

## Estimating the determinants of the demographic mismatch between schools and neighborhood\*

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### **Abstract**

This paper estimates the determinants of demographic mismatch between urban schools and surrounding neighborhood using data for elementary schools from the Los Angeles Unified School District. It compares the effect income and neighborhood ethnic composition have on school-neighborhood ethnic disparities. White and Asian households are found to be quite sensitive to neighborhood ethnic composition in using local public schools. Neighborhood income is found to promote demographic matching but the effects are generally not statistically significant.

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# 1 Introduction

Primary and secondary schools partially determine the location of households in urban areas. The large “white flight” literature has documented how access to schooling has contributed to urban segregation along lines of race and income (Baum-Snow and Lutz, 2011; Coleman, Kelly and Moore, 1975; Reber, 2005). The connection household location has to schooling is driven partially by school district policy assigning students to immediate neighborhood schools – a practice that persists (Monarrez, 2018). This assignment policy contributes to grade-school demographics matching that of surrounding neighborhoods.

Social institutions exist, however, serving to delink schooling from residential location, potentially weakening the connection between public schools and neighborhoods. The existence of private schools as well as education policy allowing parental choice may contribute to this effect. These institutions decrease the cost to households of making residential location decisions based on characteristics unrelated to local schools. Education choice may decrease residential segregation, at the cost of increasing segregation in schools (Bifulco, Ladd, and Ross, 2008; Renzulli and Evans, 2005).

This study examines the demographic disparities between school and neighborhood using a sample of elementary schools in Los Angeles. Ethnicity is used as an index of demography. This study compares the ethnic distribution of elementary schools in the Los Angeles Unified School District to their surrounding attendance areas in 2010.<sup>1</sup>

Neighborhoods in US urban areas remain segregated by race and income (Cutler, Glaeser, and Vigdor, 1999; Jargowsky, 1996; Logan, 2013), partially reflecting household sorting by individual schools and school districts (Black, 1999; Kane, Riegg and Staiger, 2006). As is the case for many large urban districts, the Los Angeles Unified School District (LAUSD), the second largest in the US, has a predominantly minority student body. In 2010, Latinos made up 72% of the average elementary school’s student body (table 1). In terms of household sorting on the basis

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<sup>1</sup> The Los Angeles Unified School District covers all of the city of Los Angeles and all or parts of 31 smaller municipalities. It also covers unincorporated areas in Los Angeles County. Los Angeles city residents make up over 80% of the total population covered by LAUSD.

of schools, the statistics on the ethnic composition of Los Angeles schools over the prior decade suggest the district is in relative equilibrium. The average elementary school in Los Angeles enrolled proportionally the same number of Asian students in 2010 as 2000 (table 1). The proportion White fell less than two percentage points over the decade. The presence of Latinos grew over the decade by four percentage points. This study finds substantial differences between the ethnic distribution of schools and the distribution of school-aged minors within the attendance areas, suggesting the make-up of schools reflects factors beyond residential sorting. If grade schools do not mirror the demographics of local neighborhoods, what social factors are inducing the disparities?

Table 1. Elementary School Demographic Characteristics for Years 2000 and 2010

Variables	2000			2010		
	Mean	Min	Max	Mean	Min	Max
Enrollment	859.04	194	2,538	606.15	136	1,681
Percent Asian	0.068	< 0.01	0.763	0.068	< 0.01	0.641
Percent Black	0.129	< 0.01	0.944	0.098	< 0.01	0.916
Percent Latino	0.676	0.027	1.00	0.719	0.024	1.00
Percent White	0.125	< 0.01	0.847	0.106	< 0.01	0.876

The observed ethnic disparities, a product of household decisions, may reflect parental selectivity increasing with household economic means. Some households may opt out of the locally assigned school because they have the means to do so. The correlation between economic class and race in the US gives rise to the possibility that the observed school-neighborhood ethnic differences are a reflection of income and wealth, not explicitly race.<sup>2</sup> Alternatively, the disparities may reflect a conscious reaction by households to the racial makeup of the neighborhood school. Some parents may not want their children attending institutions with students from disfavored groups.

<sup>2</sup> From the 2010 Census, median household income by ethnic group: Non-hispanic White - \$54,620, Black - \$32,068, Hispanic - \$37,759, Asian - \$64,308.

This study calculates the difference between school and attendance area populations by ethnic group and estimates the social determinants of the deviations for the separate groups. The study uses as determinants the neighborhood racial makeup and neighborhood income and wealth, as well as school specific characteristics. This study finds little evidence indicating household economic means contribute to the observed ethnic disparities among elementary schools. Neighborhood racial composition, however, is found to partially determine school-neighborhood deviations for Asian and White households.

## 2 Choice in LAUSD

Demographic disparities between schools and neighborhoods arise primarily from households electing not to use neighborhood schools. In the LAUSD most elementary schools have attendance areas within which students are assured a place. The district however also runs programs allowing households to use non-designated schools. In 2010, the district administered fourteen magnet schools at the elementary level and offered magnet programs within other elementary schools. The district also designated schools as falling under a gifted and talented student program parents could apply for. The LAUSD's state-mandated open enrollment program is the district's broadest effort to facilitate parental choice. The program allows parents to choose any appropriate school within the district, subject to seat availability. All schools with enrollment below capacity participate in the program. In the 2010-11 school year, 20,477 students enrolled in LAUSD schools (K-12) through the program, representing 3.22% of all students in the district. Private schools are also an option that could induce school-neighborhood disparity. In 2010, approximately 1,302 private schools, whose coverage included elementary grade levels, operated in Los Angeles County.<sup>3</sup>

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<sup>3</sup> The Open Enrollment statistics were provided by the LAUSD. The data on private schools was taken from State Department of Education website: <https://www.cde.ca.gov/ds/si/ps/>

### 3 Measure of demographic disparity

This paper's measure of school-neighborhood disparity compares the number of students in schools by ethnic group to the number of appropriately aged minors in the schools' attendance area. The deviation measure,  $D_{ij}$ , in equation 1 is the difference between the number of students by ethnic group  $j$  in kindergarten through fourth grade within school  $i$  ( $S_{ij}$ ), and the total number of minors age five to nine in school  $i$ 's attendance area by ethnic group,  $N_{ij}$ .<sup>4</sup> The deviation measure, calculated as a percentage of the total number of minors by ethnic group residing in the attendance areas, is calculated separately for Latino, Black, White and Asian students. The student counts in  $S_{ij}$  are taken from the California Department of Education data for 2010. The attendance area measure,  $N_{ij}$ , is calculated from the 2010 Census.

$$D_{ij} = \frac{S_{ij} - N_{ij}}{N_{ij}} \quad (1)$$

With few exceptions, LAUSD elementary schools have defined attendance areas the district records through digitized maps. This study calculates  $N_{ij}$  and other demographic characteristics of the attendance areas through digital overlays of the attendance areas with 2010 census tracts for Los Angeles County. Magnets schools and those with geographically overlapping attendance areas were excluded in the construction of the sample.<sup>5</sup> These exclusions narrowed the sample to 199 elementary schools from over four hundred in the district.

Table 2 records the mean school-neighborhood disparity by ethnic group. The means suggest the average public school enrolls fewer students in each ethnic group than those residing in the attendance area.<sup>6</sup> Latinos

<sup>4</sup> The grades kindergarten through fourth grade correspond to the age range of five through nine. The 2010 Census records population by age through restricted age categories.

<sup>5</sup> Overlapping attendance areas make it impossible to define the demographics of individual areas, given that some households can effectively choose the area they belong to.

<sup>6</sup> The disparities between the number of students in a school and the corresponding number within the attendance area reflects more than just the choices of households within the school's attendance area. Open Enrollment students attending a school from outside the school's attendance area may, for example, produce parity between the school's Latino population and the number of Latino's within the attendance area. A deficit of students for particular groups

are the only group whose representation on average comes close to matching their population count. The mean deficit of fifteen Latino students in table 2 represents just four percent of Latino minors residing in the attendance areas. White students generate the greatest discrepancy in absolute and percentage terms. On average, White student enrollment made up only half the White minors residing in the average school's attendance area. The percent deficits for African-American and Asian students fall between Latinos and Whites, although they are both closer to the mean discrepancy for Whites. The calculated standard deviations in table 2 suggest school-neighborhood disparities vary substantially across schools.

Table 2. The Difference between School Population and Attendance Area Age Cohort Populations by Ethnic Group

Ethnic Group	% of Attendance Area Cohort		Total Difference	
	Mean	Standard deviation	Mean	Standard Deviation
Latino	-0.040	0.540	-15.388	95.829
White	-0.506	0.524	-47.835	77.932
Black	-0.286	1.047	-14.785	41.339
Asian	-0.344	0.778	-14.522	32.574

Sample is n=199 schools with non-overlapping attendance areas. The total difference is calculated as the number of students in each school by ethnic group minus the population within the ethnic and age cohort living within the school's attendance area.

The discrepancies between the attendance area and school populations among non-Latino students could reflect households using magnet and other non-designated LAUSD schools. The comparison, however, of the total population of five-to-nine year olds living within LAUSD boundaries with the number attending LAUSD elementary schools (kindergarten through 4<sup>th</sup> grade) suggests the discrepancies largely reflect the students not using the public school system at all. For example, the total number of White students attending LAUSD elementary schools make up only 48.6% of the total number of White minors residing within LAUSD borders. The

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however implies that at least part of the disparity reflects choices made by households within the attendance area.

statistic suggests the paucity of Whites attending schools within their attendance areas does not reflect students attending magnets and other public schools within the LAUSD. The percent of Asian and African American minors using public schools, 71.3% and 82.5%, also suggest the use of schools such as magnets explains only a small portion of the demographic discrepancies found in LAUSD schools with non-overlapping attendance areas.<sup>7</sup>

## 4 Regression Model Specification and Variables

Equation 2 estimates the determinants of demographic disparities,  $D_{ij}$ , for LAUSD elementary schools. The regression models include controls for neighborhood economic characteristics in  $\gamma$ , neighborhood demographics in  $x$ , as well as two school-specific covariates, total enrollment and a measure of school quality, both represented by  $\eta$ . All of the neighborhood-specific variables, except for the number of private schools, are constructed from digital map overlays of the attendance areas with census tracts from the 2010 Census.

$$D_{ij} = \gamma\theta + x\psi + \eta\delta + \varepsilon \quad (2)$$

The mean neighborhood income and house value covariates within  $\gamma$  are constructed by averaging the variable medians for the tracts included wholly or partially within each school's attendance area. The poverty rate and the demographic covariates in  $x$  are expressed as proportions and are calculated using summations across census tracts within the attendance areas. The variables are calculated by weighing the census tracts by the proportion of the geographic area they take up in the attendance areas. The neighborhood ethnic covariates (Black, White, and Latino) represent the percentage of the total population in the attendance areas falling within the specific ethnic groups. The education attainment variable, the

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<sup>7</sup> The total number of five-to-nine year olds residing within LAUSD is calculated from the overlay of 2010 census tract data with the geographic area of the school district. The total number of elementary school students by ethnic group in LAUSD is taken from California Department of Education data.

percent with a Bachelor's or higher, corresponds to adults over 25. The remaining neighborhood covariate accounts for the number of private schools within five miles proximity of each public school in the sample.<sup>8</sup>

The number of private school alternatives is expected to contribute to the demographic disparity between neighborhood and public school. Fairlie and Resch (2002) has found that enrollment in private schools is partially determined by their proximity to households. In general, school selectivity by households is expected to contribute to school-neighborhood disparities. The percent college educated by neighborhood is included as a measure of household selectivity of schools. A number of studies including Long and Toma, 1988, Fairlie and Resch 2002, and Li, 2009 have found the education level of parents is a determinant of selectivity.

This study reasons that the observed dissimilarity between schools and neighborhoods reflects education choices made at the household level. The question is the degree race and economic means contribute to explaining the demographic disparities, controlling for other socio-economic and school characteristics. Mean household income and housing value (a measure of wealth) are hypothesized to induce school-neighborhood mismatch. School selectivity among households and the means to attend non-local institutions should increase with income and wealth (Buddin, Cordes and Kirby, 1998; Fairlie and Resch, 2002). The poverty rate is included as a measure of the population size in the attendance areas at the lower end of the income distribution. The variable, a negative indicator of means, is expected to be inversely related to school demographic disparities.

A large literature has found that households respond to school quality, measured by exam scores (Black, 1999; Bogart and Cromwell, 2000; Figlio and Lucas, 2004). From 1998 to 2013, California administered a yearly standardize exam (whose acronym is STAR) by grade level across all public schools. The exam was divided into English, Math, Science and History. This study's school quality measure is calculated as the percentage of students found proficient in Math and English, averaged over the three year period 2007-2009.

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<sup>8</sup> The measure was calculated by employing the zip code geographic indicators that came with the public and private school data. The number of private schools was summed by zip code. The zip codes with centroids within five miles of the center of each public school's zip code were identified.



The only characteristic this study accounts for that is household-specific (as opposed to neighborhood or school-specific) is the ethnicity of the individual students. The variable is used to infer the ethnicity of the household. The neighborhood-level covariates representing the ethnic composition of the attendance areas, which come from census data for the entire population, are indicators of the potential ethnic makeup of the schools – if parents utilized only the locally prescribed school. Households, in making education decisions, are modelled to be influenced by the racial makeup of the local school relative to their own. The decisions of individual households however, may alter the demographic composition of the locally assigned school. The literature implies an increase in the neighborhood proportion non-white should decrease the use of schools by white households (Baum-Snow and Lutz, 2011; Reber, 2005). There has been little research on the effect neighborhood diversity has on the schooling choices of non-white households. This study hypothesizes neighborhood racial diversity will induce White underutilization of local schools. The estimated effects among Whites serve as a basis of comparison to non-white households.

## **5 Empirical results**

Table 3 reports the determinants of the variation in local elementary school attendance by ethnic group. A positive coefficient implies the covariate induces households to use the locally assigned elementary school, decreasing the average disparity between school and attendance area. A deficit exists in the average school in students from each ethnic group relative to their numbers in the attendance areas (table 2). The empirical analysis seeks to distinguish between two broad categories of determinants of school-neighborhood disparities. Are school demographic mismatches a reflection of neighborhood economic means, or of race? Examining the size and direction of effects from the two sources contributes to understanding the social determinants of demographic disparities between schools and surrounding neighborhoods.

Table 3. Determinants of Neighborhood Attendance in Elementary Schools by Ethnic Group

Variable	Latino	White	Black	Asian
Intercept	-0.439 (0.627)	-0.129 (0.564)	-4.120* (1.145)	0.065 (0.570)
Number of Private Schools	-0.017 (0.024)	-0.003 (0.020)	0.030 (0.037)	-0.041 (0.035)
School Quality	0.710 (0.469)	0.872* (0.360)	2.755* (0.986)	3.070* (0.884)
School Size	0.029* (0.013)	0.036* (0.011)	0.053** (0.027)	0.033 (0.020)
<b>Neighborhood Income/Wealth</b>				
Mean Income	0.001 (0.005)	0.002 (0.003)	0.014 (0.011)	0.010* (0.005)
Mean House Value	0.006 (0.005)	0.001 (0.004)	-0.009 (0.011)	-0.001 (0.005)
Poverty Rate	-0.743 (0.430)	-1.172* (0.421)	1.636 (1.034)	0.851 (1.110)
<b>Neighborhood Demographics</b>				
Percent White	0.126 (0.561)	0.077 (0.521)	0.989 (0.746)	-2.172* (0.515)
Percent Latino	-0.122 (0.521)	-1.282* (0.521)	0.798 (0.765)	-2.862* (0.589)
Percent Black	-0.419 (0.501)	-0.884** (0.481)	2.451* (0.719)	-2.102* (0.662)
Percent of Adults College Degree	-0.591 (0.694)	-1.777* (0.574)	3.320* (1.212)	-1.899** (0.985)
Observations	187	187	187	187
R <sup>2</sup>	0.1499	0.4019	0.3855	0.4775

Significant at \*5% level, \*\*10% level. Standard errors, in parentheses, are corrected for heteroscedasticity.

The specification for White households in table 3 indicates neighborhood ethnic composition plays a more important role in determining school disparities than does wealth or income. The positive point estimates for the income and housing value covariates suggest the economic characteristics actually promote school-neighborhood integration among White households. The effects however are relatively small and statistically insignificant.<sup>9</sup> In contrast, neighborhood racial composition has large, statistically significant effects. White household use of local schools diminishes as the neighborhood proportion of Latinos and African-Americans expands, relative to the left-out group. The point estimates imply a standard deviation decrease in the proportion Latino would more than double the percentage of White minors in the attendance area enrolling in the local elementary school.<sup>10</sup> These results are consistent with the studies documenting ethnic disparities in schools arising from residential sorting (Baum-Snow and Lutz, 2011; Coleman, Kelly and Moore, 1975; Reber, 2005).<sup>11</sup>

The effects of race on Asian households are consistent with those found in the White specification. Utilization of local schools by Asians is inversely related to the neighborhood proportion of each of the remaining ethnic groups. The effects, all significant, are actually larger than those estimated for White households. In contrast to White households, neighborhood income is a significant determinant inducing Asian households to attend local schools.

The regression results in table 3 provide little evidence that neighborhood racial composition affects the schooling choices of Black or Latino households. The only significant racial effect suggests Black households residing in neighborhoods with larger African-American populations are attracted to local elementary schools. None of the racial composition

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<sup>9</sup> For example, a standard deviation increase in neighborhood income (equal to 19.97) would change the predicted proportional deficit of White students in the average school from -0.71 to -0.67.

<sup>10</sup> A standard deviation decrease in percentage Latino drops White underutilization by thirty-six percentage points from -0.71 to -0.35. The same experiment using African-Americans decreases White underutilization by thirteen points. The standard deviation in neighborhood proportion Latino is 0.284, for the proportion Black, 0.146.

<sup>11</sup> The results indicate an inverse relationship between attendance area poverty rate and White utilization of local schools. This result, which is unexpected given how the variable was modeled, may partially reflect White households avoiding schools with potentially larger numbers of poor students.

covariates have a significant effect on Latino use of local schools.

The income and house value variables are, with one exception, statistically insignificant and generally indicate economic means promotes school-neighborhood matching. The hypothesis that income or wealth may contribute to school-neighborhood demographic disparities is supported only by the insignificant negative point estimates for mean house value for Black and Asian households. The positive income point estimate for Asian households is the sole significant effect among the income/wealth covariates. The effect suggests Asian households sort geographically by income to attend preferred public schools.<sup>12</sup>

The measured quality of public schools has the expected positive effect on attendance across the specifications. The point estimates of the effects are larger for Black and Asian households and are statistically significant for all groups except Latinos. Proximity to private schools is found to decrease the use of public institutions, as expected, for all except Black households. The effects are statistically insignificant across specifications, which implies that while private schools are used as a substitute for public, their geographic proximity may not determine their use. The significant results for school size (measured by total enrollment) suggest larger institutions are more demographically representative of their attendance areas than smaller schools.

The summary statistics in table 2 indicate that as a proportion of the attendance area population, Latinos are much more likely than the other groups to use local public schools. The calculated standard deviations in table 2 also suggests that there is substantial variation in the use of public schools by all ethnic groups, including Latinos. The regression specification for Latinos in table 3 is distinguished in how little variation in the group's behavior the model explains relative to the other ethnic groups. The regression explains 15% of the variation in Latino use of local schools, less than half the  $R^2$  calculated for the other households.

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<sup>12</sup> The regression models are explaining variation in school use *across* attendance areas using average neighborhood income and house value as measures of economic means. Relatively wealthy households *within* the attendance areas may be more prone to use non-local public schools. The use of the mean income and home value covariates in the regressions may not detect this.

## 6 Conclusion

This study estimates the determinants of the demographic mismatch between elementary schools and their attendance areas in the Los Angeles Unified School District. The study compares the effect neighborhood income and racial makeup have on the demographic disparities. The regression estimates suggest White and Asian households are quite sensitive to neighborhood ethnic composition in using local public schools. Less evidence is found on the role of race in the schooling decisions of Black and Latino households. Neighborhood income is found to have a statistically significant effect only for Asian households. The positive estimated effect suggests public school use by Asian households reflects geographic sorting by income.

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