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# Neighborhood Coethnic Immigrant Concentrations and Mexican American Children's Early Academic Trajectories

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**Abstract** We use data from the Early Childhood Longitudinal Study, Kindergarten Class of 1998–1999 as well as neighborhood data from the 2000 U.S. Census to examine relationships between neighborhood Mexican immigrant concentration and reading ($n = 820$) and mathematics ($n = 1{,}540$) achievement among children of Mexican descent. Mixed-effects growth curves show that children living in immigrant-rich communities enter school at an achievement disadvantage relative to children in neighborhoods with fewer coethnic immigrant families. However, these disparities are driven by lower-SES families' concentration in immigrant-heavy neighborhoods as well as these neighborhoods' structural disadvantages. Controlling for children's generation status and socioeconomic status, as well as neighborhood-level measures of structural disadvantage, safety, and social support, neighborhood immigrant concentration demonstrates a modest positive association with mathematics achievement among children of Mexican immigrant parents at the time of school entry. However, we do not find strong positive associations between Mexican American children's rate of achievement growth over the elementary and middle school years and their neighborhoods' concentration of Mexican immigrants.

**Keywords** Education · Neighborhood effects · Children of immigrants · Generation status · Mexican American

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## Introduction

Despite recent declines in migration from Mexico to the United States, profound demographic effects of large-scale Mexico-U.S. migration over the past three decades continue to emerge. This is particularly true among school-aged populations, which have diversified rapidly and contain a larger share of Mexican American persons than older age groups. As this group continues to grow and age, the need to insure their academic success has become increasingly important to educators and policymakers. This need is compounded by the rapid growth of Mexican populations in new destination areas which are likely to be unfamiliar with the challenges facing immigrant families and students. This increasing variation in the types of communities in which Mexican American children reside motivates a need for a deeper understanding of neighborhood influences on their academic performance, especially during the crucial early years of school. The initial schooling years wield a powerful influence on individuals' ultimate academic achievement, educational attainment, and labor market success (Alexander and Entwisle 1988; Hart and Risley 1995; Kerckhoff and Glennie 1999; Stanovich 1986). Students who are prepared to succeed during the first years of school tend to enjoy continued success (Alexander and Entwisle 1988; Entwisle and Alexander 1993), and researchers have repeatedly found that the gap between initially high- and low-achievers grows over time (Boardman et al. 2002; Farkas and Beron 2004; Phillips et al. 1998).

In the present study, we consider the association between neighborhood coethnic immigrant concentration and Mexican American children's kindergarten through eighth grade reading and mathematics achievement trajectories, paying particular attention to differences between children whose mothers were born in Mexico and those whose mothers were born in the United States. We examine whether children of immigrant mothers experience better or worse academic outcomes in neighborhoods with high Mexican immigrant concentrations while also estimating the magnitude of generational achievement gaps in these different neighborhood contexts.

## Mexican Americans' Educational Outcomes

Recent research highlights the particular educational disadvantages facing children in Mexican American families. An achievement gap between Mexican American children and non-Latino whites has been demonstrated among children as young as 24 months (Fuller et al. 2009) and is later observed at kindergarten entry (Glick and Hohmann-Marriott 2007; Hibel 2009) and over the span of the primary and secondary school years (Boardman et al. 2002; Downey et al. 2004; Fryer and Levitt 2004). In his research on early achievement among children in Mexican immigrant families, Crosnoe (2005, 2006) found that Mexican immigrant children began kindergarten and finished first grade with significantly lower mathematics proficiency than non-Latino white, Asian, or other Latino students, while their math scores were statistically indistinguishable from those of non-Latino black students. These early disparities persist rather than diminish across the schooling years. By adolescence, Mexican American students' academic disadvantages extend

to achievement in other academic domains, curriculum track placement, drop-out rates, and post-schooling employment outcomes (Fernandez-Kelly and Portes 2008; Kao and Thompson 2003; Ream and Rumberger 2008).

Mexican Americans make up 63 % of the United States Latino population (Ennis et al. 2011). As such, the American education system's effectiveness over the coming years will be considerably shaped by Mexican American students' success or failure. It should, therefore, be a priority for future demographic and educational researchers to develop a thorough understanding of the social determinants of Mexican American students' academic performance.

## Neighborhood Effects on Educational Outcomes

Findings regarding neighborhood influences on individual academic outcomes have been mixed, with several studies reporting small or null neighborhood effects (e.g., Eamon 2005; Mayer and Jencks 1989; Pong and Hao 2007; Sanbonmatsu et al. 2006), while others demonstrate large, positive effects of neighborhood advantage on students' achievement and attainment (e.g., Ainsworth 2002; Crowder and South 2011; Leventhal and Brooks-Gunn 2004; Sampson et al. 2008; Wodtke et al. 2011). However, understanding the impact of contextual factors on Mexican American students' academic development is complicated by two forces that are often regarded as acting in opposition: concentrated structural disadvantage and community social capital.

Due to Mexican American families' relatively low standing on the U.S. socioeconomic ladder, as well as to persistent residential segregation, Mexican American children tend to be concentrated in disadvantaged neighborhoods (Alba et al. 2010). While the dispersion of Mexicans and other Latinos out of traditional gateways and in communities across the U.S. (see Suro and Singer 2003) means that a growing share of American municipalities are confronting issues of immigration and diversity, often for the first time, Mexicans neighborhoods continue to be segregated and suffer from high rates of poverty. For, example, in 2000, the typical Latino child resided in a neighborhood that was 49 % Hispanic and in which 19 % of their neighbors were in poverty; statistics that rival the average neighborhood context among black children (Alba et al. 2010). Recent work also finds that Mexican immigrants in both old gateways and in newer settlement areas have similarly high levels of neighborhood segregation (Hall 2013). Thus, despite greater diversity in the broader contexts where Mexican youth live, their neighborhood environments continue to be structurally disadvantaged.

As described by Jencks and Mayer (1990), there are a variety of reasons why growing up in a poor neighborhood tends to have deleterious effects on school success. A *contagion* model highlights the importance of living in neighborhoods in which education is not valued by other students. According to this perspective, children living in poor neighborhoods demonstrate lower performance in school because studying and other academic endeavors are discouraged by their peers and adults with whom they come into contact. Similarly, the *collective socialization* model emphasizes the absence of adult role models who demonstrate the ability to translate educational success into gainful employment and middle-class incomes. Without exposure to "living proof" of education's positive socioeconomic returns, students face little incentive to invest in their own academic careers.

In contrast to these perspectives that contend direct effects of neighborhood-level processes on academic progress, an *institutional* model argues that children in disadvantaged neighborhoods struggle academically not because of neighborhood characteristics, but because their schools are of poorer quality. This perspective proposes that, because school funding is tied mostly to the property tax base, children in poor neighborhoods are very likely to attend schools that lack basic resources, have larger class sizes, and employ teachers who are more likely to be undertrained, unmotivated, and overworked than those in more privileged schools.

While detrimental impacts of residing in poor, segregated neighborhoods have been well established among non-Latino black and white children, neighborhood characteristics' influence on Mexican American students' academic development may be more complex. A burgeoning body of research documents how an immigrant presence in neighborhoods fosters social organization. The *immigrant revitalization* model was developed largely in response to what is seen as the "unexpectedly favorable social and health outcomes for immigrant groups" (Lee and Martinez 2006, p. 90). The revitalization thesis posits that immigrants' pro-family (Oropesa and Gorman 2000) and pro-work (Van Hook and Bean 2009) cultural orientations strengthen social capital in otherwise disadvantaged communities, and that this density of pro-social ties helps to maintain trust in communities, attract commercial investment, and promote both formal (via a bolstered tax base) and informal social control (Sampson and Groves 1989; Sampson et al. 1997). The model has been applied extensively to explain the negative relationship between immigration and local crime (Feldmeyer 2009; Hagan and Palloni 1998; Lee et al. 2001; Martinez 2002; Martinez et al. 2004; Ousey and Kubrin 2009; Sampson 2008; Sampson et al. 2005), but is also relevant to understanding the academic progress of children living in immigrant-rich neighborhoods to the extent that the same social processes benefit children.

The *immigrant optimism* hypothesis represents a related perspective that is often applied to immigrants' academic performance. While not explicitly a theory of neighborhood effects, immigrant optimism explains how immigrant children and their families manage to overcome disadvantageous social contexts. This perspective suggests that immigrant families possess a dual frame-of-reference, continually drawing comparisons between the socioeconomic mobility opportunities available in their origin countries and those available in United States (Kao and Tienda 1995, 1998). The American opportunity structure's comparative openness promotes optimistic attitudes among immigrant students and their parents. Immigrant parents perceive greater potential for mobility through educational success in the United States than native parents and work diligently with other adult community members to instill similar attitudes in their children. This optimistic characteristic of immigrant families and communities is further enhanced through migration's positive selectivity: the perception of greater opportunity provides the impetus for many families' decision to migrate, which serves to select into the immigrant population those who are the most optimistic toward their life chances in the United States (Palloni and Morenoff 2001).

Applied to our research question, these theoretical perspectives yield competing hypotheses. According to contagion, collective socialization, and institutional perspectives, community immigrant concentration should be negatively associated with academic achievement. Contagion and collective socialization perspectives

suggest that this effect should operate primarily through the reduced social, human, and financial capital available in these typically disadvantaged neighborhoods, while the institutional perspective implicates poorer-quality schools attended by children living in immigrant neighborhoods. On the other hand, immigrant revitalization and optimism perspectives suggest that, conditional on measures of neighborhood disadvantage, neighborhood immigrant concentration should be positively associated with Mexican American students' academic performance. To the extent that immigrant optimism and revitalization models apply primarily to immigrants as opposed to native families, these perspectives also suggest that immigrant neighborhood effects should be the most pronounced among first- and second-generation children. We are able to partially adjudicate among these hypotheses via the analyses presented below. The strength and direction of the relationship between neighborhood immigrant concentration and children's academic achievement will be consonant with either the contagion, collective socialization, and institutional perspectives on the one hand, or the immigrant revitalization and optimism perspectives on the other. Further, by comparing achievement disparities at the time of school entry to those that emerge after children begin being exposed to differentiated school contexts, we are able to evaluate the institutional perspective's applicability relative to the contagion and collective socialization perspectives.

## Sample

Our analytic sample is a subset of the Early Childhood Longitudinal Study, Kindergarten Class of 1998–1999 (ECLS-K), consisting of approximately[1] 1,540 ethnic Mexican children who entered kindergarten in the fall of 1998.[2] The nationally representative ECLS-K was conducted by the National Center for Education Statistics (NCES) and focuses on children's school experiences beginning at school entry and concluding in the eighth grade. The ECLS-K employed a multistage cluster sampling design. Researchers drew a sample of 100 U.S. counties and then stratified these units based on size, racial/ethnic composition, and per capita income. A sample of 1,277 schools offering kindergarten programs was then drawn from the sample of counties, with schools' selection probabilities being proportional to the size of their 1998 kindergarten cohort. The final sampling stage consisted of drawing a sample of children from within each selected school with the goal of selecting 24 students per school. Since the ECLS-K followed a single cohort of children over time, the data are only representative of those children who began kindergarten in the United States in 1998. This point is particularly relevant in light of the present study's focus on the children of immigrants, as same-aged students who immigrated to the U.S. after data collection began at kindergarten entry are not included in the dataset, and the present study's findings can, therefore, not be generalized to children who immigrated after approximately age five or after fall, 1998.

Drawing on multiple sources and using multiple methods of data collection, the ECLS-K includes information from direct child assessments; interviews with parents;

[1] Disclosure safeguards established by the National Center for Education Statistics require that exact sample sizes not be reported

[2] All descriptions of the ECLS-K study are taken from Tourangeau et al. (2009) unless otherwise noted.

questionnaires administered to children, parents, teachers, and school principals; and official student records. The ECLS-K began following a nationally representative cohort of kindergarteners in the fall of 1998, and subsequent waves of data were collected from the full sample in the spring of 1999 (kindergarten), spring of 2000 (first grade), spring of 2002 (third grade), spring of 2004 (fifth grade), and spring of 2007 (eighth grade). Thus, the ECLS-K provides consistent measures of children's academic development spanning the period beginning with school entry and ending with the transition to high school. This is an important time frame to consider, as it encompasses two critical periods in a student's educational career: the beginning school transition, which spans the first 2–3 years of schooling (Alexander and Entwisle 1988), as well as the transition to high school, a particularly vulnerable time for adolescents from racial/ethnic minority and low-income backgrounds (Reyes et al. 2000).

While sample attrition is perhaps inevitable in a longitudinal study of this size and duration, we address this analytic challenge using the maximum likelihood estimator (MLE) to estimate our mixed-effects growth curve models. Unlike listwise deletion of cases with partial item missingness, MLE estimation enables us to retain all respondents in the analysis, even those who were missing on one or more measurement occasions. This approach has been demonstrated to be effective in reducing attrition bias, particularly when sample attrition is related to model covariates, as is typically the case for the contextual and family socioeconomic measures we include (Feldman and Rabe-Hesketh 2012).

In line with prior research using ECLS-K data (e.g., Reardon and Galindo 2009), we make certain sample restrictions in our analyses. When modeling reading ability, we limit the analytic sample to students who passed an English proficiency exam in the first data collection wave. Only English-proficient students were administered the reading assessments at each wave of ECLS-K data collection. As a result, the sample composition of Mexican American students with observed reading test scores changes across time, as an increasing share of English Language Learners become eligible to take the reading test as their English proficiency improves. This change in sample composition would be confounded with estimated achievement growth trajectories if students who were not English proficient at the study's outset were included in the analytic sample. Therefore, the analytic sample we use in reading achievement analyses consists of a stable group of approximately 820 students who were English proficient at kindergarten entry. No such complication exists with respect to the math achievement test, however, as students could take the test in Spanish or English formats. We are, therefore, able to conduct analyses of mathematics achievement growth using the full Mexican American student sample ($N \approx 1{,}540$).[3]

[3] As a test of the potential bias arising from non-English-proficient students' exclusion from the English achievement analysis, we present math achievement results from the same restricted sample in the Table 5 in Appendix. While the substantive conclusions suggested by this analysis are largely the same as those from the full-sample analysis, the restricted analysis reflects the higher average achievement and smaller immigrant-native disparities among English-proficient Mexican American children when compared to results from the sample including Spanish-speakers. In addition, unlike results from the full-sample analysis reported in Table 4, residence in a high-immigrant neighborhood is not significantly associated with higher math achievement at kindergarten entry among English-proficient children of immigrants.

Our outcomes of interest are reading and mathematics achievement, which we measure via students' Item Response Theory (IRT)-based $\theta$ (theta) scores derived from their responses to standardized test questions. Unlike the effectively ordinal-scaled IRT scale scores frequently used by ECLS-K analysts, $\theta$ scores are approximately interval scaled, which allows for meaningful cross-group comparisons of longitudinal achievement trajectories (NCES (NCES) 2009; Reardon 2008).

Children's ethnic affiliation was provided by their primary caregivers, and we include in our analysis all children whose caregivers identified them as "Mexican", "Mexican American," or "Chicano." Mothers and fathers were asked to report their country of birth as part of the ECLS-K questionnaire administered in the spring of first grade. We use these items to classify students into either a combined first- and second-generation category comprising children with at least one parent born in Mexico or a third-plus generation category comprising Mexican American children with no Mexican immigrant parents. Children in the combined first- and second-generation category may have been born in either the U.S. or in Mexico. However, since ECLS-K participants born in Mexico would have emigrated during their pre-school years, these children are in many ways more similar to members of the U.S.-born second generation than they are to children who migrated during middle childhood or later (Oropesa and Landale 1997; Rumbaut 2004).[4]

Additional covariates drawn from the ECLS-K include family socioeconomic status (SES) and parent-rated neighborhood safety and social support. We index respondents' scores on these independent variables using factor-analyzed scales to achieve parsimonious model specification and reduce multicollinearity while retaining the individual covariates in the model. Family SES is indicated by a scale constructed by NCES reflecting parents' income, educational attainment, and occupational prestige. We standardize this scale score ($x = 0, s = 1$) across the full, nationally representative ECLS-K sample to facilitate interpretation. As a result, non-zero variable means (see Table 1) reflect Mexican American students' mean scores relative to the grand mean of all ECLS-K respondents. We constructed a standardized neighborhood safety scale encompassing parents' responses to questions about whether it is safe for children to play outside in the neighborhood, whether drug dealing or use is a problem in the neighborhood, whether burglary or robbery is a problem in the neighborhood, and whether violent crime is a problem in the neighborhood ($\alpha = 0.71$). Social support is indicated by a similar standardized scale including parents' responses to questions about friends or family members' availability to watch the child if the parent needed to run an errand, provide a ride to the doctor if needed, provide advice if the child were struggling in school, lend cash if needed, or check in on the child if he or she were sick ($\alpha = 0.79$). NCES translated all parent questionnaires into Spanish, and bilingual interviewers conducted interviews of parents who were not English proficient.

In addition to information included in the ECLS-K, we draw on data from Summary File 3 of Census 2000 to assess Mexican immigrant concentration and

[4] Describing early-childhood immigrants to the U.S. (to whom he refers as the 1.75 generation), Rumbaut writes: "(T)hose who arrive in early childhood (ages 0-5)… are pre-school children who retain virtually no memory of their country of birth, were too young to go to school to learn to read or write in the parental language in the home country (and typically learn English without an accent), and are almost entirely socialized here." (2004:1167).

other contextual variables at the census tract level. While census tracts are imperfect operationalizations of neighborhoods (Lee et al. 2008; Pebley and Sastry 2009; Tienda 1991), they are drawn by local committees of data users and public officials and are commonly assumed to do a better job of approximating the usual conception of neighborhood than other spatial units approximated by the Census Bureau (Jargowsky 1997; White 1987). Research using more subjective measures of neighborhood definitions tends to reach substantively similar conclusions, although there is some evidence that neighborhoods defined at scales smaller than the census tract produce stronger neighborhood effects (for a review, see Hipp and Boessen 2013). To evaluate arguments related to immigrant revitalization and optimism, we model the concentration of immigrants in each child's neighborhood. Specifically, we measure the percentage of residents in a child's census tract who were born in Mexico. We divide this value by 10 to facilitate interpretation of the regression coefficients, which represent predicted changes in achievement associated with a ten-percentage-point increase in neighborhood Mexican immigrant concentration.[5]

We also use items drawn from Census 2000 to create a scale measuring neighborhood disadvantage. These items include the percentage of tract residents who do not have a high school degree, the percentage who have a bachelor's degree or more, the percentage of 16–19 year olds who are high school dropouts, the percentage of those in the labor force who are employed, the median family income, median rent-to-income ratio, the percentage of homes that are owner-occupied, the percentage of households receiving public assistance, and the percentage of families in poverty ($\alpha = 0.89$). Higher scores on this scale reflect greater neighborhood disadvantage. Like the other scales included in this study (i.e., family SES, neighborhood safety, and social support), we standardize neighborhood disadvantage scores across the full, nationally representative ECLS-K kindergarten sample.

Table 1 presents descriptive statistics for the independent variables across the full sample, as well as separately according to English proficiency at kindergarten entry. 66 % of the full analytic sample is composed of children of Mexican immigrants. These first- and second-generation children are disadvantaged relative to their third-plus generation peers, having substantially lower family SES, higher levels of neighborhood disadvantage, and lower levels of neighborhood safety and social support, on average. In addition, neighborhood immigrant concentration is twice as high among the first and second-generation children as among the third-plus generation children. It is important to note, however, that Mexican immigrants represent only 23 % of residents of these comparatively high-immigrant-concentration neighborhoods, on average. Thus, even in neighborhoods that might be considered Mexican-concentrated, Mexican immigrants do not typically constitute the residential majority.

Like generation status, English proficiency appears to be a salient axis of stratification among Mexican American children. Children who demonstrated English proficiency at kindergarten entry came from comparatively higher-SES

[5] In alternative model specifications (results not shown), we tested a binary immigrant enclave variable, coded "1" if a child's residential census tract contained 25 % or more Mexican immigrant residents or immediately bordered such a tract and had 15 % or more Mexican immigrant residents. While the pattern of results was essentially the same as those presented below, models using a continuous indicator of percent Mexican immigrant residents provided a better fit to the data.

**Table 1** Independent variable means

| Full sample ($N = 1{,}530$) | | | | | | |
|---|---|---|---|---|---|---|
| | Full sample | | Children of immigrants | | Children of U.S.-born parents | |
| | Mean | Std. dev. | Mean | Std. dev. | Mean | Std. dev. |
| Neighborhood % Mexican immigrant | 19.270 | 15.257 | 23.272 | 14.938 | 11.552 | 12.694 |
| Immigrant parents | 0.659 | – | 1.00 | – | 0.00 | – |
| Family SES | –0.561 | 0.625 | −0.758 | 0.534 | −0.180 | 0.612 |
| Neighborhood disadvantage | 0.491 | 0.713 | 0.657 | 0.680 | 0.171 | 0.665 |
| Neighborhood safety | −0.363 | 1.141 | −0.525 | 1.268 | 0.005 | 0.648 |
| Social support | −0.159 | 0.864 | −0.220 | 0.909 | −0.020 | 0.737 |
| | | | $N = 1{,}010$ | | $N = 520$ | |
| English proficient ($N = 820$) | | | | | | |
| Neighborhood % Mexican immigrant | 13.582 | 13.180 | 16.991 | 13.870 | 10.804 | 11.905 |
| Immigrant parents | 0.448 | – | 1.00 | – | 0.00 | – |
| Family SES | −0.295 | 0.613 | −0.467 | 0.589 | −0.155 | 0.598 |
| Neighborhood disadvantage | 0.237 | 0.645 | 0.353 | 0.652 | 0.143 | 0.625 |
| Neighborhood safety | −0.164 | 0.876 | −0.330 | 1.033 | −0.002 | 0.651 |
| Social support | −0.109 | 0.822 | −0.183 | 0.889 | −0.037 | 0.746 |
| | | | $N = 370$ | | $N = 460$ | |
| Non-english proficient ($N = 710$) | | | | | | |
| Neighborhood % Mexican immigrant | 25.933 | 14.827 | 26.926 | 14.319 | 16.581 | 16.323 |
| Immigrant parents | 0.904 | – | 1.00 | – | 0.00 | – |
| Family SES | −0.871 | 0.480 | −0.927 | 0.416 | −0.347 | 0.685 |
| Neighborhood disadvantage | 0.787 | 0.674 | 0.833 | 0.633 | 0.358 | 0.874 |
| Neighborhood safety | −0.595 | 0.876 | −0.647 | 1.381 | 0.058 | 0.634 |
| Social support | −0.217 | 0.908 | −0.244 | 0.921 | 0.114 | 0.66 |

**Table 1** continued

| Full sample ($N = 1{,}530$) | | | | | | |
|---|---|---|---|---|---|---|
| | Full sample | | Children of immigrants | | Children of U.S.-born parents | |
| | Mean | Std. dev. | Mean | Std. dev. | Mean | Std. dev. |
| | | | $N = 640$ | | $N = 70$ | |

Tow-tailed $t$ tests of mean differences between children of immigrant and US-born parents are significant at $p < 0.001$

**Table 2** Mean reading and math IRT theta scores by data collection wave and parents' nativity

| | Full sample | Immigrant parents | U.S.-born parents |
|---|---|---|---|
| Reading theta score (English-proficient students) | | | |
| Fall, kindergarten | −1.47 | −1.56*** | −1.39*** |
| Spring, kindergarten | −0.81 | −0.88*** | −0.75*** |
| Spring, first grade | 0.06 | 0.01 ** | 0.10 ** |
| Spring, third grade | 0.76 | 0.73 ** | 0.79 ** |
| Spring, fifth grade | 1.01 | 0.98 ** | 1.04 ** |
| Spring, eighth grade | 1.26 | 1.25 | 1.27 |
| Math theta score (All students) | | | |
| Fall, kindergarten | −1.44 | −1.53*** | −1.28*** |
| Spring, kindergarten | −0.91 | −0.99*** | −0.74*** |
| Spring, first grade | −0.08 | −0.13*** | 0.02*** |
| Spring, third grade | 0.59 | 0.54*** | 0.68*** |
| Spring, fifth grade | 0.98 | 0.94*** | 1.09*** |
| Spring, eighth grade | 1.31 | 1.27*** | 1.42*** |
| Math theta score (English-proficient students) | | | |
| Fall, kindergarten | −1.30 | −1.36*** | −1.25*** |
| Spring, kindergarten | −0.76 | −0.82 ** | −0.72 ** |
| Spring, first grade | 0.02 | −0.00 | 0.03 |
| Spring, third grade | 0.68 | 0.66 | 0.70 |
| Spring, fifth grade | 1.08 | 1.07 | 1.10 |
| Spring, eighth grade | 1.42 | 1.42 | 1.43 |

*** $p < 0.001$; ** $p < 0.01$; Two-tailed $t$ test of mean difference between children of foreign-born and US-born parents

families and lived in comparatively more advantaged neighborhoods than their non-English-proficient peers. It is especially important to bear in mind associations among English proficiency, socioeconomic resources, and social context when evaluating Mexican American children's educational performance. Like prior researchers (e.g., Reardon and Galindo 2009), we exclude non-English-proficient students from analyses of reading achievement trajectories, a decision which may bias our achievement estimates upward and potentially limits our reading achievement findings' generalizability to the population of Mexican American students who enter kindergarten already familiar with English.

Table 2 presents mean reading and mathematics achievement scores at each wave of data collection. Again, we see that children of immigrant parents are disadvantaged compared to third-plus generation children. At each grade level from kindergarten through eighth grade, children of Mexican immigrants' achievement scores lag behind those of their coethnic, third-plus generation peers. Of interest, however, is that fact that English-proficient children of immigrants' achievement scores grow closer to third-plus generation students' scores over time. In reading, the initial statistically significant 0.17-point gap declines to nonsignificance by the conclusion of eighth grade, while the initial 0.11-point mathematics achievement gap declines to

nonsignificance by the conclusion of first grade. However, it is important to note that English-proficient children of immigrants are comparatively more advantaged (or, more accurately, less severely disadvantaged) than non-English-proficient first- and second-generation Mexican American children, as illustrated in Table 1. As the middle panel of Table 2 demonstrates, when non-English-proficient children are included in the sample, the 0.15-point initial math achievement gap between Mexican American children of foreign- and native-born parents remains remarkably steady over the elementary and middle school years. We examine factors driving these longitudinal trends in the multivariate analyses described below.

## Method

We employ four-level random coefficients growth curve models to examine students' initial status and rate of change for reading and mathematics test scores across the 9-year span encompassing kindergarten entry through eighth grade completion. Our models account for the dependence resulting from the nesting of test scores within students, students within neighborhoods, and neighborhoods within school districts. In a simplified form, these models can be expressed as concurrent sub-models. The level-1 submodel takes the following general form:

$$Y_{tijk} = \pi_{0ijk} + \pi_{1ijk}(\text{year in school}_{ijk}) + \pi_{2ijk}(\text{year in school}^2_{ijk}) + \pi_{3ijk}(\text{year in school}^3_{ijk}) + \varepsilon_{tijk}$$

where $Y_{tijk}$ represents the reading or mathematics achievement score at school year $t$ for child $i$ in neighborhood $j$ in school district $k$, expressed as a cubic function of the child-specific time of assessment. Deviations from this trajectory are captured by the random error term, $\varepsilon_{tijk}$.

The level-2 submodel gauges the extent to which the level-1 parameters vary as a function of time-invariant, person-specific characteristics and their associated random effects. The level-2 submodel is expressed as:

$$\pi_{0ijk} = \beta_{00ijk} + \beta_{01}\,\mathrm{X}_{ijk} + r_{0ijk}$$

$$\pi_{1ijk} = \beta_{10ijk} + \beta_{11}\,\mathrm{X}_{ijk} + r_{1ijk}$$

$$\pi_{2ijk} = \beta_{20ijk}$$

$$\pi_{3ijk} = \beta_{30ijk}$$

Each child's intercept, $\pi_{0ijk}$, and linear growth parameter, $\pi_{1ijk}$, are modeled as functions of a population-average intercept plus slope parameters ($\beta_{01}$, $\beta_{11}$,) associated with a vector **X** of child-level covariates (e.g., immigrant generation status). The intercept and linear growth equations each also contain a random effect that captures individual variation around the population average for each estimated level-1 parameter.

The level-3 submodel is expressed as

$$\beta_{00} = \gamma_{000jk} + \gamma_{001jk}\, \mathrm{W}_{jk} + \upsilon_{00jk}$$

$$\beta_{10} = \gamma_{100jk} + \gamma_{001jk}\, \mathrm{W}_{jk} + \upsilon_{10jk}$$

where the level-2 intercept and linear slope vary as a function of a census-tract-specific intercept and error terms, as well as slope coefficients representing the influence of tract-level factors (e.g., neighborhood immigrant concentration) on children's initial ability and linear rate of ability growth.

The final, level-4 submodel is expressed as

$$\gamma_{000k} = \eta_{0000k} + u_{000k}$$

$$\gamma_{100k} = \eta_{1000k} + u_{100k}$$

While no school district-level covariates are included in the models, we include district-level random intercepts to adjust for dependence to geographic and administrative clustering of children and neighborhoods within school districts.

## Results

### Reading Achievement

Table 3 presents results from growth models predicting children's kindergarten through eighth grade reading achievement trajectories. Since our primary interest lies in investigating neighborhood coethnic immigrant concentration's association with Mexican American students' achievement growth, we begin by estimating a conditional growth curve model incorporating a measure of the percentage of Mexican immigrant residents in each student's residential census tract. This variable is negatively associated with students' initial reading achievement, such that a ten-percentage-point increase in Mexican immigrant concentration corresponds with a 3.3 % ("tract % Mexican immigrant" coefficient [−0.048] divided by the intercept [−1.468], which represents the predicted test score for students in a zero-percent Mexican immigrant neighborhood) decrease in students' predicted reading test score at school entry. The slope coefficient for neighborhood Mexican immigrant concentration, however, is significant and positive, implying that residence in immigrant-rich neighborhoods is not adversely associated with Mexican American students' reading trajectories over the elementary and middle school years. However, while it is significantly different from zero, the rate-of-change coefficient for Mexican immigrant concentration is quite small: compared to the average linear rate of achievement growth (0.976 points per year, indicated by "Year in School" coefficient for Model 1) each additional ten-percentage-point increase in neighborhood Mexican immigrant concentration corresponds to only a 0.4 % increase in yearly reading achievement gain. Considered together, the intercept and slope coefficients for neighborhood immigrant concentration indicate that students who reside in largely Mexican immigrant neighborhoods demonstrate lower reading achievement over the elementary and middle school years than students in less

**Table 3** Mixed-effects models for K-8 reading achievement

| | Model 1 | Model 2 | Model 3 | Model 4 |
|---|---|---|---|---|
| | Coef. (S.E.) | Coef. (S.E.) | Coef. (S.E.) | Coef. (S.E.) |
| Independent variables: model intercept | | | | |
| Constant term | −1.468 *** (0.021) | −1.429 *** (0.023) | 1.429 *** (0.026) | −1.46 *** (0.028) |
| Tract % Mexican immigrant | −0.048 *** (0.010) | −0.038 *** (0.010) | −0.038 *** (0.015) | 0.018 (0.018) |
| Immigrant family | | −0.111 *** (0.026) | −0.112 *** (0.037) | −0.046 (0.039) |
| Immigrant family × tract % immigrant | | | 0.001 (0.020) | −0.033 (0.020) |
| Family SES | | | | 0.072 *** (0.019) |
| Neighborhood disadvantage | | | | −0.089 ** (0.029) |
| Neighborhood safety | | | | 0.024 (0.015) |
| Social support | | | | 0.033 * (0.016) |
| Independent variables: slope | | | | |
| Year in school | 0.976 *** (0.012) | 0.971 *** (0.012) | 0.975 *** (0.012) | 0.986 *** (0.013) |
| Year in school$^2$ | −0.128 *** (0.004) | −0.129 *** (0.004) | −0.129 *** (0.004) | −0.131 *** (0.004) |
| Year in school$^3$ | 0.006 *** (0.000) | 0.006 *** (0.000) | 0.006 *** (0.000) | 0.006 *** (0.000) |
| Tract % immig. × years School | 0.004 ** (0.002) | 0.002 (0.002) | −0.002 (0.002) | −0.005$^{\dagger}$ (0.003) |
| Imm. family × years School | | 0.018 *** (0.004) | 0.091 (0.057) | −0.000 (0.006) |
| Imm. family × tract % Imm. × years school | | | 0.007 * (0.003) | 0.010 ** (0.003) |
| Family SES × years school | | | | −0.005 (0.003) |
| Neighborhood disadvantage × years school | | | | 0.004 (0.004) |
| Neighborhood safety × years school | | | | −0.004$^{\dagger}$ (0.002) |
| Social support × years school | | | | −0.006 * (0.003) |
| Random effect variances | | | | |
| School District, Intercept | 0.008 (0.004) | 0.008 (0.004) | 0.008 (0.004) | 0.007 (0.005) |
| Census tract, Intercept | 0.005 (0.007) | 0.004 (0.007) | 0.005 (0.007) | 0.017 (0.008) |

**Table 3** continued

| | Model 1 | Model 2 | Model 3 | Model 4 |
|---|---|---|---|---|
| | Coef. (S.E.) | Coef. (S.E.) | Coef. (S.E.) | Coef. (S.E.) |
| Child | | | | |
| Intercept | 0.080 (0.008) | 0.080 (0.008) | 0.080 (0.008) | 0.077 (0.008) |
| Year in school | 0.000 (0.000) | 0.000 (0.000) | 0.000 (0.000) | 0.001 (0.000) |
| Residual Variance | 0.067 (0.002) | 0.068 (0.002) | 0.067 (0.002) | 0.048 (0.002) |
| Intraclass correlations | | | | |
| School District−Level | 0.050 | 0.050 | 0.050 | 0.047 |
| Census tract level | 0.031 | 0.025 | 0.031 | 0.114 |
| Child-level | 0.500 | 0.500 | 0.500 | 0.517 |
| Model log Likelihood | −1031 | −1017 | −1014 | −892 |
| AIC; BIC | 2083; 2150 | 2060; 2140 | 2058; 2150 | 1829; 1968 |
| Model *N*, District | 200 | 200 | 200 | 190 |
| Model *N*, Tract | 630 | 630 | 630 | 580 |
| Model *N*, Child | 820 | 820 | 820 | 740 |
| Total Observations | 3,430 | 3,430 | 3,430 | 3,100 |

All frequencies rounded to the nearest ten per NCES regulations "Tract % Immigrant" are measured in units of 10 % points

** $p < 0.01$; * $p < 0.05$; † $p < 0.10$

immigrant-heavy neighborhoods, and this disparity is attributable to achievement inequalities that predate kindergarten entry.

With neighborhood immigrant concentration's main effect estimated, we next test for variation in this association by students' immigrant generation status in Models 2 and 3. As the descriptive statistics reported in Table 1 indicate, Mexican American children of immigrants live in neighborhoods with twice the average Mexican immigrant concentration of the third-plus generation children's neighborhoods. It is possible that the neighborhood associations reported in the Model 1 results reflect aggregated family-level differences between immigrant and native families; thus, we control for students' immigrant generational status in Model 2. Results indicate that this child-level variable acts as a source of spuriousness in the negative association between neighborhood immigrant concentration and initial reading ability, and its inclusion reduces the positive association between immigrant concentration and reading achievement growth to non-significance. The results also show that, consistent with prior work, net of neighborhood immigrant concentration, children of immigrants begin their educational careers at an 8 % (−0.111/−1.429, the ratio of the "immigrant family" coefficient to the constant term for Model 2) reading deficit, but catch up to their children of U.S.-born parents by the end of elementary school (the initial deficit among children of immigrants is 0.111 points, but with children of immigrants' additional 0.018-point gain per year of schooling, this predicted gap closes in slightly more than 6 years).

Immigrant revitalization and immigrant optimism perspectives suggest that recent immigrants derive especially strong benefits from the social capital available in immigrant-rich communities. Applied to children's educational outcomes, we might, therefore, expect to find that generation status moderates the effect of neighborhood immigrant concentration such that first- and second-generation children experience stronger positive associations between neighborhood immigrant concentration and achievement than third-plus-generation students. Results from models including a cross-level interaction between Mexican immigrant concentration and students' generation status (Model 3) suggest that generation status does not moderate the neighborhood context effect on initial achievement. However, the corresponding slope suggests that neighborhood immigrant concentration's association with reading achievement growth is conditional on generation status. While third-plus-generation children's achievement growth is not predicted to change in response to increases in neighborhood immigrant concentration, children of immigrant parents experience an estimated 0.7 % increase in linear achievement growth with each ten-percentage-point increase in immigrant concentration. This finding suggests that after children begin formal schooling, residence in a coethnic immigrant neighborhood is associated with unique, though decidedly modest, increases in achievement among children of immigrants.

The final model presented in Table 3 tests for mediation of neighborhood immigrant concentration and immigrant generation status associations using measures of family and neighborhood disadvantage. Family SES is significantly and positively associated with both initial reading achievement and the rate of increase over the elementary and middle school years, a finding that has been well established in the sociology of education literature. Neighborhood disadvantage is

negatively associated with initial reading achievement, though it is not a significant predictor of achievement growth. While social support is also positively associated with initial reading achievement, it demonstrates an unexpected significant, negative association with achievement growth. Unlike the other measures of neighborhood disadvantage, neighborhood safety is not significantly associated with initial achievement or achievement growth over time.

Including these neighborhood covariates alters the estimated relationships among neighborhood immigrant concentration, generational status, and reading achievement in important ways. Conditional on family and neighborhood context, neither immigrant generation status nor neighborhood immigrant concentration is significantly associated with initial reading achievement. Further, family and neighborhood contexts appear to suppress immigrant concentration's positive association with immigrant students' reading achievement growth, as the coefficient for the three-way interaction of generation status, neighborhood immigrant concentration, and year in school demonstrates a 43-percent increase in magnitude from Model 3 to Model 4. Despite this increase, however, the net effect of neighborhood immigrant concentration on immigrant students' reading achievement growth remains small, amounting to a one percent increase (relative to children of U.S.-born parents) in linear rate of achievement growth per ten-percentage-point increase in neighborhood immigrant concentration (children of immigrants' linear growth $= 0.986 - 0.005 - 0.000 + 0.010 = 0.991$; third-plus-generation children's linear growth $= 0.986 - 0.005 = 0.981$).

## Mathematics Achievement

Table 4 presents results from growth models predicting children's kindergarten through eighth grade math achievement trajectories. As in Table 3, we begin by estimating a baseline growth model including a measure of neighborhood immigrant concentration (Model 1). Like reading achievement, initial mathematics achievement is negatively associated with immigrant concentration, such that a ten-percentage-point increase in Mexican immigrant concentration is associated with a 3 % ($-0.044/-1.413$, the ratio of the "Tract % Mexican" intercept coefficient to the constant term for Model 1) reduction in predicted math achievement at kindergarten entry. However, unlike reading achievement, mathematics achievement growth is not significantly associated with neighborhood immigrant concentration.

Models 2 and 3 include students' generation status as a predictor of mathematics achievement and a moderator of the neighborhood immigrant concentration effect, respectively. Results from Model 2 indicate that children of immigrants demonstrate an initial 15 % ($-0.202/-1.317$, the ratio of the "immigrant family" intercept coefficient to the constant term for Model 2) disadvantage in mathematics achievement relative to third-plus-generation Mexican Americans, yet their linear achievement growth is approximately three percent greater (0.025/0.807, the ratio of the "immigrant family $\times$ years of school" term's slope coefficient to the average linear slope coefficient for the third-plus generation children). Furthermore, moderation tests show that children of Mexican immigrants do not experience the estimated immigrant concentration "penalty" on initial mathematics achievement that applies to the third-plus-generation students. In Model 3, the

**Table 4** Mixed-effects models for K-8 math achievement

| | Model 1<br>Coef. (S.E.) | Model 2<br>Coef. (S.E.) | Model 3<br>Coef. (S.E.) | Model4<br>Coef. (S.E.) | Mode5<br>Coef. (S.E.) |
|---|---|---|---|---|---|
| Intercept | | | | | |
| Constant term | −1.413 *** (0.020) | −1.317 *** (0.021) | −1.276 *** 0.025) | 1.513 *** (0.032) | 1.510 *** (0.034) |
| Tract % Mexican immigrant | −0.044 *** (0.007) | −0.024 ** (0.008) | −0.060 *** (0.013) | −0.049 *** (0.013) | 0.002 (0.016) |
| Immigrant family | | −0.202 *** (0.023) | −0.278 *** (0.032) | −0.196 *** (0.032) | −0.157 *** (0.034) |
| Immigrant family × tract % immigrant | | | 0.050 *** (0.016) | 0.064 *** (0.015) | 0.034 * (0.016) |
| English proficient | | | | 0.253 *** (0.023) | 0.226 *** (0.025) |
| Family SES | | | | | 0.038 ** (0.014) |
| Neighborhood disadvantage | | | | | −0.065 ** (0.021) |
| Neighborhood safety | | | | | 0.007 ***(0.009) |
| Social support | | | | | 0.009 (0.011) |
| Independent variables: slope | | | | | |
| Year in school | 0.818 *** (0.008) | 0.807 *** (0.008) | 0.804 *** (0.009) | 0.819 *** (0.009) | 0.822 *** (0.010) |
| Year in school$^2$ | −0.089 *** (0.002) | −0.089 *** (0.002) | −0.089 *** (0.002) | −0.090 *** (0.002) | −0.090 *** (0.002) |
| Year in school$^3$ | 0.004 *** (0.000) | 0.004 *** (0.000) | 0.004 *** (0.000) | 0.004 *** (0.000) | 0.004 *** (0.000) |
| Tract % immig. × years school | 0.000 (0.019) | −0.003 * (0.001) | 0.000 (0.002) | −0.000 (0.002) | −0.000 (0.003) |
| Imm. family × years school | | 0.025 *** (0.004) | 0.029 *** (0.005) | 0.025 *** (0.005) | 0.020 *** (0.002) |
| Imm. family × tract % Imm. × years school | | | −0.003 (0.003) | −0.004 (0.003) | −0.005 (0.000) |
| Eng. proficient × years school | | | | −0.013 *** (0.004) | −0.012 *** (0.004) |
| Family SES × years school | | | | | −0.004 (0.003) |
| Neighborhood disadvantage × years school | | | | | 0.001 (0.003) |
| Neighborhood safety × years school | | | | | −0.001 (0.002) |
| Social support × years school | | | | | 0.000 (0.002) |
| Random effect variances | | | | | |
| School district, intercept | 0.009 (0.004) | 0.006 (0.003) | 0.006 (0.003) | 0.005 (0.003) | 0.006 (0.003) |

**Table 4** continued

| | Model 1 Coef. (S.E.) | Model 2 Coef. (S.E.) | Model 3 Coef. (S.E.) | Model4 Coef. (S.E.) | Mode5 Coef. (S.E.) |
|---|---|---|---|---|---|
| Census tract, intercept | 0.010 (0.005) | 0.009 (0.004) | 0.009 (0.004) | 0.009 (0.004) | 0.009 (0.005) |
| Child intercept | 0.100 (0.006) | 0.094 (0.005) | 0.094 (0.005) | 0.086 (0.005) | 0.080 (0.005) |
| Year in school | 0.001 (0.000) | 0.001 (0.000) | 0.001 (0.000) | 0.001 (0.000) | 0.001 (0.000) |
| Residual variance | 0.054 (0.001) | 0.054 (0.001) | 0.054 (0.001) | 0.053 (0.000) | 0.053 (0.001) |
| Intraclass correlations | | | | | |
| School district-level | 0.052 | 0.037 | 0.037 | 0.033 | 0.041 |
| Census tract level | 0.058 | 0.055 | 0.055 | 0.059 | 0.061 |
| Child-level | 0.578 | 0.577 | 0.577 | 0.562 | 0.541 |
| Model log likelihood | −1,616 | −1,569 | −1,564 | −1,505 | −1,292 |
| AIC | 3,254; 3,328 | 3,165; 3,252 | 3,158; 3,259 | 3,044; 3,158 | 2,634; 2,799 |
| Model *N*, district | 240 | 240 | 240 | 240 | 193 |
| Model *N,* tract | 930 | 930 | 930 | 930 | 536 |
| Model *N,* child | 1,540 | 1,540 | 1,540 | 1,540 | 694 |
| Total observations | 6,230 | 6230 | 6230 | 6,230 | 5,540 |

All frequencies rounded to the nearest ten per NCES regulations "Tract % Immigrant" are measured in units of 10 % points

** $p < 0.01$; * $p < 0.05$; † $p < 0.10$

coefficient for the main effect of immigrant concentration on initial mathematics achievement ($b = -0.060$) represents the estimated association among Mexican American children of U.S.-born parents. This negative effect is offset by the positive coefficient for the interaction of immigrant generation status and neighborhood immigrant concentration ($b = 0.050$) among children of immigrants, suggesting that, while neighborhood immigrant concentration may not be a particular boon to immigrant children's initial mathematics achievement, neither is it associated with the same initial disadvantage evident among Mexican American children of U.S.-born parents.

The descriptive comparisons presented in Table 2 suggest that English proficiency is an important differentiating factor between children of immigrant and U.S.-born parents' early academic achievement. We include an indicator of English proficiency in Model 4 to adjust for this possible confounding factor. Results indicate that, controlling for generation status and neighborhood immigrant concentration, English-proficient students begin kindergarten with 17 % higher mathematics achievement scores than non-English-proficient students (0.253/−1.513, the ratio of "English Proficient" intercept coefficient to the constant term). However, the negative yearly growth coefficient ($b = -0.013$) associated with English proficiency indicates that children who were not English proficient at kindergarten entry gain ground in mathematics achievement relative to their English-proficient peers over the course of the elementary and middle school years. The English proficiency measure's addition to the model also modifies predicted associations between other key independent variables and initial mathematics achievement. After adjusting for English proficiency, the negative initial achievement coefficient associated with first/second-generation status is reduced in magnitude by nearly a third (−0.196 − −0.278/−0.278), though it remains statistically significant. Adjusting for English proficiency also reduces the negative coefficient for neighborhood immigrant concentration among third-plus generation children by 18 % and increases the positive coefficient for the interaction term indexing immigrant concentration among children in immigrant families by 28 %.

The final model in Table 4 adds family SES and neighborhood context covariates. Similar to the reading achievement results reported in Table 3, these variables collectively explain the predicted negative association between neighborhood immigrant concentration and students' initial mathematics achievement. However, the positive coefficient for the interaction between first/second-generation status and neighborhood immigrant concentration remains statistically significant, indicating that residence in immigrant-rich neighborhoods is associated with a unique, albeit small, benefit with respect to math achievement at kindergarten entry among children of immigrant parents.

## Discussion

The Mexican American population in the U.S. has exploded over the last three decades, accounting for at least one-third of the nation's population growth since

2000. Due to continual immigration and comparatively high fertility levels, the Mexican American population of 32 million is nearly as large as the African American population of 37 million. As the Mexican American population expands, questions about their incorporation into the American mainstream become increasingly pressing. Of critical concern are challenges that Mexican Americans face in the American educational system. While Mexican immigrants' geographic redistribution has received a great deal of research attention, the sheer size of the Mexican population and moderate levels of residential segregation mean that Mexican youth still tend to be concentrated in areas with large immigrant populations and in neighborhoods that are socioeconomically disadvantaged. Ultimately, then, a major question for social scientists and education policymakers becomes, how are neighborhood conditions promoting or inhibiting Mexican American youths' educational progress?

We have sought in this paper to shed light on this important issue by examining academic achievement trajectories among Mexican American students from the point at which they enter the U.S. schooling system until the year immediately preceding high school entry. Understanding the relationship between neighborhood context and academic development is critically important at this early stage in the educational pipeline, as academic achievement gaps develop early and continue to expand during these pivotal years (e.g., Entwisle and Alexander 1993; Alexander et al. 1997).

Using panel data from the ECLS-K linked to Census data on children's neighborhoods of residence, we found that, at the time of kindergarten entry, Mexican American children living in immigrant-rich neighborhoods score lower on reading and math assessments than Mexican American students in non-immigrant neighborhoods. However, subsequent models controlling for a range of family and community-level covariates reveal that this negative association is attributable to lower-SES families' concentration in immigrant-heavy neighborhoods as well as the higher levels of structural disadvantage in these neighborhoods. Controlling for these confounding factors, neighborhood immigrant concentration does not demonstrate a negative association with initial achievement. On the contrary, among children of immigrant parents, neighborhood coethnic immigrant concentration is positively associated with initial math achievement.

While our results suggest that neighborhood immigrant context is associated with Mexican American children's academic performance at school entry, we do not find especially strong evidence of neighborhood effects on students' achievement gains during elementary and middle school. This outcome is similar to Cortes's (2006) finding that first- and second-generation adolescents in high-immigrant-concentration high schools demonstrated equivalent achievement to their peers in schools with low immigrant student enrollments. In our models, the three-way interaction among immigrant generation status, neighborhood immigrant concentration, and year in school is a positive and significant predictor of reading achievement growth. However, it bears repeating that this effect is quite small, as we estimate that children in immigrant families experience a 1 % advantage in yearly reading achievement growth with every ten-percentage-point increase in neighborhood

Mexican immigrant concentration. We adjusted for stable child/family characteristics via the mixed-effects model and controlled for a relatively narrowly selected set of potential family- and neighborhood-level sources of spuriousness when estimating the association between coethnic immigrant concentration and achievement growth. In light of our parsimonious approach to covariate selection, it is possible that a more elaborate model specification would reduce this already small association still further, a point that must be kept in mind when considering our findings' implications.

Our findings for academic achievement at kindergarten entry support the predictions generated by contagion and collective socialization models. These perspectives predict that neighborhood immigrant concentration will be negatively associated with achievement for all students, and that this effect would be explained by neighborhood safety, neighborhood disadvantage, and social support. This is the pattern we observe with respect to Mexican American students' initial reading and math performance.

At the same time, our findings are partly consistent with immigrant revitalization and immigrant optimism perspectives. These perspectives imply that, net of the structural disadvantages that characterize many immigrant-rich neighborhoods, coethnic immigrant concentration should be associated with higher levels of academic performance among children in immigrant families. We find that neighborhood immigrant concentration is positively associated with initial mathematics achievement among children of immigrants, which may reflect a particular advantage to residence in immigrant neighborhoods among first and second-generation Mexican Americans. The small but significant positive association between neighborhood immigrant concentration and children of immigrants' reading achievement growth rate is similarly in line with this interpretation. In both cases, immigrant concentration's positive associations accrue only to children of immigrant parents. One interpretation of this finding is that the educational benefits of residence in a coethnic community fade across generations.

In contrast to the theoretical perspectives described above, our results are inconsistent with the institutional model of neighborhood educational effects. This perspective would predict negative effects of neighborhood immigrant concentration on children's achievement growth during the school years due to immigrant children's limited access to quality schools in these communities. However, we find evidence of the opposite association among children from immigrant families in terms of reading achievement and null relationships between neighborhood immigrant concentration and mathematics achievement growth. Our results, therefore, suggest that schools serving children who live in immigrant-rich neighborhoods are equivalently effective to schools in non-immigrant communities.

## Appendix

See Table 5.

**Table 5** Mixed-Effects Models For K-8 Math Achievement: English-proficient Kindergarteners Only

| | Model 1<br>Coef. (S.E.) | Model 2<br>Coef. (S.E.) | Model 3<br>Coef. (S.E.) | Model 4<br>Coef. (S.E.) |
|---|---|---|---|---|
| Independent variables: model intercept | | | | |
| Constant term | −1.309 (0.021) | −1.278 *** (0.023) | −1.263 *** (0.025) | −1.276 *** (0.028) |
| Tract % Mexican immigrant | −0.028 ** (0.010) | −0.020 (0.011) | −0.034 * (0.015) | 0.011 (0.018) |
| Immigrant family | | −0.087 ** (0.026) | −0.125 ** (0.037) | −0.079 * (0.039) |
| Immigrant family × tract % immigrant | | | 0.000 (0.000) | 0.000 (0.020) |
| Family SES | | | | 0.055** (0.018) |
| Neighborhood disadvantage | | | | −0.065 * (0.028) |
| Neighborhood safety | | | | 0.014 (0.015) |
| Social support | | | | 0.024 (0.016) |
| Independent variables: slope | | | | |
| Years of schooling | 0.780 *** (0.010) | 0.775 *** (0.010) | 0.775 *** (0.011) | 0.778*** (0.011) |
| Years of schooling$^2$ | −0.083 *** (0.003) | −0.083 *** (0.003) | −0.083 *** (0.003) | 0.084 *** (0.003) |
| Years of schooling$^3$ | 0.003 *** (0.000) | 0.003 *** (0.000) | 0.003 *** (0.000) | 0.003 *** (0.000) |
| Tract % immig. × years school | 0.000 (0.002) | −0.000 (0.010) | −0.001 (0.002) | −0.002 (0.003) |
| Imm. family × years school | | 0.018 *** (0.004) | 0.018 ** (0.006) | 0.011 (0.006) |
| Imm. family × Tract % Imm. × Years school | | | 0.000 (0.000) | 0.001 (0.003) |
| Family SES × years school | | | | −0.007 (0.004) |
| Neighborhood disadvantage × years school | | | | 0.002 (0.004) |
| Neighborhood safety × years school | | | | −0.002 (0.003) |
| Social support × years school | | | | −0.005 (0.003) |
| Log likelihood | −706 | −694 | −693 | −589 |
| AIC; BIC | 1,434; 1,501 | 1,415; 1,494 | 1,416; 1,508 | 1,224; 1,362 |
| Model *N*, district | 200 | 200 | 200 | 190 |
| Model *N*, tract | 630 | 630 | 630 | 580 |

**Table 5** continued

| | Model 1<br>Coef. (S.E.) | Model 2<br>Coef. (S.E.) | Model 3<br>Coef. (S.E.) | Model 4<br>Coef. (S.E.) |
|---|---|---|---|---|
| Model *N,* child | 820 | 820 | 820 | 740 |
| Total observations | 3,430 | 3,430 | 3,430 | 3,100 |

All frequencies rounded to the nearest ten per NCES regulations

*** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$

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