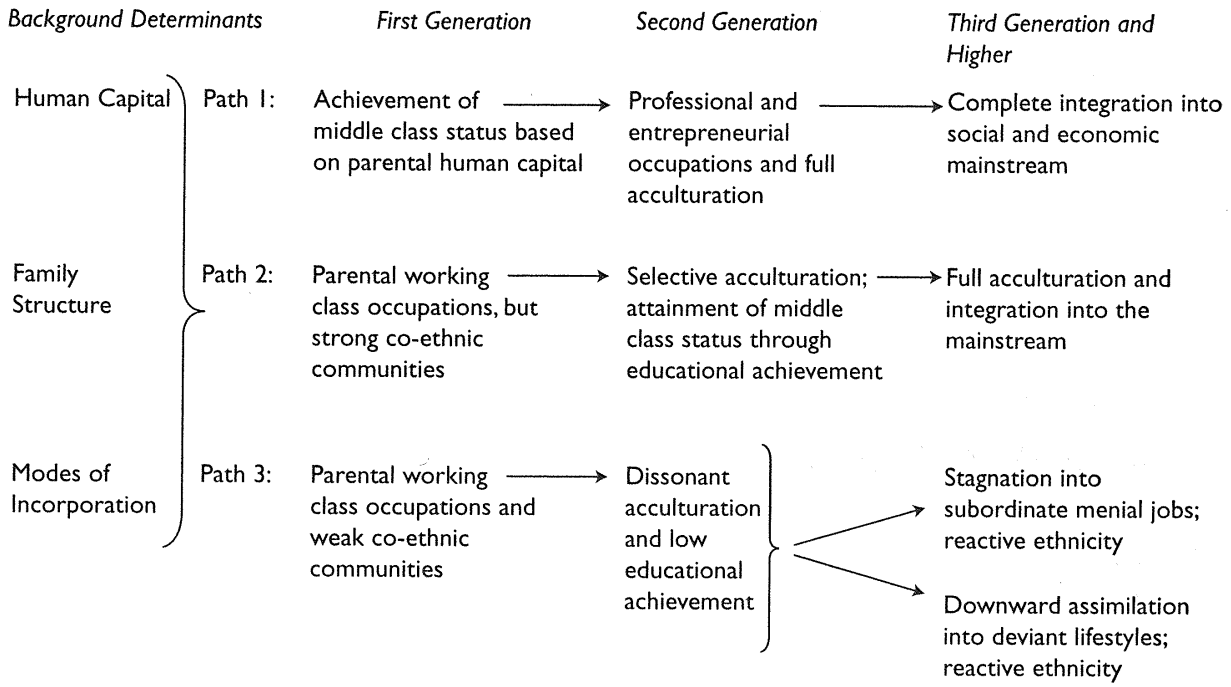

Figure 1.1 Mobility pathways across generations (Portes and Rumbaut, 2014).

Social scientists define both initial socioeconomic status (SES) and job opportunities as the human capital immigrants bring with them. Family structure includes whether or not the family is intact when immigrating. Last, as articulated in context of reception (Portes & Zhou, 1993), government policy (receptive, indifferent, or hostile—including state language policies), societal reception (prejudiced or nonprejudiced), and strength of co-ethnic community determine mode of incorporation. The combination of these factors segments the first generation into a pathway that influences subsequent generations.

According to Portes and Rumbaut (2014), English language ability impacts the initial job an immigrant attains, which also impacts the community in which they settle. As seen in Figure 1.1, immigrants and their EL children typically clump into three groups: workers, entrepreneurs, or professionals. Professionals usually come into the country with the highest levels of linguistic cultural capital while workers come in with the least. Professionals tend to settle in a more

dispersed manner, while workers tend to concentrate linguistically. Therefore, as seen in Figure 1.1, professionals usually settle into Path 1, while workers settle into Path 2 or 3.

Despite its use as a prevalent model, segmented assimilation has its shortcomings. It assumes that immigrants fall into one of three categories, while much research shows that the initial composition of ELs has become increasingly diverse (Glick et al., 2013; Massey, 2013). The Portes & Rumbaut (2014) model maintains that only those who emigrate as a professional and settle in a dispersed manner become fluent bilinguals in the U.S. This may not always be the case. The model also shows that only children of entrepreneurs and professionals who grow up in strong ethnic enclaves likely end up as a fluent bilingual. Recent evidence maintains that EL children of workers are becoming fluent bilinguals as well (Akresh et al., 2014; Massey, 2008). More research is needed on the context surrounding these cases, as fluent bilingualism has been shown to have significant cognitive and economic benefits (Portes & Rumbaut, 2014; Rodríguez, Carrasquillo, & Lee, 2014).

While segmented assimilation acknowledges some aspects of opportunity structure, it fails to account for the school quality in the location of settlement for the second and subsequent generations. The politics driving English education policy for ELs vary across the U.S. In addition, researchers found that White residents living in states with higher concentrations of Latinx residents appear more likely to favor politically conservative and restrictive policies towards immigrants and their EL children (Abrajano & Hajnal, 2015). Such policies and subsequent school practices may prohibit ELs from achieving upward mobility. The current segmented assimilation model does not explain EL assimilation fully, as it ignores the impact of education. The need exists for more nuanced theoretical frameworks that allow for the complex and interconnected study of linguistic ability, capital, and opportunity structure, as well as the

use of new methodological approaches that centralize the role of "place" in understanding the ability of ELs to build linguistic proficiency and to integrate successfully into American society.

1.2.2 Opportunity Structure

While many refer to America as the "land of opportunity," the overall opportunity structure has become unfavorable in recent years (Chetty et al., 2014). EL children may be particularly vulnerable to this, which places them possibly at higher risk of downward or no mobility than native English speakers (Massey, 2008; Portes & Rumbaut, 2014; Putnam, 2007). Scholars have determined that certain geographic locations contain more opportunities for upward mobility. These locations display lower concentrations of black residents, lower amounts of segregation, smaller income inequalities, higher quality schooling, higher levels of social capital, and more stable family structures (Chetty et al., 2014). Table 1.1 summarizes the constructs, measures, and findings of the Chetty et al. (2014) study. Chetty et al. (2014) reveal that opportunity structure represents a place-based problem. Local contexts vary in the amount of each measure of opportunity available for upward mobility. Some areas provide possibilities of upward mobility. Social scientists consider this particularly important for ELs. As EL children attempt to integrate into American society, they do it within a specific opportunity structure, much of which is unfavorable for particular groups (Massey, 2008). Additionally, some scholars have suggested that a Black/non-Black color line has emerged in many areas of immigrant settlement as a result of the immense growth of Asian and Latinx residents (Lee & Bean, 2010). They also found that cities with higher percentages of Black residents had firmer racial boundaries. Study 2 explores the relationship between opportunity structure and EL settlement in St. Louis, where a strong history of a Black/White color line exists. Such explorations help to better understand how ELs

Table 1.1 Findings from Chetty et al. (2014).

Construct	Measure	Significance
Fraction of Black residents	Fraction of Black residents	Less upward mobility in areas where there is a higher fraction of Black residents
Segregation	Level of racial diversity (based on Theil, 1972).	Less upward mobility found in more racially segregated areas
	Income segregation (Reardon, 2011)	Those in areas of concentrated poverty were significantly less likely to have upward mobility, while those in concentrated affluence were unaffected
	Commuting times	Shorter commuting times are significantly correlated with upward mobility
Inequality	Mean family income	No correlation with upward mobility
	Bottom 99% of Gini coefficient of parental income	Income inequality is negatively correlated to upward mobility
	Share of top 1% of income	Weak negative correlation between share of top 1% of income and upward mobility
School quality	Expenditure per student (proxy)	Higher expenditures on students are significantly correlated with upward mobility
	Class size (proxy)	Larger class size is correlated with less upward mobility
	Test scores, grades 3-8 (adjusted for parental income)	Higher test scores are positively correlated with upward mobility
	Dropout rates (adjusted for parental income)	Lower dropout rates are highly correlated with upward mobility
Social capital	Social capital index (composite based on Rupasingha and Goetz, 2008)	More social capital is significantly correlated to upward mobility
	Number of bowling alleys (Putnam, 2005)	More bowling alleys are significantly related to upward mobility
	Religiousity	Strongly positively related to upward mobility
	Rates of violent crime	Higher crime rates negatively related to upward mobility
Family Structure	Fraction of children in single-parent households	Strongly negatively correlated to upward mobility

	Fraction of divorced adults	Negatively correlated to upward mobility
	Fraction of married adults	Positively correlated to upward mobility

integrate in newer immigrant destinations.

Once they arrive in the U.S., many immigrants choose to settle into enclaves. EL children tend to live in areas with higher populations of immigrants and be isolated linguistically (Glick et al., 2013). This linguistic isolation has both positive and negative effects on EL children (Drake, 2014; Galster, Metzger, & Waite, 1999; Glick et al., 2013). For example, ethnic communities segregated by race and income may lead members to lower trajectories for upward mobility, but research suggests that the social networks within enclaves provide a protective factor for EL scholastic achievement (Drake, 2014; Glick et al., 2013; Portes & Rumbaut, 2014). Some evidence shows unequal distribution of access to quality education, particularly for ELs and children of color (Massey, 2008; Samson & Lesaux, 2015; Schultz, 2014). Depending on where ELs settle, access to quality education may be limited, and by extension, access to quality English instruction may be limited as well. Scholars also argue that social capital and family structures represent the most important factors for EL integration (Portes & Rumbaut, 2014; Waters, Tran, Kasinitz, & Mollenkopf, 2010). However, researchers often fail to study these factors in combination with the specific measures of opportunity structure. Figure 1.2 demonstrates how this dissertation examines opportunity structure, with a focus on the impact of education for ELs, with prevailing models of assimilation. By focusing on the education available to ELs in the location of settlement, this dissertation integrates opportunity structure

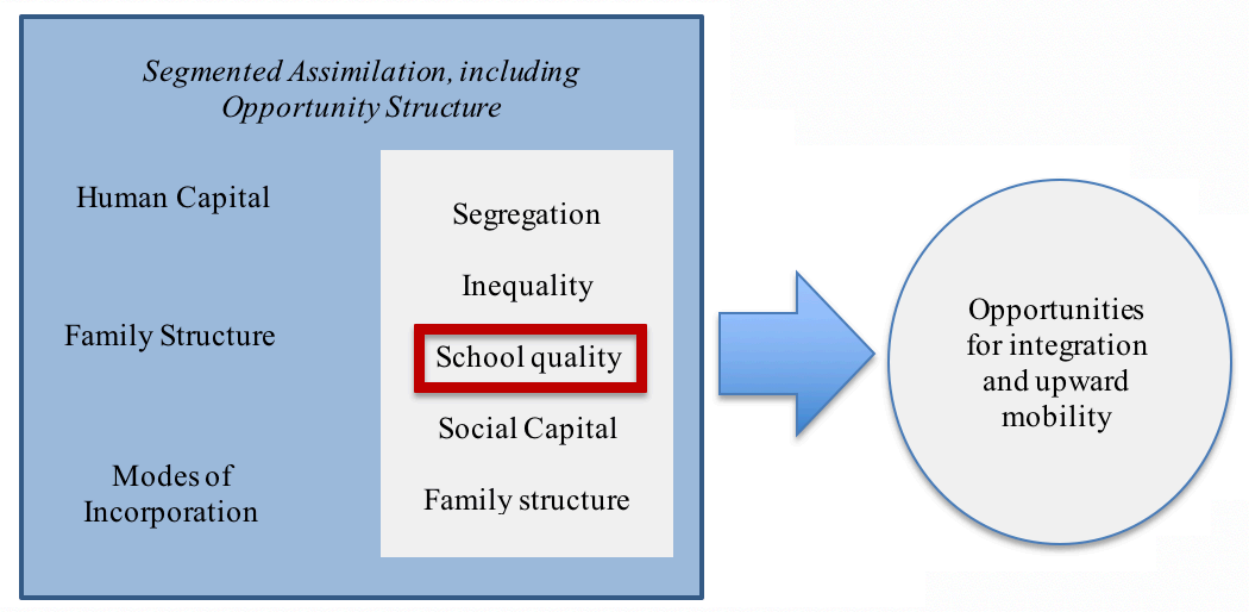

Figure 1.2 Conceptual model of segmented assimilation including opportunity structure. Adapted from Chetty et al. (2014) and Portes and Rumbaut (2014).

literature into the segmented assimilation framework in order to examine possibilities for EL assimilation in a more holistic manner.

1.3 Brief Literature Review

1.3.1 Capital (Bourdieu, 1986) and Structure (Sewell, 1992)

The concept of capital (Bourdieu, 1986) appears in all three studies of the dissertation. While Portes and Rumbaut (2014) discuss capital in their updated segmented assimilation model, they refer to it as human capital, such as SES and job opportunities. Bourdieu's (1986) theory is more specific. According to Bourdieu, capital can take cultural, social, and economic forms. Each variety of capital comes in dominant and non-dominant forms. The majority power values dominant forms, while de-valuing highly non-dominant forms. People acquire cultural capital, such as familiarity with dominant culture, aspirations, and credentials (like high school

diplomas) needed for upward mobility through interactions with surrounding context and internalized through socialization. For example, the ability to speak English proficiently represents a form of dominant linguistic cultural capital in the U.S. ELs fluent in English may obtain increased access to dominant social capital, which often leads to economic gains.

Given the power of capital, all forms of capital can be reproduced or expanded, as evidenced in the power of the English language in America. As the third study will show, establishing English as the official language in Arizona gives power to the English language and reinforces its dominance. This requires ELs in Arizona to possess high levels of English proficiency in order to access dominant cultural capital like STEM coursework and dominant social capital, such as classmates in the mainstream classroom. The segmented assimilation model (Portes & Rumbaut, 2014) suggests that parents of ELs who possess dominant forms of human capital (essentially, economic capital) tend to settle in areas with higher levels of dominant social and cultural capital. This enhances their children's ability to access quality education and their potential for upward mobility.

However, all forms of capital take effort and time to accumulate and occur within a specific structure. Sewell (1992), defines structures as the schemas or rules that guide society. Immigration policy and language policy in schools represent explicit structures. However, some structures prove difficult to discern, as they are not always stated explicitly. Instead, they act more like "generalizable procedures applied to the enactment/reproduction of social life" (Sewell, 1992, p. 8). The racialization of EL students that lead to tracking them into lower level coursework serves as an example of less explicit structure. A particular set of resources reinforces all structures, whether explicit or implicit. These resources can be human, like caring and knowledgeable teachers, and nonhuman, like a Calculus book. Both individual and

combined resources can act as forms of power. The first study in the dissertation shows that structure can be reinforced or navigated around, depending on how agentic an EL can be. The capacity for EL agency is often found through interactions and capital gained within their local schools. Thus, the context of EL education becomes critical to their eventual ability to assimilate.

1.3.2 Context of Reception (Portes & Zhou, 1993)

Access to the dominant resources leading to capacity for agency within ELs occurs most often through their local schools. While all ELs possess some capacity to navigate the American opportunity structure, those with better access to dominant social and cultural resources, and belief in American schema[4], are more equipped to act agentically. However, the context of reception that ELs encounter in schools can impact their access to dominant social and cultural resources. The governmental policies in place, the segment of the labor market to which their parents belong, and the ethnic community present in their location of settlement determine the context of reception for ELs (Portes & Zhou, 1993). Interactions with these elements of society lead to either positive or negative reception for them and their parents and influence how well they assimilate into dominant American society.

Governmental policies establish the initial context of reception through policies that result in receptivity, indifference, or hostility towards immigration and ELs. Receptive policies encourage or assist the settlement of newcomers. For example, laws and diplomatic agreements such as the Bracero Program enticed Mexican farm laborers in the 1940s to fill labor shortages, and the refugee resettlement program reimburses costs associated with social and settlement services (Portes & Rumbaut, 2014). Receptive policies are relatively rare in American history (Schultz, 2016), as federal immigration policies are typically indifferent, or hostile. While immigration

[4] Sewell (1992) defines schemas as the "rules" that a culture believes in. An example of American schema is the belief that hard work and higher education will lead to a successful life.

scholars characterize current federal policy as indifferent (Portes & Zhou, 1993), state and local policies differ in their restrictive nature. English-only initiatives and language instruction restrictions vary by state, but seem directed towards undocumented immigrants (Abrajano & Hanjal, 2015; Wright, 2005). Proposition 203 (Prop 203) in Arizona, which requires all ELs to participate in four hours of Structured English Immersion (SEI) instruction without regard to other academic content, is an example of locally hostile policy (Gándara & Orfield, 2010). As this dissertation will show, the context of reception EL children experience within their schools lacks uniformity across the U.S.

1.4 Organization and Guiding Questions of Dissertation

This dissertation explores the role education plays in assimilation and the potential for upward mobility for EL children in the location of settlement. Specifically, the first study looks at how ELs have historically navigated repressive linguistic policies in their local schools. The second study provides a regional school district analysis of the opportunity structure in place for ELs in a new immigrant destination. The last study examines how place influences the opportunities available to Hispanic and EL students to access the STEM coursework and requirements necessary for college admission in Arizona within their local school districts. The following questions guide the analysis:

Study 1

Using qualitative document analysis (Bowen, 2009), the first study examines scholarship from historical pieces such as primary documents, books, and articles focused on Native American, Japanese, and Mexican immigrants to evaluate how these groups have resisted becoming the targets of deliberate and focused enculturation techniques in America. This broad, national, and historical contextualization of ELs in the U.S., and the accompanying examination of policy

deepens understanding of the ways in which ELs utilize their social, cultural, and discursive resources within the often-hostile context of reception they receive in schools. The following research questions drive the analysis:

1). How has the English language schooling process shaped enculturation and/or assimilation for English Learners throughout American history?

2). How did English Learners react to the schooling process?

Study 2

This second study uses data from the American Community Survey (ACS) to explore the geographic location and potential clustering of all ELs, as well as particular subgroups of ELs within the St. Louis metropolitan area. The article then tests the hypothesis that specific subgroups of ELs are related differentially to specific components of the St. Louis metropolitan opportunity structure. I use both Ordinary Least Squares (OLS) and Geographic Weighted Regression (GWR) to examine the relationship between each language subgroup and indicators of opportunity structure in the St. Louis metropolitan region. The following research questions guide the analysis:

1). Do EL children from specific language backgrounds cluster in specific school districts within the St. Louis metropolitan region?

2). Is it necessary to account for the spatial clustering of EL groups and measures of opportunity structure?

3). Which of the opportunity structure variables are related to type of EL group at the district level, using a GWR model?

Study 3

The final study examines how place influences the opportunities available to Hispanic and EL students to access the STEM coursework and requirements for college admission in Arizona. Specifically, the study uses GWR to analyze the relationships between the percentage of Hispanic students and EL students within districts and the number of STEM classes offered, SAT/ACT taking, and district dropout rates. This study seeks to answer the following questions:

1). Are the percentages of Hispanic and EL students within districts and the number of higher math (Advanced Math and Calculus) and lab science (Biology, Chemistry and Physics) classes offered spatially related?

2). Are the percentages of Hispanic and EL students within districts and the total percentage of the student body taking the SAT/ACT, the percentage of Hispanic students taking the SAT/ACT, and the percentage of EL students taking the SAT/ACT within districts spatially related?

3). Are the percentages of Hispanic and EL students within districts and the percentage of students who drop out within districts spatially related?

The closing chapter of the dissertation discusses the connections among the three studies and considers the implications for educators, policy makers, and future research.

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Chapter 2: Resisting assimilation: Deliberate acculturation by the American English Language Learner

2.1 Introduction

Immigration rates are on the rise and have been steadily increasing since the 1980s. Nearly 10% of school-aged children in the United States participate in programs designed for English Language Learners (ELLs) (U.S. Department of Education, 2012). The steady increase of ELLs has rekindled many of the earlier debates on how to educate language-minority students (Borden, 2014). For centuries, education policy has historically been viewed as having an influential role in crafting the roles of immigrants in American society. It is difficult for any child to escape the compulsory schooling experience. While schooling had the possibility to affect all learners, schools were often designed with young children from "non-native" backgrounds in mind, particularly from the nineteenth century on (Tyack, 1974). However, the nature of enculturative influences from schooling changed depending on the purposes for, and methods by which the students were being educated. For the purposes of this article, schooling is framed as a formal process of acquiring new knowledge, whereby the "student" learns academic topics, social norms, and interpersonal behaviors that have been agreed upon by the dominant "American" (white, anglo-saxon, protestant) culture. Building on this framework, the article examines scholarship from historical pieces such as primary documents, books, and articles focused on Native American, and Japanese and Mexican immigrants to evaluate how these groups have traditionally been targets of deliberate and focused enculturation techniques. This article argues that despite documented attempts by various educators over centuries to enculturate and/or assimilate ELLs into American schools through strict English instruction, students, with the

support of their families and communities, have always, and continue to employ a variety of cultural resources to act agentically against hegemonic structures.

Educators have had many goals for schooling throughout American history. In the colonial period, religious leaders drove the majority of instruction, as they were the major institution in power. Their ultimate goal was salvation of souls. However, they believed that in order to subdue the "savages," students needed to assimilate to Western colonial standards of living through means of linguistic and cultural control (Motha, 2014). Educators in the colonial period wanted their learners to become integrated into the dominant culture, but only in the role envisioned for them. In order to achieve this goal, students were subjected to enculturation techniques in which linguicism, or the intentional destruction of language through educational measures, were predominantly used (Motha, 2014). As this analysis will show, these efforts varied in terms of outcomes.

However, the process of enculturation changed, depending on the time period and the context in which the students were being instructed. Over time, the focus of educators shifted to Americanization. With a growing dependence on the government as the dominant institution, Americanizers wanted immigrants and those viewed as "others" to become imbued with a sense of loyalty to the country. Part of this Americanization process included "preparing adult immigrants and their children to be citizens of the United States committed to the democratic ideals of this country, [traditionally through] mastering English, learning American history and civics, and understanding and embracing the democratic ideals of this country" (Mirel, 2010, p. 5). Learning English became a key component to becoming "American." However, it was only one component. As Tamura (1993) points out, immigrants were often expected to exhibit "undivided loyalty to the United States" by casting aside their native culture (p. 59). Despite the

intent of Americanizers, students did not blindly assimilate into their new culture, and roles envisioned for them. Instead, deliberate forms of acculturation was the typical result.

Both Native Americans and immigrants used acculturation techniques to adapt to American norms, while allowing some "persistence of ethnic identity" (Tamura, 1993, p. 52). Brown (2007) defines acculturation as a personal shift in "world-view, self-identity, and systems of thinking, acting, feeling, and communicating" (p. 194). Learning a new language plays a vital role in this shift. However, according to Mirel (2010), many immigrants did not "abandon their cultural backgrounds and merge imperceptibly into white America," but rather forged a "broader, more cosmopolitan, and ultimately more democratic vision of American culture and national identity" (p. 4). While nearly all immigrants and non-English speakers eventually adopted the English language, their impact on American culture, identity, and even the English language is evident in current American society, and thus, their ability to acculturate as they choose becomes more apparent.

2.2 Colonial Era—Conflicts in Language Approach

The colonial desire for assimilation of those designated as "other" was evident from the beginning of American history. In his novel, *The Invasion Within: The Contest of Cultures in Colonial North America*, Axtell (1985) likened interactions between Europeans and Native Americans as "cultural warfare" (p. 4). While missionaries desired to spread religious salvation, they also believed this salvation would lead to a well-controlled nation. Many Puritan and Catholic missionaries used whatever means were necessary to attempt to reach their "savage" audience: reservation schools, boarding schools, sending Native American boys to grammar schools in the towns, sending Native American boys to Europe, instruction in native language, or instruction in French or English. However, by the late 1600s, English-only became desirable,

particularly by the Puritans in New England. Daniel Gookin, Superintendent of the Praying Indians, believed that speaking English was the only way to truly convert the Native Americans. Using an ideology of linguistic imperialism, Gookin (1792) argued:

> The changing of the language of a barbarous people, into the speech of a more civil and potent nation that have conquered them, hath been an approved experiment, to reduce such a people unto the civility and religion of the prevailing nation (p. 222).

Like many, he believed that if one conquered the speech of the people, one would be able to conquer their minds. Eventually, some of the Praying Indians in New England desired schooling, as they recognized the "economic and political value of English literacy" (Axtel, 1985, p. 183). Therefore, Puritan and Catholic missionaries may have experienced some minimal success in enculturating the Praying Indians. However, for the majority of the Native American population, little changed as a result of missionary efforts. The majority of Native Americans successfully resisted, and continued to acculturate to American society at their own rate. Although many Native Americans were able to resist the enculturative efforts of the missionaries, some deliberately embraced literacy efforts for their own purposes. Therefore, one can argue that deliberate acculturation by non-English speakers was evident as early as the colonial period.

2.3 Nineteenth Century—Americanizing the East Coast, Midwest, and Southwest

The 19th century marked the beginning of mass immigration to the United States. As the number of immigrants to the U.S. rapidly increased, one of the most focused reform efforts of the 19th century was directed at public education. It was during this time that "the idea took hold that the public school was uniquely responsible for the Americanization and assimilation of the largest foreign immigration in the nation's history" (Ravitch, 1974, p. 176). The issue of language instruction "became a symbolic battle between those who wanted to impose one standard of

belief and those who welcomed pluralistic forms of education" (Tyack, 1974, p. 109). During this time, policymakers continued to coerce Native Americans to the civilized American lifestyle necessary to meet the demands of the Dawes Act (Adams, 1995). In order to civilize the Native American, compulsory schooling was enforced, as "the Indians' surest path out of savagery was the education of their children" (Adams, 1995, p. 63). Further, many policy makers believed children needed to be removed from the "savagery" of their native environment as much as possible. Thus, the Pratt model of reform was instituted through the creation of Native American boarding schools.

The Pratt model called for an emphasis on English-only instruction, giving students Americanized names, providing students with citizenship instruction, and direct contact with model American culture through an outing program. Americanizers argued that only through a mutual language (English) could teachers lecture their students on the "various aspects of the white man's civilization, especially the ideals and values that served the basis for that civilization" (Adams, 1995, p. 42). As a result, Native American languages were forbidden at schools in 1890. However, students resisted this hegemonic structure through renaming hated teachers, retelling cultural legends, folktales and stories, and using English to their own benefit. Despite the attempts to indoctrinate Native Americans in civility, Adams concluded that it was "the very institution [boarding schools] designed to extinguish Indian identity altogether may have in fact contributed to its very persistence in the form of twentieth-century pan-Indian consciousness" (p. 336). Rather than being completely stripped of their Native American identity, students succeeded in appropriating English when necessary while actively resisting white enculturation to forge their own identity as a Native American. Throughout the 19th century, they continually thwarted Americanization efforts. While Native Americans faced more

intense Americanization tactics than ever before, they still maintained their ethnic identity in schools.

2.4 Twentieth Century—Americanizing the West Coast

The beginning of the 20th century saw the peak of immigration to the United States. It also brought rapid expansion to the West Coast. During this time most major cities on the West Coast had more foreign-born than native-born residents. Americanizers worked diligently to inculcate these new groups through English instruction. Ellwood Cubberley (1909) Professor of Education at Stanford University believed that the goal of educating immigrants was:

> to break up these groups or settlements, to assimilate and amalgamate these people as part of our American race, and to implant in their children, so far as can be done, the Anglo-Saxon conception of righteousness, law and order, and popular government, and to awaken in them a reverence for our democratic institutions and for those things in our national life which we as a people hold to be of abiding worth (p. 15-16).

Although the West Coast had been Mexican territory a half century earlier, many Americanizers viewed those of Mexican descent as "foreign" by the early 1900s. Following the passage of the Home Teacher Act (1915), Americanization programs in California focused heavily on instructing Mexican mothers in the areas of English, school attendance, household duties, and sanitation, as well as American citizenship (Sánchez, 1993). While the Immigration Act of 1924 distinguished immigrants based on their "whiteness" nationwide, Mexicans in the Southwest were difficult to classify due to economic and political ties with Mexico (Ngai, 1999). However, this did not prevent educators from discriminating against them. Donato (2003) in his article "Sugar Beets, Segregation and Schools: Mexican Americans in a Northern Colorado Community, 1920-1960," demonstrated how schooling experiences for Mexican Americans suggest that Americanizers never intended for their students to become a part of American society. Instruction of Mexican immigrants included education of youth in only English,

segregated content, and segregated schools. Even at the elementary school level, "teachers were indifferent about Mexican American children and expected them to leave school at a very early age" (Donato, 2003, p. 82). These low expectations were often reflected in low graduation rates. Although some Mexican Americans attempted to open their own Spanish language schools, such schools were not able to stay open for long.

By the 1930s, the Mexican American Movement actively advocated for the use of American education to aid in the progress of Mexican Americans while remaining proud of being Mexican. For example, in publications such as the *Mexican Voice,* they encouraged other students to overcome the effects of the prejudice they experienced in American schools. Therefore, Mexican immigrants did not blindly assimilate to American culture as Americanizers wished. Instead, Mexican Americans crafted their own identity as ethnic Americans where their native language was still prominent, but some agency towards accepting American ideals (i.e. advancement through education) was evident.

Despite efforts by the Immigration Act of 1924 to prohibit Asian immigration to the mainland, Asian Americans were able to successfully craft their own ethnic identity in Hawaii in the early 20th century. Tamura (1993) in *Americanization, Acculturation, and Ethnic Identity: The Nisei Generation in Hawaii* describes the acculturation process of the Japanese immigrants in the U.S. territory. While schools were used as the "chief instrument of Americanization" (Tamura, 1993, p. 55), the Japanese were able navigate dual identities and form their own concept of what it meant to be a Japanese American. Similar to Mexican Americans in California, the Japanese in Hawaii faced immersion in English-only programs, segregation, and prejudice. According to Asato (2003), the Japanese worked from the beginning of their immigration (the 1800s) to establish Japanese language schools, which operated outside of American school hours. By the

20th century these schools caused much conflict with Americanizers, who believed "good citizenship meant that the Nisei should discard all traces of Japanese ways" (Tamura, 1993, p. 152). Although legislators in Hawaii passed laws to try to limit the reach of the Japanese language schools, such laws were eventually ruled unconstitutional by the Supreme Court (Asato, 2003; Kam, 2006). Failing with the law, Americanizers in Hawaii then tried another approach. They launched anti-Japanese propaganda, which increased as World War II approached (Okawa, 2011). As tensions with Japan grew, many Japanese language schools were often targets of overt racism, and Japanese leaders in Hawaii were arrested and interned (Okawa, 2011). Regardless of the challenges they faced, Japanese students were able to slowly integrate into the segregated English Standard Schools. Although most Japanese preferred speaking their "native" Hawaiian Creole English, many became bilingual, or even trilingual with the additions of Standard English and occasional Japanese. After WWII many Japanese fought to reopen their schools, and the use of Hawaiian Creole persists to this day (Kam, 2006). Many schools remain open to this day. Thus, as Tamura (1993) argues, there is "clear evidence of the triumph of acculturation over Americanization" (p. 159) for Japanese Americans.

Overall, immigrants in the 20th century demonstrated their ability to actively acculturate to American society through maintenance of their ethnic identities. Despite Americanizers' attempts to force immigrants into the roles they envisioned for them as workers, both Mexican Americans and Japanese Americans were able to retain vestiges of their native culture and language. In California, Mexicans succeeded in integrating their culture into American dress through the zoot suit, the commercialization of Spanish music, and the distinctly "Mexican air" that permeates Los Angeles (Sánchez, 1993). Japanese Americans, with schooling and occupational goals similar to Americans, were able to integrate into American schooling

somewhat more successfully than Mexican Americans, as well as gain significant political and economic power in Hawaii. Regardless, both cultures were able to choose how they wanted to acculturate to American culture, and thus, were able to expand beyond the narrow roles Americanizers envisioned for them.

2.5 Modern Context

The latter part of the 20th century saw both progress and setbacks for non-English speaking groups. Although the Immigration and Nationality Act of 1965 (Hart-Celler Act) eliminated the nationality-based quota system of 1924, it had a significant impact upon many groups. According to Dobkin (2009), despite originally being lauded for its ability to open the borders, many components of the Hart-Celler Act had clear racial and language bias. This made it more difficult for those who did not speak English to obtain visas and legal citizenship. Further, modern immigration is not as clear-cut as many would like to believe. Immigration (both legal and illegal) is often a multi-faceted experience in which migrants make several trips to and throughout the U.S. before settling with their families (Akresh, Massey, and Frank, 2014). Additionally, English is a key component of this settlement. The continued popularity of English-only programs demands this of immigrants, and demonstrates how the foundation of the Anglo-Saxon schooling system has continued to influence language policy in the United States (Ovando, 2003).

In 1968 the Bilingual Education Act (Title VII of the Elementary and Secondary Education Act) allowed for the first time federal funds to support bilingual programs. However, as Ovando (2003) noted, the definition of a bilingual program was left deliberately vague. Additionally, no federal dollars were allocated for such programs. However, the *Lau v. Nichols* (1974) case determined that all students had a right to same curriculum as English-speaking students, through

whatever means necessary, including bilingual education (Gándara, Losen, August, Uriarte, Gómez & Hopkins, 2010). But that ruling did not guarantee students would receive instruction in anything other than English. Further, while the *Castañeda v. Pickard* (1978) case established guidelines for examining the ability of schools to uphold Title VI of the Civil Rights Act, there is no formal endorsement of bilingual programs (Gándara, et al., 2010). Additionally, with the passage of No Child Left Behind in 2001 and the introduction of high stakes testing for ELLs, the implications of placing children into various programs changed dramatically. The term bilingual has "completely vanished from the federal law" (Wiley & Wright, 2004, p. 155). As written, current federal law actively discourages the use of bilingual programs in schools. All students are required to be tested in English, no matter their level of English proficiency. Such policies seem to reinforce the old idea that only "English literacy count[s] as literacy" (Wiley &Wright, 2004, p. 159).

As the number of Spanish-speaking ELLs increase in the U.S., it becomes evident that many of our current language-specific policies such as Proposition 227 in California and Proposition 203 in Arizona still expect immigrant students to blindly assimilate to the strict use of English (Proposition 203, 2000; Proposition 227, 1998). Worse, these students are more likely to be segregated from their native English-speaking peers (Gándara et al., 2010; Gándara & Aldana, 2014). In fact, "cross-school segregation and within-school tracking reduce the extent to which different kinds of students have the opportunity to interact with one another" (Darling-Hammond, 2010, p. 61). Thus, policy makers continue to claim that they want to create policy that helps students adapt to the United States, yet in practice, immigrant students continue to be linguistically, culturally, and academically marginalized as they have been for centuries.

2.6 Conclusion

As this analysis shows, the "success" of an immigrant group to acculturate is not determined by native language, or even race. Despite schooling structures that imposed their own agendas on ELLs, all populations showed agency in how they integrated in American society. In colonial America, Native Americans successfully resisted the enculturating efforts of the missionaries, or adopted their practices only when they desired it for personal fulfillment. Immigrants throughout the 19th century showed a propensity for adapting to American society. By the 20th century, schools were used to actively Americanize ELLs. Although the desire to indoctrinate all learners through Americanization, Mexican Americans and Japanese Americans deliberately crafted their place in American society as ethnic Americans. For current immigrants, the struggle against linguistic and cultural domination continues. Many students face English-only policies, concentrated poverty, cross- and within-school segregation, and often, sub-par teachers (Darling-Hammond, 2010). Current federal policy does little to direct the schooling of non-English speaking students. Additionally, it is difficult for researchers to definitively say what kind of education model works best for ELLs, although growing evidence supports bilingual/dual immersion programs (Valentino & Reardon, 2014). More research into the efficacy of these programs could prove beneficial for policy makers, educators, and ELLs. Further, as Motha (2014) points out, educators need to become more aware of their own propensity to be complicit in continuing to engage in enculturative practices. Regardless, while policy makers and educators continue to push their own agendas on ELLs, ELLs continue to demonstrate their abilities to push back, and create their own sense of what it means to be an American.

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Chapter 3: Geography of the Midwestern English Learner: An Inquiry into Opportunity to Learn English in St. Louis

3.1 Introduction

Recent projections indicate immigrants and their children are driving the majority of U.S. population growth (Cohn, 2015). For many immigrants and their children, English language ability plays a crucial role in their ability to integrate into to American society. For example, Portes and Rumbaut (2014) contend that English language ability impacts the initial job an immigrant is able to attain, which in turn impacts the community and school district one has the possibility to settle within. However, investigating English language ability without examining context of settlement is problematic. School quality and instruction in the location of settlement play a role in academic outcomes for English Learning (EL)[1] children (Telles & Ortiz, 2008). Existing evidence also suggests that access to quality education is not equally distributed, particularly for ELs and EL children of color (Massey, 2008; Samson & Lesaux, 2015). Therefore, English language ability for the children of immigrants is difficult to disentangle from the school context.

Newcomers often settle in concentrated patterns and create migratory networks (Massey, 2008; Portes & Rumbaut, 2014). Once a demographic group establishes a presence in certain areas and school districts, others from similar backgrounds migrate towards them. Scholars argue that while schools are viewed by parents of ELs to be one of the most approachable American

[1] Children in Missouri are identified as a potential EL if they speak any language other than English as home. All potential EL students are screened by their school to determine eligibility for English Language Delivery (ELD) services. In this study, all children who are potential ELs are examined. For more information on the process of determining EL eligibility, visit http://dese.mo.gov/sites/default/files/cur-eld-entry-exit-criteria-0817.pdf

institutions (Bean, Brown, & Bachmeier, 2015), questions remain about the ability of schools to provide the academic, language, and social resources EL students need, particularly when they are spatially concentrated (Drake, 2014). Research has shown that immigrants are seeking non-traditional destinations (Massey, 2008). Midwestern cities and suburbs have grown significantly in ELs throughout the past two decades due to labor market changes (Massey, 2008). By opting for smaller Midwestern cities, concentrated EL presence becomes more noticeable. Like many smaller Midwestern cities, St. Louis is experiencing significant growth in its EL student population from a variety of language backgrounds (U.S. Census Bureau, 2013). The St. Louis Mosaic Project draws immigrants and aims to become a cultural hub (St. Louis Mosaic, 2018). St. Louis experienced a large influx of Bosnian refugees in the late 1990s and early 2000s. The International Institute of St. Louis offers aid to approximately 7,500 refugees and immigrants every year (International Institute of St. Louis, 2017). This diverse blend of ELs in St. Louis creates a unique context to study settlement.

However, the St. Louis metropolitan region suffers from a history of intense racial segregation and racial tension. This has impacted students for generations (Tate, et al., 2014; Wells & Crain, 1997). Students in the region still feel the effects of the *Liddell v. Board of Education* (1972, 1980, 1983, 1999) case, allowing for the largest inter-district transfer program in the United States and funding the creation of the city's magnet schools in an attempt to battle *de facto* segregation (Wells & Crain, 1997). More recently, students in a few unaccredited suburban school districts were allowed to transfer to neighboring, accredited school districts as a result of *Turner v. Clayton* (2010). Therefore, the school district that ELs settle into within the St. Louis metropolitan region likely has a direct impact on the opportunities they encounter in their local school, particularly for students of color. While previous waves of immigrants were able to

overcome their ethnic differences to "become white" and eventually settled comfortably in suburban districts (Lee & Bean, 2010; Mormino, 2002; Well & Crain, 1997), it is unclear where newer waves of immigrants, are able to settle. This article examines where various EL groups settle within the St. Louis metropolitan region and determines what relationships between EL settlement patterns and opportunities for upward mobility exist within local school districts.

3.2 Segmented Assimilation and EL Clustering

Classic assimilation theory (Alba & Nee, 2003) argues that once immigrants and their children have adopted the language, cultures, and values of their new home they assimilate into the country's mainstream society. However, recent research shows the process of assimilation is complex and ethnic differences remain (Kasinitz, Waters, Mollenkopf, & Holdaway, 2008; Telles & Ortiz, 2008; Zhou, 2014). Ethnic differences may persist due to the growing impact of coethnic community (Kasinitz, 2008; Zhou, 2014). Segmented assimilation acknowledges the role of pre-migration factors such as ethnicity and English ability along with context of reception. It argues that an immigrant and their children are able to assimilate into the dominant culture based on their color/race, location of settlement, and the mobility structure of the area of settlement (Portes and Zhou, 1993). Specifically, immigrant ability to socially assimilate may be hampered if they are a person of color, live in urban areas, face occupational segmentation, or have poor parental resources. Segmented assimilation was the first major theory of immigrant integration to recognize the ability to access social and economic resources in the U.S. promotes upward mobility. This theory asserts that modern immigrants face greater challenges than previous waves in integrating within the three-generation time span. While nearly all modern immigrant groups still exhibit linguistic assimilation at the same rate as previous immigrant groups, the social and economic context they are attempting to integrate is significantly different

than it was before the 1965 Hart-Celler Act eliminated national origin immigration restrictions, and therefore, the geographic location of settlement becomes highly important.

To combat difficult contexts of reception, Portes and Zhou (1993) argue that one of the most important resources for immigrants is the support network found through their coethnic community. Without proper support networks, it is difficult for ELs to circumvent the lack of resources and increasingly restrictive opportunity structure found in American society. Furthermore, research shows that some immigrant communities produce ethnic resources in order to enable better education outcomes for the second generation (Kasinitz, et al., 2008; Zhou, 2014). For example, ethnic institutions such as Chinese-language schools are established in cities across the country, including St. Louis (Zhou & Li, 2003). Such schools provide social, academic, and cultural support in addition to the resources found in local school districts.

Immigrant assimilation and success is difficult to predict due to the significant role of initial English ability in EL assimilation. Segmented assimilation provides insight to the process, according to Portes and Rumbaut (2014). Initial English language ability dictates the type of job an immigrant can attain, which then influences the community and subsequent school district placement. Immigrants typically cluster into three economic groups: workers, entrepreneurs, or professionals. Professionals usually come into the country with the highest levels of linguistic cultural capital while workers come in with the least. Further, professionals tend to settle in a more dispersed manner, while workers are often linguistically concentrated. Additionally, it has been shown that immigrants from some countries concentrate in the better school systems, while other immigrant groups are in some of the worst (Waters, Tran, Kasinitz, Mollenkopf, 2010). Such concentrations may reinforce certain cumulative patterns of (dis)advantage for each immigrant group.

Despite its use as a prevalent model, segmented assimilation has its shortcomings. It assumes that immigrants fall into one of three categories, while much research shows that the initial composition of ELs has become increasingly diverse (Glick et al., 2013; Massey, 2013). The Portes & Rumbaut (2014) model maintains that only those who emigrate as a professional and settle in a dispersed manner become fluent bilinguals in the U.S. This may not always be the case. The model also shows that only children of entrepreneurs and professionals who grow up in strong ethnic enclaves likely end up as a fluent bilingual. Recent evidence maintains that EL children of workers are becoming fluent bilinguals as well (Akresh et al., 2014; Massey, 2008). More research is needed on the context surrounding these cases, as fluent bilingualism has been shown to have significant cognitive and economic benefits (Portes & Rumbaut, 2014; Rodríguez, Carrasquillo, & Lee, 2014).

While segmented assimilation acknowledges some aspects of opportunity structure, it fails to account for the school quality in the location of settlement for the second and subsequent generations. The politics driving English education policy for ELs vary across the U.S. In addition, researchers found that White residents living in states with higher concentrations of Latinx residents appear more likely to favor politically conservative and restrictive policies towards immigrants and their EL children (Abrajano & Hajnal, 2015). Such policies and subsequent school practices may prohibit ELs from achieving upward mobility. The current segmented assimilation model does not explain EL assimilation fully, as it ignores the impact of education. This article uses geospatial methods to examine the role of "place" in conjunction with the opportunity structure variables that allow ELs to better integrate into American society through their local school districts.

3.3 Importance of local context

3.3.1 Opportunity structure in America

While many refer to America as the "land of opportunity," the overall opportunity structure has become unfavorable in recent years (Chetty et al., 2014). EL children may be particularly vulnerable to this, which places them possibly at higher risk of downward or no mobility than native English speakers (Massey, 2008; Portes & Rumbaut, 2014; Putnam, 2007). Scholars have determined that certain geographic locations contain more opportunities for upward mobility. These locations display lower concentrations of black residents, lower amounts of segregation, smaller income inequalities, higher quality schooling, higher levels of social capital, and more stable family structures (Chetty et al., 2014). Table 3.1 summarizes the constructs, measures, and findings of the Chetty et al. (2014) study. Chetty et al. (2014) reveal that opportunity structure represents a place-based problem. Local contexts vary in the amount of each measure of opportunity available for upward mobility. Some areas provide possibilities of upward mobility, while others do not. Social scientists consider this particularly important for ELs. As EL children attempt to integrate into American society, they do it within a specific opportunity structure, much of which is unfavorable for particular groups (Massey, 2008). Additionally, some scholars have suggested that a Black/non-Black color line has emerged in many areas of immigrant settlement as a result of the immense growth of Asian and Latinx residents (Lee & Bean, 2010). They also found that cities with higher percentages of Black residents had firmer racial boundaries. Further exploration of the relationship between opportunity structure and EL settlement in St. Louis, where a strong history of a Black/White color line exists is necessary. Such explorations help to better understand how ELs integrate in newer immigrant destinations.

Table 3.1 Findings from Chetty et al. (2014).

Construct	Measure	Significance
Fraction of Black residents	Fraction of Black residents	Less upward mobility in areas where there is a higher fraction of Black residents
Segregation	Level of racial diversity (based on Theil, 1972).	Less upward mobility found in more racially segregated areas
	Income segregation (Reardon, 2011)	Those in areas of concentrated poverty were significantly less likely to have upward mobility, while those in concentrated affluence were unaffected
	Commuting times	Shorter commuting times are significantly correlated with upward mobility
Inequality	Mean family income	No correlation with upward mobility
	Bottom 99% of Gini coefficient of parental income	Income inequality is negatively correlated to upward mobility
	Share of top 1% of income	Weak negative correlation between share of top 1% of income and upward mobility
School quality	Expenditure per student (proxy)	Higher expenditures on students are significantly correlated with upward mobility
	Class size (proxy)	Larger class size is correlated with less upward mobility
	Test scores, grades 3-8 (adjusted for parental income)	Higher test scores are positively correlated with upward mobility
	Dropout rates (adjusted for parental income)	Lower dropout rates are highly correlated with upward mobility
Social capital	Social capital index (composite based on Rupasingha and Goetz, 2008)	More social capital is significantly correlated to upward mobility
	Number of bowling alleys (Putnam, 2005)	More bowling alleys are significantly related to upward mobility
	Religiousity	Strongly positively related to upward mobility
	Rates of violent crime	Higher crime rates negatively related to upward mobility
Family Structure	Fraction of children in single-parent households	Strongly negatively correlated to upward mobility

	Fraction of divorced adults	Negatively correlated to upward mobility
	Fraction of married adults	Positively correlated to upward mobility

Once they arrive in the U.S., many immigrants choose to settle into enclaves. EL children tend to live in areas with higher populations of immigrants and be isolated linguistically (Glick et al., 2013). This linguistic isolation has both positive and negative effects on EL children (Drake, 2014; Galster, Metzger, & Waite, 1999; Glick et al., 2013). For example, ethnic communities segregated by race and income may lead members to lower trajectories for upward mobility, but research suggests that the social networks within enclaves provide a protective factor for EL scholastic achievement (Drake, 2014; Glick et al., 2013; Portes & Rumbaut, 2014). Some evidence shows unequal distribution of access to quality education, particularly for ELs and children of color (Massey, 2008; Samson & Lesaux, 2015; Schultz, 2014). Depending on where ELs settle, access to quality education may be limited, and by extension, access to quality English instruction may be limited as well. Scholars also argue that social capital and family structures represent the most important factors for EL integration (Portes & Rumbaut, 2014; Waters, Tran, Kasinitz, & Mollenkopf, 2010). This article seeks to examine opportunity structure, with a particular focus on school district quality, in conjunction with prevailing models of assimilation for ELs.

3.3.2 Immigrants in new destinations

The Midwest was once a great immigration destination, first for the French, then the Irish, before becoming primarily Germans and Italians in the late 1800s (Tyack, 1974). Immigration restrictions in the early 1900s stymied most immigration. Outside the major destination city of Chicago, the Midwest—and Missouri in particular—has not received significant numbers of

immigrants for nearly a century. But now, ELs settle more frequently in non-typical, non-gateway cities (Massey, 2008). As seen in Table 3.2, many cities in the Midwest still have less than 10% foreign-born population and immigration literature largely ignores them.

However, Midwestern cities are unique in several ways. Table 3.2 show no stereotypical settlement pattern. While many cities in the Midwest receive Latinx immigrants as their largest group, others have higher numbers of Asians. Scholars have also noted that despite the large numbers of Latin Americans in the U.S., Asian immigrants represent the fastest growing population (Lee & Zhou, 2015). Additionally, Europeans often comprise the second largest group for most cities. Regardless of background, settling in new areas unaccustomed to

Table 3.2 Composition of foreign-born population in Midwestern cities (US Census, 2012)

	Cinci.	Des Moines	Detroit	Indy	Kansas City	Milw.	Minn.	St. Louis
Foreign-Born (total %)	4.50	7.00	8.66	6.21	4.78	6.92	9.85	5.13
Europe	19.22	18.77	26.65	9.97	11.74	21.78	11.39	27.90
Asia	39.91	31.98	49.70	30.20	27.05	29.76	39.52	43.41
Africa	12.22	9.48	3.26	9.38	10.72	4.60	20.49	7.36
Oceania	0.53	0.83	0.24	0.42	2.08	0.21	0.38	0.79
Latin America	25.08	36.37	13.38	47.99	45.90	41.95	25.60	18.21
Northern America	3.04	2.57	6.73	2.05	2.49	1.71	2.61	2.29

immigrants, such as the Midwest, means that there are fewer institutional and social resources offered, which may slow the assimilation process (Massey 2008; Spees, Potochnick, & Perreira, 2016). Therefore, a Midwestern state like Missouri offers a unique context of study that may operate differently than traditional gateway cities.

Like other Midwestern cities, both Kansas City and St. Louis have recently seen significant growth in their immigrant population. However, the demographics of immigrants that each community receives differs. As seen in Table 3.2, both St. Louis and Kansas City are comprised of an immigrant population around 5%. However, St. Louis experiences a relatively high percentage of Asian immigrants, while Kansas City receives a considerable amount of Latinx immigrants. These patterns likely result based on regional labor demands (Massey, 2008). The growing biotech corridor outside of St. Louis likely draws Asian immigrants, as are local efforts by business leaders (Moore, 2012). The relatively large amounts of Asian immigrants in St. Louis make it an interesting context for study, as Asians are frequently dubbed the "model minority" (Lee & Zhou, 2015; Tuan, 1999), which implies that they assimilate in different ways from other immigrants. Additionally, St. Louis has received a significant portion of White European ELs due to Bosnian refugee resettlement. Refugees differs from immigrants in that they receive federal assistance in settlement for their first 90 days, but are expected to repay many of their expenses (Hamdan, 2018). Given that both immigrants from Asia and Europe are often regarded positively due to their race (Lee & Zhou, 2015; Tuan, 1999; Waters, 1990), opportunities in the location of their settlement may differ in cities such as St. Louis, where they comprise the majority of immigrants.

3.3.3 Context of St. Louis

Immigration and segregation in St. Louis have both impacted significantly the settlement of the city and surrounding region. While the French and Spanish comprised the initial settlement along the Mississippi riverfront, St. Louis is known for its predominantly German, Irish, and Italian heritage (Mormino, 2002). The federal government admitted Missouri as a slave state in 1820, making it the last "Northern" state to be allowed to do so (Wells & Crain, 1997). At the time of mass European immigration in the 1850s, St. Louis was the most "ethnic" city in the U.S., with Germans comprising nearly a third of its population. During this period St. Louis saw a significant reduction in its slave population, likely as a result of German anti-slavery sentiment (Wells & Crain, 1997).

During the same period, ethnic enclaves existed for German, Irish, and Italian immigrants, as well as freed and formerly enslaved Blacks (Mormino, 2002). However, the residential patterns of the enclaves reflected the ethnic, socioeconomic, and political divisions among the various groups. German immigrants, who fit in with the dominant White, Anglo-Saxon, Protestant, and anti-slavery St. Louisan culture, amassed considerable political power, and open their own German language schools (Schultz, 2016). However, they restricted these schools to White residents only, and not all White immigrants in St. Louis had the same level of success. The poorer Irish immigrant settlements on the north side of St. Louis became known for its "ghettos." Eventually, the western edge of the city and the newly formed St. Louis County attracted more upper-class settlement from second and third generation German immigrants (Mormino, 2002).

The city of St. Louis experienced an influx of Blacks in the early to mid-1900s, just as mass European immigration began to end, which exacerbated existing segregation within city limits (Wells & Crain, 1997). Following World War I, St. Louis saw an outmigration of its White

population to St. Louis County. Formerly White immigrant ethnic enclaves on the city's middle north side slowly gave way to more Black settlement (Gordon, 2008). During this time, restrictive deed covenants governed settlement in the St. Louis region. According to several measures, the Home Owners Loan Corporation (HOLC) rated and assessed neighborhoods within the city and surrounding suburbs in St. Louis County, but Black residents dominated those with the lowest scores (Gordon, 2008). Furthermore, the Federal Housing Administration (FHA) admitted to following the HOLC ratings when making insurance decisions that created segregation by SES. While many of the descendants of White immigrant groups sought higher-rated and higher-priced home locations outside of the city in the mid-1900s, the zoning policy restricted many Black residents to living in locations with the lowest ratings. Scholars recognized St. Louis for having the highest amounts of substandard housing by the end of World War II (Wells & Crain, 1997). Such racially explicit zoning policies led to the segregation regime that continues today in the St. Louis metropolitan area (Gordon, 2008; Jones, Harris, & Tate, 2015; Tate et al., 2014; Wells & Crain, 1997).

As a result of racially explicit zoning practices, students throughout the St. Louis metropolitan region experienced *de jure* segregation prior to the *Brown v. Board of Education* (1954) ruling, and then *de facto* segregation in schools. In 1972 the *Liddell* case attempted to change this. A judicial decree in 1975 mandated the creation of a magnets school program to attract White residents from St. Louis County to the St. Louis Public Schools (SLPS) (Wells & Crain, 1997). However, this measure failed to reverse the racial imbalance found in many of the neighborhood schools. Under the threat of mandated integration, SLPS and 16 districts in St. Louis County entered into the nation's largest inter-district voluntary student transfer program in 1983 (Heaney & Uchitelle, 2004; Tate, et al, 2014). As of 2018, over 4,200 SLPS students and 150

metropolitan school district students continue to participate in the voluntary transfer program, although program leaders will begin phasing out new enrollment following the 2018-2019 school year (Voluntary Interdistrict Choice Corporation, VICC, 2017). Despite once operating the largest desegregation programs in the country, St. Louis metropolitan school districts remain segregated in many ways. Research continues to show that the SLPS district, as well as other predominantly Black districts located in northern St. Louis county, continue to experience segregation, poverty, less qualified teachers, and poorer academic outcomes (Harris, Jones, & Tate, 2017; Schultz, 2014; Tate & Hogrebe, 2015).

Thus, the continued inequities in school quality led to the *Turner v. Clayton* (2010) case, where the Missouri Supreme court ruled under Missouri Revised Statutes § 167.131 (2000) that students in unaccredited school districts had a right to transfer to a neighboring accredited school district (Tate et al., 2014). Between 2014 and 2017, the state allowed students in the unaccredited northern St. Louis metropolitan districts of Riverview Gardens and Normandy to transfer to nearby accredited districts (Taketa, 2017; Tate et al., 2014). Riverview Gardens regained provisional accreditation in 2017 and Normandy regained provisional accreditation on January 2, 2018 (Taketa, 2017). Students in Riverview Gardens ended the transfer agreement at the end of the 2016-2017 school year, and students in Normandy will be allowed to continue to transfer until the end of the 2017-2018 school year. Therefore, continued educational disparities by race and social class in the region embody the context of schooling for students of color and EL students.

Currently, St. Louis is reflective of the changing demography of immigrant destinations and ultimate EL assimilation (Massey, 2008). St. Louis represents one of many Rust Belt cities that continue to lose domestic residents but receives increasing amounts of immigrants (Frey, 2017).

Additionally, several universities and a growing biotech corridor attract Asian immigrants from higher SES and higher educated backgrounds. However, the Latinx population has also grown significantly in many districts within the past decade (Frey, 2017). As a result, some districts designed special International Welcome Centers to offer intensive English and social support to their rapidly growing and diverse EL populations (Taketa, 2017). A relatively affordable mid-size city, St. Louis also receives a significant number of refugees each year. The International Institute of St. Louis resettled over 1,100 refugees during their 2016 fiscal year (Moore, 2017). Over the last 30 years, the International Institute has resettled over 22,000 refugees from around the world in the St. Louis metropolitan region, including the largest Bosnian resettlement in the U.S. (International Institute of St. Louis, 2017). Refugees receive a specific location of settlement within the city of St. Louis; however, many complain of dangerous conditions and move to St. Louis County as soon as possible (Yako & Biswas, 2014).

The wide variety of different ELs in St. Louis provides a unique opportunity to examine variation in EL settlement and corresponding opportunity structure. Chetty et al. (2014) ranked St. Louis among the bottom 10 of the 50 largest metropolitan regions regarding opportunity structure. Furthermore, St. Louis has a well-documented history of being segregated by vital components of opportunity structure such as race, SES, and school quality (Gordon, 2008; Schultz, 2014; Tate et al., 2014). Therefore, the context of St. Louis may offer less upward mobility not only for the general population, but also very specifically for ELs settled within the region. This article tests the hypothesis that specific subgroups of ELs are related differentially to particular components of the St. Louis metropolitan opportunity structure.

3.4 Tobler's First Law of Geography

Given the tendency of immigrant groups to settle within ethnic enclaves, it follows that there is a high likelihood that factors dealing with immigrants are spatially correlated. Tobler's First Law of Geography helps to understand the nature of variable clustering. This principle states that although everything is related, things closer to one another are more related than those further apart (Mitchell, 2009). In this study, the geographic location of language groups is examined and it will be determined whether immigrants from similar language backgrounds cluster together. If language groups do cluster, then the argument that typical linear regression models such as Ordinary Least Squares (OLS) may be accurate, as the assumption of independent observations cannot be met (Mitchell, 2009). If clustering of groups is found, a comparison of OLS and Geographic Weighted Regression (GWR) results can be done to accurately examine the relationship between each language subgroup and indicators of opportunity structure in the St. Louis metropolitan region.

The following research questions guide the analysis in this study:

1). Do EL children with similar language backgrounds cluster in specific school districts within the St. Louis metropolitan region?

2). Is it necessary to account for the spatial clustering of EL groups and measures of opportunity structure?

3). Which of the opportunity structure variables are related to type of EL group at the district level, based on Geographic Weighted Regression (GWR) model?

3.5 Methods

3.5.1 Data Sources and Variables

Data for this paper was obtained from the American Community Survey (ACS) 2008-2012 dataset (U.S. Census Bureau, 2013) and through the Missouri Department of Elementary and Secondary Education (DESE). Shape files for the Missouri school districts were obtained from the United States Census Bureau Tiger Line files for elementary, charter, and unified school districts. Although data was available for each school district in the state of Missouri, this study only examines the 30 St. Louis metropolitan districts, as this is where a significant portion of ELs in the state are located. A full list of the districts included in this study, and a description of how the dataset was constructed is provided in Appendix A[2].

The language groups included in the analysis were drawn from self-identified categories within the ACS Language Spoken at Home table for all children (ages 5-17) enrolled in Missouri public schools. Specific language categories from the ACS included in this study are: (1) Language other than English; (2) Spanish; (3) Other Indo-European languages; (4) Asian/Pacific Islander languages; and (5) Other languages[3]. This data is presented in percentage of children (5-17) who speak these languages at home.

Opportunity structure variables included in the study are the percentage of black students, Theil index (1972) segregation measure, median household income, Gini Coefficient, third grade literacy attainment, percentage of teachers with Master's degrees, percentage of students who live in households where English is spoken "less than 'very well'" (ACS, 2013), and the percentage of married mothers for each district. Table 3.3 summarizes all of the variables, data sources, and relevancy of the data used in this analysis.

[2] A full listing of replication data, data sources, and descriptive statistics is available in Appendix A.
[3] Examples of "Other Languages" in the ACS (2013) data include: Arabic, Hindi, and Urdu.

Table 3.3 Variables and data sources

Variable	Data Sources	Significance for Study
Percentage of black students	DESE, 2015	Less upward mobility found in areas with a higher black population (Chetty et al., 2014)
Segregation	DESE, 2015	Less upward mobility for people of all races found in areas with a higher segregation Theil (1972) index (Chetty et al., 2014)
Median Household Income	ACS, 2008-2013	Indicator of SES and initial integration pathway for ELs (Portes & Rumbaut, 2014); less upward mobility found in areas with lower income (Chetty et al., 2014)
Gini coefficient (inequality)	ACS, 2008-2013	Income inequality is negatively correlated to upward mobility (Chetty et al., 2014)
Grade 3 district literacy attainment (school quality)	DESE, 2015	Literacy attainment is positively correlated with upward mobility, and may be reflective of EL ability to acquire English academic language (Chetty et al., 2014; Samson & Lesaux, 2015)
Percentage of teachers with masters degrees (school quality)	DESE, 2015	Teachers of ELs have less specialized coursework (reading and ESL instruction) than teachers of native English speakers (Samson & Lesaux, 2015)
Speak English less than "very well" (proxy for social capital)	ACS, 2008-2013	Indicator of amount of contact with native English speakers, which is critical for developing proficiency (Drake, 2014) and social capital for ELs
Percentage of married mothers (family structure)	ACS, 2008-2013	Family structure plays a prominent role in upward mobility, particularly for ELs (Chetty et al., 2014; Portes & Rumbaut, 2014)

Table 3.4 Descriptive Statistics for St. Louis Metropolitan School Districts (N=30)

Variable	Minimum	Maximum	Mean	SD
Speakers of Another Language	1.30	41.80	9.83	8.00
Spanish	0.00	11.90	3.12	2.53
Indo-European Languages	0.00	34.40	4.23	6.77
Asian/Pacific Islander Languages	0.00	7.00	1.79	2.02
Other Languages	0.00	4.50	0.73	1.02
Speak English less than "very well"	0.00	6.70	1.56	1.55
Black students	1.21	98.69	31.60	32.42
Segregation (Theil Index)	-0.01	0.04	0.01	0.01
Median Household Income (U.S. dollars)	28,632.99	108,924.00	61,025.87	20,542.52
Gini coefficient	0.34	0.55	0.43	0.05
Grade 3 district literacy attainment	17.10	76.50	56.07	16.69
Teachers with Masters degrees	50.30	92.70	73.37	10.33
Married mothers	26.9	89.3	66.46	19.78

Note. Unless otherwise noted, all information given in the table is in percentage.

Descriptive statistics for all variables in the study can be found in Table 3.4. On average, districts

in the St. Louis metropolitan region possess 9.83% of students who speak a language other than English at home. Bayless, a small suburban district south of St. Louis city districts has over 40% students who speak a language other than English at home. Children who speak an Indo-European language at home have the highest district average of 4.23%, followed by Spanish and Asian/Pacific Islander languages, at an average of 3.12% and 1.79%.

3.5.2 Data Sources and Variables

Moran's I was used to identify significant clustering of ELs in general and specific EL language subgroups within the region. A Moran's I analysis reveals the districts that possess higher or lower percentages than expected of ELs, and where particular language groups are located. Moran's I is a spatial autocorrelation tool available through ArcMap (ESRI, 10.5.1, 2017). It determines if features possess similar amounts of an attribute as its neighbors, and whether or not the result is due to chance. In this study, school districts act as the features and the percentage of people from each langue group are the attributes. A Moran's I Index value is calculated, as well as a z-score and p-value. The Moran's I index value ranges between -1 and 1, where results closer to 1 signify attributes are clustered and -1 indicate that attributes are dispersed. The corresponding z-score and p-value determine the significance of the Moran's I statistic. The following process occurs in order to calculate Moran's I: For each pair of features (school districts) the mean is subtracted from the value of each target and neighbor feature. These values are then multiplied. The result is multiplied by the weight of that particular pair. This process is repeated for all feature pairs and summed.

$$\sum_i \sum_j w_{ij} (x_i - \bar{x}) (x_j - \bar{x})$$

Then, the variance from the mean for all features is calculated. Weights for each pair of features are summed. The variance for all features is multiplied by the summed weights.

$$\sum_i \sum_j w_{ij} \frac{\sum_i (x_i - \bar{x})^2}{n}$$

Last, this value is divided into the sum of the weighted cross products to get the ratio (Moran's I).

$$I = \frac{n \sum_i \sum_j w_{ij} (x_i - \bar{x}) (x_j - \bar{x})}{\sum_i \sum_j w_{ij} \sum_i (x_i - \bar{x})^2}$$

Research questions 2 and 3 seek to better understand the relationship between the geographic location of the various EL groups and the opportunity structure in place for those groups, and how this relationship varies. Two methods are used. Ordinary Least Squares is used first, as it is a commonly used linear regression technique, and is viewed to be the best linear unbiased estimate of relationships between variables (Cohen, Cohen, West, & Aiken, 2003). However, this is only the case when all assumptions for statistical validity can be met. If clustering of data occurs as determined by Moran's I, or if data is not linear, then it is likely that the regression coefficient, standard errors, or both, are biased. Due to its social nature, demographic data often violates statistical assumptions (Mitchell, 2009) as certain groups tend to clump together. This is highly likely with language groups (Massey, 2008; Portes & Rumbaut, 2014). Therefore, Geographic Weighted Regression (GWR) is better at accurately calculating the relationships between such variables.

Furthermore, GWR is a useful method when analyzing units such as school districts, as the boundaries are spatial in nature. When comparing units such as school districts, it is important to

recognize that a non-stationary relationship often exists. This means that the relationships exhibited vary spatially (Fotheringham, Brunsdon, Charlton, 2002). GWR accounts for this spatial variation and allows geographic location to act as a context variable. Instead of creating a global regression model (as in OLS), GWR can reveal more information by creating a local equation for each feature within the dataset. This study uses an adaptive spatial kernel to calculate the weights in the GWR model. Each point in the dataset gets its own weight based on its distance from the regression point (see Figure 3.1). The process is repeated until all regression points within the dataset are accounted for in the model. For this study, the school districtpolygons act as the data points. Data points that are closer to the regression point are given more weight, while points further away are given less weight. This leads to smaller residuals, and a better fitting regression line (Fotheringham et al., 2002).

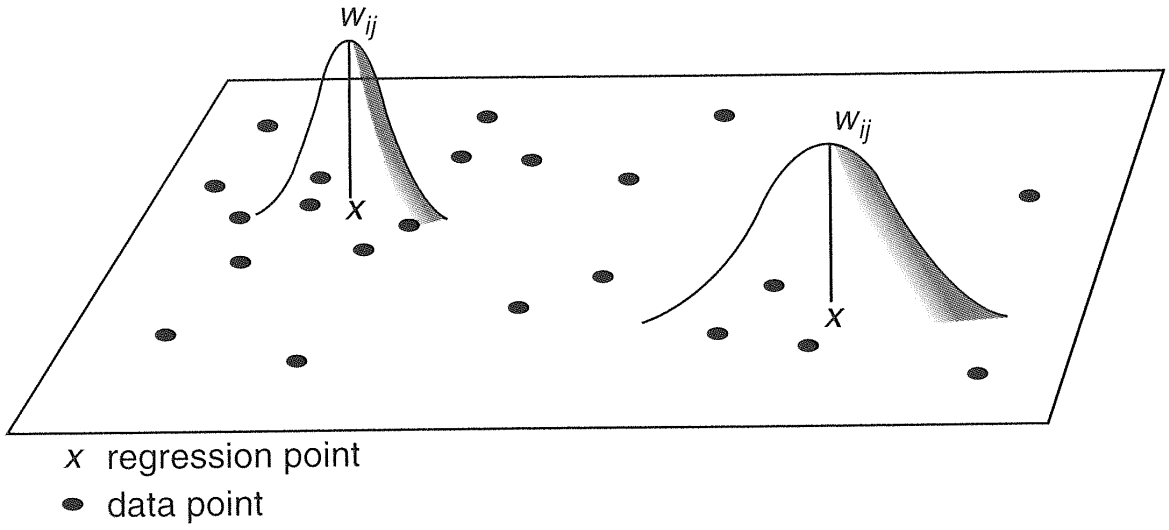

Figure 3.1 Adaptive Spatial Kerning (Fotheringham, et al., 2002)

The resulting equation is:

$$y_i = \beta_0 (u_i, v_i) + B_1(u_i, v_i)x_{i1} + \beta_k(u_i, v_i)x_{ik} + \varepsilon$$

As stated previously, both OLS and GWR models will be used to examine the relationship between language groups to evaluate clustering and opportunity structure. These models compare and determine whether or not variable relationships vary across districts or stationary status. Overall R^2 values and Akaike Information Criterion (AIC) reflect the strength of the model fit. The model with the lower AIC provide the better fit. If the GWR model for the dependent variable produces a lower AIC and higher R^2 it affirms the GWR model as a better model. In this study R^2 values, beta coefficients, and statistically significant t-values were mapped to show district variation. In order to control for the Type I error rate, the Benjamini-Hochberg correction for multiple comparisons was used to determine significance levels (Thissen, Steinberg, & Kuang, 2002).

3.6 Results

3.6.1 Moran's I

Moran's I analysis revealed that while the Spanish and "Other" language groups in the St. Louis metropolitan region are randomly dispersed, all speakers of another language, Indo-European, and Asian/Pacific Islander languages are significantly clustered. Results from the Moran's I analysis can be found in Table 3.5. In general, children who speak a language other than English are slightly clustered ($I = 0.13$, $z = 3.58$, $p < .001$). This means that children who speak a language other than English are located in school districts nearer to one another and this clustering is not random, suggesting that ethnic clustering is occurring.

Table 3.5 Moran's I Results for Language Groups

Language Group	Morans I	z-score	p-value
Speakers of Another Language	0.13	3.58	.00***
Speakers of Spanish	0.01	0.86	0.39
Speakers of Indo-European Languages	0.16	4.61	.00***
Speakers of Asian/Pacific Islander Languages	0.07	2.16	0.03*
Speakers of Other Languages	-0.06	-0.55	0.59

*$p < .05$. ***$p < .001$.

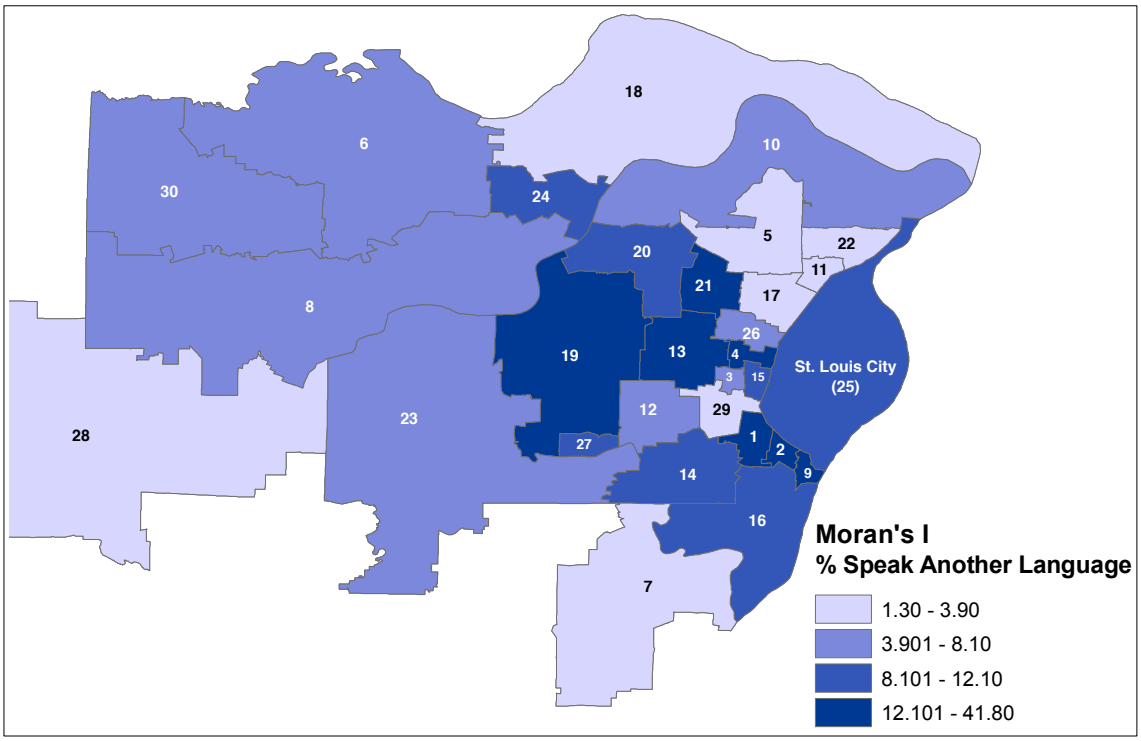

Figure 3.2 Percentages of all speakers of a language other than English (ELs).

Note: Darker areas indicate higher percentages for the district.

Figure 3.2 shows where all speakers of another language are located in the St. Louis metropolitan area. Although similar statistical results were found for children coming from an Indo-European language background ($I = 0.16$, $z = 4.61$, $p < .001$), Figure 3.3 shows the highest amounts of these speakers are more likely to be located in smaller school districts just south of St. Louis. Children who speak an Asian/Pacific Islander language experience slight clustering, ($I = 0.07$, $z = 2.16$, $p < .05$). Figure 3.4 shows that the highest percentages of these speakers are located in districts in the western suburbs of St. Louis, as well as the smaller districts just south of the city. Results for the remaining subgroups differ, however. Spanish speaking children and speakers of all other languages are randomly located. Overall, these results indicate that a GWR model may be more appropriate than an OLS model when examining all EL children. Additionally, given the significant ethnic clustering, GWR models may be better for children

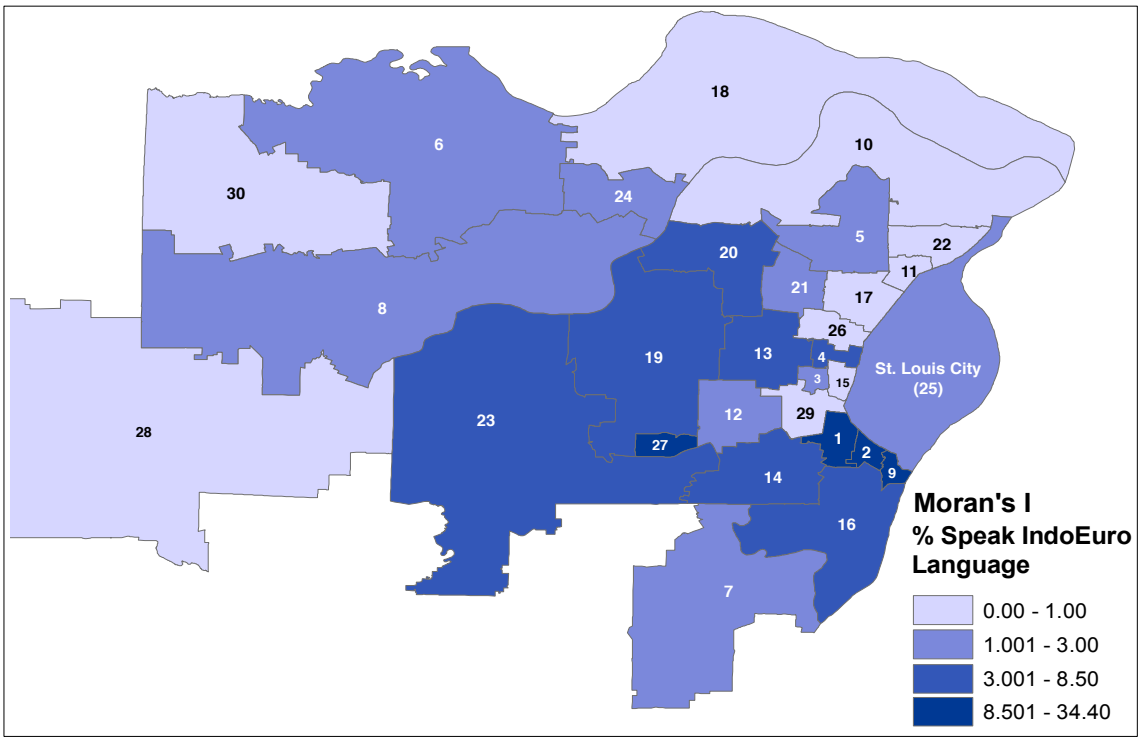

Figure 3.3 Percentage of speakers of Indo-European Languages.
Note: Darker areas indicate higher percentages for the district.

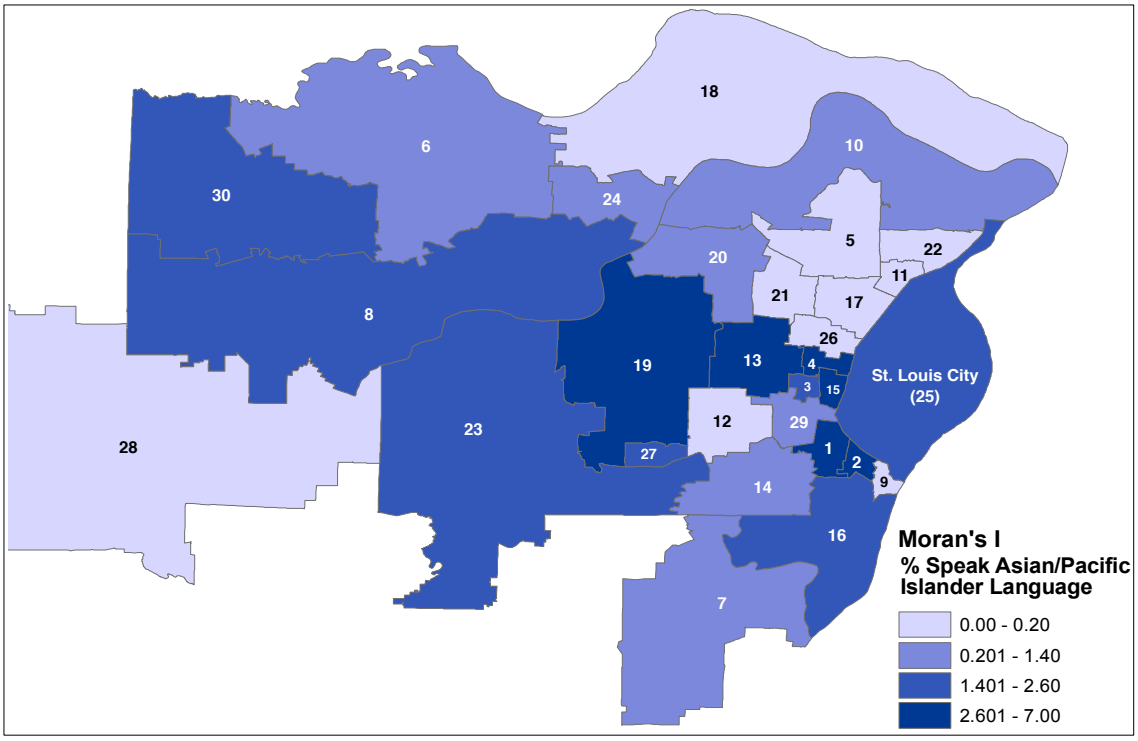

Figure 3.4 Percentage of speakers of Asian/Pacific-Islander languages.
Note: Darker areas indicate higher percentages for the district.

who speak an Indo-European or Asian/Pacific Islander languages at home.

3.6.2 OLS vs. GWR

Given the results of the Moran's I analysis, a model comparison was conducted for all children who spoke another language, as well as for the specific speakers of Indo-European and Asian/Pacific Islander languages.

Results for children who speak another language

Results from the model comparison for all children who speak another language are examined first and are available in Table 3.6. Overall R^2 values, adjusted R^2 values, AIC values, and the number of neighbors used in the GWR analysis are shown. For many of the examined variables, GWR models produced higher R^2 and lower AIC values than the OLS model. Percentage of black students, median household income, percentage of students attaining proficient and

advanced scores, percentage of teachers with Master's degrees, and percentage of married mothers all have a significantly lower AIC values, as well as higher R^2 values, indicating better model fit for the GWR model for these variables. These results answer the second research question affirmatively; yes, it is necessary to account for the spatial clustering of EL groups and measures of opportunity structure. Furthermore, the overall adjusted R^2 for the GWR model for percentage of black students and students who speak another language is 0.75, indicating a strong relationship between these variables. Figure 3.5 shows that this relationship varies across the St. Louis metropolitan region, but is strongest within the northern and far western districts.

Table 3.6 Overall R^2 Results for Speakers of Another Language

	OLS			GWR			
	R^2	Adj. R^2	AIC	R^2	Adj. R^2	AIC	Neighbors
% Black	0.08	0.05	298.24	0.84	0.75	270.12*	15
Segregation	0.19	0.17	-180.35	0.60	0.32	-182.28	23
Gini Coefficient	0.00	-0.04	-87.48	0.67	0.43	-89.16	13
Median Household Income	0.01	-0.03	687.70	0.64	0.48	676.33*	17
% Proficient & Advanced	0.03	-0.01	260.15	0.79	0.66	238.73*	18
% Masters	0.03	-0.01	231.28	0.49	0.33	224.70*	21
Violent Act Incident Rate	0.01	-0.02	36.95	0.04	-0.07	39.32	30
% Less Than 'Very Well'	0.67	0.66	85.24	0.67	0.63	88.20	30
% Married Mothers	0.03	-0.00	270.13	0.61	0.45	251.93*	18

Note. * indicates that the difference in AIC values is significant.

Given the history of segregation for Black students in the northern St. Louis, these results demonstrate that ELs are not immune to the strong color line in St. Louis. Although the overall adjusted R^2 value is 0.75, local values range from 0.00 to 0.79. This indicates that the relationship between percentage of Black students and percentage of speakers of another language in each district varies by location. Figure 3.5a shows where the local R^2 values are statistically significant. The darker area indicates districts with significant R^2 values, according to the Benjamini-Hochberg correction. Figure 3.5a shows that the St. Louis Public School District and northern suburban districts possess both higher percentages of Black students and have significantly lower percentages of students who speak another language. This results are interesting because it appears that ELs in St. Louis are avoiding historically Black areas. Further,

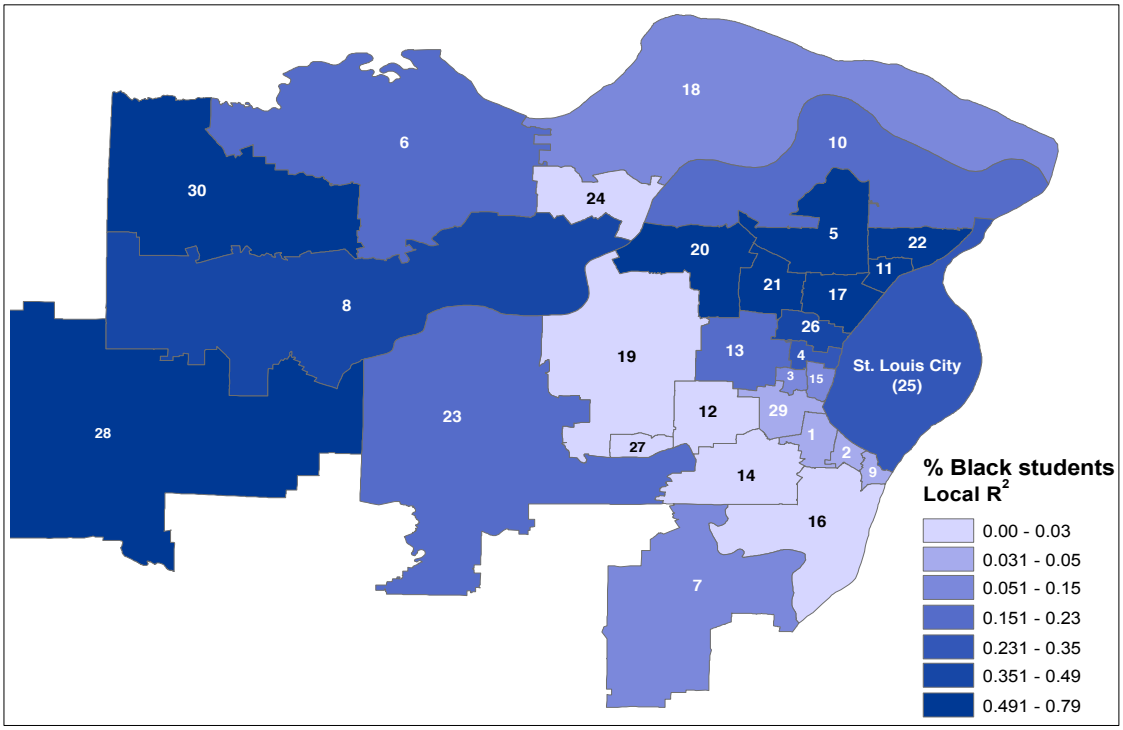

Figure 3.5 Local R^2 values for Percentage Speakers of Another Language and Percentage of Black Students.

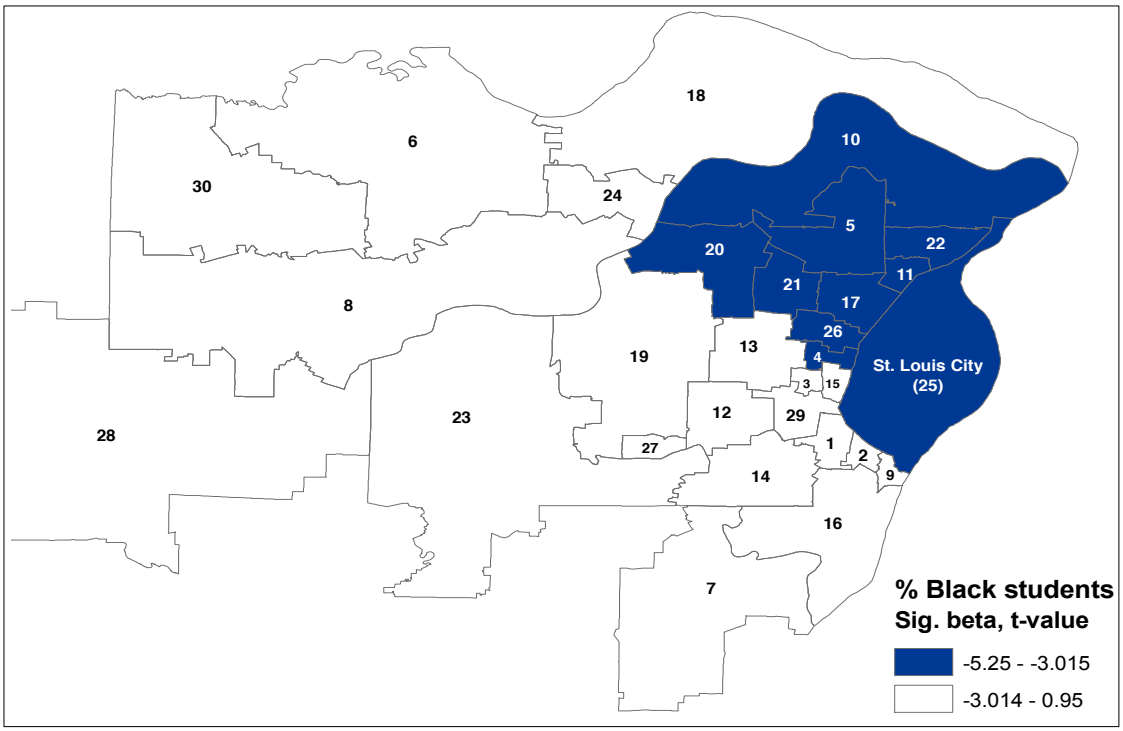

Figure 3.5a. Statistically significant beta coefficients (darker area) for Percentage Speakers of Another Language and Percentage of Black Students.

results reflect previous research on opportunity structure (Chetty et al., 2014), and find that median household income, and the percentage of students attaining proficient and advanced in Language Arts are correlated with percentage of Black students in St. Louis, and thus the GWR results are very similar. All of the figures from these analyses can be found in Appendix B.

Figure 3.6 shows that the relationship between percentage of speakers of another language and percentage of teachers with Master's degrees varies in the St. Louis metropolitan region, but is strongest in the northern and farthest southwest suburban districts. Although the adjusted R^2 value is 0.33, local values range from 0.00 to 0.47, demonstrating that in some districts there is very little to no relationship between the two variables, while in others the relationship is moderate. Figure 3.6a shows that the beta coefficients are significant for only a few of the northern suburbs, specifically in the districts where there are fewer teachers with Master's

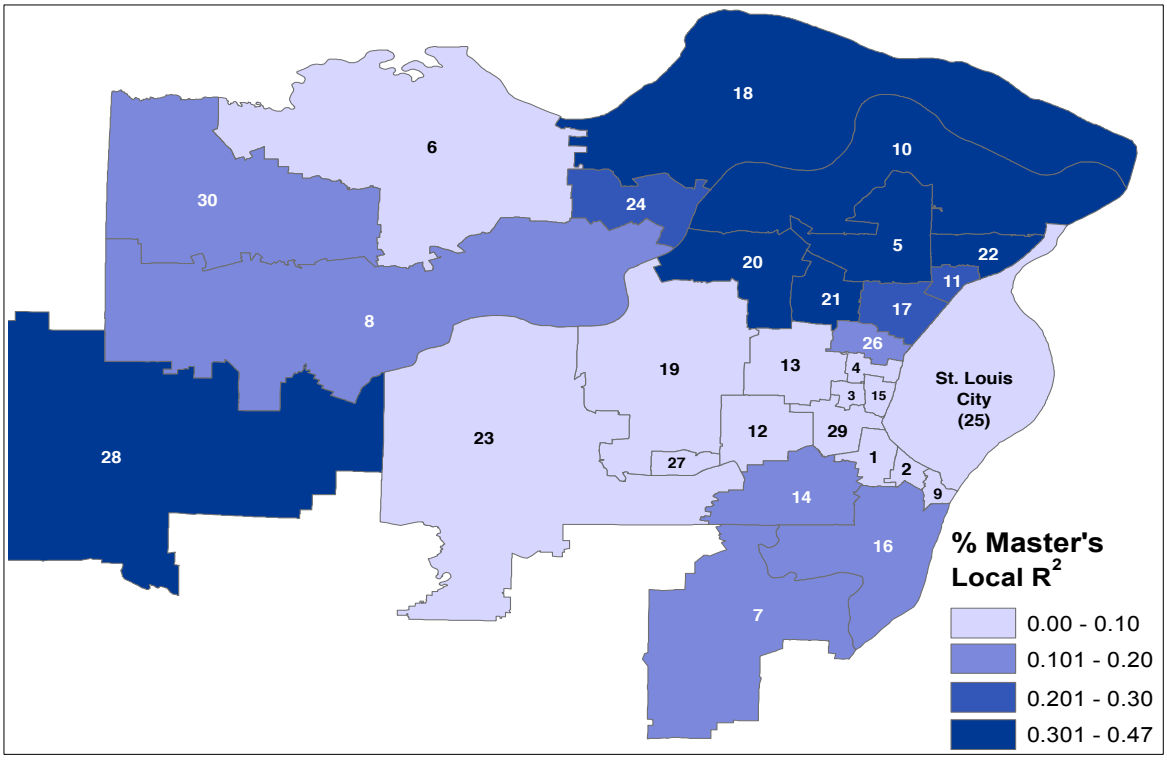

Figure 3.6 Local R^2 values for Percentage Speakers of Another Language and Percentage of Teachers with Master's Degrees.

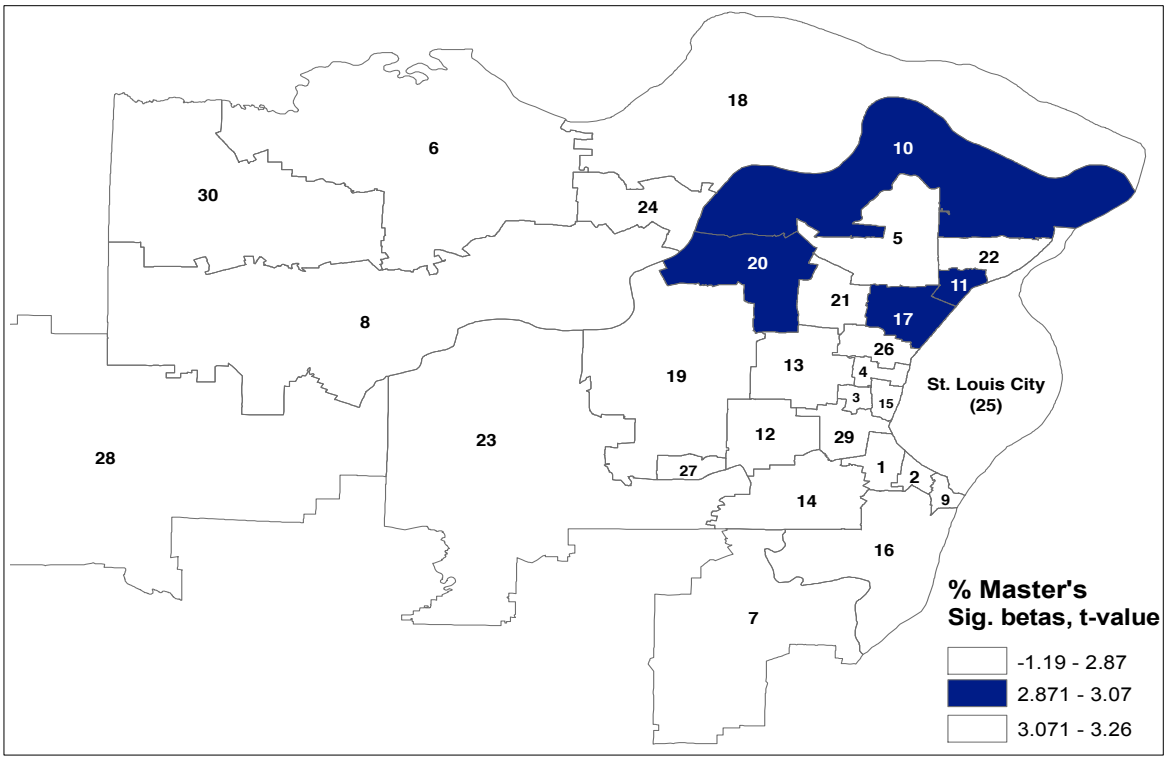

Figure 3.6a Statistically significant beta coefficients (darker area) for Percentage Speakers of Another Language and Percentage of Teachers with Master's Degrees.

degrees and fewer students who speak another language.

Last, the relationship between the percentage of speakers of another language and percentage of married mothers is examined. The overall adjusted model R^2 is 0.45, indicating a moderate relationship between the two variables. However, as seen in Figure 3.7, local R^2 values are similar to the values found for percentage of teachers with Master's degrees. Local R^2 values range from 0.00 to 0.45, with the strongest relationships existing in the northern suburbs. Figure 3.7a shows that beta coefficients for the St. Louis Public School District as well as several northern suburban districts are significant. On average, these districts have lower percentages of married mothers and lower percentages of students who speak another language.

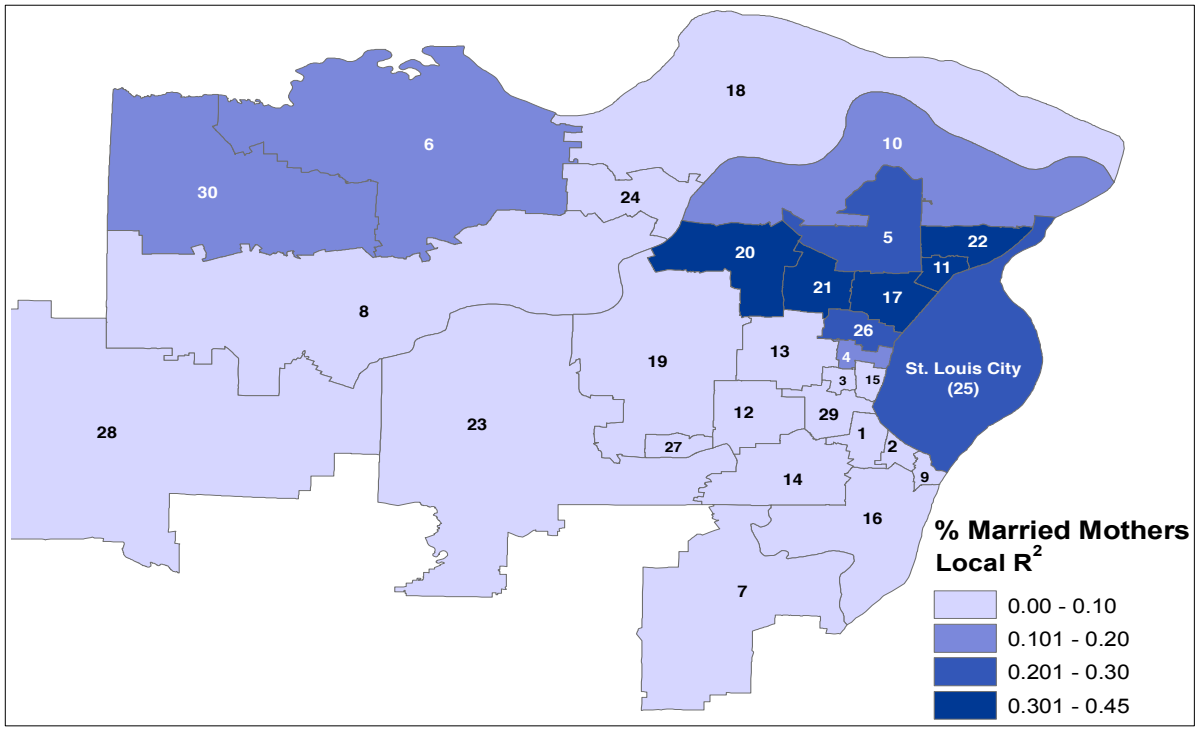

Figure 3.7 Local R^2 values for Percentage Speakers of Another Language and Percentage of Married Mothers.

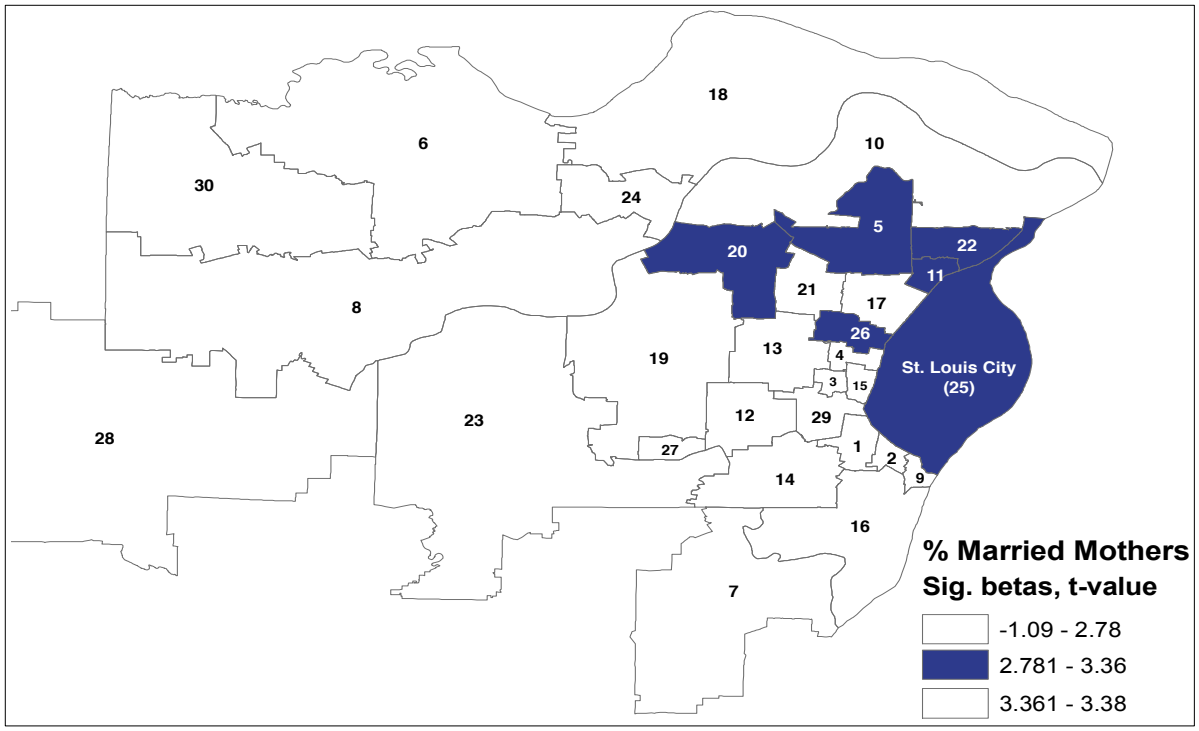

Figure 3.7a Statistically significant beta coefficients (darker area) for Percentage Speakers of Another Language and Percentage of Married Mothers.

Results for language subgroups

Overall, the GWR results for speakers of Indo-European languages are very similar to the overall group of speakers of another language. Similar to the results for Speakers of Another Language, GWR results for Speakers of Indo-European languages were also significant for percentage of black students, median household income, percentage of students proficient and advanced in Language Arts, percentage of teachers with Master's degrees, and percentage of married mothers. Appendix B provides the maps illustrating this pattern. Despite this pattern, as seen in Table 3.7, GWR results for speakers of Indo-European languages had one new variable that was significantly different from the OLS model. The relationship between Gini Coefficient and Indo-European languages produced a significant model.

Table 3.7 Overall R^2 Results for Speakers of Indo-European Languages

	OLS			GWR			
	R^2	Adj. R^2	AIC	R^2	Adj. R^2	AIC	Neighbors
% Black	0.07	0.04	298.65	0.80	0.70	274.03*	15
Segregation	0.09	0.06	-176.68	0.41	0.25	-179.12	21
Gini Coefficient	0.09	0.05	-90.15	0.75	0.57	-98.36*	13
Median Household Income	0.00	-0.04	687.87	0.71	0.55	673.16*	15
% Proficient & Advanced	0.01	-0.03	260.80	0.85	0.74	235.61*	13
% Masters	0.00	-0.03	233.03	0.41	0.25	226.86*	21
Violent Act Incident Rate	0.02	-0.01	36.59	0.05	-0.05	38.54	30
% Less Than 'Very Well'	0.46	0.44	99.88	0.47	0.42	102.03	30
% Married Mothers	0.04	0.00	270.00	0.75	0.61	251.75*	15

Note. * indicates that the difference in AIC values is significant.

Figure 3.8 shows that this relationship varies across the St. Louis metropolitan region, but is strongest in the districts south of the city and a few of the far northwestern districts. The overall adjusted R^2 value is 0.75, indicating a strong relationship between percentage of speakers of another language and district Gini Coefficient. However, local values only range from 0.02 to 0.58. Figure 3.8a shows the where the local R^2 values are statistically significant. Only districts south of St. Louis, where the highest concentration of speakers of Indo-European languages are located, possess significant beta coefficients.

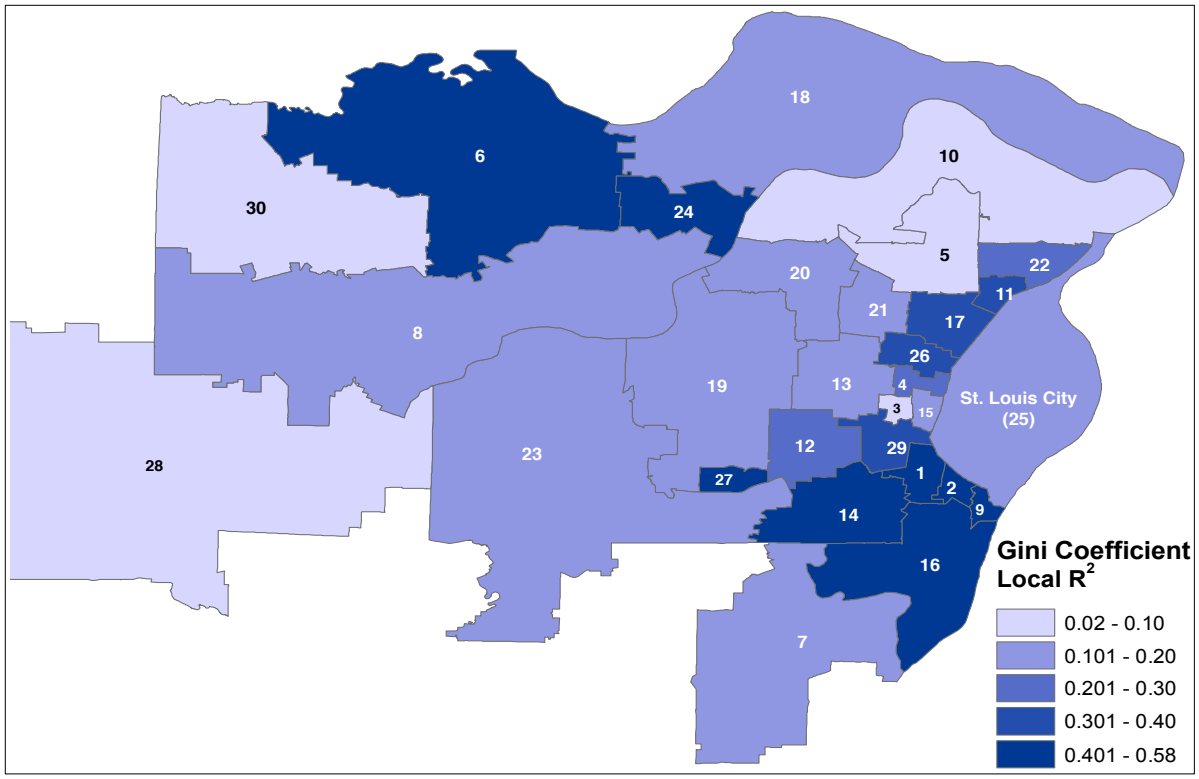

Figure 3.8 Local R^2 values for Percentage Speakers of Indo-European Languages and Gini Coefficient.

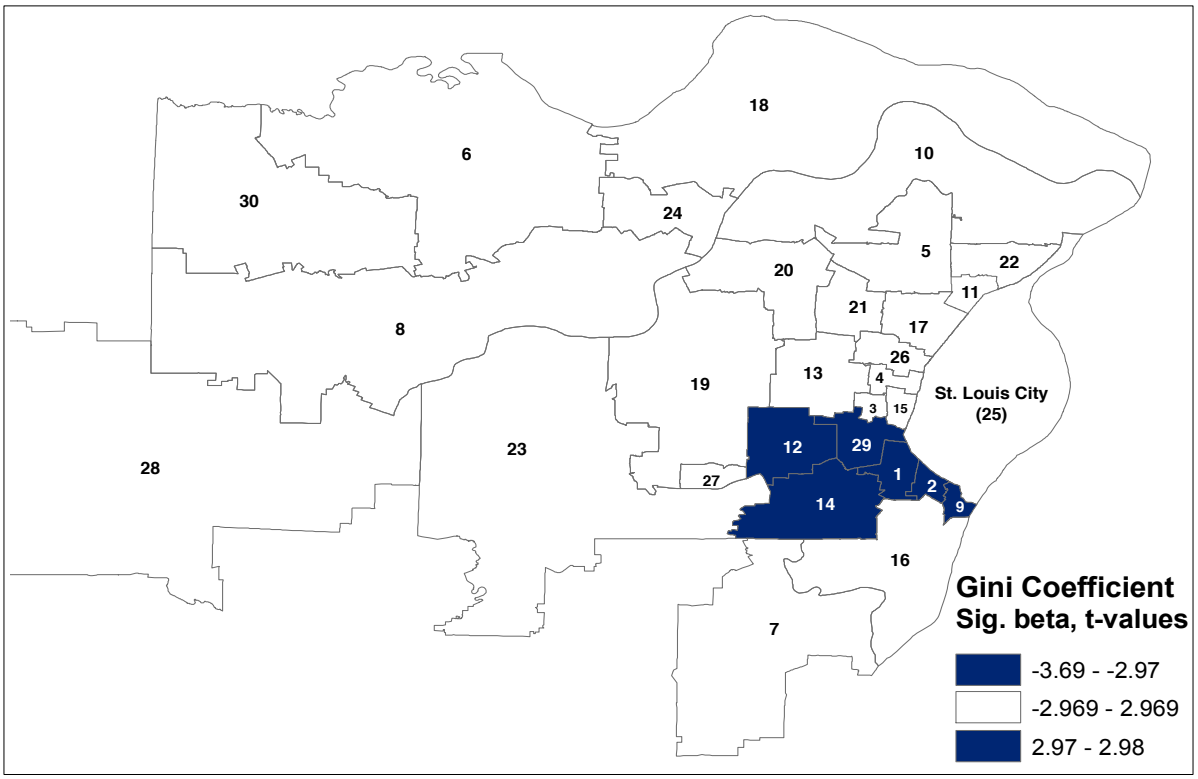

Figure 3.8a Statistically significant t-values of the beta coefficients (darker area) for Percentage Speakers of Indo-European Languages and Gini Coefficients.

Last, Table 3.8 describes results from the model comparison for Speakers of Asian/Pacific Islander Languages. Again, the model comparison results mirror the results for the overall group of speakers of languages other than English. GWR results for percentage of black students, median household income, percentage of students proficient and advanced in Language Arts, percentage of teachers with Master's degrees, and percentage of married mothers indicate higher R^2 values and lower AIC values. Since the maps for these variables closely resemble the maps for the overall group of Speakers of Another Language, all of the maps for Asian/Pacific Islander languages can be found in Appendix B.

Table 3.8 Overall R^2 Results for Speakers of Asian/Pacific Islander Languages

	OLS			GWR			
	R^2	Adj. R^2	AICc	R^2	Adj. R^2	AICc	Neighbors
% Black	0.14	0.11	296.43	0.83	0.74	270.97*	15
Segregation	0.10	0.07	-176.98	0.19	0.10	-176.94	30
Gini Coefficient	0.09	0.06	-90.41	0.68	0.45	-91.20	13
Median Household Income	0.14	0.11	683.39	0.65	0.50	673.25*	16
% Proficient & Advanced	0.18	0.15	254.98	0.84	0.73	232.79*	12
% Masters	0.12	0.09	228.25	0.54	0.39	221.36*	19
Violent Act Incident Rate	0.05	0.02	35.77	0.07	-0.03	38.22	30
% Less Than 'Very Well'	0.33	0.31	106.23	0.35	0.28	108.53	30
% Married Mothers	0.09	0.05	268.42	0.69	0.56	253.03*	16

Note. * indicates that the difference in AIC values is significant.

3.7 Conclusions and Implications

Although certain groups of ELs might not immigrate in large numbers, their tendency to cluster within particular districts may have a greater impact on the communities around them. ELs in new destinations and smaller suburban districts can significantly change the needs and the structure of the district they settle within. This analysis shows that students from Asian/Pacific Islander language and Indo-European language backgrounds cluster in specific areas of the St. Louis metropolitan region. Some of these districts, particularly south of the city, are quite small. Therefore, students speaking another language comprise over 40% of their population. Given that the influx of students speaking other languages is relatively recent (Bayless School District, 2014), these districts have greater need for language resources that are not necessary in the broader metropolitan region. Further, while the location of Spanish speaking students is not statistically significant in this analysis at the metropolitan level, a local suburban school district has created a special International Welcome Center designed to offer intensive English and social support as a result of rapidly changing student demographics (Taketa, 2017). Such intensive support may enable incoming EL students to thrive in their new environment. While the EL population throughout the St. Louis metropolitan region is not overwhelmingly large, the ways in which they are concentrated clearly has an impact on their local school district.

It is important to note that districts with less than 20 EL students are not required to offer a full-time English for Speakers of Other Languages (ESOL) teacher (Vandeven, 2015). Given the changing demographics of both the country and the St. Louis metropolitan region, not only is this exception a disservice to students, but it also may be a violation of student civil rights. According to the second part of the *Castañeda v. Pickard* (1981) ruling, schools are responsible for providing the personnel necessary to successfully implement English language development.

Failing to provide a certified ESOL teacher can have serious implications for a student's language development. Similarly, in districts with less than 30 ELs, demographic and achievement information on these students is suppressed to maintain confidentiality. This may make it very difficult for scholars, as well as the wider community, to understand how ELs are acclimating to their new districts. As EL populations continue to grow, districts will want to consider gathering more information on these students, as it may enable them to better serve their growing EL population.

This study found it is necessary to account for the spatial clustering of EL groups and measures of opportunity structure. The results from the Moran's I analysis and the comparison of the OLS and GWR models demonstrate that it is necessary to do so. Not only do particular language groups cluster in specific districts within the metropolitan area, but GWR models also produced higher R^2 values for many of the opportunity structure variables than the OLS models. By allowing the relationships between variables to vary across geographic location, the importance of local context for EL settlement becomes clear.

Although this paper does not directly investigate race, the results of this analysis highlight its importance, particularly for ELs in St. Louis. The St. Louis metropolitan region has a lengthy history of both ethnic clustering and segregation. St. Louis' history of ethnic enclaves and migration patterns have left an indelible impact on the region. When coupled with the region's legacy of segregation, the implications of current EL settlement become clear. Chetty et al. (2014) argue that there are fewer opportunities for upward mobility in areas with higher percentage of black residents, more segregation, higher income inequalities, lower quality schooling, lower levels of social capital, and less stable family structures. The current analysis shows that ELs in the St. Louis metropolitan region have limited presence in these districts.

Specifically, ELs in St. Louis are not located in districts with higher black percentages of black students, lower median household incomes, lower percentages of students achieving proficient/advanced levels on the Language Arts portion of the MAP, lower percentages of teachers with Master's degrees, and percentages of married mothers.

Students from Indo-European and Asian/Pacific Islander language backgrounds followed the overall EL group trends. As Waters et al. (2010) noted, instead of ELs showing highly selective acculturation and upward mobility, particular groups may able to wield their capital in ways that allow them to concentrate in better school systems from the start. Given that ELs in the St. Louis metropolitan areas are significantly avoiding areas with less potential for upward mobility, this explanation seems plausible. Additionally, it is important to recognize that the vast majority of ELs in the St. Louis metropolitan region hail from Asian or European language families. This analysis shows that European language background ELs are continuing the traditions started by previous European immigrants and settling in ways that enable them to cultivate dominant cultural, social, and economic capital. It also appears from this analysis that Asian ELs in St. Louis follow a similar pattern. Given that most Asian immigrants are hyperselective[4], it would make sense that they would likely settle in wealthier areas (Lee & Zhou, 2015). Furthermore, research has shown better outcomes for EL students in new destinations (Spees et al., 2016). The ELs in St. Louis are reflecting this trend. Similarly, research from Lee & Bean (2010) suggest that the color line for immigrants may be shifting. Specifically, they argue that a Black/non-Black color line may be emerging in American society with the addition of immigrants from a variety of ethnic backgrounds. However, it is unclear from the current analysis if ELs are deliberately avoiding/selecting into particular districts or settling in locations close to job

[4] Hyperselectivity (Lee & Zhou, 2015) in immigrants indicates that they are both better educated and more likely to be selected for immigration than the average citizen in the sending nation.

opportunities that they already have the dominant cultural and social capital for. As the biotech corridor of St. Louis grows, it will be important to examine the continued settlement of ELs within the region and explore the implications of a potentially intensifying Black/non-Black color line in the region (Lee & Bean, 2010; Wells & Crain, 1997).

As this analysis demonstrates, the highest percentages of ELs can be found in suburban school districts, mostly south and west of the city. Continued analysis of broader metropolitan regions is also important because while segmented assimilation scholars note that immigrant settlement is generally an "urban phenomenon" (Portes & Rumbaut, 2014, p. 100), this is clearly changing, and is evident in metropolitan St. Louis. These districts often have higher percentages of students achieving proficient and advanced on the MAP, as well as higher percentages of teachers with Master's degrees. However, it is important to understand that simply because ELs are avoiding particular urban districts, it does not guarantee that they are receiving instruction targeted to them. While Asian and European ELs in St. Louis are not located in districts with less opportunity for upward mobility, Spees et al. (2016) found that overall, students in new destinations had lower access to EL services. Such services are important, as services have a positive relationship with academic achievement. Additionally, teachers of ELs will need to know how to impart domain-specific knowledge, while properly scaffolding language instruction to be compliant with Common Core State Standards (Santos, Darling-Hammond, & Cheuk, 2012). The current analysis did not examine the language resources or specific curriculum offered to EL students within each district. Future research on the region could benefit from examining EL instruction in conjunction with other resources.

Last, it is important to note that certain forms of capital are more dominant and expected in particular communities and their associated school districts. Some ELs may bring these with

them, while others may not. Asian EL students are typically lauded for their superior intellect and dedication to education, which contributes to the "model minority" myth (Lee & Zhou, 2015; Tuan, 1999). In turn, an immigrant's linguistic and cultural capital might be received better based on the social and cultural package they bring with. It bears noting that both Asian and European ELs in St. Louis are likely to have encountered positive contexts of reception due to their race and skills they brought with them. Many of the European ELs were refugees and offered governmental assistance during initial settlement. Asian ELs were likely drawn to St. Louis through the growing biotech labor market. It is likely that positive reception of both groups has aided in their ability to access better opportunity structures. However, while this analysis demonstrates that Asian and European ELs in the St. Louis metropolitan area are settling into particular districts, and avoiding others, it does not directly measure how well they have been accepted by the English-speaking, native-born majority within their districts. Microaggressions within classrooms and the broader school community may still be occurring and may need to be addressed.

Overall, this analysis demonstrates the importance of examining local context of settlement for ELs in conjunction with the opportunity structure available to them in their local school district. Further, this analysis indicates that a statewide language policy may not be the best method for addressing the complex needs of ELs in the St. Louis metropolitan region. Specifically, this article accentuates the necessity of awareness to local variation, even within a metropolitan area. The educational needs and agency of ELs vary from district to district. This is evidenced by the local district that created its own welcome school for its Spanish-speaking ELs despite that group not having a significant percentage of ELs across the metropolitan area. States need continue to give Local Education Agencies (LEAs) the power to create their own curriculum, particularly

when concentrations of EL students occur. Additionally, state policy makers need to make funding for EL students more flexible. Doing so may allow district leaders to put in place better resources for teachers and parents of ELs. Lastly, the state of Missouri should reexamine its ESOL teacher policy. If the policy of exempting districts from hiring a full-time ESOL teacher for fewer than 20 EL students remains in place, it will disproportionately affect smaller districts. Regardless, more training for classroom teachers will be necessary in order to best meet the diverse needs of this quickly growing segment of the student population.

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3.9 Appendix A

3.9.1 St. Louis metropolitan school districts

1. Affton
2. Bayless
3. Brentwood
4. Clayton
5. Ferguson-Florissant
6. Fort Zumwalt
7. Fox
8. Francis Howell
9. Hancock Place
10. Hazelwood
11. Jennings
12. Kirkwood
13. Ladue
14. Lindbergh
15. Maplewood-Richmond Heights
16. Mehlville
17. Normandy
18. Orchard Farm
19. Parkway
20. Pattonville
21. Ritenour
22. Riverview Gardens
23. Rockwood
24. St. Charles
25. St. Louis City
26. University City
27. Valley Park
28. Washington
29. Webster Groves
30. Wentzville

3.9.2 Study Replication Information

The table below includes all of the variables included in the article, the table name from which the data was originally obtained, the original name of the variables, and a link to download the original data used in this article. The complete dataset created for this study is available for download at: lmschultz.com.

Table 3.9 Variable names and direct links to data sources

Variable Name in Article	Table Name	Variable Name in Table	Link to Data Download
Language other than English Spanish Indo-European Asian/Pacific Islander Other Languages	Language Spoken at Home by Ability to Speak English for the Population 5 Years and Over	Language other than English; Spanish; Other-Indo-European languages; Asian and Pacific Islander languages; and Other languages	https://nces.ed.gov/programsedge/tables.aspx?ds=acsProfile&y=2015
Percentage of black students	District Report Card (K-12 Enrollment)	Black	https://mcds.dese.mo.gov/guidedinquiry/
Segregation (Theil Index)	Computed by author from District Report Card (K-12 Enrollment)	Asian, Black, Hispanic, Indian, White	lmschultz.com; http://mcds.dese.mo.gov/Pages/default.aspx
Median Household Income	Median Household Income in the Past 12 Months (in 2013 Inflation-Adjusted Dollars); B19013	Students Eligible for Free or Reduced Price Lunch	http://factfinder2.census.gov
Gini coefficient	Gini Index of Income Inequality (School Districts, Missouri)	Gini Index	http://factfinder2.census.gov

Grade 3 district literacy attainment	Achievement Level Report	Third Grade	https://mcds.dese.mo.gov/guidedinquiry/
Percentage of teachers with Masters degrees	District Report Card	Professional Staff with Advanced Degrees	https://mcds.dese.mo.gov/guidedinquiry/
Speak English less than "very well"	Language Spoken at Home by Ability to Speak English for the Population 5 Years and Over	Speak English less than "very well"	https://nces.ed.gov/programsedge/tables.aspx?ds=acsProfile&y=2015
Percentage of married mothers	Household Type for Children Under 18 Years in Households (Excluding Householders, Spouses, and Unmarried Partners)	In-couple married families	http://factfinder2.census.gov

3.10 Appendix B

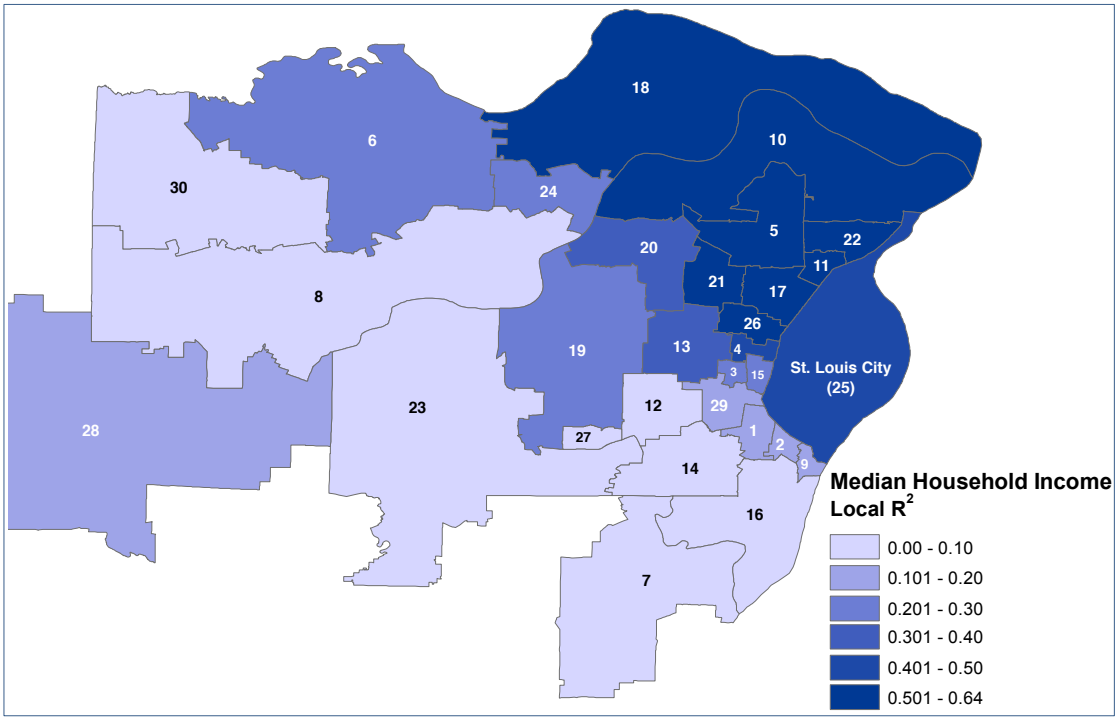

Figure 3.9 Local R^2 values for Percentage Speakers of Another Language and Median Household Income.

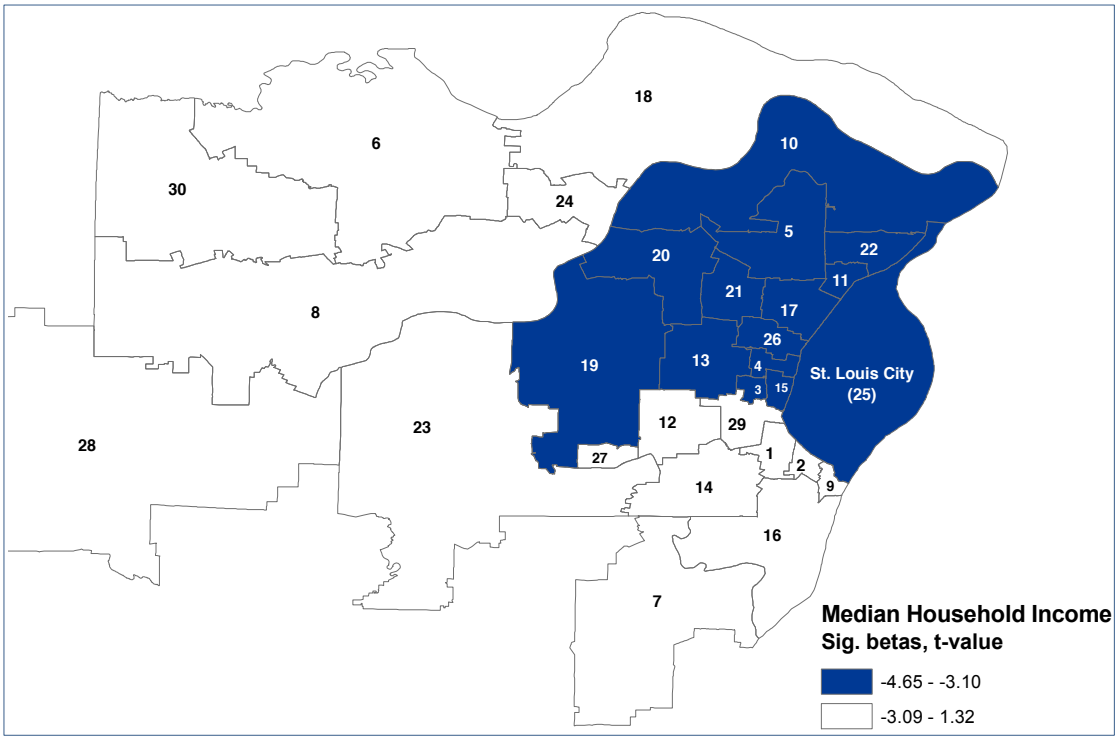

Figure 3.9 Statistically significant beta coefficients (darker area) for Percentage Speakers of Another Language and Median Household Income.

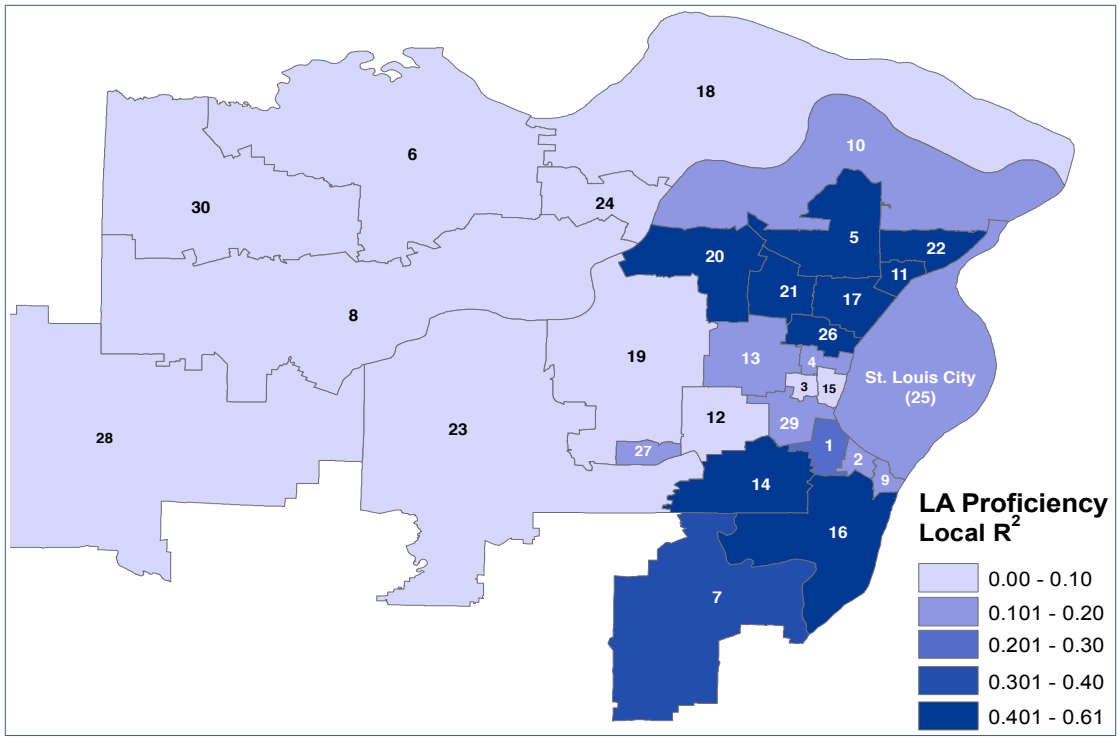

Figure 3.10 Local R^2 values for Percentage Speakers of Another Language and Percentage of Students Proficient & Advanced in Language Arts.

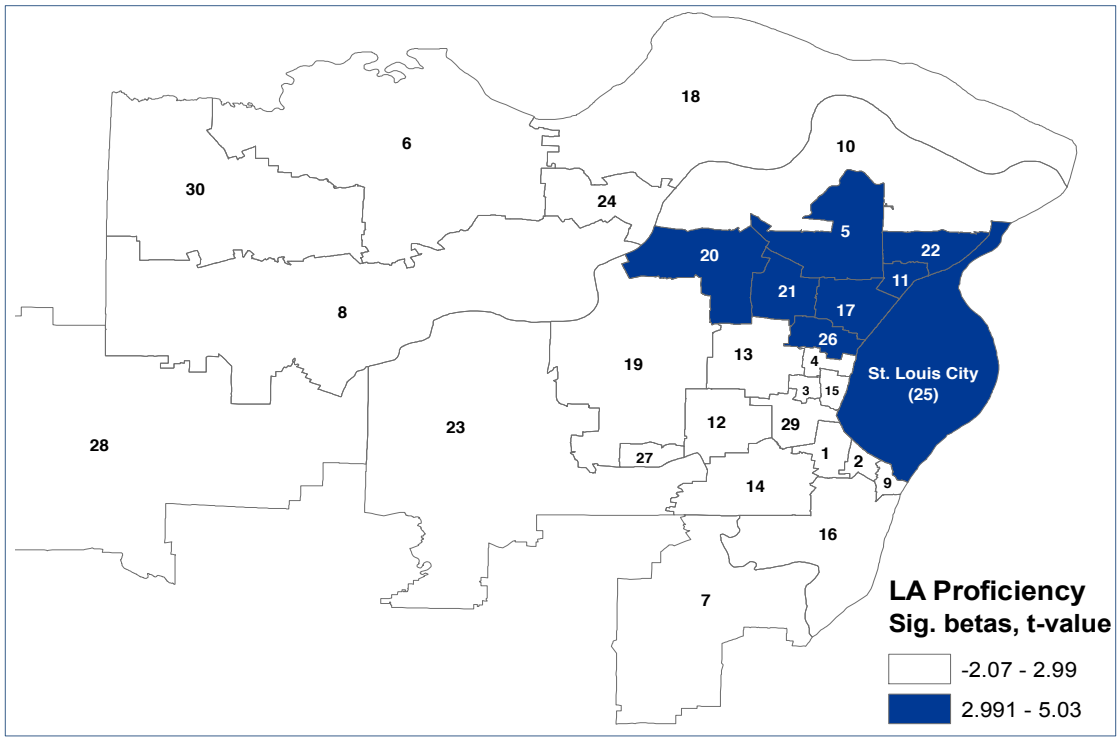

Figure 3.10a Statistically significant beta coefficients (darker area) for Percentage Speakers of Another Language and Percentage of Students Proficient & Advanced in Language Arts.

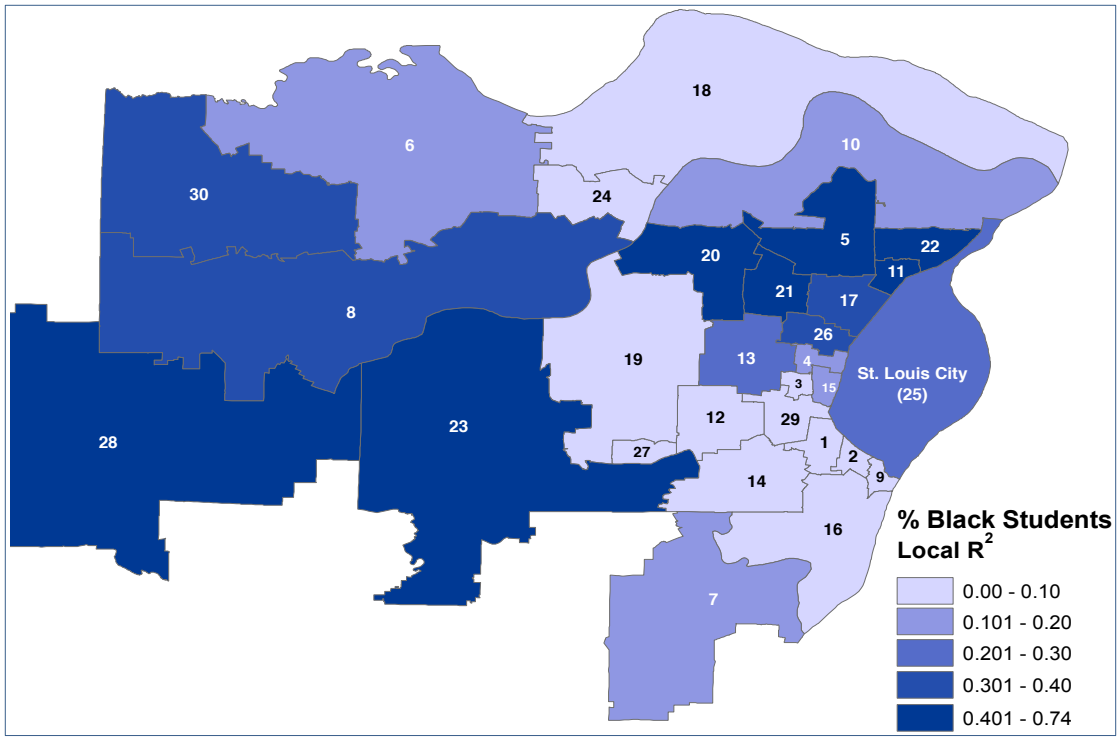

Figure 3.11 Local R^2 values for Percentage Speakers of Indo-European Languages and Percentage of Black Students.

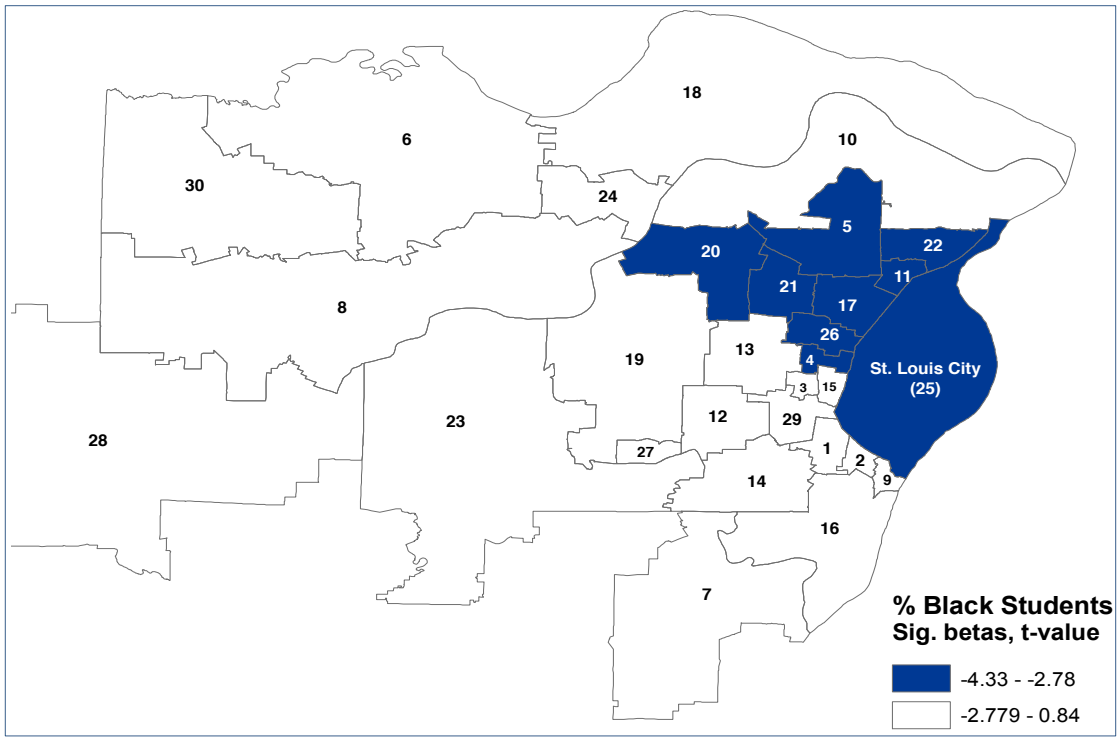

Figure 3.11a Statistically significant beta coefficients (darker area) for Percentage Speakers of Indo-European Languages and Percentage of Black Students.

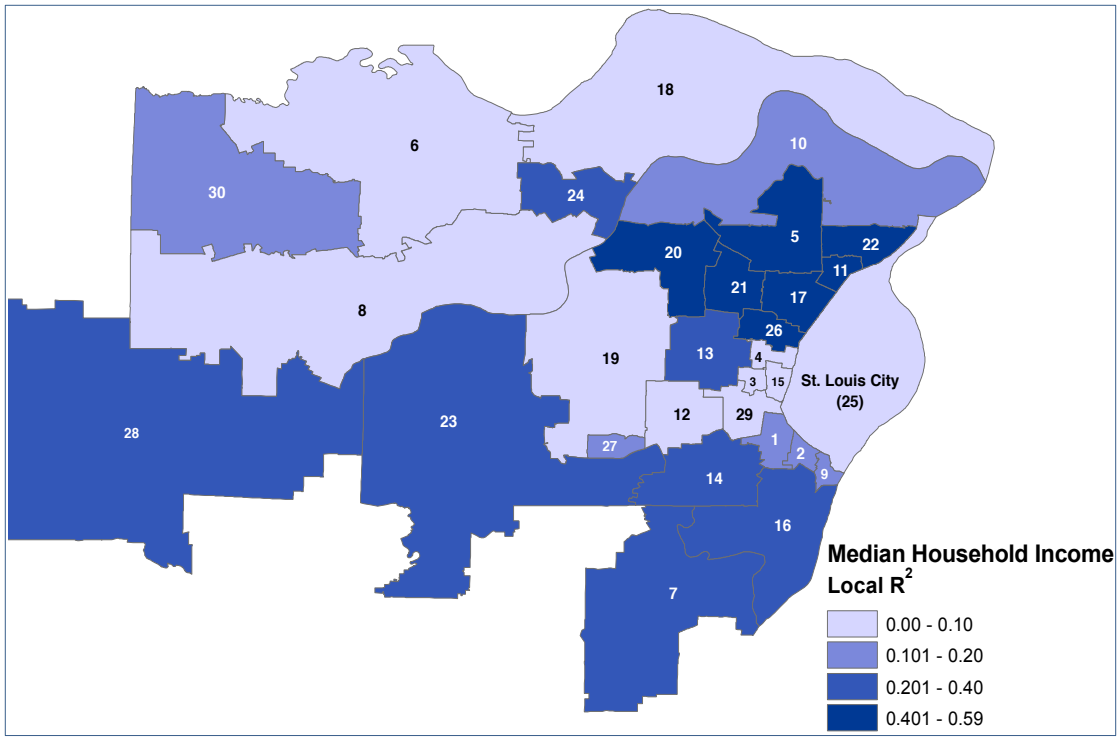

Figure 3.12 Local R^2 values for Percentage Speakers of Indo-European Languages and Median Household Incomes.

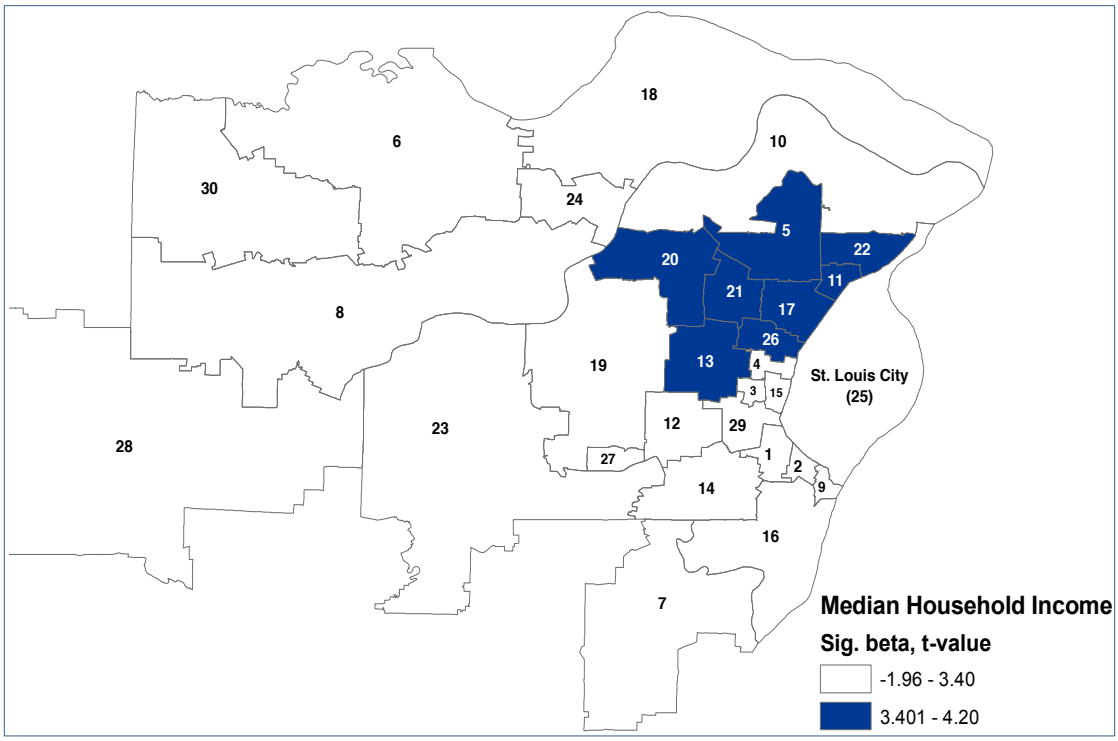

Figure 3.12a Statistically significant beta coefficients (darker area) for Percentage Speakers of Indo-European Languages and Median Household.

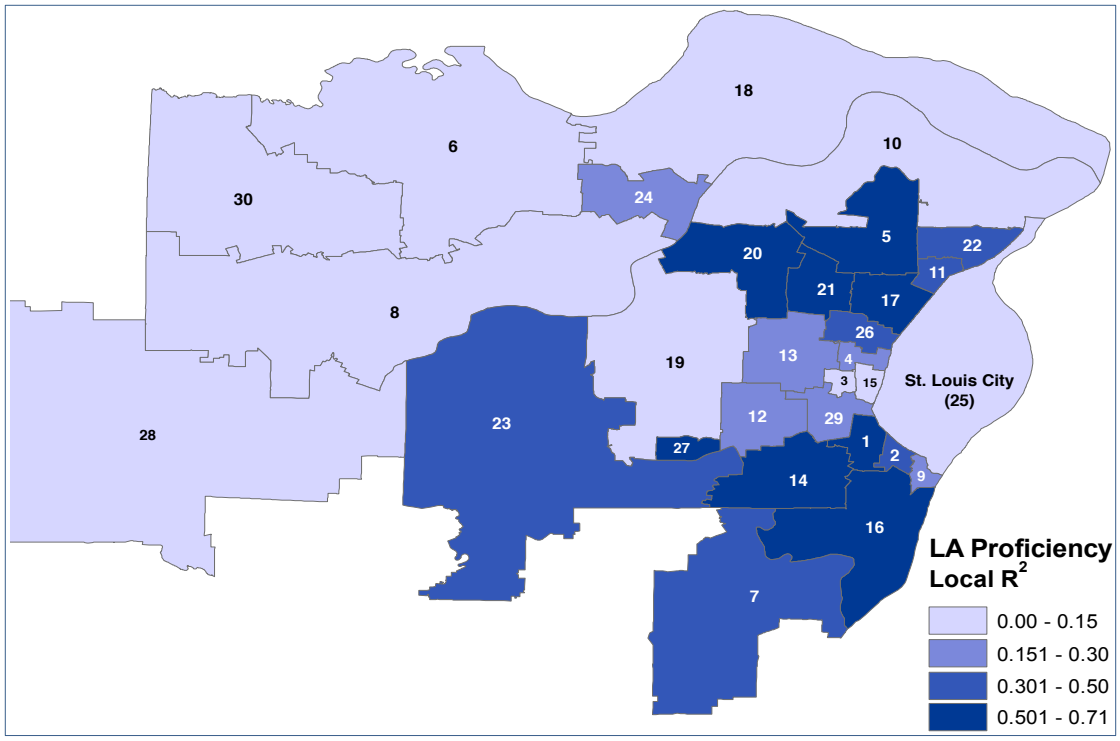

Figure 3.13 GWR showing local R^2 values for Percentage Speakers of Indo-European Languages and Percentage of Students Proficient or Advanced in Language Arts.

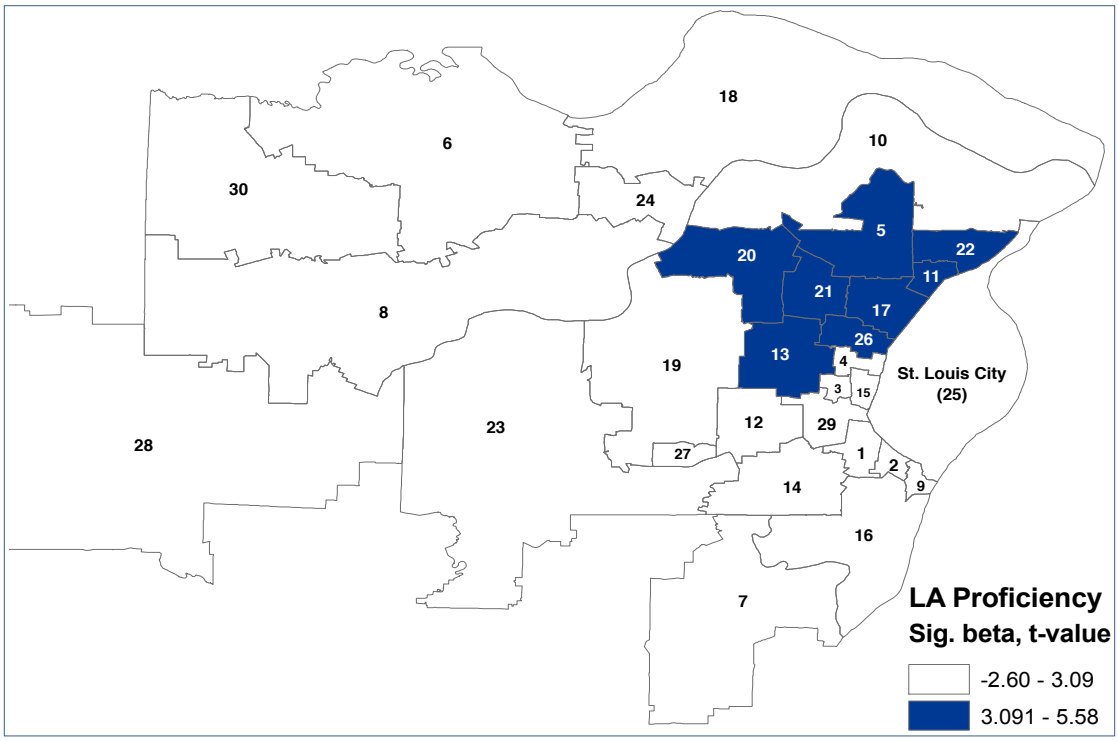

Figure 3.13a Statistically significant beta coefficients (darker area) for Percentage Speakers of Indo-European Languages and Percentage of Students Proficient or Advanced in Language Arts.

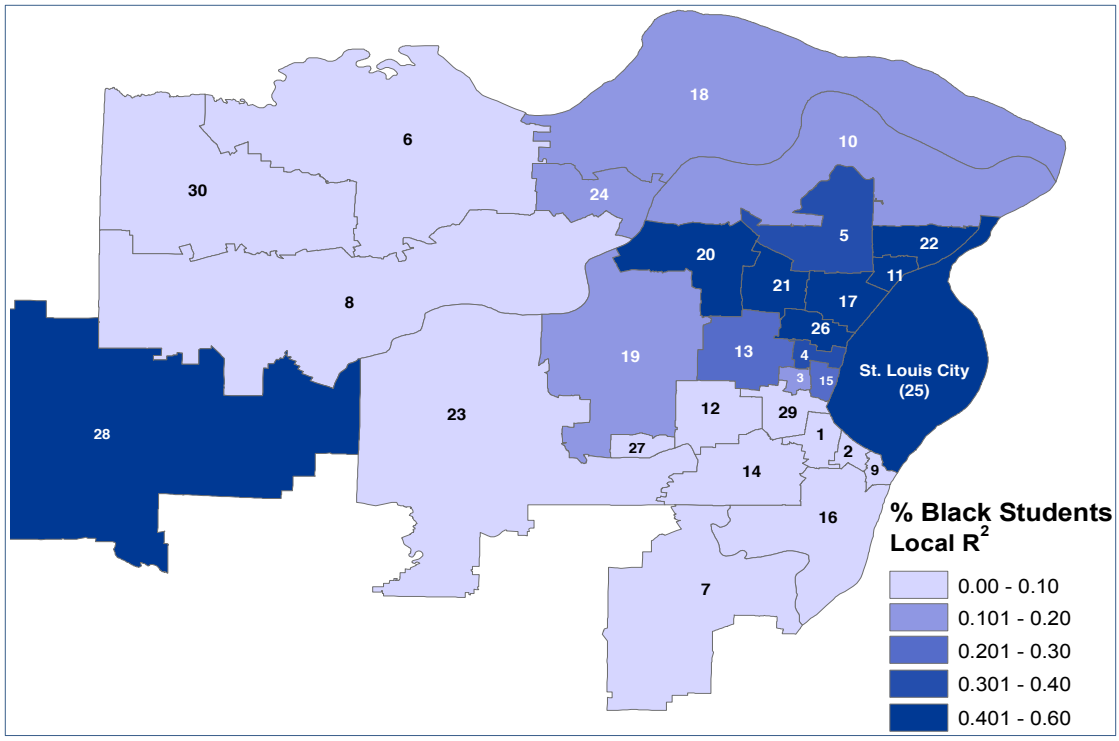

Figure 3.14 Local R^2 values for Percentage Speakers of Asian/Pacific Islander Languages and Percentage of Black Students.

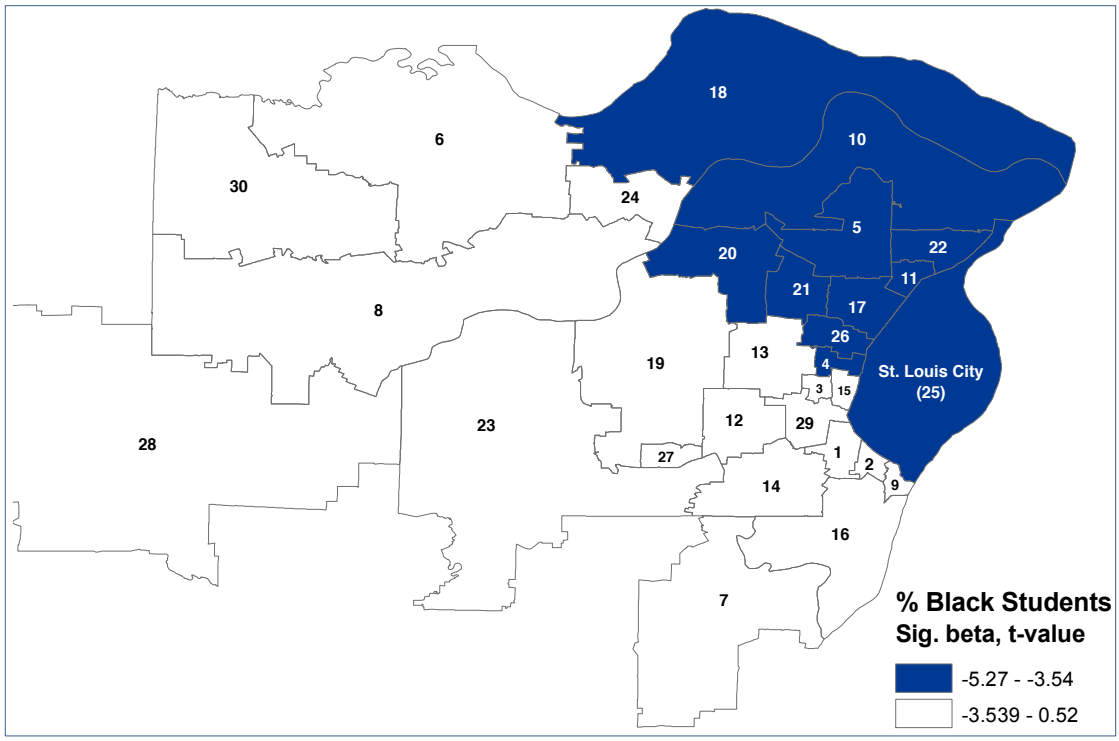

Figure 3.14a Statistically significant beta coefficients (darker area) for Percentage Speakers of Asian/Pacific Islander Languages and Percentage of Black Students.

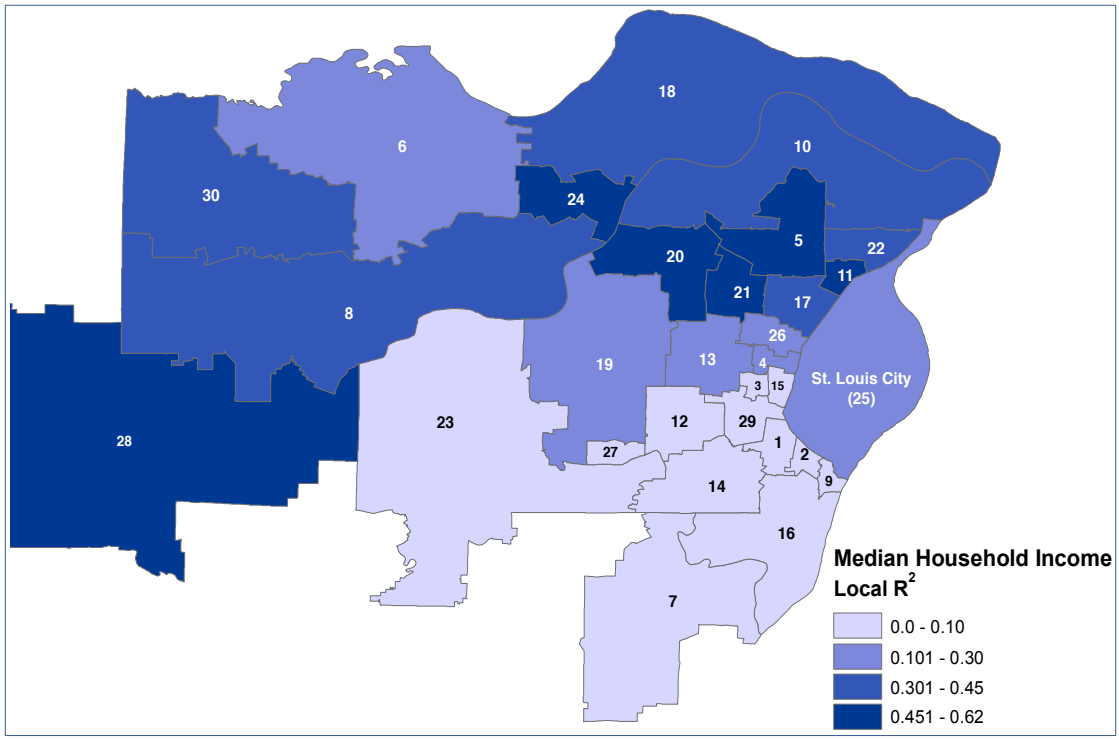

Figure 3.15 Local R^2 values for Percentage Speakers of Asian/Pacific Islander Languages and Median Household.

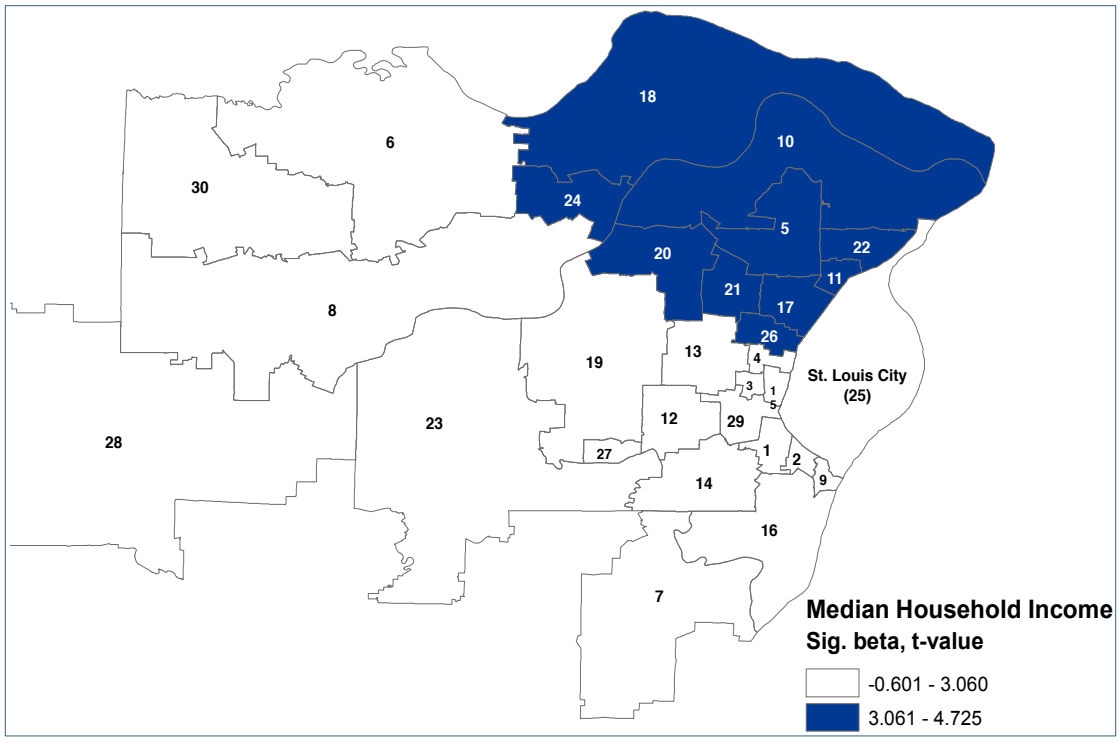

Figure 3.15a Statistically significant beta coefficients (darker area) for Percentage Speakers of Asian/Pacific Islander Languages and Median Household Income.

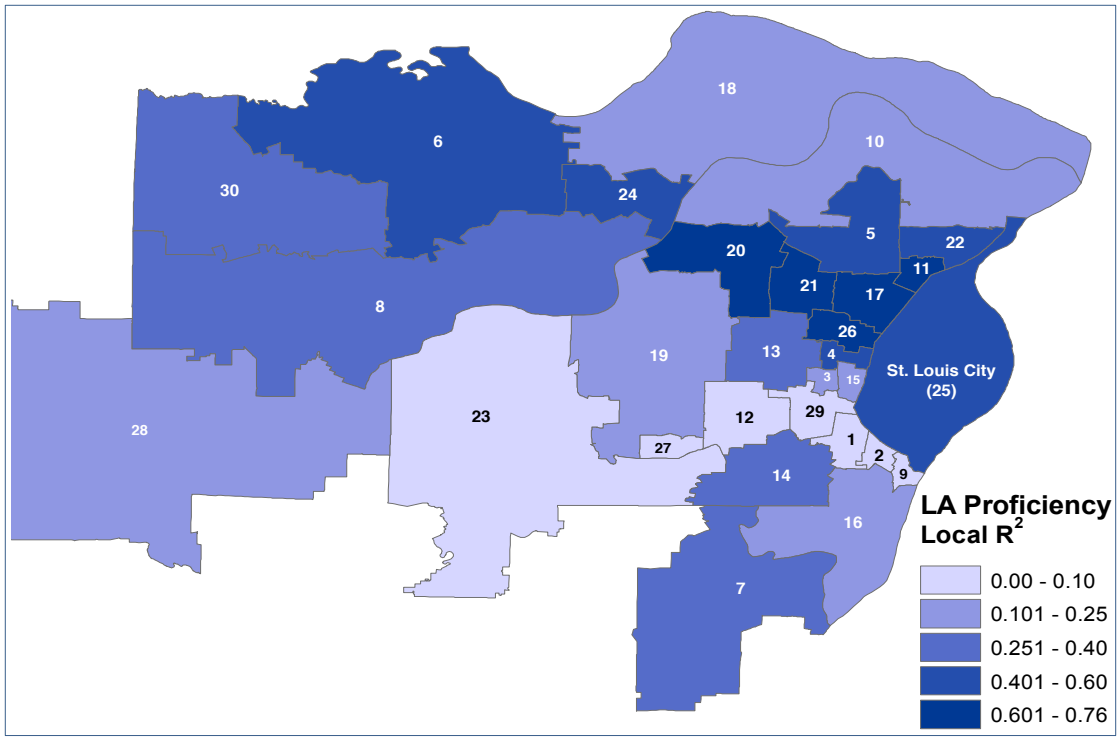

Figure 3.16 Local R^2 values for Percentage Speakers of Asian/Pacific Islander Languages and Percentage of Students Proficient or Advanced in Language Arts.

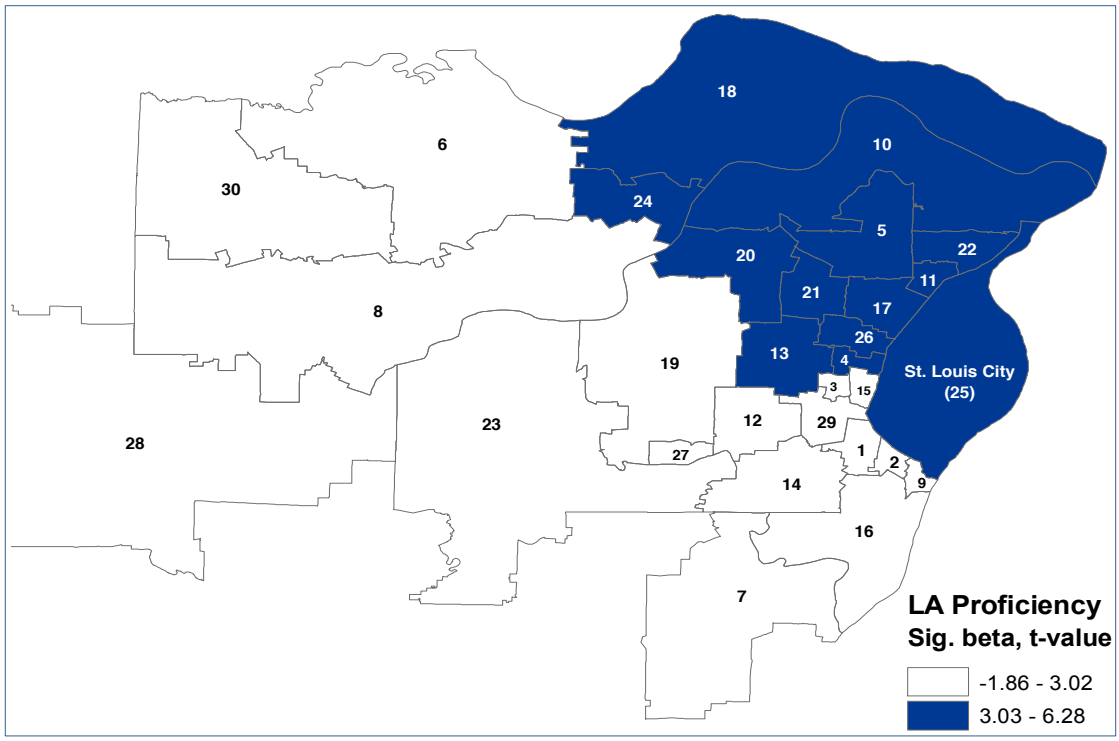

Figure 3.16a. Statistically significant beta coefficients (darker area) for Percentage Speakers of Asian/Pacific Islander Languages and Percentage of Students Proficient or Advanced in Language Arts.

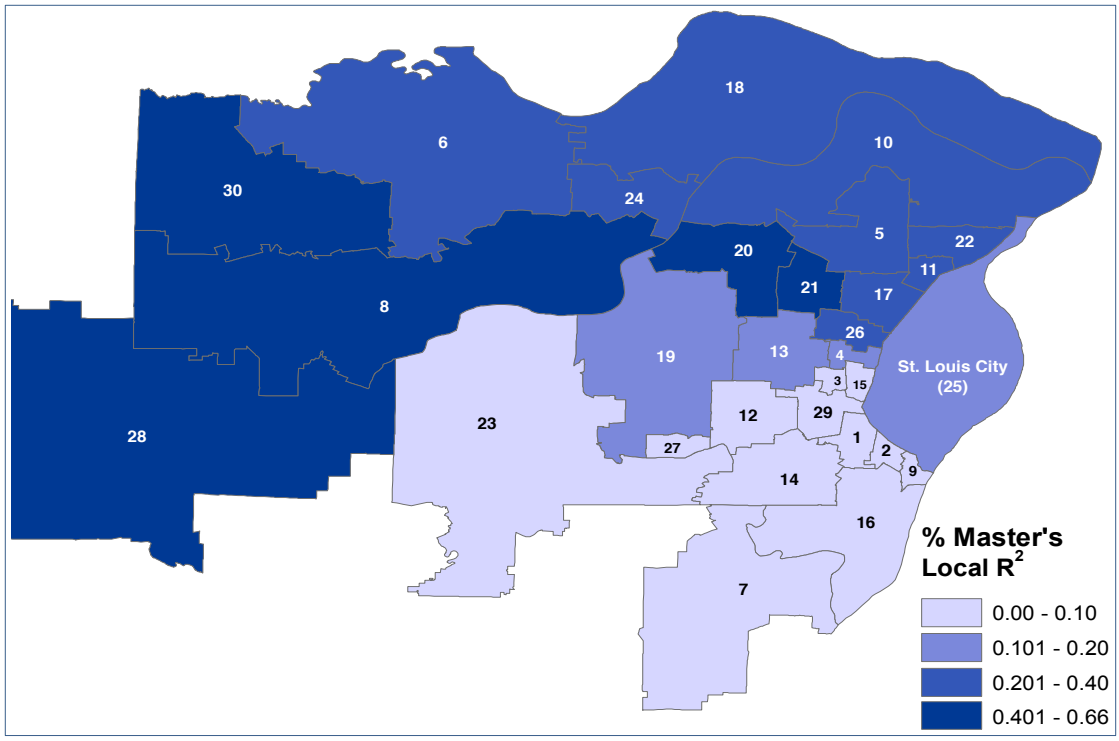

Figure 3.17. Local R^2 values for Percentage Speakers of Asian/Pacific Islander Languages and Percentage of Teachers with Master's Degrees.

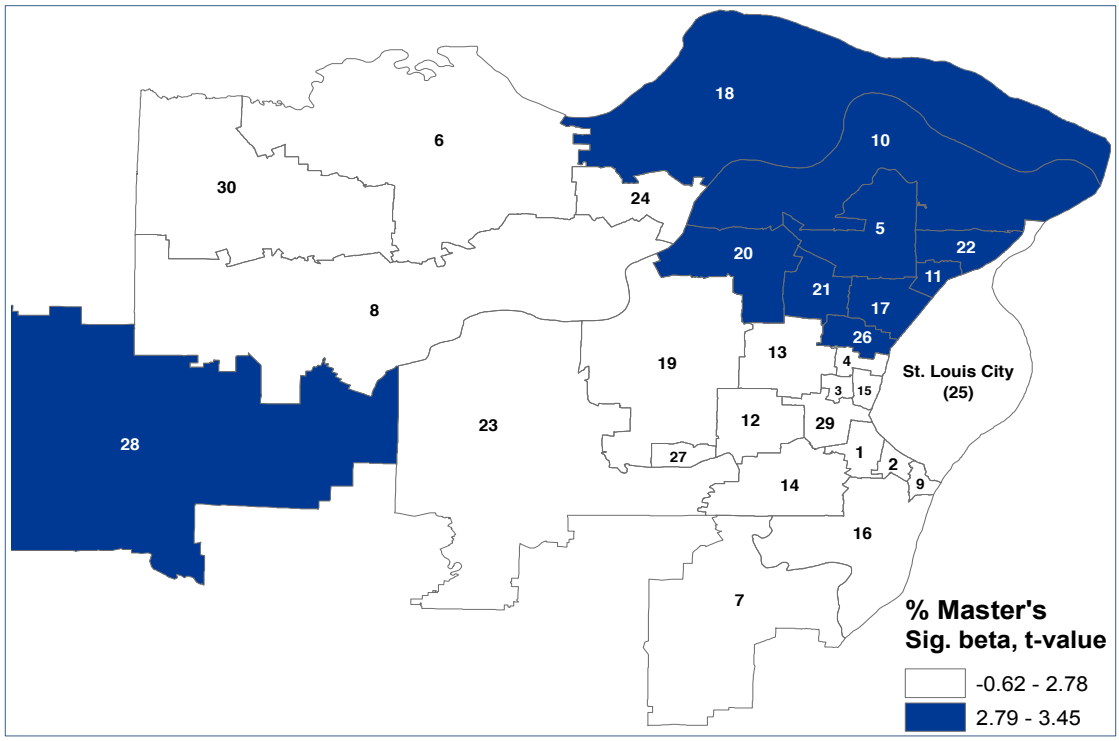

Figure 3.17a Statistically significant beta coefficients (darker area) for Percentage Speakers of Asian/Pacific Islander Languages and Percentage of Teachers with Master's Degrees.

Chapter 4: Access to Upward Mobility for Arizona Hispanic and English Learner Students: Geographic Access to STEM College Requirements

4.1 Introduction

The state of Arizona announced that one of its education goals is for 70% of their students to achieve enrollment in education past high school and for 60% of their students to obtain a higher education degree (Arizona Governor Doug Ducey, Office of Education, 2017). In his efforts to ensure students' adequate progression towards higher education, Doug Ducey, the Governor of Arizona, released the Arizona Education Progress Meter. One of the strategies he announced called for a better alignment of education outcomes to workforce needs. Many rural school districts participate in the Arizona STEM network, led by the Science Foundation of Arizona in order to prepare more students in rural districts for careers in Science, Technology, Engineering, and Mathematics (STEM) (Science Foundation of Arizona, 2018). However, Arizona, like many new immigrant destination states (Massey, 2008) has dealt with an influx of students over the last 20 years who do not speak English. Currently, about 6.5% of the student population participates in English Language Learner (ELL) programs (National Center for Education Statistics, 2017). Many of these English Learners (ELs) are clustered within certain districts throughout the state, while other districts have no ELs at all. Furthermore, Arizona's unique compilation of ELs creates challenges, with 25% of state land designated as Native American reservations where many of the students speak a variety of indigenous languages. Given the unequal distribution of access to quality education, particularly for ELs and children of color (Massey, 2008; Samson & Lesaux, 2015; Schultz, 2014) creates a vital need to examine how the

geographic location of ELs in Arizona may be related to the STEM education opportunities available to them.

The state requires all ELs in Arizona to participate in four hours of Structured English Immersion (SEI) instruction based on its interpretation and implementation of a law commonly referred to as Prop 203 (Mahoney, McSwan, Haladyna, & García, 2010, Proposition 203, 2000). Instead of spending time in a variety of content areas, including STEM, EL students enrolled in SEI spend four hours of their day on explicit instruction of components of the English language, such as phonology, morphology, syntax, and semantics. One study documented a re-segregation of Hispanic ELs both between and within schools in Arizona as a result of Prop 203 (Gándara & Orfield, 2010). Gándara & Orfield (2010) argued that Hispanic ELs in Arizona are now triply segregated by language ability, by ethnicity, and by SES. The segregation of Hispanic EL students may limit severely their ability to gain access to the higher-level STEM coursework. Students' lack of access to STEM coursework restricts their entry into state universities. Therefore, this article seeks to examine how place might influence the opportunities available to Hispanic and EL students to access the STEM coursework and to meet the requirements for college admission in Arizona.

4.2 A Historical Perspective of EL Education in Arizona

Given its mixture of urban, suburban, and rural school districts, Arizona presents a unique context in which to study geographic variation in access to higher STEM coursework for ELs. With nearly 25% of the state's land area designated tribal land and with the vast majority of the state's Native Americans concentrated in these spaces (Combs & Nicholas, 2012), this represents one of the unique geographic factors within Arizona. Federal law characterizes many of these students as Limited English Proficient (LEP) and schools label them as ELs because they speak

Indian English or an indigenous language at home. Language instruction in Arizona is associated with a history of language decimation and cultural assimilation, particularly for Native Americans, and more recently, Spanish speakers (Schultz, 2016; Wright, 2005).

Native Americans in Arizona have a long history of negative interactions with the federal and local government over education, dating back to the late 1800s with boarding school practices (Adams, 1995). The primary goal of the boarding school model served to inculcate Native American students with the English language in an attempt to eradicate their native practices and culture (Schultz, 2016). However, the Navajo in particular resisted the forcible removal of their children to off-reservation schools, and acts of resistance by children in schools ensued (Adams, 1995; Schultz, 2016). Given the state's history of coercive education tactics, a mistrust of American public schools remains and Native American students continue to be at increased risk of dropping out (Balter & Grossman, 2009; Combs & Nicholas, 2012; McCarty, 2009). Additionally, more recent research showed that educational policies such as No Child Left Behind (NCLB) and Prop 203, which removed and subsequently forbade support for heritage language and cultural instruction, exacerbate negative academic outcomes for Native American students in Arizona, leading to lower student achievement and higher dropout rates (Balter & Grossman, 2009; Combs & Nicholas, 2012). Last, these educational policies conflict directly with tribal sovereignty.

Native Americans have historically been targets of English only measures in Arizona. However, scholars recognized Arizona as a new immigrant destination, and have seen a dramatic increase to its EL population (Massey, 2008). Subsequently, now English Only measures focus on Hispanic EL students (Gándara & Orfield, 2010). Over 60% of the state's immigrants come from

a Latinx background (ACS, 2016). Of the immigrants from a Latinx background[1], 90% come from Mexico and identify as Hispanic. Within Arizona school districts, 88.1% of ELs identify as Hispanic, and 1.9% identify as Native American (Arizona Department of Education, 2013). Over 80% of the state's ELs speak Spanish, and nearly 3% of ELs come from approximately 20 different Native American language backgrounds (Wright, 2005). Research shows that Mexican American students suffer from a heightened risk of downward assimilation due to the negative reception they often receive in their local schools (Cortina, 2008; Portes & Rumbaut, 2014; Telles & Ortiz, 2008). Downward assimilation occurs when a group of immigrants integrate into the "native" culture and replicate some of its negative attributes. If downward assimilation happens, students remain at risk for lower academic trajectories and for dropping out instead of integrating into mainstream culture. Prop 203 exacerbates this risk further by requiring four hours of English instruction for all ELs and by creating mandated segregation through their English education policy (Gándara & Orfield, 2010).

Given the history of language instruction in Arizona, policy scholars liken Prop 203 to "political spectacle" (Wright, 2005, p. 662). Some scholars argued that school officials created Prop 203 not out of an authentic desire to improve schooling for ELs, but rather to cater to political desires to punish undocumented immigrants (Wright, 2005; Gándara, Losen, August, Uriarte, Gómez, & Hopkins, 2010). Prop 203 mandates English as the only language of instruction (Gándara, et al., 2010). The proposition requires at least one year of daily four-hour SEI blocks for all students designated as an EL. During SEI, instructors teach students components of the English language, such as phonology, morphology, syntax, and semantics. EL students must score proficient on the Arizona English Language Learner Assessment (AZELLA) in order to be released from the SEI

[1] The term "Latinx" in this paper notes the gender fluidity of people who come from Latin American heritage, including Brazilians. In this paper the term "Hispanic" refers only to people from Spanish-speaking heritage.

requirement. Gándara and colleagues (2010) found that it takes students several years to pass, or that it requires them to return in subsequent years. They express the greater concern that SEI takes time away from other content areas. It effectively bars ELs from college-level coursework and tracked away from college-bound students (Gándara & Orfield, 2010). As a result of Prop 203, Gándara and Orfield (2010) deemed it excessive segregation for Hispanic and EL students in Arizona. Furthermore, the four-hour SEI block removes EL students from their native-speaking peers.

Gándara & Orfield (2010) claim that the SEI model of English instruction proves particularly damaging to secondary students, as it creates a barrier to required coursework for high school completion and college readiness. For example, admittance to a four-year institution such as Arizona State University requires that a student take: four years of English; four years of math, with at least one advanced math class beyond Algebra II; three years of lab sciences such as Biology, Chemistry, Earth Science, Physics, etc.; two years of social sciences; and one year of fine arts. An applicant must also meet one of the following requirements: be part of the top 25% of their graduating class; have a 3.0 GPA; and/or obtain a 22 or higher on their ACT (https://students. asu.edu/freshman/requirements). Applicants can make up to two exceptions, but not for both the math and science course requirements. These standards prove unattainable for many students classified as ELs and tracked into SEI coursework, thereby diminishing their opportunities to access a four-year college.

4.3 Spatial Opportunity Structure and School Districts

Researchers recognized schools as a key component of opportunity structure (Chetty, Hendren, Kline, & Saez, 2014; Galster & Sharkey, 2017; Owens, 2017). Place-based literature recognizes that "spatially inscribed social differences" (Sampson, 2012, p. 16) exist and that the

environment that surrounds people constantly shapes them. Children spend a significant portion of their youth within schools. Galster and Sharkey (2017) theorized that spatial opportunity structure frames the capacity for individual attainment as mediated by the physical space around them. They argue further that "various dimensions of inequality are organized in space" (Galster & Sharkey, 2017, p. 2). They recognized the following dimensions of inequality: economic segregation, neighborhood/residential segregation, school and school district segregation, job/economic opportunities, environmental hazards, and violence.

Scholars determined that locations of upward social and economic mobility often have high quality schooling (Chetty et al., 2014). Children and adolescents spend a significant portion of their waking hours in schools and recognizable demarcations between districts exist. Schools and school district segregation patterns are consistent with neighborhood and residential segregation patterns (Galster & Sharkey, 2017). Recent research showed that children experience heightened segregation, particularly when accounting for school district boundaries (Owens, 2017). Therefore, place matters when examining the opportunities available to children through their local education systems.

In terms of residential patterns, researchers consider school districts more important than individual schools, as research found that school district quality as a whole impacts the decisions parents of school-aged children make about where to live (Owens, 2017). Moreover, Latinx children experience increasing levels of segregation. Within Arizona, 78% of Latinx students attend schools where a majority of their classmates are students of color (Gándara & Orfield, 2010). Research indicates that job opportunities more than any other factor influence EL parental settlement decisions (Massey, 2008). However, their children face limited upward mobility given

unequal access to quality education, particularly for ELs and children of color (Massey, 2008; Samson & Lesaux, 2015; Schultz, 2014).

4.4 Literature Review

4.4.1 Students of Color, ELs, and Coursework Taking

Previous research demonstrated that place impacts significantly the opportunities for learning available to students (Hogrebe & Tate, 2012; Tate, Jones, Thorne-Wallington, & Hogrebe, 2012). School districts reflect neighborhood-level trends of racial, economic, and linguistic makeup (Galster & Sharkey, 2017). Geographic access to STEM courses is an important factor to examine, as research shows that students in urban and low SES areas have less access to STEM coursework and experience STEM teacher shortages (Hagedorn & Purnamasari, 2012). If a district is composed largely of racial and linguistic minorities, it is likely that a geographic inequity of education exists (Massey, 2008).

It is understood that racial segregation is intensifying for those from a Latinx background (Orfield & Lee, 2005; Owens, 2017; Telles & Ortiz, 2008). Students from a Latinx background are more likely to be located in lower SES areas, which tend to have lower quality schools (Orfield & Lee, 2005; Owens, 2017). Mexican Americans are particularly at risk for poor education outcomes and have shown downward assimilation in regard to education (Telles & Ortiz, 2008). Telles & Ortiz (2008) speculate that racialization contributes to negative education outcomes for Mexican American students. Specifically, schools and teachers have lower expectations of Mexican students, who then internalize these lower expectations. Further, Mexican American students face both structural and personal discrimination due to racialization, which results in them being tracked into lower coursework. Other research shows that teachers invest more instructional time and effort in non-Hispanic white and Asian students (Valencia,

2002). Also, schools within segregated neighborhoods and in areas with lower incomes offer fewer college preparatory courses than schools in predominantly White and Asian neighborhoods (Gándara & Orfield, 2010). Therefore, the likelihood exists that districts in Arizona with more Hispanic students might offer less higher-level STEM coursework.

Gaining access to college admission can be difficult for some students based on the hierarchy of coursework necessary for college admission eligibility. Students must progress through specific classes in order to meet the minimum requirements for college admission. STEM courses, particularly math and science, represent a hierarchical structure. Examining access to STEM courses is important, as the number of STEM courses taken and time spent learning in math and science content are interrelated (Tate et al., 2012). Further, the number of STEM courses taken is associated with academic attainment (Plunk, Tate, Bierut, & Grucza, 2014). Although some EL students might gain access to college preparatory coursework, typically students placed early on the "college track" are able to take all of the requirements necessary (Callahan, 2005; Callahan & Shifrer, 2016; Harklau, 1994; Kanno & Kangas, 2014). Given that extensive research shows that inequitable access to college-track coursework exists for students from racial and/or linguistic minority backgrounds within schools (Cabrera, Barkum, LaNasa, 2005; Callahan, 2005; Callahan & Shifrer, 2016; Harklau, 1994; Kanno & Kangas, 2014; Orfield & Lee, 2005; Telles & Ortiz, 2008; Wang & Goldschmidt, 1999), it is vital to examine access to STEM coursework for EL and Hispanic students in Arizona as the potential SEI effect represents a unique factor.

Researchers consider academic preparation in high school a major predictor of college access, and scholars have attempted to determine why ELs are less likely to enroll in college (Kanno & Cromley, 2015). They found that the focus of academic preparation for ELs place heavy emphasis on English language learning and not academic rigor. Consistent with this finding,

educators require Arizona's EL students to enroll in four-hour SEI blocks. No other subject matter may be taken during this time. Further, Callahan and Shifrer (2016) estimated that nearly two-thirds of high school ELs are long-term English as a Second Language (ESL) students. Additionally, consistent literature exists demonstrating the practice of tracking ELs into lower-level coursework (Callahan, 2005; Callahan & Shifrer, 2016; Harklau, 1994; Kanno & Kangas, 2014; Kanno & Cromley, 2015; Wang & Goldschmidt, 1999). The lower-level tracks form academic, social, and physical barriers within schools (Callahan, 2005). Triply segregated, these students continue to face roadblocks after being released from the SEI track, and access to higher-level coursework exists in limited cases. Callahan (2005) found anecdotal evidence that suggests teachers and administrators try to reserve upper-level courses for students in the college track. For ELs, track placement represents a stronger predictor of academic achievement and the coursework they take than English proficiency. Callahan found that less than 2% of her sample took coursework that would make them eligible for four-year college admissions. Callahan and Shifrer (2016) noted that ELs are less likely to complete college-level benchmark coursework than native English speaking and non-EL labeled students. Therefore, the possibility exists that EL students in Arizona school districts serving higher percentages of students in the SEI track may have less access to college-preparatory STEM courses.

4.4.2 Student SAT/ACT Taking

Standardized college examinations such as the SAT and ACT serve as gatekeepers to college admission. Both school and teacher expectations of students can influence the alignment of coursework offered, teacher practices, and student expectations about their future (Campbell Wilcox, Angelis, Baker, & Lawson, 2014). Schools with higher percentages of Hispanic and EL students and lower teacher expectations may have fewer students sit for standardized tests such

as the SAT or ACT. In rural districts, often only one high school exists. Therefore, what happens in the high school may reflect broader district-wide expectations of students. Further, smaller districts find it difficult "to offer rigorous, deep, and broad academic programs that meet the needs of all students" (Campbell Wilcox, et al., 2014, p. 7). This may result in district-wide lower expectations for students, but particularly for EL students as schools fail to provide the academic, and social resources EL students require to meet college entrance standards (Callahan, 2005; Callahan & Shifrer, 2016; Kanno & Kangas, 2014; Kanno & Cromley, 2015). Additionally, research found that Hispanic students in lower SES schools do not possess knowledge about accessing SAT/ACT examinations and test preparations (Deil-Amen & Tevis, 2010). Lower SAT/ACT test scores or less SAT/ACT test-taking may result. Similarly, districts experiencing segregation, concentrated poverty, or concentrated linguistic minorities may have fewer students sit for the SAT/ACT examinations. Given the increased importance of SAT/ACT test scores to the college admissions process (Posselt, Jaquette, Bielby, & Bastedo, 2012), the percentage of EL students taking the SAT/ACT in Arizona school districts warrants examination.

4.4.3 Student Dropout Rates

High school graduation represents an essential milestone for college eligibility. Research shows that students who spend more time in EL programs in Arizona are less likely to graduate (Huang, Haas, Zhu, & Tran, 2016). However, dropout rates vary by location. Students living in either rural or urban areas are at particular risk of dropping out (Campbell Wilcox, et al., 2014). Students of color and immigrant students are also at a higher risk of dropping out (Cortina, 2008; Portes & Rumbaut, 2014). District-wide expectations impact dropout rates, particularly within rural communities (Campbell Wilcox, et al., 2014). Some scholars argued that offering rigorous coursework in addition to setting high expectations for students might help lower dropout rates

(Campbell Wilcox, et al., 2014; Demi, Coleman-Jensen, & Snyder, 2010). Conversely, previous research estimates that higher STEM graduation requirements lead to higher dropout rates (Lillard & DeCicca, 2001 in Tate et al., 2014). Therefore, scholars must determine if the number of STEM courses available to students has a relationship with the percentage of students who dropped out in Arizona.

4.5 Research Questions/Purpose

Given the history surrounding the education of Native American, Hispanic, and EL students in Arizona, examining the opportunities for STEM coursework taking, SAT/ACT taking, and district dropout rates can offer insight into the possibilities of college admittance for these students. The overarching question that this study sought to answer is: how does place influence the opportunities available to Hispanic and EL students to access the coursework and college admission eligibility to a four-year university in Arizona? The following research questions guided the study:

1). Are the percentages of Hispanic and EL students within districts and the number of higher math (Advanced Math and Calculus) and lab science (Biology, Chemistry and Physics) classes offered spatially related?

2). Are the percentages of Hispanic and EL students within districts and the total percentage of the student body taking the SAT/ACT, the percentage of Hispanic students taking the SAT/ACT, and the percentage of EL students taking the SAT/ACT within districts spatially related?

3). Are the percentages of Hispanic and EL students within districts and the percentage of students who drop out within districts spatially related?

4.6 Methodology

4.6.1 Data Sources and Variables

I obtained district and course enrollment, district demographic, and district SAT/ACT-taking data from the U.S. Department of Education (2013) 2013-2014 Office of Civil Rights Data Collection (CRDC). I retrieved the percentage of students who dropped out in the 2013-2014 academic year from the Arizona Department of Education (ADE) website. I then obtained shape files for Arizona school districts from the 2013-2014 school year from the United States Census Bureau Tiger Line files for elementary, high school, and unified school districts. I did not examine charter schools in this study. Although a total of 211 public school districts in the state of Arizona existed during the 2013-2014 school year, I examined only variables for secondary schools. As a result, I included 161 school districts in this study from 48 elementary districts, 15 high school districts, and 98 unified districts. I used areal interpolation (ArcGIS 10.5) in the unified district of "No School District defined" to account for the underlying spatial continuum of students living in the geographic locations with no defined school district and missing secondary data. Thirteen of the elementary school districts included in this study educated K-12 students in one building and had secondary level data. The remaining 35 elementary districts did not serve high school students. For these 35 elementary districts, I examined each district website to determine in which local unified or high school district their students attended high school. I applied data from the corresponding unified or high school district to each of these 35 elementary districts. The number of STEM classes, the percentage of students taking the SAT/ACT, and the percentage of students who drop out from the high school districts were also used in their feeder elementary districts. In essence, each of these elementary districts were treated as a geographic extension of the high school where their students attended secondary

Table 4.1 Variables and data sources

Variable	Data Sources	Description
Percentage of Hispanic Students	CRDC, 2013	Percentage of students who identify as "Hispanic" within the district
Percentage of EL Students	CRDC, 2013	Percentage of students identified as "LEP" within the district
Higher Math Classes	CRDC, 2013	Total number of Advanced Math and Calculus class sections offered within the district
Biology Classes	CRDC, 2013	Number of Biology class sections offered within the district
Chemistry Classes	CRDC, 2013	Number of Chemistry class sections offered within the district
Physics Classes	CRDC, 2013	Number of Physics class sections offered within the district
Access to Lab Science Courses	CRDC, 2013; individual district websites	Number of different lab science courses (i.e. Biology, Chemistry, Physics, Earth Science, etc.) offered within the district
Percentage of Hispanic Students Taking the SAT/ACT	CRDC, 2013	Percentage of students who identify as "Hispanic" who took the SAT/ACT within the district
Percentage of EL Students Taking the SAT/ACT	CRDC, 2013	Percentage of students identified as LEP who took the SAT/ACT within the district
Percentage of All Students Taking SAT/ACT	CRDC, 2013	Percentage of all students within the district who took the SAT/ACT
% Students who Drop Out	ADE, 2013-2014	Percentage of all students within the district who dropped out during the 2013-2014 school year

school.

Table 4.1 provides a brief description of the variables used in this study and the corresponding data sources. Student demographic data used in the study include the percentage of students in the district who identify as "Hispanic" and the percentage of students in the district classified as "LEP" students. I referred to all students designated as LEP by their districts as ELs in this article. STEM coursework variables include all Higher Math classes, Biology, Chemistry, Physics, and access to lab courses[2]. The study defined Higher Math as math courses beyond Algebra II that are counted for college admissions to four-year Arizona state colleges.

For courses beyond Algebra II, the CRDC data collection reports the total number of Advanced Math (i.e. Trigonometry, Trigonometry/Algebra, Trigonometry/Analytic Geometry, Trigonometry/Math Analysis, Analytic Geometry, Math Analysis, Math Analysis/Analytic Geometry, Probability and Statistics, and Pre-Calculus) class sections and Calculus class sections. However, the CRDC data collection does not report the number of each course offered within districts. In this study, I combined the total number of math class sections of Advanced Math and Calculus offered within the district to create the Higher Math Classes variable.

For state colleges in Arizona, the science admissions requirement includes three lab science courses. However, the colleges do not dictate which lab courses a student must take. The CRDC data collection reports the number of Biology, Chemistry, and Physics class sections offered. I examined each of these variables individually. Conversely, districts may not offer these three specific courses and may offer other lab science courses in their place. If the CRDC data indicated fewer than three lab science courses being offered, I examined the school district website to determine if they offered at least three lab science courses in some form, whether on

[2] AP courses are not included in this analysis as the CRDC data only reports the total number of AP classes offered within the district, but does not specify which courses are offered.

campus, online, or via dual-enrollment. I coded Lab Science access as 1 – 3, where 1 represented at least one lab course was offered, 2 represented at least two lab courses were offered, and 3 represented three or more lab courses were offered. I also examined the percentage of Hispanic students taking the SAT/ACT, the percentage of EL students taking SAT/ACT, and the total percentage of the student body taking the SAT/ACT within districts. Last, the percentage of students who dropped out during the 2013-2014 school year comprised the percentage students who drop out variable. Table 4.2 provides the descriptive statistics for all variables in the results section.

4.6.2 Analysis

I expected significant variability in district enrollment since Arizona contains rural, suburban, and urban districts. School districts with higher enrollment numbers typically have the capacity to offer a higher number of courses, particularly for math (Hogrebe & Tate, 2017; Monk & Haller, 1993). In Arizona, the correlation between district enrollment and the number of math class sections offered was $r\,(159) = 0.86$, $p < 0.001$. The correlation between district enrollment and Biology classes was $r\,(159) = 0.11$, $p < 0.17$. For district enrollment and Chemistry classes the correlation was $r\,(159) = 0.85$, $p < 0.001$. The correlation between Physics classes and district enrollment was $r\,(159) = 0.82$, $p < 0.001$. Therefore, district enrollment size correlated with the number of Higher Math, Chemistry, and Physics class sections. The study accounted for Total District Enrollment within the Ordinary Least Squares (OLS) and the Geographic Weighted Regression (GWR) models as an explanatory variable.

I completed OLS analysis first, as it is a commonly used linear regression technique and is viewed to be the best linear unbiased estimate of relationships between variables (Cohen, Cohen, West, & Aiken, 2003). However, it represents the best linear unbiased estimate of relationships

between variables only when all assumptions for statistical validity can be met. If clustering of data occurs, or if data is not linear, then there exists the likelihood that the regression coefficient, standard errors, or both, may be biased. Due to its social nature, district demographic data such as enrollment size and student composition variables often violate statistical assumptions (Mitchell, 2009). Further, many Native American groups in Arizona are located geographically on reservations throughout the state. Therefore, GWR may be better at calculating accurately the relationships for the variables in this study.

GWR represents a useful method when analyzing school district factors because of the spatial nature of the boundaries. In this study, I used spatial and nonspatial data to produce maps and to visualize relationships in geographic space with ArcMap 10.5.1, geographic information system (GIS) software (ESRI, 2017). The spatial technique of GWR accounts for geographically clustered data and allows for the relationships between variables to differ by location (Fotheringham, Brunsdon, Charlton, 2002). In this study, local R^2 coefficients for the relationships between the percentage of Hispanic students, percentage of EL students, the number of Higher Math classes, the number of Biology classes, the number of Chemistry classes, the number of Physics classes, Access to Lab Science Courses, the percentage of Hispanic students taking the SAT/ACT, the percentage of EL students taking the SAT/ACT, the percentage of all students in the district taking the SAT/ACT, and the percentage of students who dropped out are represented visually in maps. When relationships vary by location, they exhibit spatial heterogeneity (Fotheringham, 2002). Instead of creating a global regression model (as in OLS), I gave the coefficients in GWR geographic weights based on their spatial location. GWR does this through a process called adaptive spatial kerning (see Figure 4.1). The model weighted data points closest to the specified location more heavily than data points farther away. The

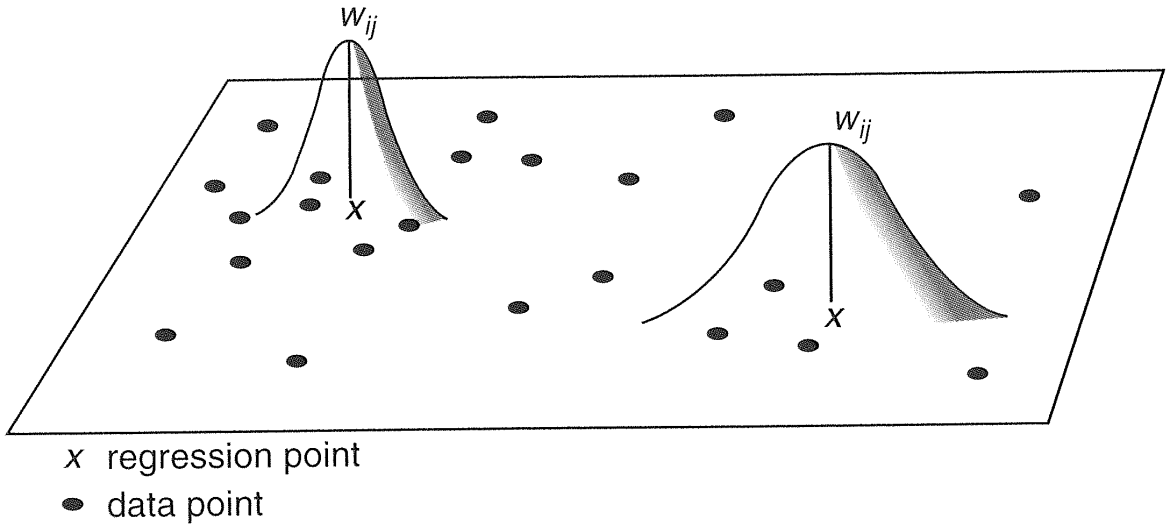

Figure 4.1 Adaptive Spatial Kerning (Fotheringham, et al., 2002)

model repeated the adaptive kerning process until it accounted for all data points within the dataset. For this study, the school district polygons act as the data points.

The geographic weights (u_i, v_i) in GWR represent the distance of each data point (school district) from the location of *i* (Fotheringham et al., 2002). The GWR models computed a local regression line for each district and the group of that district's nearest neighbors through the adaptive kerning process. Kernel size can vary dramatically by location, and thus plays an important role in determining geographic weights. For example, in areas where higher numbers of geographically smaller districts exists, the kernel size will be smaller. Adaptive kerning leads to smaller residuals, as GWR computes a local regression equation for each data point. Using the geographic weights, the regression equation becomes:

$$y_i = \beta_0 (u_i, v_i) + \beta_1 (u_i, v_i) x_{i1} + \beta_k (u_i, v_i) x_{ik} + \varepsilon$$

Last, the study examined the differences between the OLS models and the GWR to determine which model reflects a better fit. Overall R^2 values and Akaike Information Criterion (AIC)

reflect the strength of the model fit. The model with the lower AIC provides the better fit (Fotheringham, 2002). If the GWR model for the dependent variable produces a lower AIC and higher R^2, it affirms the GWR model as a better model. This study mapped R^2 values, beta coefficients, and statistically significant t-values in ArcMap 10.5.1 (ESRI, 2017) to show district variation. In order to control for the family-wise Type I (false positive) error rate of the 161 beta coefficients in this study, I used the Benjamini-Hochberg correction for multiple comparisons to determine significance levels at the 0.05 alpha-level (Thissen, Steinberg, & Kuang, 2002).

4.7 Results

Table 4.2 contains the descriptive statistics for all variables in this study. The average percentage of students who identify as Hispanic students within a district is 33.56%. However, some districts have no Hispanic students, while other districts are comprised almost entirely of Hispanic students. This geographic variability in student composition can be seen in Figure 4.2. The Quartile procedure in ArcMap 10.5.1 (ESRI, 2017) divided the percentage of Hispanic students into four interval ranges. The lighter areas regions are less than or equal to the state's average of percentage of Hispanic students in a district. The darker regions are districts that exceed the state average percentage of Hispanic students. The Northeastern quadrant of the state and Native American reservations have smaller than average percentage of Hispanic students. The regions with the highest percentages of Hispanic students can be found in rural districts in the Western part of the state, and in smaller, rural districts along the border of Mexico and New Mexico. Many of these districts are comprised of one K-12 community school. Some of these districts offer vocational agricultural programs and secondary courses online (Bowie Unified School District website, 2018).

Table 4.2 Descriptive Statistics

Variable	Minimum	Maximum	Mean	SD
% Hispanic Students	0.00	98.31	33.56	26.05
% EL Students	0.00	84.62	5.11	8.96
Total District Enrollment	44	64,048	5,310.58	9,731.75
Higher Math Classes	1	175	16.16	33.82
Biology Classes	1	31	3.41	5.99
Chemistry Classes	0	185	13.52	27.19
Physics Classes	0	79	5.48	11.32
Lab Courses	1	3	2.94	0.33
% Hispanic Students taking the SAT/ACT	0.00	57.14	7.13	8.84
% EL Students taking the SAT/ACT	0.00	54.32	2.27	7.72
% All Students taking the SAT/ACT	0.00	46.40	9.23	8.30
% Students who drop out	0.00	16.70	3.04	2.52

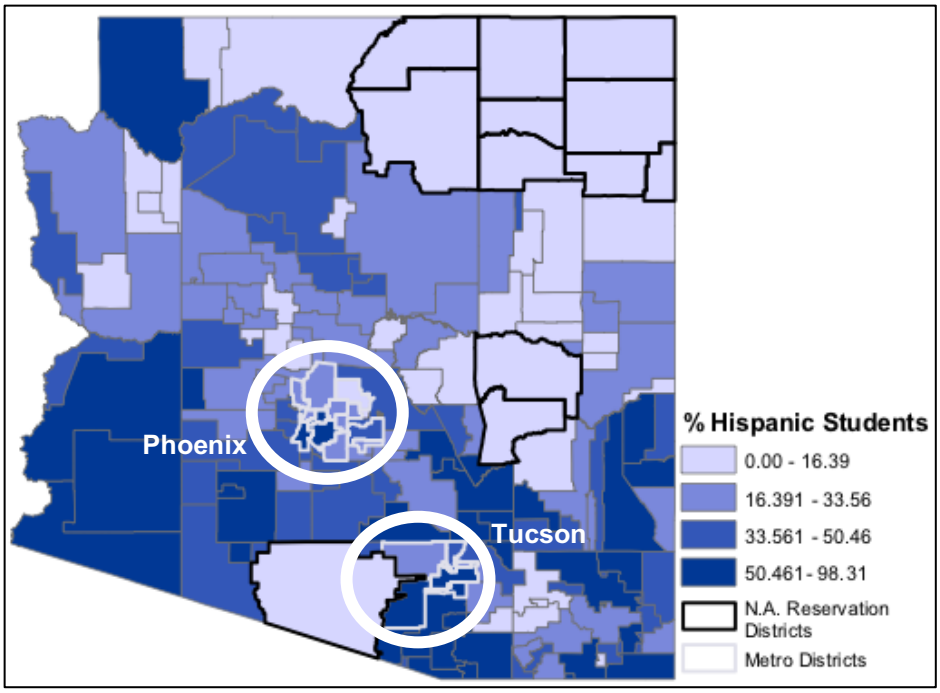

Figure 4.2 Location of Hispanic Students in Arizona school districts

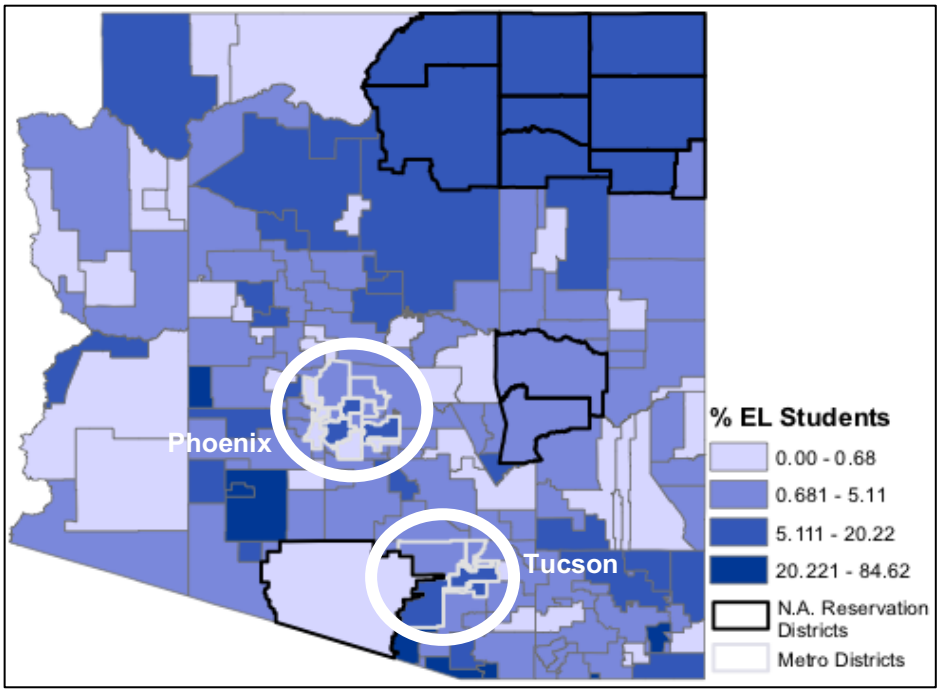

Figure 4.3 Location of EL Students in Arizona school districts

Figure 4.3 illustrates the distribution of percentage of EL students within school districts in Arizona. The Quartile procedure in ArcMap 10.5.1 (ESRI, 2017) divided the percentage of EL students into four interval ranges. The percentage of EL students found within districts varies considerably between districts, with some districts having no students that identified as ELs, while other, smaller districts, have nearly 85% of their student body as ELs. Although several smaller districts throughout Arizona have both high concentrations of Hispanic students and EL students, it is important to note that districts throughout the Northeastern region of the state have more than average percentages of ELs due to the language revitalization efforts being made by the Native American communities located there (see Figure 3). The districts in this region are comprised of approximately 5% to 20% EL students.

4.7.1 OLS and GWR Results for Hispanic Students

Table 4.3 describes the results for the OLS and GWR models for the percentage of Hispanic students within school districts. This table shows the overall R^2 values, adjusted R^2 values, AIC values, and the number of neighbors used in the GWR analysis. The GWR models produced higher R^2 and lower AIC values than the OLS model for several of the variables. The number of Higher Math classes, number of Biology classes, number of Chemistry classes, percentage of students taking the SAT/ACT, and the dropout rate all have significantly lower AIC values, as well as higher R^2 values, indicating better fit for the GWR model for these variables. For the number of Higher Math classes offered, the overall adjusted R^2 for the GWR model is 0.79, indicating a strong relationship between the variables. Figure 4.4 shows that the relationship between percentage of Hispanic students and the number of higher math classes offered is quite variable across the state of Arizona, ranging from local R^2 values of 0.06 to 0.95. The strongest relationships are located in the metropolitan areas of Phoenix and Tucson. Local R^2 values in

Table 4.3 Overall R^2 Results for Hispanic students

	OLS			GWR			
	R^2	**Adj. R^2**	**AICc**	**R^2**	**Adj. R^2**	**AICc**	**Neighbors**
Higher Math	0.70	0.70	1403.10	0.84	0.79	1369.88*	37
Biology	0.00	0.00	1040.28	0.15	0.06	1036.02*	78
Chemistry	0.67	0.67	1348.03	0.72	0.69	1344.09*	84
Physics	0.60	0.59	1100.08	0.60	0.59	1100.96	161
Lab Access	0.04	0.03	98.02	0.07	0.05	97.07	155
Hispanic ACT	0.00	0.00	1163.88	0.23	0.10	1158.07*	47
EL ACT	0.00	0.00	1120.14	0.02	0.00	1120.54	159
Total ACT	0.01	0.01	1141.25	0.26	0.14	1131.14*	47
% Students drop out	0.01	0.01	757.03	0.49	0.32	724.34*	28

these areas are higher than the overall adjusted R^2 value of 0.79, indicating that the percentage of Hispanic students is very strongly related to the number of higher math classes offered in these districts. Figure 4.4a shows where the local R^2 values are significant statistically. The darker area indicates districts with significant beta coefficients at alpha 0.05, according to the Benjamini-Hochberg correction described in the Analysis section. The districts within and surrounding the Phoenix metropolitan area exhibit significance. Although the relationships within districts in the Tucson metropolitan area are not significant, a few of the districts around it are significant. These findings suggest that in these districts there tend to be low percentages of Hispanic students, and a larger number of Higher Math classes offered.

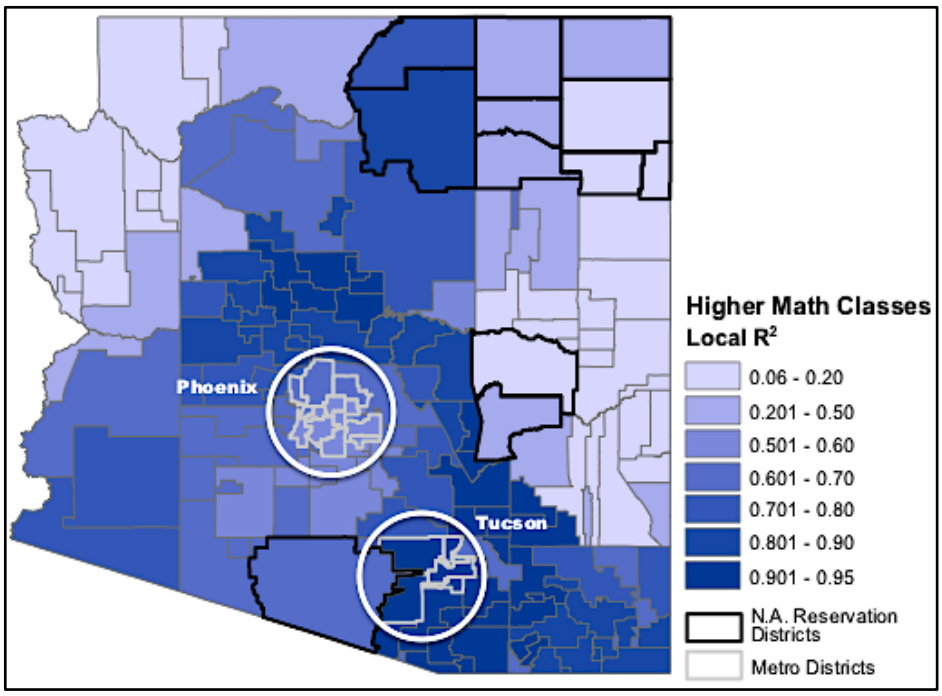

Figure 4.4 Local R^2 values for Percentage of Hispanic Students and Number of Higher Math Classes Offered.

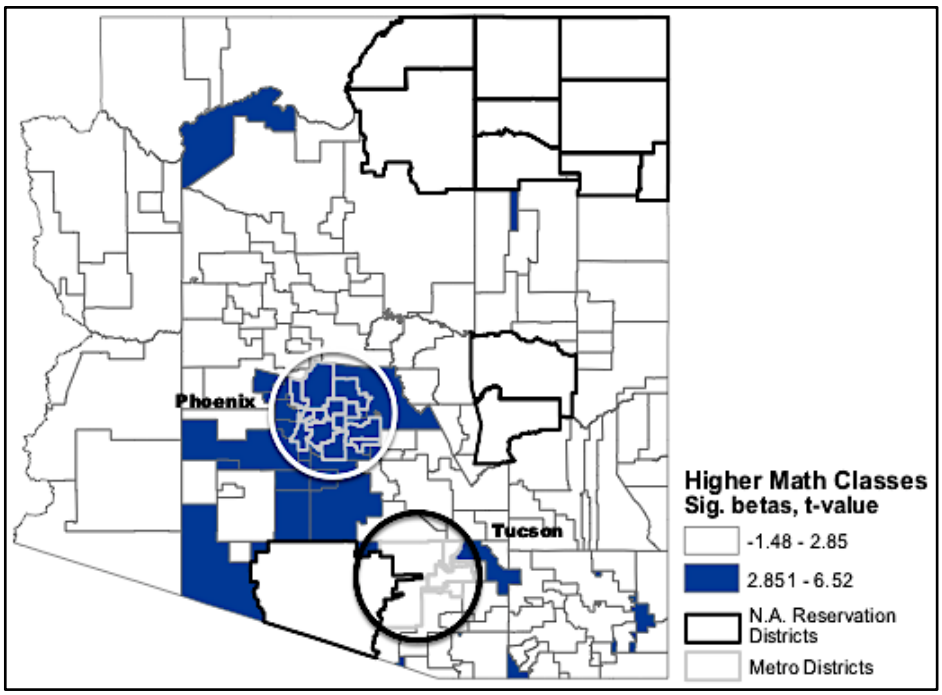

Figure 4.4a Statistically significant beta coefficients (darker area) for Percentage of Hispanic Students and Number of Higher Math Classes Offered.

Figure 4.5 shows that when controlling for district enrollment size, the relationship between percentage of Hispanic students and the number of Biology classes offered within districts varies throughout the state, with local R^2 values ranging from 0.00 through 0.16. The strongest local R^2 values were located in the Western part of the state. However, none of the relationships in the districts were significant once I applied the Benjamini-Hochberg correction for multiple tests. Variability in local R^2 values was also found for the relationship between the percentage of Hispanic students within districts and the number of Chemistry classes offered (see Figure 4.6). Local R^2 values were quite high and ranged between 0.56 and 0.96, with the strongest relationship limited to the Southeastern part of the state along the border with New Mexico. But, none of the relationships within districts were significant once I applied the Benjamini-Hochberg correction.

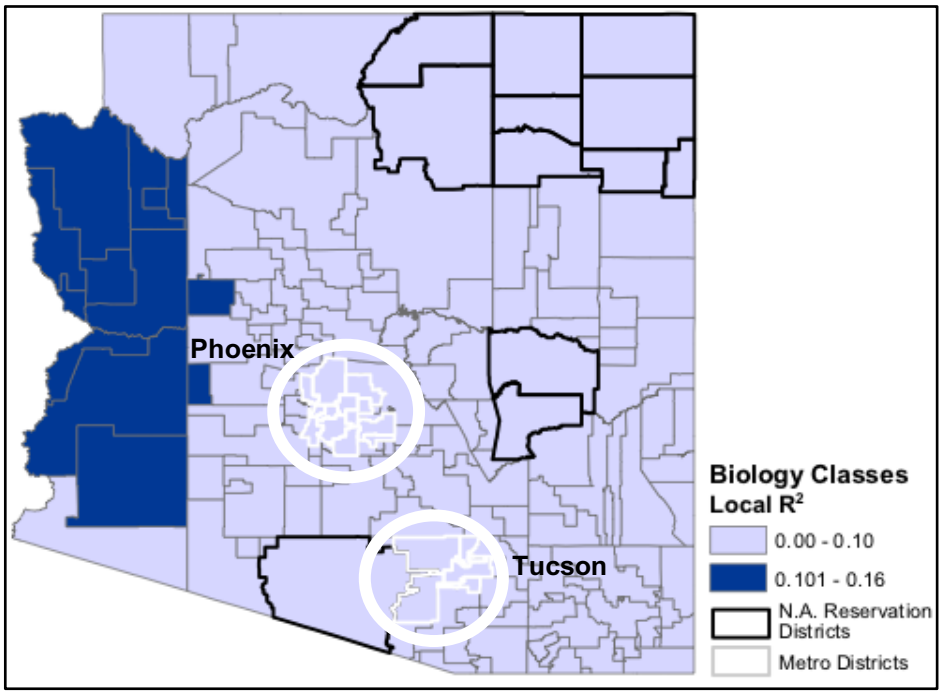

Figure 4.5 Local R^2 values for Percentage of Hispanic Students and the number of Biology Classes Offered.

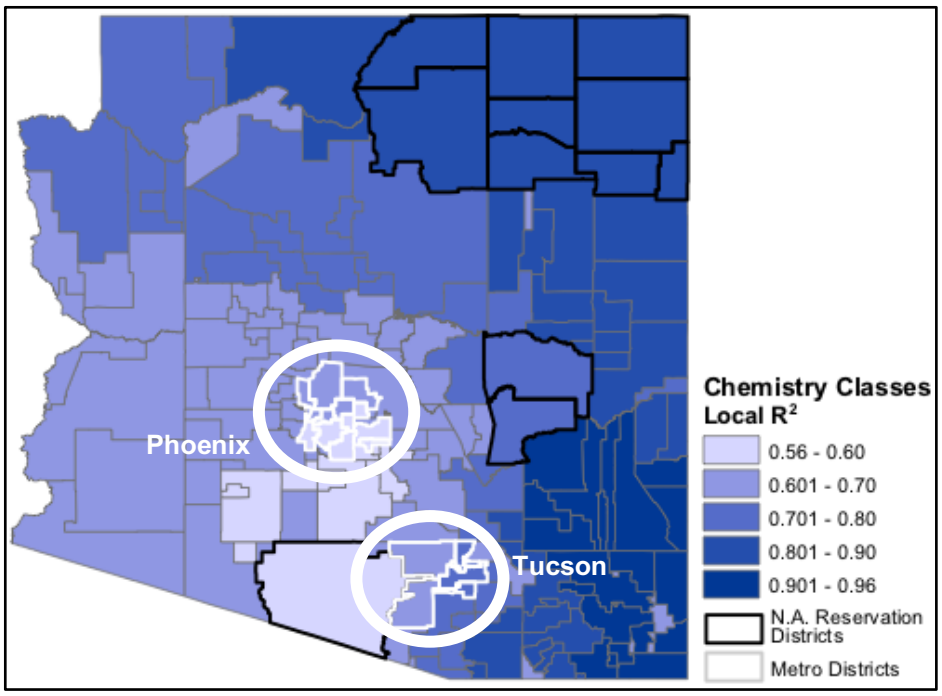

Figure 4.6. Local R^2 values for Percentage of Hispanic Students and the number of Chemistry Classes Offered.

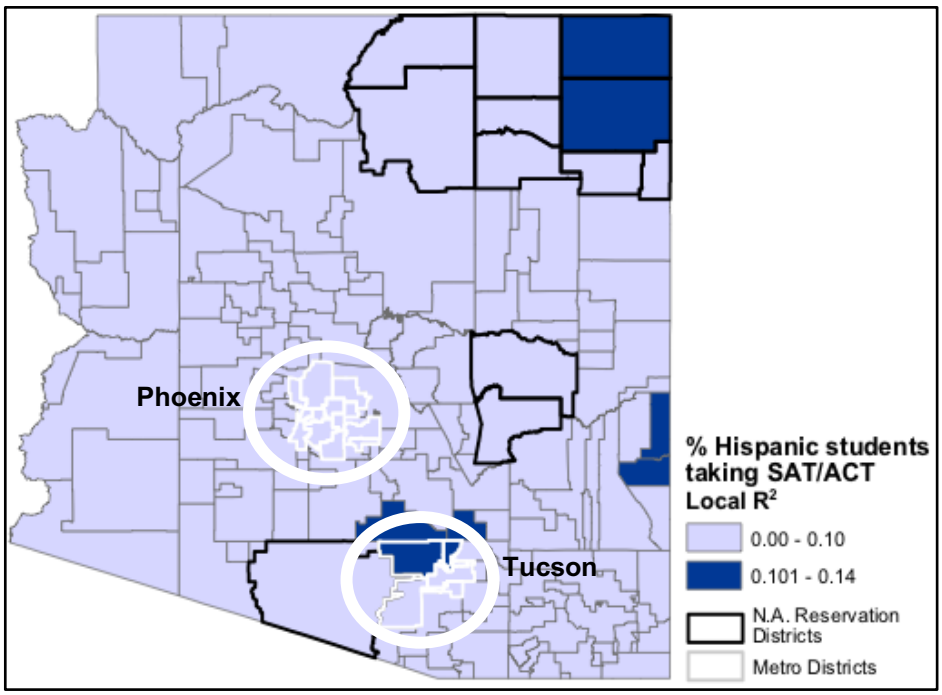

Figure 4.7 Local R^2 values for Percentage of Hispanic Students and the Percentage of Hispanic Students Taking the SAT/ACT.

Figure 4.7 shows the relationship between percentage of Hispanic students and the percentage of Hispanic students taking the SAT/ACT in the district. The GWR adjusted R^2 value was 0.10, although the relationship was variable (see Figure 4.7). In contrast, the OLS R^2 value was 0.00. This indicates that while the GWR R^2 value is weak, location impacted the relationship between the percentage of Hispanic students and percentage of Hispanic students taking the SAT/ACT in Arizona. Although the relationship is variable, none of the relationships within districts were significant once I applied the Benajmini-Hochberg correction. Figure 4.8 shows similar results for the relationship between the percentage of Hispanic students and percentage of all students within the district taking the SAT/ACT. Despite the weak GWR adjusted R^2 value of 0.14, the relationship between the percentage of Hispanic students and percentage of all students within the district taking the SAT/ACT was weak to moderate when allowed to vary by context (see

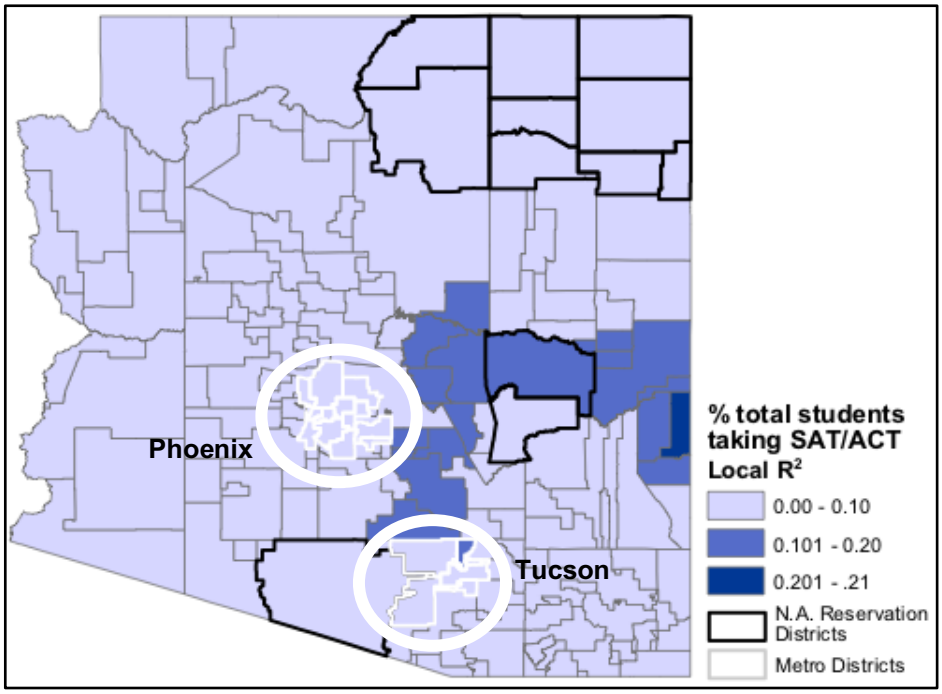

Figure 4.8 Local R^2 values for Percentage of Hispanic Students and the Total Percentage of Students Taking the SAT/ACT.

Figure 4.8). Again, none of the relationships within districts were significant once the I applied the Benajmini-Hochberg correction for multiple tests.

Last, Figure 4.9 shows the local R^2 values for the relationship between percentage of Hispanic students and the percentage of students who dropped out in the 2013-2014 school year. Again, the relationship varies across the state, with the relationship being the strongest in the districts that encompass a Native American reservation along the border with Mexico and the districts around Tucson. Local R^2 values range from 0.501 – 0.81. These local R^2 values are higher than the moderate adjusted R^2 value of 0.32. However, lower local R^2 values ranging from 0.101 – 0.30 exists throughout much the Navajo nation in the Northwest quadrant of the state (see Figure 4.9). But, as seen in Figure 4.9a, both areas within and around Native American reservations display significant negative relationships between the percentage of Hispanic students within districts

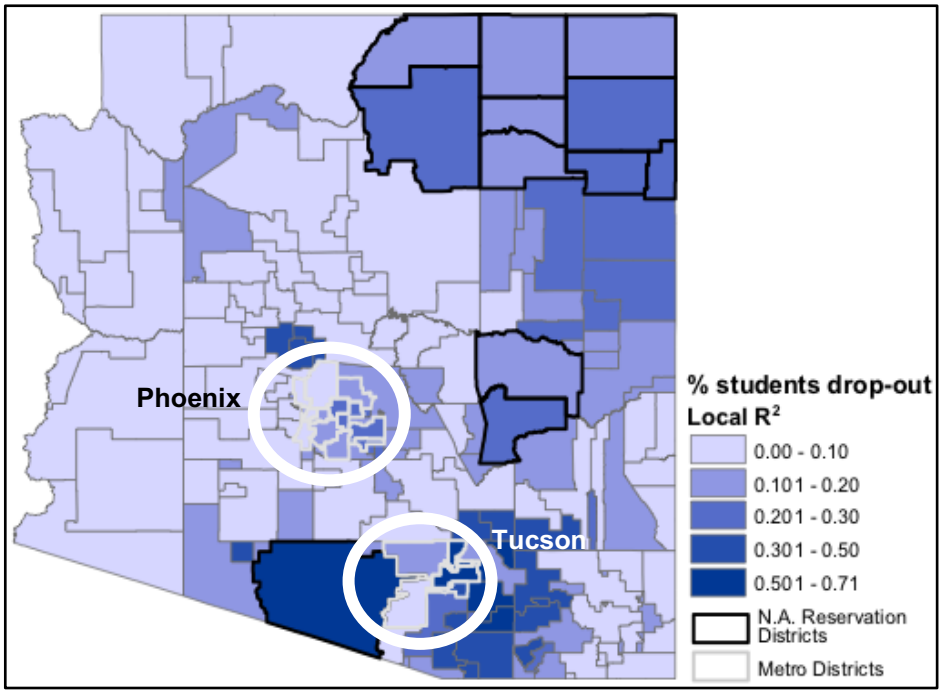

Figure 4.9 Local R^2 values for Percentage of Hispanic Students and the Total Percentage of Students Who Drop Out.

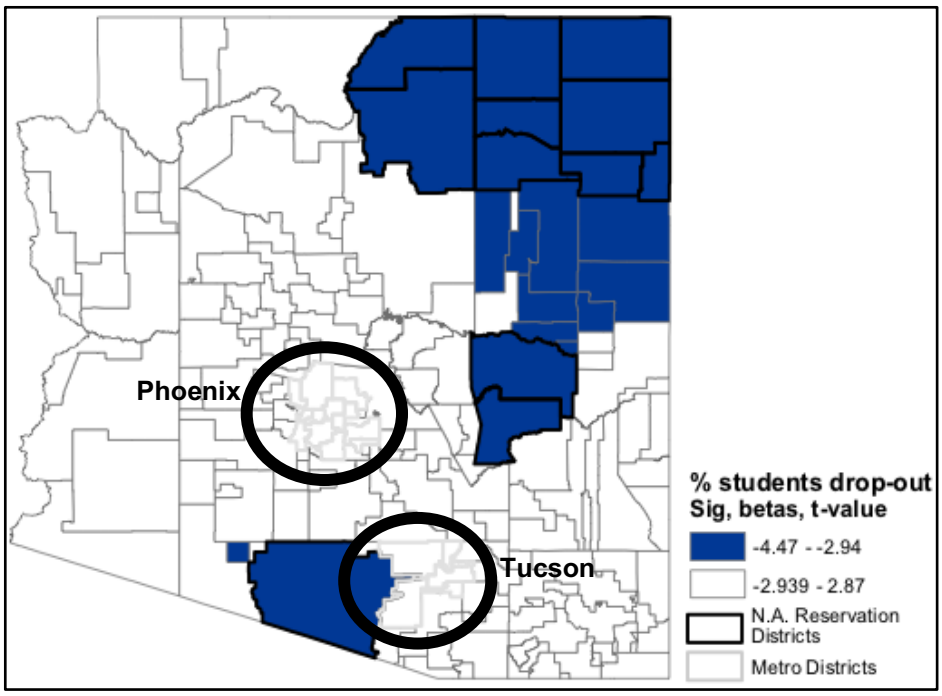

Figure 4.9a Statistically significant beta coefficients (darker area) for Percentage of Hispanic Students and the Total Percentage of Students Who Drop Out.

and the percentage of students who drop out. This is due likely to the lower percentages of Hispanic students, but higher dropout rates found in these districts.

4.7.2 OLS and GWR Results for EL Students

Table 4.4 describes the results for percentage of EL students in districts. The relationships between percentage of EL students and the number of Biology classes, the percentage of Hispanic students taking the SAT/ACT, and the percentage of students who drop out all have significantly lower AIC values, as well as higher R^2 values, indicating better model fit for the GWR model for these variables. Figure 4.10 provides the local R^2 values for the relationship between percentage of EL students within the district the number of Biology classes offered. The GWR global adjusted R^2 for the relationship between the percentage of EL students and the number of Biology classes offered is 0.13, indicating a weak relationship between the variables.

Table 4.4 Overall R^2 Results for EL students

	OLS			GWR			
	R^2	**Adj. R^2**	**AICc**	**R^2**	**Adj. R^2**	**AICc**	**Neighbors**
Higher Math	0.70	0.70	1402.97	0.76	0.72	1401.13	59
Biology	0.00	0.00	1038.24	0.27	0.13	1031.53*	50
Chemistry	0.67	0.67	1349.13	0.70	0.68	1349.68	86
Physics	0.60	0.59	1098.79	0.60	0.59	1100.64	161
Lab Access	0.02	0.01	102.14	0.04	0.02	101.53	161
Hispanic ACT	0.03	0.02	1161.57	0.17	0.09	1155.89*	80
LEP ACT	0.06	0.05	1112.51	0.08	0.05	1112.53	159
Total ACT	0.01	0.00	1142.17	0.18	0.07	1141.02	54
Drop Out Rate	0.02	0.00	771.20	0.48	0.32	736.32*	36

Note: * indicates significant difference between models

However, Figure 4.10 shows that the relationship between percentage of EL students and the number of Biology classes offered varies throughout the state. Local R^2 values are the strongest in the northwestern region of the state, the Tucson metropolitan area, and the Tohono O'Odham Nation Reservation in the southern part of the state. Figure 4.10a shows that this relationship is significant for the districts around Tucson and the Tohono O'Odham Nation Reservation, where the districts offered less than the average number of Biology classes.

Figure 4.11 shows that the local R^2 values for the percentage of EL students and total percentage of Hispanic students taking the SAT/ACT vary across the state of Arizona. Local R^2 values are

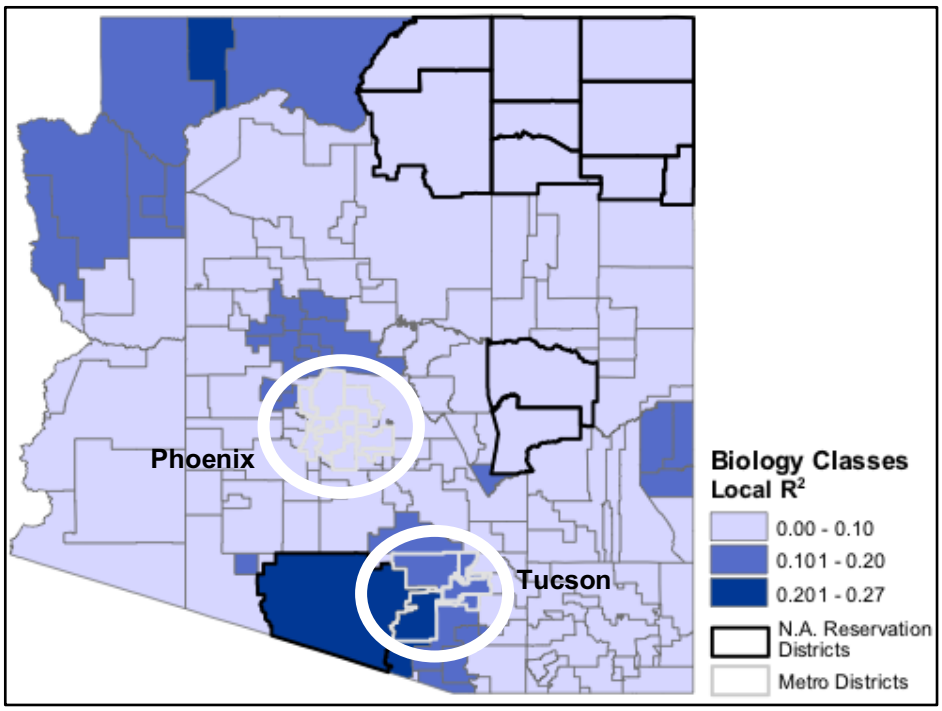

Figure 4.10 Local R^2 values for Percentage of EL Students and the number of Biology Classes Offered.

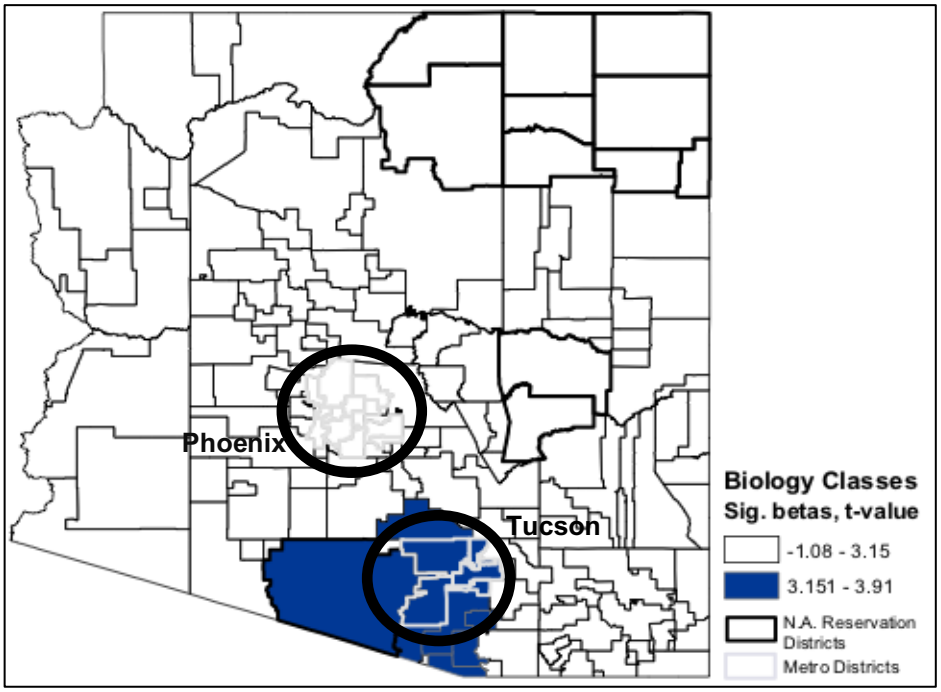

Figure 4.10a Statistically significant beta coefficients (darker area) for Percentage of EL Students and the number of Biology Classes Offered.

the strongest in the Northeast quadrant of Arizona, with local R^2 values in the moderate range of 0.201 – 0.22. Figure 4.11a shows that this is also where the local R^2 values are statistically significant. The darker area indicates districts with significant beta coefficients at alpha 0.05, according to the Benjamini-Hochberg correction. Overall, this significant relationship is due likely to the lower percentages of Hispanic students, but relatively higher amounts of ELs located within these districts.

Last, Figure 4.12 shows the local R^2 values for the relationship between the percentage of EL students and the percentage of students who drop out within districts. The strength of the relationship between the variables varies throughout the state. The relationship between the percentage of EL students and percentage of students who drop out is strongest in the Phoenix

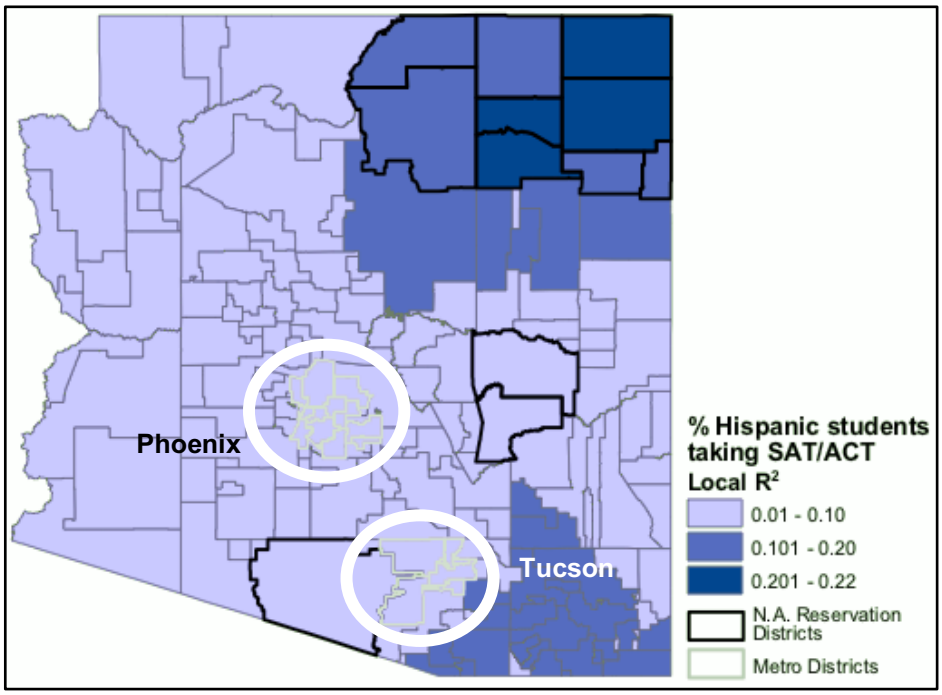

Figure 4.11 Local R^2 values for Percentage of EL Students and the Percentage of Hispanic Students Taking the SAT/ACT.

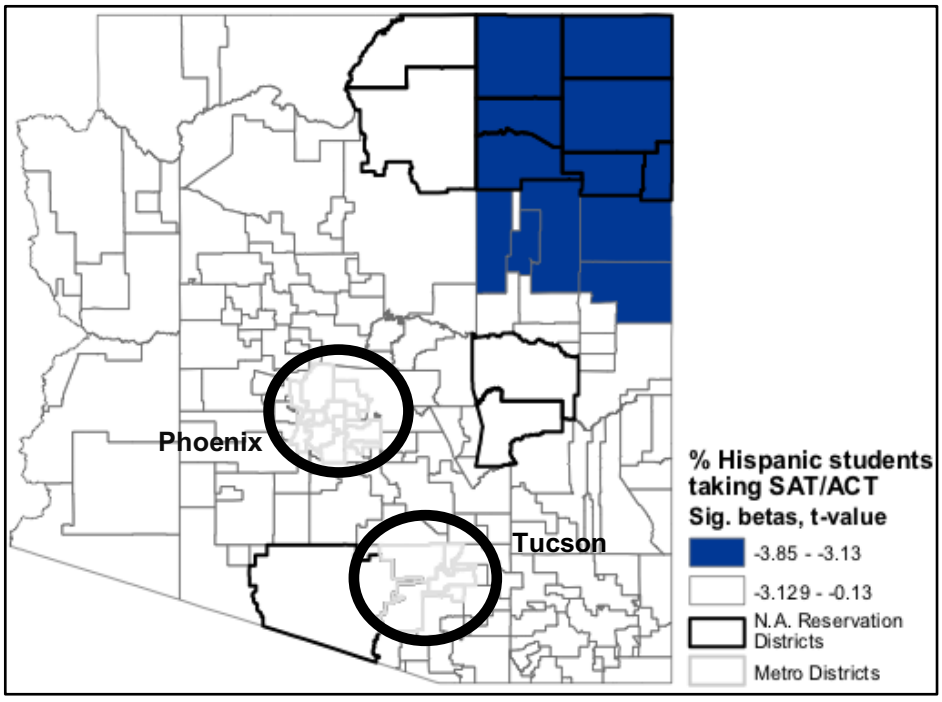

Figure 4.11a Statistically significant beta coefficients (darker area) for Percentage of EL Students and the Percentage of Hispanic Students Taking the SAT/ACT.

metropolitan area and in the Northeast quadrant of the state, with moderate R^2 values of 0.401-0.52. Figure 4.12a shows that the relationship between variables is statistically significant for many of the districts in the Northeastern quadrant of the state and within and around Phoenix. In general, many of the significant districts in the Northeastern quadrant exhibit higher percentages of ELs and higher percentages of students that drop out. However, a few significant suburban districts in the Phoenix area reverse this overall trend, as lower percentages of EL students and lower percentages of students dropping out exist.

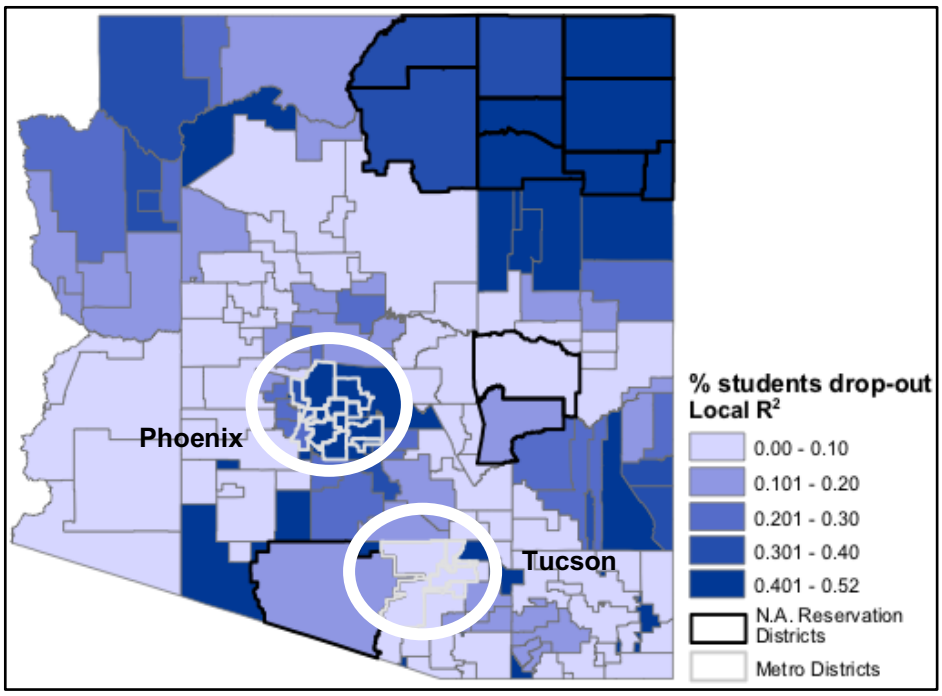

Figure 4.12 Local R^2 values for Percentage of EL Students and the Percentage of Students who Drop Out.

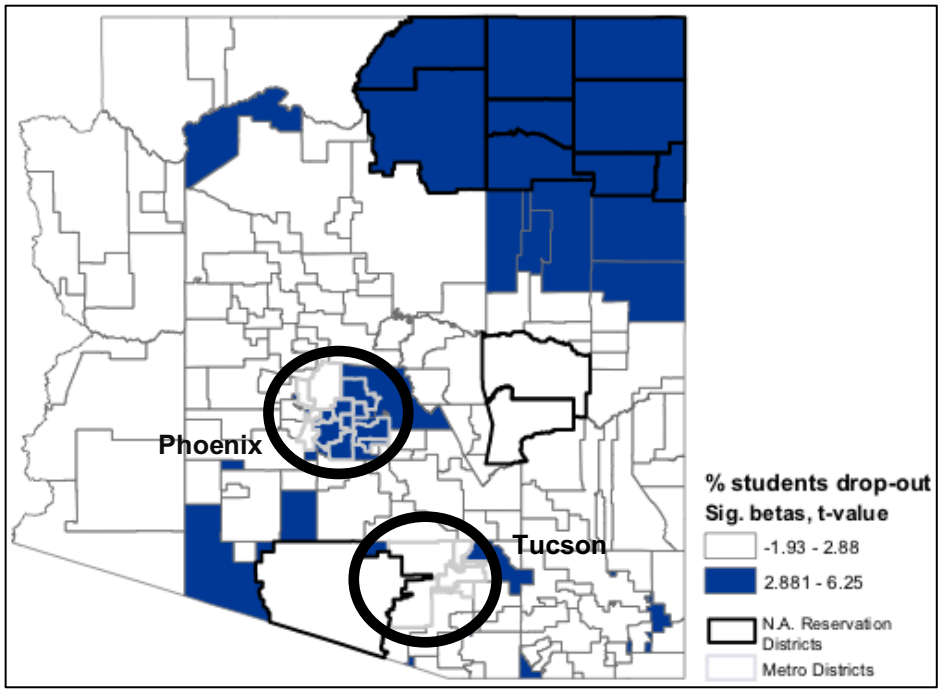

Figure 4.12a Statistically significant beta coefficients (darker area) for Percentage of EL Students and the Percentage of Students who Drop Out.

4.8 Conclusions and Implications

Place clearly impacts the opportunities available to Hispanic and EL students to access the STEM coursework and college admission requirements to four-year universities in Arizona. Given the documented educational inequities that exist for both Hispanic and EL students, the results from this study highlight the barriers Hispanic and EL students face in achieving higher education. Specifically, this analysis found that the urban areas of the state offered geographic access to Higher Math classes for Hispanic students and Biology classes for ELs. Additionally, the spatial analyses in this study indicate that EL students in the Northeastern quadrant of the state experience geographic disadvantage. These findings raise questions about the legacy of negative educational outcomes for Native American students in those districts. As previous research showed, a geographic inequity of education will likely exist in a district composed largely of racial and linguistic minorities (Massey, 2008). The results of this study indicate this to be true in Arizona.

Given that the state of Arizona wants to put more students into the college-level STEM pipeline, district leaders and policy makers must investigate the variability in STEM opportunities offered in districts. This study found with district enrollment size controlled for, Hispanic students in the metropolitan area of Phoenix had more access to Higher Math classes than Hispanic students in other areas of the state. However, many of the Hispanic students in Arizona are clustered in smaller, rural districts. Failure to provide the growing population of Hispanic students in rural districts the same opportunities to take higher level math classes raises concern for educational equity for these students. Similarly, results for the relationship between the percentage of EL students and the number of Biology classes offered in districts suggest geographic disadvantages. EL students in the Tucson area have less access to Biology classes. Restricted access to a lab

science course such as Biology represents a barrier to college entrance requirement in the state of Arizona. This study cannot rule out the possibility that these districts offer other lab science courses instead of Biology. However, if EL students have less access to foundational lab science courses such as Biology, it follows that other college preparatory science courses such as Chemistry and Physics are absent.

The strength of the relationship between the percentage of EL students and the percentage of Hispanic students taking the SAT/ACT within districts also were dependent geographically. It is important to note that the average percentage of ELs taking the SAT/ACT throughout the state is only 2.27%. While Native American ELs make up a very small percentage of the total EL population in Arizona (3%), they are concentrated highly on tribal lands. The vast majority of districts throughout the northeastern quadrant of the state report that no EL students take standardized college exams. Given the relatively high percentages of Native American students labeled as ELs in these districts, these results raise questions about the access Native American EL students have to the college admissions process in Arizona.

Last, the geographic pattern of dropout rates in Arizona is clear. Many students on and near Native American reservations continue to drop out of school. For both the percentage of Hispanic students and the percentage of EL students, significant relationships exist with the dropout rates on many of the Native American reservations, where up to 16.7% of the student body dropped out in 2013-2014. These findings have significant implications for the Native American students' access to college. Research shows that Prop 203, which forbade heritage language and cultural instruction, led to lower student achievement and higher dropout rates (Balter & Grossman, 2009; Combs & Nicholas, 2012). Although a documented history of higher dropout rates amongst the Native American student population exists (Balter & Grossman, 2009;

Combs & Nicholas, 2012; McCarty, 2009), the results from the spatial analysis showed that it represents a regional problem that extends beyond the boundaries of the reservation. More research should be conducted to examine the impact of Prop 203 on college access for Native American students in Arizona. Furthermore, ELs in metropolitan Phoenix face similar challenges. Due to the implementation of Prop 203, students in these districts already face challenges graduating from high school on time (Gándara & Orfield, 2010). To understand better why Native American ELs and ELs in metropolitan Phoenix continue dropping out at higher rates requires further research in these districts.

Although the research questions in this study did not examine explicitly access to STEM coursework and college admissions eligibility for Native American students in Arizona, the results indicate the conditions for inequitable access exist. The requirements of Prop 203 restrict Native American ELs in public school districts, despite them residing on tribal lands. Given the history of linguistic and cultural decimation for Native Americans in Arizona (Schultz, 2016), the ramifications of requiring Native American EL students to sit in SEI for four hours a day is disturbing. Further, almost no ELs in these districts take college entrance exams and dropout rates remain high. These results suggest that very few Native American ELs have access to higher education in Arizona. Policy makers in Arizona would benefit from a deeper exploration into the educational inequities that exist for Native American students.

Place clearly matters for Hispanic and EL students in Arizona. Given that 78% of Latinx students attend schools in Arizona where a majority of their classmates are students of color (Gándara & Orfield, 2010), and that segregation is intensifying for Latinx students in general (Owens, 2017), the variation in opportunities available in their local school districts matter. Furthermore, when the historical and political history of Arizona's linguistic education for Hispanic, Native

American, and EL children is taken into account, considerations about the impact the local contexts have become important. Students need access to STEM coursework and the desire to pursue a STEM degree. Research showed that ELs are less likely than non-ELs to be qualified for and apply to college, and that four-year university access remains an elusive goal (Kanno & Cromley, 2015). Therefore, solutions must be found if educational policies and district conditions inhibit the advancement of students to college. Educators, scholars, and policy makers must examine further the ways in which place matters for the schooling of Hispanic and EL children in Arizona if they want more students to gain access to the STEM pipeline.

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4.10 Appendix—Study Replication Information

Table 4.5 Study replication information

Variable Name in Article	Table Name	Variable Name in Table	Link to Data Downloads
Percentage of Hispanic Students	Enrollment Data	Race/Ethnicity-Hispanic	https://ocrdata.ed.gov/flex/Reports.aspx?type=district
Percentage of EL Students	Enrollment Data	LEP	https://ocrdata.ed.gov/flex/Reports.aspx?type=district
Higher Math Classes	High School Math and Science	Advanced Mathmatics, Calculus	https://ocrdata.ed.gov/flex/Reports.aspx?type=district
Biology Classes	High School Math and Science	Biology	https://ocrdata.ed.gov/flex/Reports.aspx?type=district
Chemistry Classes	High School Math and Science	Chemistry	https://ocrdata.ed.gov/flex/Reports.aspx?type=district
Physics Classes	High School Math and Science	Physics	https://ocrdata.ed.gov/flex/Reports.aspx?type=district
Access to Lab Science Courses	High School Math and Science	Biology, Physics, Chemistry	https://ocrdata.ed.gov/flex/Reports.aspx?type=district
Percentage of Hispanic Students Taking the SAT/ACT	Took SAT/ACT (2009+)	Hispanic	https://ocrdata.ed.gov/flex/Reports.aspx?type=district
Percentage of EL Students Taking the SAT/ACT	Took SAT/ACT (2009+)	LEP	https://ocrdata.ed.gov/flex/Reports.aspx?type=district
Percentage of All Students Taking SAT/ACT	Took SAT/ACT (2009+)	Total Enrollment	https://ocrdata.ed.gov/flex/Reports.aspx?type=district
% Students who Drop Out	Drop-out rates 2014	Drop-out rate	http://www.azed.gov/accountability-research/data/

Chapter 5: Conclusion

As Feliciano (2005) suggests, an education in American schools does not guarantee EL students a path towards upward mobility. Instead, this dissertation highlights how place plays a critical role in the opportunities for assimilation and upward mobility for EL children.

The first study (Chapter 2) of the dissertation suggests that EL students, along with the support of their families and communities, have always employed and continue to employ cultural capital and a variety of resources to act agentically against hostile hegemonic structures. While the success of each group depended upon the time period, the goals of education, and local context, this analysis shows each EL group uses forms of selective acculturation to adapt to dominant American culture, while maintaining ethnic identities. However, policy makers and educators continue to marginalize immigrant students linguistically, culturally, and academically as they have done for centuries through restrictive language policies and practices within schools. The results from this study support the growing evidence that bilingual/dual immersion programs may be the most beneficial for EL identity, assimilation, and upward mobility (Valentino & Reardon, 2014). More research into the contexts surrounding the efficacy of these programs could prove beneficial for policy makers, educators, and ELs in American schools.

The second study (Chapter 3) reveals that ELs in new destinations and smaller suburban districts can significantly change the needs and the structure of the district in which they settle. Results suggest further that instead of ELs showing highly selective acculturation and upward mobility, particular immigrant groups may able to wield their capital in ways that allow them to concentrate their children in better school systems from the start. This leads to certain ELs in St. Louis having access to dominant cultural, social, and economic capital from early on in their academic careers. Overall, this analysis indicates that a statewide language policy may not be the

best method for addressing the complex needs of ELs in the St. Louis metropolitan region, as local variation within the region exists.

Study three (Chapter 4) highlights the role geography plays in the academic barriers Hispanic and EL students face in achieving higher education within Arizona. Given the clear geographic patterns of access to STEM coursework and college admissions eligibility within Arizona school districts, this study indicates that place impacts opportunities for upward mobility for Hispanic and EL students in Arizona. Although the research questions did not explicitly examine access to STEM coursework and college admissions eligibility for Native American students in Arizona, the results from study warrant further investigation into the probability that inequitable access continues to occur.

5.1 Limitations

While all three studies show that integrating education into the segmented assimilation model may be useful, these analyses are descriptive in nature. Although this dissertation neither examined individual cases nor made causal linkages, all studies demonstrated that the acquisition of English in America is not a neutral act. All three studies highlight the power dynamics undergirding upward mobility for ELs in American society. Though it does not possess the depth of a case study, the first study (Chapter 2) illuminates how ELs in repressive environments can act agentically. ELs may not assimilate successfully in accordance with Portes & Rumbaut's (2014) model, but that model fails to take into account the additional barriers these students encounter in their local schools. Studies 2 and 3 (Chapters 3 and 4) describe the relationships that exist between location of EL groups and indicators of the potential for upward mobility. Although causal and individual-level analyses were beyond the scope of this dissertation,

qualitative case studies focused on the context of reception ELs receive in their local schools could prove to deepen understanding of the impact of local context.

5.2 Implications for Future Research

All three studies within the dissertation demonstrate that the location of schooling for EL students impacts their potential for assimilation and upward mobility. The U.S. has a history of negative interactions with both the indigenous and immigrant EL populations. The racialization of EL students occurring in schools likely reflects the reception they receive. That reception represents possibly a legacy of race relations within that specific context. Each immigrant group brings strengths and challenges when they enter U.S. schools. The studies in this dissertation reveal that the opportunities available to each group depend not only upon their background, but the place-based opportunities available to ELs within their schools. While global models of immigrant assimilation prove useful for understanding the broader U.S. context, these studies show that considerable variation in local context of reception and education opportunities remains for ELs. Therefore, geographic analyses such as GWR that show the impact of place may reveal educational challenges for ELs that global models mask.

Interdisciplinary approaches to studying EL assimilation could also prove to be useful. Such approaches would examine holistically the challenges ELs face on their path towards upward mobility. Collaborations among educators, sociologists, social workers, EL students, and their parents could enhance outcomes for EL students. As shown in the first study (Chapter 2), EL students will find a way to act agentically within their local environment. Promoting their voices and experiences in education and policy discussions could shine a light on the best path forward for this growing segment of our population. Finally, educators possess significant power in fostering upward mobility in their students. Teachers hold the ultimate responsibility for the

daily interactions that ELs have in American schools. While a single teacher may not be able to undo the systemic educational challenges faced by EL students, teachers can create culturally affirming and academically challenging pedagogy. Such pedagogy would form dominant cultural and social capital within EL students and place them on a path towards upward mobility.

Appendix

Glossary of Key Terms

Assimilation: Long-term process in which ethnic distinctions between immigrants and the host society (the society they have moved into) have diminished. This is evidenced when immigrants and their children have adopted the language, culture(s), and values of their new home. As this occurs, they are accepted into the country's mainstream.

English Learners (EL)s: Non-native English speakers who are designated by their local school districts as potentially being "Limited English Proficient" (LEP).

Immigrant: Person who has come to live in another country permanently.

Opportunity Structure: External factors that affect a person's outcomes in life. These factors include socioeconomic status, institutions (such as schools), politics, and surrounding environment.

Racialization: The designation of a racial and/or ethnic distinction placed upon members of a community by the dominant mainstream society. This leads to the creation of stereotypes about the members of the community and its members being placed in a racial hierarchy.

Refugee: A person forced to leave their home country to escape war, or persecution. A refugee is often eligible for governmental assistance for settlement in a new country.

Segmented Assimilation: The mode of incorporation into American society based on the resources and challenges an immigrant experiences. Immigrants experience downward assimilation, selective acculturation, or full acculturation and integration into the mainstream culture. Downward assimilation occurs when children of immigrants take on the negative attributes of the host society and settlement into the lower class of society. Selective acculturation occurs when second-generation children adapt to mainstream society while maintaining elements of their culture, such as their home language and traditions. Full acculturation leads to the complete integration of children of immigrants into mainstream culture, and often, upward mobility.

Upward Mobility: Upward movement in society in comparison to the previous generation. For immigrants, this is often evident through higher levels of education and socioeconomic attainment.