SEPARATE WHEN EQUAL? RACIAL INEQUALITY AND RESIDENTIAL SEGREGATION

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RACIAL SORTING AND NEIGHBORHOOD QUALITY

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SEPARATE WHEN EQUAL – MAIN HYPOTHESIS

- Because race is correlated with income and income affects residential choices, racial segregation would emerge even in the absence of explicit sorting on the basis of race (Schelling (1969, 1971)).

- A seemingly natural corollary: A reduction in racial socioeconomic inequality would lead to a reduction in segregation.

- We conjecture that the opposite would occur in US metro areas

THREE MOTIVATING FACTS:

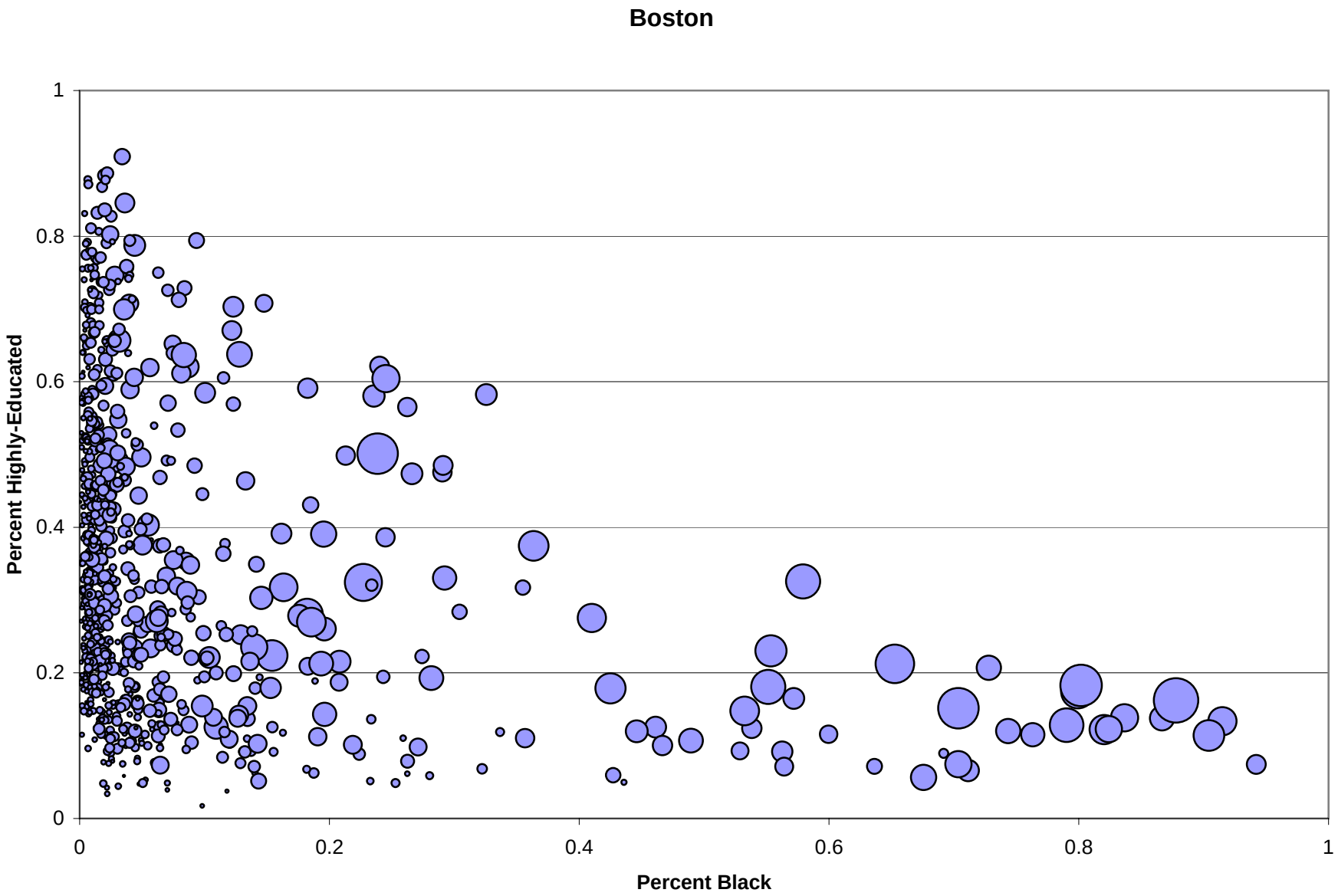
1. In US metro areas, middle-class black neighborhoods are in short supply.

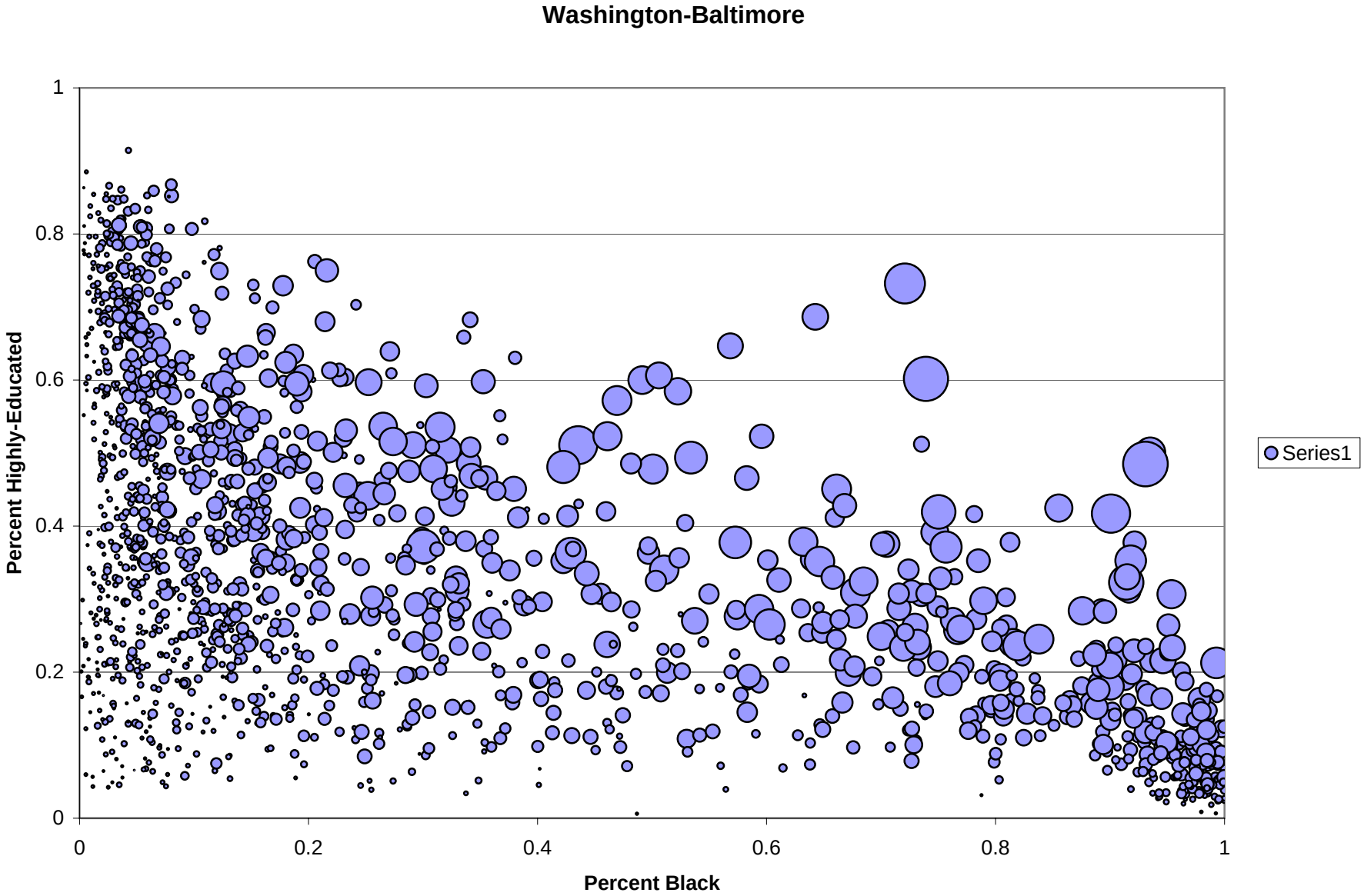
2. Given available neighborhoods, highly-educated blacks choose a very diverse set of neighborhoods: ranging from predominantly-white high-SES to predominantly-black low-SES neighborhoods.

    - Suggests that short supply of middle-class black neighborhoods may be binding.

3. Metropolitan areas with a greater proportion of highly-educated blacks (proxying for socioeconomic status (SES)) tend to have a greater supply.

    - Such neighborhoods might provide an attractive alternative for high-SES (and possibly other blacks) leading to an increase in segregation.


Boston
Percent Highly-Educated
1
0.8
0.6
0.4
0.2
0
0
0.2
0.4
0.6
0.8
1
Percent Black


Washington-Baltimore
Percent Highly-Educated
Percent Black
0
0.2
0.4
0.6
0.8
1
Series1

HOW TO TEST THIS COUNTERFACTUAL CONJECTURE?

Conjecture concerns how the metropolitan housing market equilibrium is affected by a change in the primitives.

Two broad approaches:

1. Reduced-Form: Treat each metropolitan area in the US as a distinct equilibrium observation. Examine how equilibrium structure is affected by change in primitive.

2. Structural: Estimate underlying preferences using equilibrium model of residential sorting. Individual decisions observed in current equilibrium reveal preferences – can then infer impact of change in primitives using counterfactual simulation.

STYLIZED EQUILIBRIUM MODEL OF DECENTRALIZED RESIDENTIAL CHOICE

- Use to explore the impact of increasing the proportion of highly educated blacks in the metropolitan population on segregation.

- Show how previously non-existent middle-class black neighborhoods may emerge leading to higher levels of residential segregation.

Two separate cases:

1. When the proportion of highly educated blacks rises from a low to moderate level, the exposure of highly educated blacks to other highly educated blacks *and* to less-educated blacks may increase.

2. When there is a sufficient mass of highly educated blacks, exclusively high-SES black neighborhoods emerge, consistent with the idea of black gentrification.

PRIMARY EMPIRICAL ANALYSIS

- Our primary empirical analysis uses Census Tract Summary Files from the 2000 Census
- Examines how composition of metropolitan population affects neighborhood-level exposure to others in terms of race and education.

Main Results

1. Segregation of both blacks of all education levels is sharply increasing in proportion of blacks in metropolitan area with college degree.

2. Result holds no matter how this increase occurs (e.g., holding proportion black constant; holding proportion highly-educated constant).

3. Results are robust to controls for metropolitan size and region

4. Also show strong positive correlation between change in segregation and change in proportion of college-educated blacks in metropolitan area.

EXAMINING ALTERNATIVE EXPLANATIONS

Our main finding: strong positive correlation between neighborhood segregation and the proportion of highly educated blacks at the metro area.

Emphasize that most of the leading alternative explanations for a correlation between these measures would imply *negative* rather than positive relationship.

1. Statistical discrimination in either the housing or mortgage market
2. Standard explanations related to within-metro sorting on the basis of socioeconomic characteristics.

We examine the following potential explanations in greater detail:

1. Impact of segregation on socioeconomic outcomes (reverse causation)
2. Across-metro sorting on the basis of observables;
3. Across-metro sorting on unobservables.

RECONCILING WITH CUTLER-GLAESER (1997)

- Reconcile our results with apparently conflicting correlation highlighted in an important and well-known paper by Cutler and Glaeser (1997) (CG)

- Focusing on young adults aged 20-30, CG demonstrate that the educational attainment of blacks is lower in more segregated metropolitan areas.

- As one considers successively older individuals, however, this negative relation turns positive, and becomes strongly so for blacks aged 50+

- Relevant to the interpretation of the magnitudes of our findings - because the two forces work against each other, the strength of the mechanism we draw attention to will tend to be understated.

- What is striking, given the results in CG, is that the overall correlation is not negative but rather significantly positive.

IMPLICATIONS

1. Evolution of Residential Segregation and Racial Inequality

- When combined with the central conclusion of CG, our results draw attention to the operation of an important negative feedback loop in the evolution of residential segregation and racial socioeconomic inequality.

- Any exogenous movement towards convergence in racial socioeconomic inequality will be inhibited because of this negative feedback effect.

2. Residential Isolation of Poorer Blacks in the United States

- Wilson (1987) and Cutler, Glaeser and Vigdor (1999): with reductions in the strength of centralized discrimination in second half of 20th century, the exodus of highly educated blacks from inner-city neighborhoods resulted in reductions in the exposure of less-educated to highly educated blacks

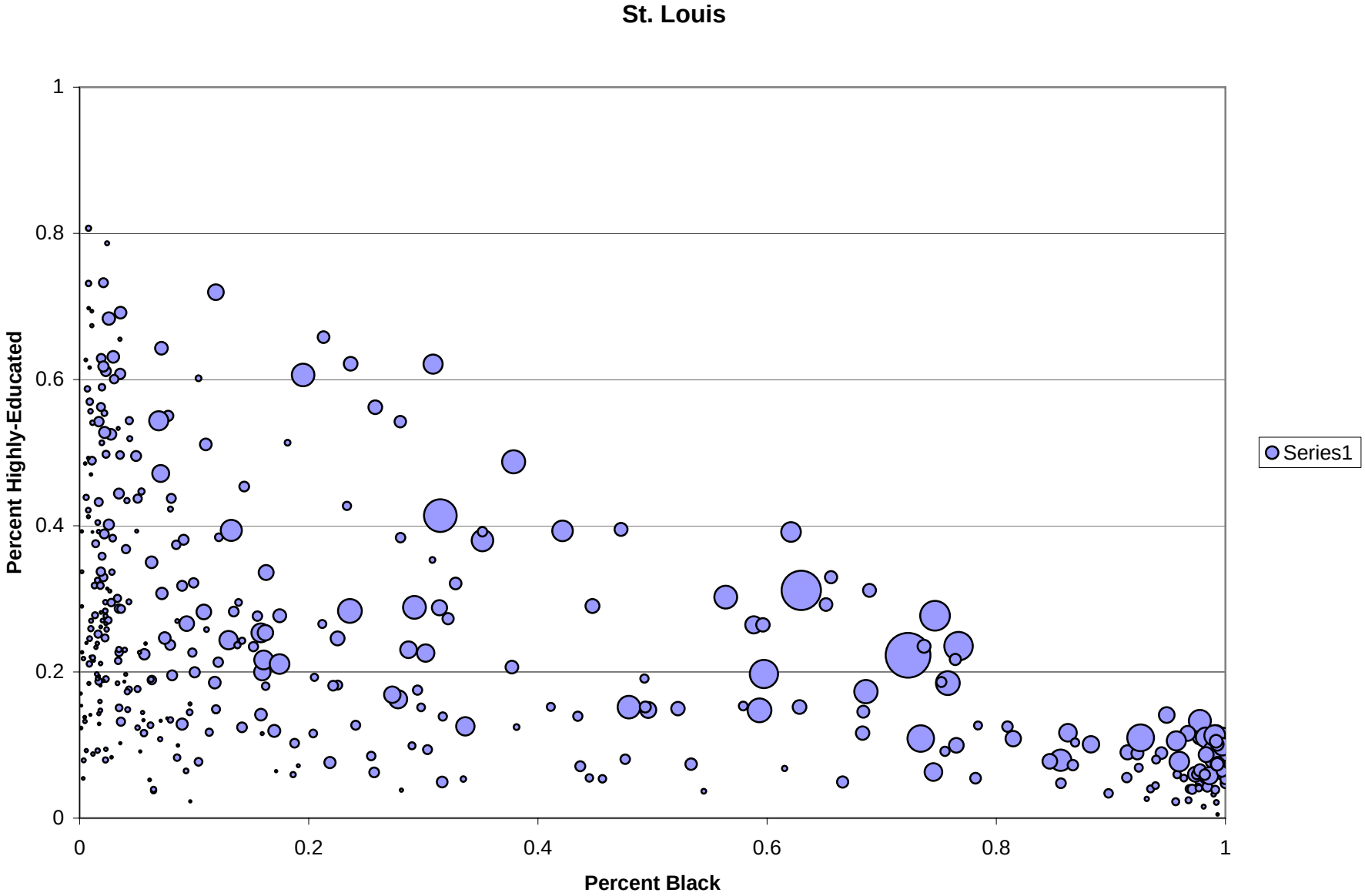
- Our findings indicate that a critical density of highly educated blacks is necessary to sustain mixed-socioeconomic black neighborhoods – historically density may have been too low.

- Both theory and empirics imply that as the density of highly educated blacks in the population increases, mixed-socioeconomic black neighborhoods become more sustainable and should begin to re-emerge.

- In metro areas where the proportion of highly educated blacks is sufficiently high, theory and empirics predict the formation of exclusively middle-class black neighborhoods, consistent with the observed patterns of black gentrification in some U.S. cities, (e.g. Atlanta and Washington DC).

TABLE 1: MAKE-UP OF US POPULATION LIVING IN METRO AREA

Race	Education	Percentage of Overall Population	Percentage by Race
Black	*Less than HS*	0.029	0.258
Non-Hispanic	*HS*	0.032	0.291
	Some College	0.033	0.297
	College Degree	0.011	0.102
	Advanced Degree	0.006	0.052
White	*Less than HS*	0.091	0.132
Non-Hispanic	*HS*	0.185	0.266
	Some College	0.192	0.277
	College Degree	0.124	0.178
	Advanced Degree	0.102	0.147


St. Louis
Percent Highly-Educated
Percent Black
0
0.2
0.4
0.6
0.8
1
Series1

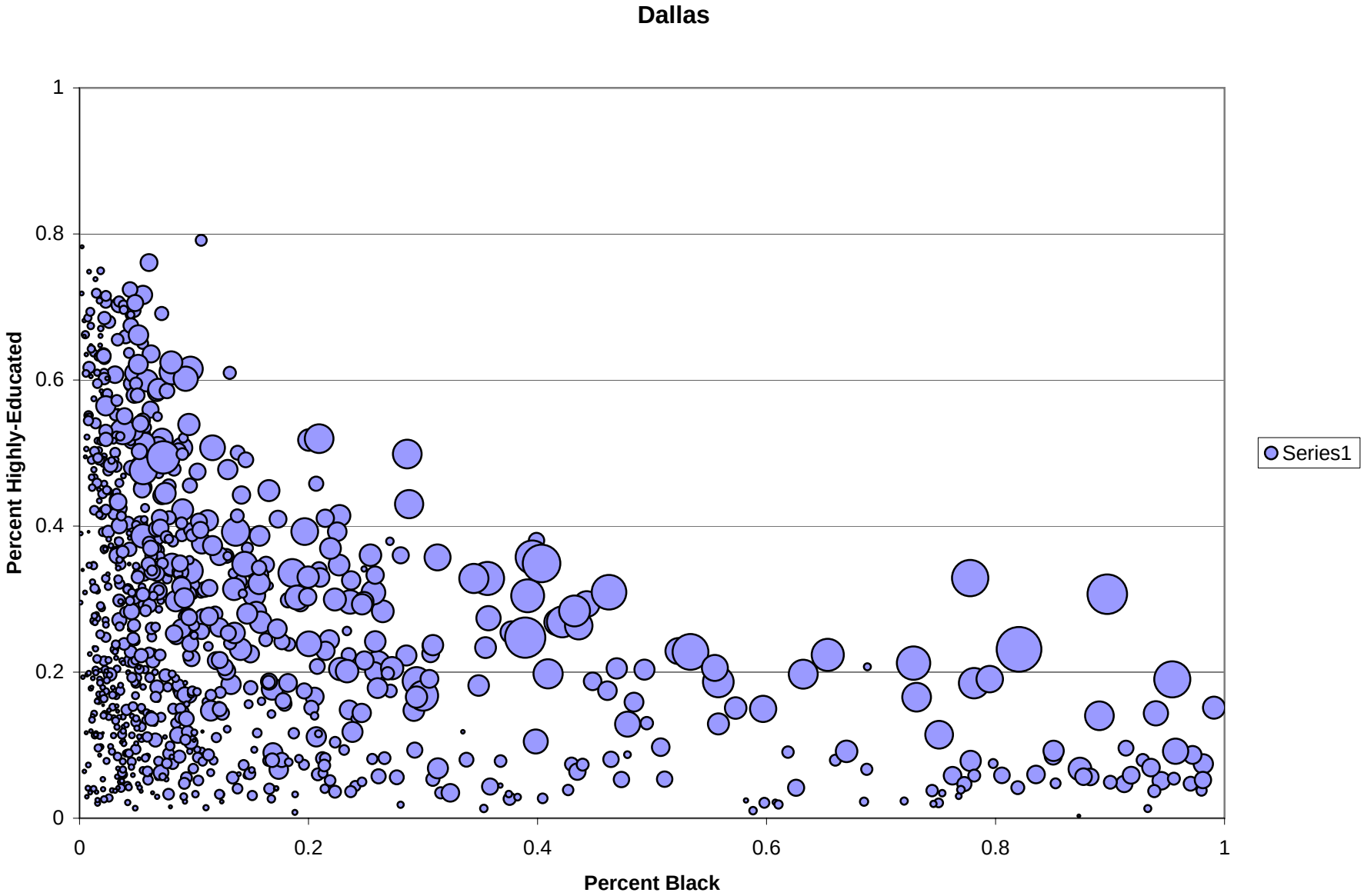

Dallas
Percent Highly-Educated
Percent Black
0
0.2
0.4
0.6
0.8
1
Series1

Table 2: Number of Tracts in United States in 2000 by Race and Education

	Percent College Degree or More			
Percent Black	*All*	*>20%*	*>40%*	*>60%*
>0% Black	49,021	26,351	11,094	3,005
	100.0%	53.8%	22.6%	6.1%
>20% Black	9,149	2,567	641	59
	100.0%	28.1%	7.0%	0.6%
>40% Black	5,657	1,164	142	14
	100.0%	20.6%	2.5%	0.2%
>60% Black	3,921	623	44	5
	100.0%	15.9%	1.1%	0.1%
>80% Black	2,559	271	21	1
	100.0%	10.6%	0.8%	0.0%

Table 2: Number of Tracts in United States in 2000 by Race and Education

	Percent College Degree or More			
Percent White	*All*	*>20%*	*>40%*	*>60%*
>0% White	49,021	26,351	11,094	3,005
	100.0%	53.8%	22.6%	6.1%
>20% White	43,179	25,178	11,041	2,999
	100.0%	58.3%	25.6%	6.9%
>40% White	39,602	24,566	10,839	2,967
	100.0%	62.0%	27.4%	7.5%
>60% White	35,154	22,543	10,214	2,870
	100.0%	64.1%	29.1%	8.2%
>80% White	26,910	17,539	8,102	2,339
	100.0%	65.2%	30.1%	8.7%

Table 3: Locations of Tracts with High Fractions of Both Black and College-Educated Individuals

	Number of tracts meeting both race and education criteria					
Percentage black	*>80%*	*>60%*	*>40%*	*Metro Size*	*Percent*	*% of Black Hhlds*
Percentage w/ college degre	*>40%*	*>40%*	*>40%*	*(millions)*	*Black*	*College-Educated*
Baltimore-Washington	5	14	33	5.06	0.24	0.21
Detroit	5	8	19	3.51	0.19	0.13
Chicago		3	16	6.11	0.16	0.15
New York		4	15	14.88	0.15	0.17
Los Angeles	4	6	10	11.50	0.06	0.18
Atlanta	5	5	8	2.65	0.26	0.22
Cleveland		1	6	1.96	0.15	0.11
Philadelphia		1	5	4.12	0.17	0.13
San Francisco-Oakland			5	4.95	0.06	0.19
Raleigh-Durham		1	3	0.65	0.12	0.22
Indianapolis			3	1.05	0.12	0.14
Jackson, MS	1	1	2	0.44	0.25	0.17
Houston	1	1	2	3.10	0.15	0.18
Columbia, SC			2	0.59	0.17	0.17
New Orleans			2	0.85	0.33	0.13
					Average for US Metro Areas	
Total	**21**	**44**	**142**		**0.11**	**0.15**

Table 4: Neighborhood Patterns for College-Educated Households in the United States

Panel A: Neighborhood Patterns for College-Educated Black Households

Individuals first ranked by percent black in Census tract within its MSA

Quintile	1	2	3	4	5	Total
Percent Black	5.7	14.4	28.3	54.6	78.9	32.0
Percent College Educated	38.0	31.6	26.2	18.4	13.8	27.2
Percent Black and College E	1.3	3.3	6.2	8.0	10.0	5.2

Panel B: Neighborhood Patterns for College-Educated White Households

Individuals first ranked by percent black in Census tract within its MSA

Quintile	1	2	3	4	5	Total
Percent White	55.0	77.9	86.6	90.4	94.5	77.4
Percent College Educated	27.0	36.2	40.7	39.3	39.2	35.3
Percent White and College E	20.1	30.4	36.2	36.1	37.4	30.4

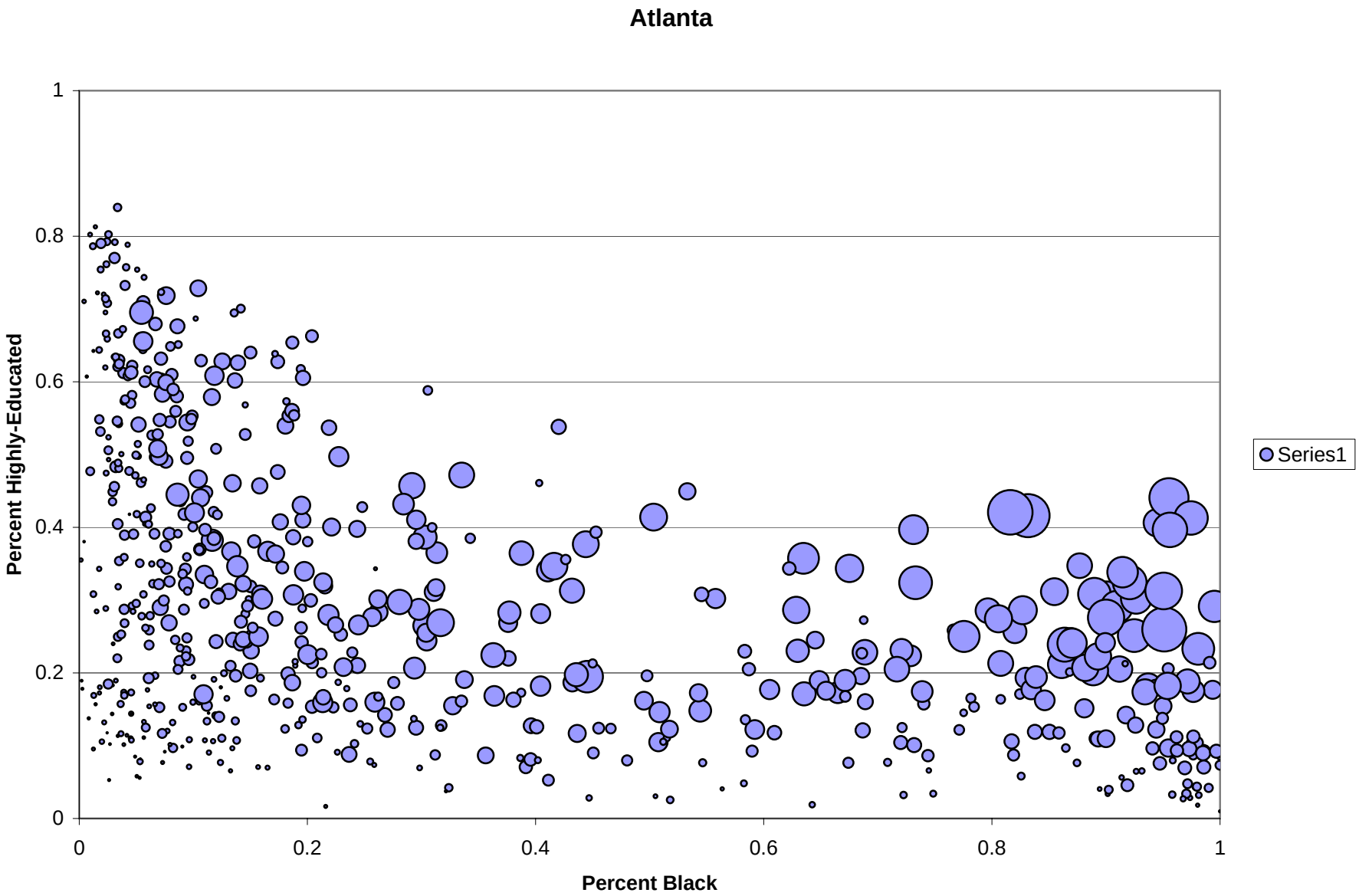

Atlanta
Percent Highly-Educated
Percent Black
0
0.2
0.4
0.6
0.8
1
Series1

Table 4: The Availability of Middle-Class Black Neighborhoods in 2000

Dependent Variable:	log(number of tracts in MSA >60% black and >40% college-educated)	log(number of tracts in MSA >60% black and >20% college-educated)	log(number of tracts in MSA >40% black and >40% college-educated)	log(number of tracts in MSA >40% black and >20% college-educated)
	(1)	(2)	(3)	(4)
Metropolitan Composition				
% Black with college degree	42.16	55.70	36.14	38.51
	(10.28)	(11.33)	(13.35)	(11.37)
% Black with less than college deg	-4.51	0.49	-1.52	5.22
	(1.83)	(2.34)	(2.42)	(2.21)
% White with college degree	-1.64	1.06	0.49	3.52
	(1.20)	(1.49)	(1.55)	(1.62)
% White with less than college deg	0.06	1.77	-0.21	1.84
	(0.57)	(0.73)	(0.65)	(0.81)
Log (population)	0.257	0.635	0.392	0.661
	(0.073)	(0.095)	(0.099)	(0.087)
N	267	267	267	267

SPATIAL MODEL OF RESIDENTIAL LOCATION CHOICE

To fix intuition, we present simple model that formalizes neighborhood formation mechanism.

Three key ingredients:

1. Preferences are such that, net of housing prices, households prefer to live with others of the same race and education.
   - Generates multidimensional sorting

2. Critical neighborhood size
   - Average cost declining in number of residents captures notion of fixed costs in provision of local public and private goods.

3. Ideal locations spread out across metro area for idiosyncratic reasons.
   - Emphasizes *small numbers* problem, rather than *coordination* problem.
   - Insufficient mass to form local neighborhoods combining high amenity levels and high proportion of blacks.

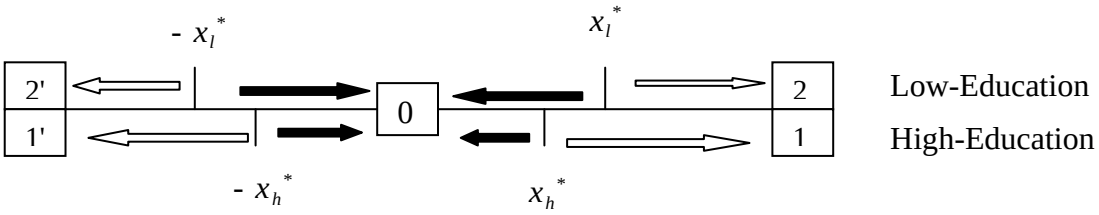


Figure 1: Equilibrium of the Model when r_b is small.

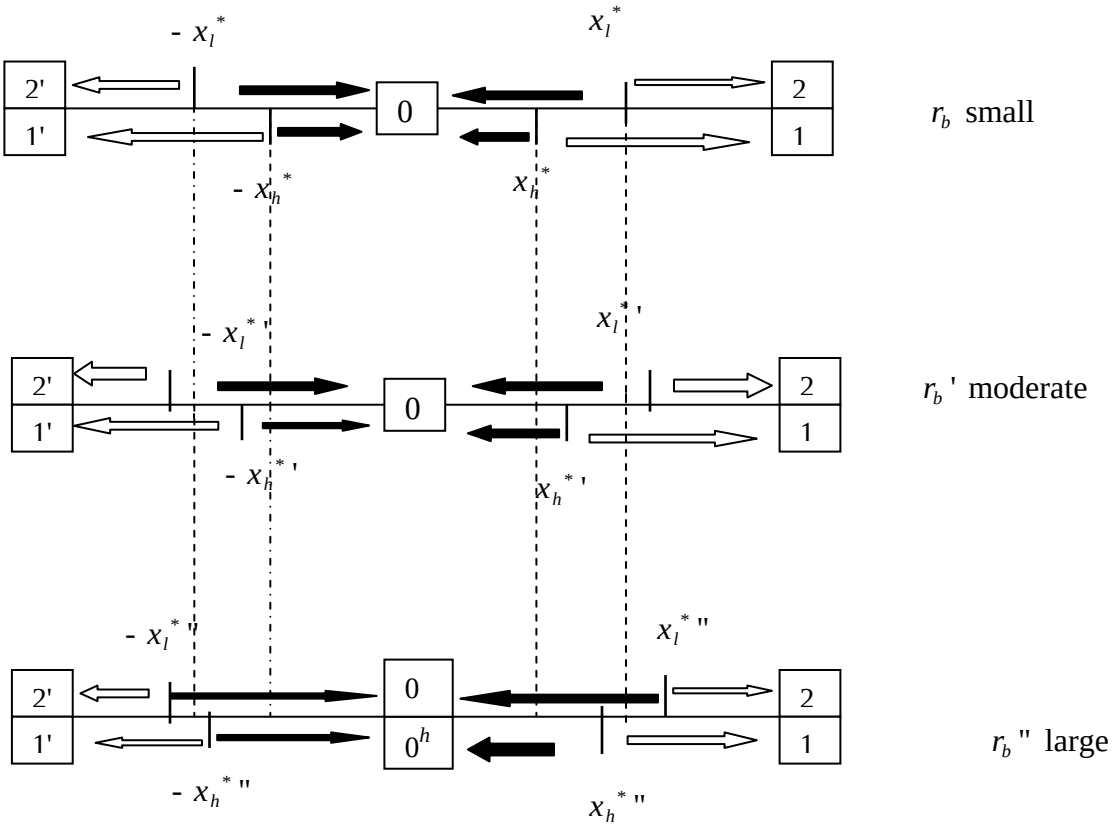


Figure 2: Comparative Statics with Respect to r_b.

SPATIAL MODEL OF RESIDENTIAL LOCATION CHOICE
Results from increasing proportion of highly educated blacks (r_b)

Initially, highly educated blacks live in either

- black but predominantly low-education community 0, or
- highly educated but predominantly white community 1.

r_b small but increasing:

- Community 0 becomes unambiguously more attractive for highly educated blacks.
- Exposure of highly educated blacks to other highly educated blacks increases at the expense of exposure to highly educated whites.

r_b sufficiently large:

- Exclusive all-black highly educated community 0^h will emerge when benefits of separating exceed costs for highly educated blacks.
- Existence of community 0^h leads to further departure of highly educated blacks from community 1, resulting in greater racial segregation in residential locations.

DATA

- Primary dataset compiled from 2000 Census.
- Summary Files – joint distribution of education by race for each Census tract in US. (Tracts typically contain 3,000 to 5,000 individuals.)
- Focus on non-Hispanic black and non-Hispanic white adults aged 25+.
- Dataset consists of 277 MSA/CMSAs and ~49,000 tracts.
- Data based on Census microdata from 1980, 1990, and 2000 are also used in parts of analysis. These provide individual-level data at larger levels of geographic aggregation.

BASIC REGRESSION SPECIFICATIONS

i indexes individuals
m indexes metropolitan areas
Y_{im} tract-level exposure of individual *i* in metro area *m*
X_i race-education category of individual i (e.g., college-educated and black)
Z_m fraction of individuals in race-education category in metro area *m*

Table 5: Within-MSA variation in average exposure

$$Y_{im} = bX_i + x_m + e_{im}$$

Table 6: Main Specification

$$Y_{im} = bX_i + gX_i X_m + x_m + e_{im}$$

Table 5: Neighborhood-Level Composition by Race and Education

Panel A: All Metropolitan Areas

	Neighborhood Composition relative to Metro Area ($Z_n - Z_m$)			
Individual	% Black College Degree	% Black < College Deg	% Black	% College Degree
Black w/ less than college degree	0.021	0.196	0.217	-0.063
Black w/ college degree	0.026	0.133	0.159	-0.021
White w/ less than college degree	-0.003	-0.014	-0.017	-0.009
White w/ college degree	-0.001	-0.010	-0.011	0.044

Table 5: Average Tract-Level Exposure by Race and Education

Panel A: Metropolitan Areas Below Median Fraction of Colleg-Educated Blacks (<1.23 percent)

	Average Tract-Level Exposure Relative to MSA Average					
Individual	*Black < Col Deg*	*Black Col Deg*	*White < Col Deg*	*White Col Deg*	Col Deg	Black
Black < Col Deg	0.111	0.013	-0.107	-0.049	-0.038	0.124
Black Col Deg	0.078	0.016	-0.078	-0.014	0.005	0.094
White < Col Deg	-0.006	-0.001	0.030	-0.003	-0.004	-0.007
White Col Deg	-0.007	0.000	0.002	0.042	0.045	-0.007

Panel B: Metropolitan Areas Above Median Fraction of College-Educated Blacks (>1.23 percent)

	Average Tract-Level Exposure Relative to MSA Average					
Individual	*Black < Col Deg*	*Black Col Deg*	*White < Col Deg*	*White Col Deg*	Col Deg	Black
Black < Col Deg	0.220	0.024	-0.144	-0.085	-0.070	0.244
Black Col Deg	0.147	0.028	-0.110	-0.052	-0.027	0.175
White < Col Deg	-0.024	-0.005	0.067	-0.004	-0.014	-0.029
White Col Deg	-0.012	-0.002	0.002	0.044	0.043	-0.014

Table 6: Fixed Effects Regression of Neighborhood Composition on Interactions of Individual and Metro Characteristics

Dependent Variable:	**Neighborhood (Tract) Composition**			
	% Black Col Deg	**% Black < Col Deg**	**% Black**	**% College Degree**
	(1)	**(2)**	**(3)**	**(4)**
Individual_BlackHighEd* Metro_%BlackHighEd	0.968 (0.201)	3.040 (1.575)	4.008 (1.720)	-1.261 (0.861)
Individual_BlackHighEd* Metro_%BlackLowEd	-0.065 (0.062)	0.069 (0.360)	0.004 (0.413)	0.128 (0.124)
Individual_BlackHighEd* Metro_%WhiteHighEd	-0.058 (0.018)	-0.257 (0.091)	-0.315 (0.104)	0.070 (0.042)
Individual_BlackHighEd* Metro_%WhiteLowEd	0.000 (0.024)	0.148 (0.091)	0.149 (0.113)	0.066 (0.033)
Individual_BlackLowEd* Metro_%BlackHighEd	1.022 (0.119)	4.911 (1.983)	5.933 (2.030)	-2.340 (1.295)
Individual_BlackLowEd* Metro_%BlackLowEd	-0.086 (0.040)	-0.062 (0.399)	-0.148 (0.427)	0.319 (0.185)
Individual_BlackLowEd* Metro_%WhiteHighEd	-0.039 (0.014)	-0.325 (0.094)	-0.364 (0.105)	0.191 (0.045)
Individual_BlackLowEd* Metro_%WhiteLowEd	0.014 (0.017)	0.218 (0.124)	0.232 (0.140)	0.079 (0.044)
Individual_BlackHighEd	0.023 (0.015)	0.030 (0.060)	0.053 (0.073)	-0.007 (0.024)
Individual_BlackLowEd	0.011 (0.011)	0.049 (0.078)	0.059 (0.088)	-0.086 (0.029)
Individual_WhiteHighEd	-0.004 (0.002)	-0.038 (0.011)	-0.041 (0.011)	0.094 (0.014)
Individual_WhiteLowEd	-0.005 (0.002)	-0.037 (0.010)	-0.041 (0.012)	0.035 (0.012)
Includes MSA Fixed Effects	Yes	Yes	Yes	Yes

Note: All regressions include metropolitan area fixed effects. 'High Ed' refers to individuals with a college degree and 'Low Ed' refers to those with less than a college degree. Each regression is estimated on the sample of individuals 25 years and old

PRIMARY STATISTICAL TESTS

How are exposure rates (over and above MSA average) affected by increase in fraction of highly educated blacks in the metro population.

1. Holding the fraction highly-educated in the metro population constant
   i.e., offsetting increase in the fraction of highly-educated blacks with decrease in fraction of highly-educated whites.

2. Holding the fraction black in the metro population constant
   i.e., offsetting increase in the fraction of highly-educated blacks with decrease in fraction of less-educated blacks.

Table 7: Predicted Change in Neighborhood Composition relative to Metropolitan Average ($Z_n - Z_m$)

Estimated effect of a one percent increase in fraction of highly-educated blacks in MSA

	Panel 1		**Panel 2**		**Panel 3**	
Sample:	Full Sample		Full Sample		Full Sample	
Defintion of 'High Ed':	Col. Deg. or More		Col. Deg. or More		Col. Deg. or More	
Race-Education caetgory decreased by one percent	Omitted Category: Asians; Hispanics		High-Ed Whites		Low-Ed Blacks	
Individual:	*Black High Ed*	*Black Low Ed*	*Black High Ed*	*Black Low Ed*	*Black High Ed*	*Black Low Ed*
Change in Rel. Neighborhood Exposure ($Z_n - Z_m$)						
% Black & High Ed	0.010	0.011	0.010	0.011	0.010	0.011
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
% Black & Low Ed	0.030	0.049	0.033	0.052	0.030	0.050
	0.055	*0.014*	*0.034*	*0.009*	*0.119*	*0.038*
% Black	0.040	0.059	0.043	0.064	0.040	0.061
	0.020	*0.004*	*0.012*	*0.002*	*0.057*	*0.012*
% Highly Educated	-0.013	-0.023	-0.013	-0.025	-0.014	-0.027
	0.144	*0.072*	*0.071*	*0.052*	*0.156*	*0.126*
Includes interactions with region and population?	No		No		No	

Table 7: Predicted Change in Neighborhood Composition relative to Metropolitan Average ($Z_n - Z_m$)

Estimated effect of a one percent increase in fraction of college-educated blacks in MSA holding the fraction of blacks consta

	Panel 1		**Panel 2**		**Panel 3**	
Sample:	Full Sample		Full Sample		Full Sample	
Defintion of 'High Ed':	Col. Deg. or More		Some Col. or More		Some Col. or More	
Individual:	*Black High Ed*	*Black Low Ed*	*Black High Ed*	*Black Low Ed*	*Black High Ed*	*Black Low Ed*
Change in Rel. Neighborhood Exposure ($Z_n - Z_m$)						
% Black & High Ed	0.010	0.011	0.027	0.027	0.023	0.021
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
% Black & Low Ed	0.030	0.050	0.017	0.031	0.014	0.025
	0.119	*0.038*	*0.159*	*0.017*	*0.176*	*0.035*
% Black	0.040	0.061	0.044	0.058	0.038	0.046
	0.057	*0.012*	*0.014*	*0.003*	*0.006*	*0.003*
% Highly Educated	-0.014	-0.027	-0.003	-0.013	-0.002	-0.011
	0.156	*0.126*	*0.680*	*0.094*	*0.869*	*0.351*
Includes interactions with region and population?	No		No		Yes	

Table 7: Predicted Change in Neighborhood Composition relative to Metropolitan Average ($Z_n - Z_m$)

Estimated effect of a one percent increase in fraction of college-educated blacks in MSA holding the fraction of blacks consta

	Panel 4		**Panel 5**		**Panel 6**	
Sample:	MSA Pop < 200K		MSA Pop 200-600K		MSA Pop > 600K	
Defintion of 'High Ed':	Some Col. or More		Some Col. or More		Some Col. or More	
Individual:	*Black High Ed*	*Black Low Ed*	*Black High Ed*	*Black Low Ed*	*Black High Ed*	*Black Low Ed*
Change in Rel. Neighborhood Exposure ($Z_n - Z_m$)						
% Black & High Ed	0.001	0.003	0.012	0.012	0.027	0.024
	0.644	*0.311*	*0.015*	*0.001*	*0.000*	*0.001*
% Black & Low Ed	0.001	0.011	0.013	0.016	0.012	0.025
	0.892	*0.104*	*0.063*	*0.046*	*0.431*	*0.204*
% Black	0.002	0.014	0.025	0.028	0.040	0.049
	0.810	*0.119*	*0.022*	*0.012*	*0.067*	*0.055*
% Highly Educated	-0.005	0.002	-0.001	-0.002	-0.003	-0.017
	0.471	*0.653*	*0.849*	*0.758*	*0.763*	*0.195*
Includes interactions with region and population?	Yes		Yes		Yes	

Table 11: Relating Changes in Segregation to Changes in Metropolitan Composition

Dependent Variable:	**Change in Dissimilarity Index (1990-2000)**	
Weights:	**MSA Population**	**None**
Change in Metropolitan Characteristics (1990-2000)		
% Black w/ College-Degree	3.013	3.472
	(0.822)	(0.632)
% Black w/ Less Than College-Degree	-0.214	-0.040
	(0.293)	(0.238)
% White w/ College-Degree	0.051	-0.004
	(0.191)	(0.174)
% White w/ Less Than College-Degree	0.052	0.310
	(0.170)	(0.148)
Population (in millions)	-0.0017	-0.0031
	(0.0009)	(0.0012)
Constant	-0.056	-0.042
	(0.009)	(0.007)
N	220	220

ALTERNATIVE EXPLANATIONS

Most alternative explanations for correlation between average education level of black population and segregation of highly-educated blacks would imply a negative correlation:

1. Statistical Discrimination
2. Standard Intuition Regarding Sorting on SES Characteristics

REVERSE CAUSALITY – RECONCILING WITH CUTLER-GLAESER

Cutler-Glaeser Regression

$$Educ_{im} = aSeg_m + bSeg_m Black_i + gX_{im} + e_{im}$$

Table 8. Cutler-Glaeser Education and Earnings Regressions by Age

Coefficient on interaction between black and metropolitan segregation (dissimilarity index)

	Age of Sample					
Dependent Variable	20-24	25-30	31-40	41-50	51-60	61-70
College Graduation	-0.094	-0.064	0.002	0.074	0.070	0.034
	(0.032)	(0.062)	(0.069)	(0.059)	(0.046)	(0.054)
Ln(Earnings)	-0.786	-0.433	-0.026	0.239	0.411	0.081
	(0.140)	(0.094)	(0.084)	(0.092)	(0.131)	(0.280)

RECONCILING WITH CUTLER-GLAESER
Explaining the Age Profile

1. From purely mechanical perspective, reconciles results.

2. Consistent with operation of both mechanisms
   - Because many individuals migrate in young adulthood, would generally expect negative relationship associated with CG mechanism to be strongest for young adults
   - Conversely, the positive correlation suggested by our mechanism should be strongest among older individuals
     - These individuals have had the greatest amount of time to influence metropolitan neighborhood structure.

3. Alternative explanations for age profile
   - Productive effect of segregation differed historically (Collins and Margo (2000)
   - Cohort rather than age effect (Results same using 1980, 1990, 200 Census).

SORTING ON OBSERVABLES

- Bias might arise if highly-educated blacks migrate disproportionately to more segregated metropolitan areas -- another form of reverse causation

SORTING ON UNOBSERVABLES

- Bias might arise if highly-educated blacks that select into MSAs with a higher fraction of educated blacks have a stronger taste for segregation.
- Using 2000 PUMS data, decompose current MSA composition into terms based on on where householder lived 5 years previous and difference between current and lagged composition.

(1) $$Y_{im}^{t} = g_1 X_m^{t-1} + g_2 \left(X_m^{t} - X_m^{t-1} \right) + x_m^{t} + e_{im}^{t}$$

- If only real effect relates to impact of metropolitan characteristics expect $\gamma_1=\gamma_2$. If positive selection bias, would generally expect $\gamma_2 > \gamma_1$
- Results: if anything selection gives rise to slight negative bias.

Table 9: Assessing Across-Metropolitan Sorting on Observable Characteristics

Dependent Variable:	Number of tracts in MSA >60% Black and >40% College-Educated		
Sample:	Movers	Movers	Stayers
	(1)	(2)	(3)
Individual Characteristic:			
Black with college degree	1.075	1.165	0.903
	(0.107)	(0.147)	(0.812)
Black with less than college degree	0.197	0.253	0.380
	(0.054)	(0.087)	(0.681)
White with college degree	0.157	0.170	-0.248
	(0.053)	(0.094)	(0.577)
White with less than college degree	-0.499	-0.561	-0.704
	(0.052)	(0.075)	(0.562)
Includes fixed effects for MSA of residence 5 years prior to Census?	Yes	No	No

Table 10: Assessing Sorting on Unobservables: Including Lagged and Differenced Metro Area Composition

Estimated effect of a 1% increase in fraction of highly-educated blacks in MSA holding the fraction of blacks

Individual:		Panel 1 *Black - Some college*		Panel 2 *Black - HS degree or*	
Neighborhood Measure	***Time-Period***				
	Current (2000)	0.023		0.024	
		0.000		*0.000*	
% PUMA	Lagged (1995)		0.024		0.024
Black - Some college or more			*0.000*		*0.000*
	Differenced (2000-1995)		0.017		0.020
			0.000		*0.000*
	Current (2000)	0.010		0.022	
		0.092		*0.008*	
% PUMA	Lagged (1995)		0.011		0.023
Black - HS degree or less			*0.085*		*0.010*
	Differenced (2000-1995)		0.004		0.011
			0.722		*0.226*
	Current (2000)	0.033		0.046	
		0.001		*0.000*	
% PUMA	Lagged (1995)		0.035		0.047
Black			*0.001*		*0.001*
	Differenced (2000-1995)		0.020		0.031
			0.076		*0.010*

PAPER #2: RACIAL SORTING AND NEIGHBORHOOD QUALITY

- In cities throughout the United States, blacks tend to live in significantly poorer and lower-amenity neighborhoods than whites.

- Many researchers posit that such neighborhood differences play a central role in the perpetuation of racial inequality (see Wilson (1987) and Massey and Denton (1993), for example).

- An obvious first-order explanation is that an individual's race is strongly correlated with socioeconomic status (SES), and poorer households can only afford lower quality neighborhoods.

- We conjecture that another explanation may be important, due to a combination of racial sorting and the short supply of predominantly black, high-amenity neighborhoods in almost all U.S. metropolitan areas.

THE IMPLICIT PRICE OF NEIGHBORHOOD QUALITY

- Short Supply ➔ Bundling of Neighborhood Race and Neighborhood Amenities

- Would be of little import if households had identical preferences for neighborhood racial composition or if race played no role in household location decisions.

- Given any form of segregating preferences in the population, drives a wedge between the *implicit price* that whites versus blacks must pay in order to consume higher levels of a given neighborhood amenity.

- Resulting consumption of neighborhood amenities by blacks would be lower than that of otherwise-identical whites.

MAIN CONJECTURE

- Given the short supply of high-amenity, predominantly black neighborhoods in most metropolitan areas, racial sorting is likely to exacerbate the gap between blacks and whites in the consumption of many neighborhood amenities.

- Resulting adverse effects of racial sorting for blacks may diminish as the proportion of (especially high-SES) blacks in the metropolitan population grows larger and high-amenity black neighborhoods form,

- Preferences vs. Discrimination

EQUILIBRIUM MODEL OF RESIDENTIAL SORTING:

Builds on the discrete choice framework McFadden (1978), BLP (1995):

- Preferences defined over housing and neighborhood attributes, including many that depend on how households sort across neighborhoods:
  - school quality; crime; neighborhood sociodemographics.
- Each household's demand varies with own characteristics including
  - wealth, income, education, race, family composition.
- Model captures employment geography in a manner consistent with underlying individual decision-making.
  - Equil. prices exhibit local peaks around any # of employment centers
- Close model with assumption that prices adjust to clear market.
- Model estimated so as to deal with correlation of neighborhood sociodemographics and unobserved housing/neighborhood quality.

SAN FRANCISCO BAY AREA DATASET - 1990

Restricted-Access Census Data – Precise geographic information on residential and employment locations (Census block)

- Household Characteristics – income (various sources), education, ethnicity/race, family size/structure, age, employment status, employment location(s)
- Housing Characteristics, Prices
- Neighborhood Sociodemographics

Able to Match with Additional Data on

- Schools – school-level data on test scores, inputs, enrollment compositions
- Crime
- Land Use – industrial, commercial, residential, open space

The study area for our analysis consists of six contiguous Bay Area counties: Alameda, Contra Costa, Marin, San Mateo, San Francisco, and Santa Clara.

- The six counties include over 1,100 Census tracts, and almost 39,500 Census blocks, the smallest unit of aggregation in our data.

Sample consists of ~ 650,000 people in 242,000 households

EQUILIBRIUM COUNTERFACTUAL SIMULATIONS

1. Eliminating ‘Preferences’ for Neighborhood Racial Composition

- Substantial decrease in racial segregation across all socioeconomic levels in the new equilibrium,
  - Some segregation persists due to the sizeable average differences remaining between blacks and whites in education, income, and wealth.
- Black-white gap in neighborhood school quality and crime reduced by more than half and the gap in average neighborhood income and education by nearly this amount.

Bottom Line: *Racial sorting as important as the underlying socioeconomic differences between whites and blacks in driving differences in the consumption of neighborhood amenities.*

EQUILIBRIUM COUNTERFACTUAL SIMULATIONS

2. Equalizing Proportion of Blacks and Whites in Population

- Leaves all preference parameters and average socioeconomic characteristics of both whites and blacks unchanged.

- New equilibrium is characterized by a sharp increase in the availability of highly-amenity, predominantly-black neighborhoods.

- As a result, the observed white-black gaps in the consumption of neighborhood amenities decline by nearly the same amount as in our original simulation –

Bottom Line: *The adverse effects of racial sorting for blacks in the Bay Area in terms of neighborhood amenities would be virtually eliminated were blacks to constitute a larger proportion of the metropolitan area's population.*

IMPLICATIONS

- Our analysis draws attention to a consequence of racial sorting - the significant distortion affecting the neighborhood *quality* choice – that has not been the primary focus of segregation literature.

- The substantial reductions in neighborhood quality for blacks that we find are likely to have a significant impact on the inter-generational persistence of racial differences in education, income, and wealth.

- Segregation not a sufficient statistic for gauging impact of racial sorting at either neighborhood or metropolitan level.

Table 5: Housing and Neighborhood Consumption Patterns for Households in Highest Income Quartile

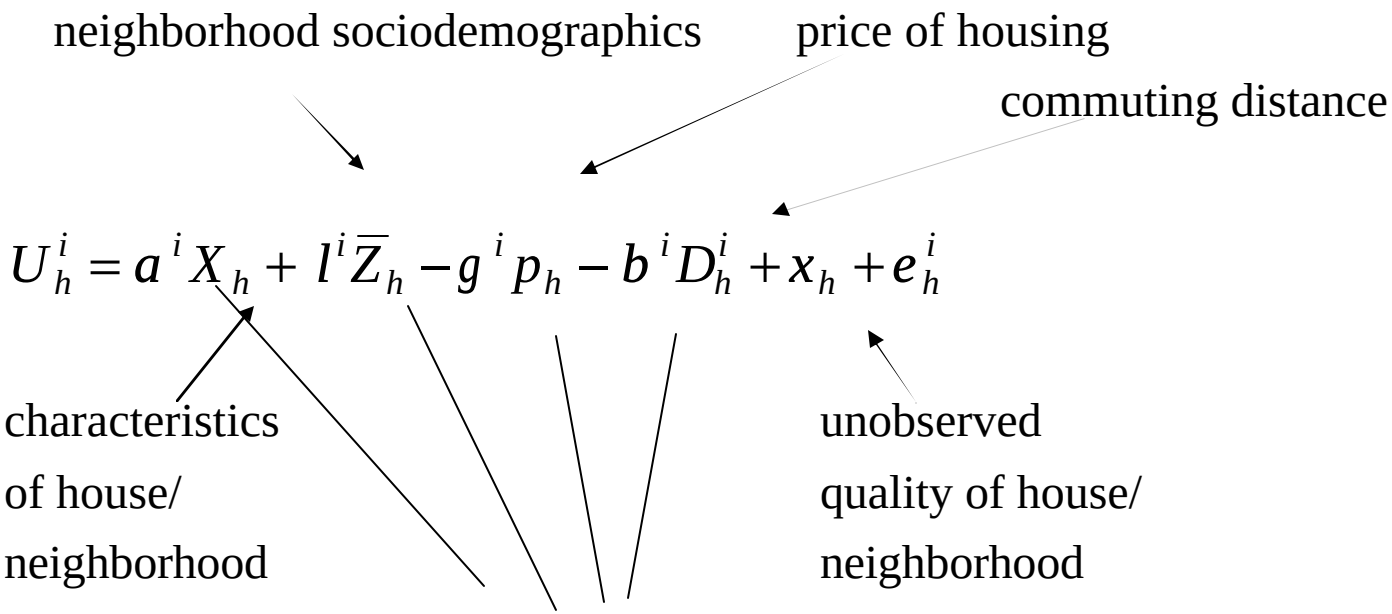
Panel A: Housing and Neighborhood Consumption of Black Households in Highest Income Quartile

Households ranked by % Black in neighborhood - consumption measures summarized by quintile

Quintile	**1**	**2**	**3**	**4**	**5**	**Total**
Percent Neighborhood - Black	0-4	4-8	8-20	20-54	54-100	24
Average Test Score	559	528	508	459	418	494
Crime Rate	4	6	8	17	22	11
Average Neighborhood Income	71,150	57,450	55,200	47,300	36,650	53,550
Percent Neighborhood - College Degree +	54	46	43	41	25	42
House Price	1,584	1,320	1,245	1,163	814	1,225
Number of Rooms	6.8	6.2	6.3	6.1	6.2	6.3
Home Ownership	80	71	76	77	87	78
Average Income of Black Households in Top Inc	107,750	98,150	95,300	96,350	91,250	97,760

Residential Location Decision

Each household *i* chooses its residence *h* to maximize utility



$$a^i = a_0 + \sum_r a_r z_r^i$$

Each coefficient is allowed to vary w/ hhld's own characteristics: (race, education, income, hhld size/structure, work status/location, age), z^i.

Characterizing the Housing Market.

- Assume that the housing market can be fully characterized by a set of housing types that is a subset of the full set of available houses, letting the supply of housing of type h be given by S_h.

- Hhld i chooses housing type h if the utility that it receives from this choice exceeds the utility that it receives from all other possible house choices - that is, when

$$V_h^i > V_k^i \quad \Rightarrow \quad W_h^i + e_h^i > W_k^i + e_k^i \quad \Rightarrow \quad e_h^i - e_k^i > W_k^i - W_h^i \qquad \forall \quad k \neq h$$

  where W^i_h includes all of the non-idiosyncratic components of utility function V^i_h.

- Probability P^i_h that household *i* chooses housing type *h* can be written as a function of the full vectors of house/neighborhood characteristics:

$$P_h^i = f_h(Z^i, \mathbf{X}, \mathbf{p}, \mathrm{x})$$

as well as the household's own characteristics Z^i.

Equilibrium

Aggregating the probabilities in equation (4) over all observed households yields the predicted demand for each housing type *h*, D_h:

$$D_h = \sum_i P_h^i \ .$$

In order for the housing market to clear, the demand for houses of type *h* must equal the supply of such houses and so:

$$D_h = S_h, \quad \forall h \quad \Rightarrow \quad \sum_i P_h^i = S_h \quad \forall h \ .$$

Given the decentralized nature of the housing market, prices are assumed to adjust in order to clear the market.

Define a *sorting equilibrium* to be a set of residential location decisions and a vector of housing prices such that the housing market clears and each household makes its optimal location decision given the location decisions of all other households.

ESTIMATION

Rewrite utility in terms of interaction terms, m^i_h, and mean indirect utility, d_h:

$$U^i_h = d_h + m^i_h + e^i_h$$

where

$$d_h = a_0 X_h + l_0 \bar{Z}_h - g_0 p_h + x_h$$

Probability household *i* chooses housing type *h:*

$$P^i_h = \exp(d_h + \hat{m}^i_h) \Big/ \sum_k \exp(d_k + \hat{m}^i_k)$$

'Likelihood' Function

$$\ell = \sum_i \sum_h I^i_h \ln(P^i_h)$$

where I^i_h is an indicator variable that equals 1 if household *i* chooses house *h*

First Stage 'ML' estimation returns estimates of:

- interaction terms – those in m^i_h
- mean indirect utilities, d_h

The Mechanics of the First Step of the Estimation

Derivative of the log-likelihood function with respect to d_h:

$$\begin{aligned} \partial \ell / \partial d_h &= \sum_{i \in h} \partial \ln(P_h^i) / \partial d_h + \sum_{i \notin h} \partial \ln(P_h^i) / \partial d_h \\ &= \sum_{i \in h} \left(1 - P_h^i\right) + \sum_{i \notin h} \left(- P_h^i\right) \\ &= S_h - \sum_i \left(P_h^i\right) = 0 \end{aligned}$$

Fundamental trade-off in the likelihood function:

- increase in any particular d_h raises the probability that each household in the sample chooses house type h

Thus the first step of the estimation consists of choosing the interaction parameters that best match each individual with their chosen house, while ensuring that total predicted demand equals supply for each house type.

Second Stage – Mean Indirect Utility Regression

Given the estimate of d obtained from fitting the observed individual location decisions, second stage estimating equation

(1) $$d_h = a_0 X_h + l_0 \bar{Z}_h - g_0 p_h + x_h$$

Modified Hedonic Price Regression

(2) $$p_h + {}^{1}\!/_{g_0} d_h = {}^{a_0}\!/_{g_0} X_h + {}^{l_0}\!/_{g_0} \bar{Z}_h + {}^{1}\!/_{g_0} x_h$$

- With homogeneous preferences (no sorting) estimation reduces to hedonic price regression.
- In presence of heterogeneous preferences, the mean-utility d_h estimated in the first stage provides an adjustment to the hedonic price equation so that it accurately returns mean preferences.
- The Price of a View of the Golden Gate Bridge?

Endogeneity of School Quality and Neighborhood Sociodemographics

Neighborhood sociodemographic characteristics mechanically correlated with unobserved housing and neighborhood quality.

$$d_h = a_0 X_h + l_0 \bar{Z}_h - g_0 p_h + x_h$$

Boundary Fixed Effects

- Using a sample of houses near school attendance zone boundaries, Black (1999) estimates a hedonic price regression that includes boundary fixed effects.
- By including BFEs, this strategy essentially compares the prices of houses in similar neighborhoods, but that fall on opposite sides of boundary determining school attendance.

Key Issue: Sorting with respect to boundary

- Important to control for sociodemographics.
- BFEs turn out to be useful in dealing with endogeneity of neighborhood scoidemographic characteristics – controlling for much of variation in unobserved housing and neighborhood quality

Racial Preferences Versus Discrimination

Strategy of using BFEs is designed to deal with the correlation of neighborhood sociodemographic characteristics with any unobserved component of neighborhood quality valued the same by households of all races.

Cannot distinguish whether estimated racial interactions result from:

(i) discrimination in the housing market,

(ii) direct preferences for the race of one's neighbors, and

(iii) preferences for race-specific portions of unobserved neighborhood quality.

That is, these underlying explanations are indistinguishable from one another because they give rise to predicted residential location decisions that are observationally equivalent in the data.

Our inability to distinguish preferences from discrimination implies that the primary counterfactual simulation – where we set the estimated 'preference' parameters associated with neighborhood race to zero – essentially sets all factors that affect racial sorting, whether as a result of preferences or discrimination, to zero.

Table 3. Overall Sample and Sub-Sample Near School District Boundaries

Sample			
Boundary/Weights	**high test score side***	**low test score side***	**t-test for**
Observations	**13,348**	**14,610**	**difference in**
	(4)	(5)	**means**
	Mean	Mean	((4) versus (5))
Housing/Neighborhood Characteristics			
monthly house price	1,158	1,105	5.71
average test score	558	515	50.96
1 if unit owned	0.632	0.626	1.04
number of rooms	5.207	5.134	3.13
% Census block group white	0.712	0.686	9.62
% block group college degree or more	0.463	0.451	5.14
average block group income	58,771	55,457	10.23

Table 6: Implied Mean MWTP Measures

Sample	within .25 mile of boundaries		within .25 mile of boundaries	
Boundary Fixed Effects	No	Yes	No	Yes
Observations	27,958	27,958	27,958	27,958
	(2)	(3)	(2)	(3)
% Black*	-285.46	-233.94	-94.96	-40.46
	(32.06)	(38.87)	(35.28)	(42.74)
% College Degree or More	185.74	164.78	235.04	177.11
	(25.96)	(39.42)	(28.57)	(43.34)
Average Income*	89.48	85.44	113.26	109.22
	(2.18)	(2.64)	(2.40)	(2.90)
Average Test Score (in s.d.'s)	16.69	21.46	19.01	23.67
	(4.23)	(5.29)	(4.66)	(5.81)
Owner-Occupied	141.08	148.15	117.59	125.63
	(7.40)	(7.38)	(8.14)	(8.12)
Number of Rooms	111.67	109.28	123.91	121.72
	(1.95)	(1.96)	(2.15)	(2.16)

Table 7. Heterogeneity in Marginal Willingness to Pay for Selected Neighborhood and Housing Attributes

	Neighborhood Sociodemographics					House Cha
	+10% Asian vs. White (at mean)	+10% Black vs. White (at mean)	+10% Hisp vs. White (at mean)	+10% College Educated	Blk Group Avg Income + $10,000	Own vs. Rent
Mean MWTP	10.4	-23.4	15.0	16.5	85.4	148.2
	(5.9)	(3.9)	(5.5)	(3.9)	(2.6)	(7.4)
Race (at mean income=$54,755)						
Asian	97.9	-10.5	25.0	10.3	86.9	253.3
Black	38.5	66.6	44.1	35.9	65.8	80.3
Hispanic	8.7	-9.3	71.1	17.5	91.0	130.7
White	-8.1	-37.8	1.1	14.8	86.5	139.5
Education						
less than college degree	15.6	-26.0	17.4	-9.1	87.5	134.5
college degree	3.8	-20.1	11.9	49.4	82.7	165.6

Table 9: Counterfactual - Eliminating Racial Interactions in Location Decision

Panel A: Overall Results

	Neighborhood and Housing Consumption Measures									
	Percent Black	*Percent White*	*Home Ownership*	*House Size*	*Average Test Score*	*Crime Rate*	*House Value*	*Commute*	*Avg. N'hood Income*	*% N'hood Colleg Educ.*
Black										
Pre-Simulation	0.379	0.424	0.40	4.50	458	18.73	740	9.89	37,377	0.31
Post-Simulation	0.146	0.645	0.35	4.53	496	13.01	846	9.05	44,356	0.37
White										
Pre-Simulation	0.048	0.761	0.63	5.36	541	6.14	1160	10.28	57,624	0.47
Post-Simulation	0.071	0.725	0.63	5.31	531	7.71	1127	9.88	55,696	0.45

Panel B: Results by Income Quartile

	Neighborhood and Housing Consumption Measures									
	Percent Black	*Percent White*	*Home Ownership*	*House Size*	*Average Test Score*	*Crime Rate*	*House Value*	*Commute*	*Avg. N'hood Income*	*% N'hood Colleg Educ.*
Black - Lowest Income Quartile										
Pre-Simulation	0.467	0.302	0.31	4.08	445	21.29	612	9.76	33,093	0.28
Post-Simulation -	0.172	0.609	0.22	3.94	482	15.30	661	8.82	39,258	0.32
Black - Highest Income Quartile										
Pre-Simulation	0.24	0.516	0.72	5.96	502	11.53	1,261	10.00	53,053	0.43
Post-Simulation -	0.107	0.671	0.76	6.26	533	7.29	1,477	10.02	60,365	0.50
White - Lowest Income Quartile										
Pre-Simulation	0.058	0.718	0.46	4.36	521	8.42	838	9.88	46,710	0.40
Post-Simulation -	0.068	0.696	0.45	4.30	506	10.95	786	9.47	44,732	0.36
White - Highest Income Quartile										
Pre-Simulation	0.026	0.807	0.87	6.56	565	4.18	1,607	11.16	71,805	0.56
Post-Simulation -	0.063	0.716	0.87	6.51	559	4.93	1,586	10.73	69,387	0.55

Table 9: Counterfactual - Equalizing Proportion of Blacks and Whites in Metropolitan Population

	Neighborhood and Housing Consumption Measures									
	Percent Black	*Percent White*	*Home Ownership*	*House Size*	*Average Test Score*	*Crime Rate*	*House Value*	*Commute*	*Avg. N'hood Income*	*% N'hood Colleg Educ.*
Black										
Pre-Simulation	0.379	0.424	0.40	4.50	458	18.73	740	9.9	37,400	0.31
Post-Simulation -	0.720	0.131	0.45	4.71	499	11.89	925	8.9	31,700	0.30
White										
Pre-Simulation	0.048	0.761	0.63	5.36	541	6.14	1160	10.3	57,600	0.47
Post-Simulation -	0.125	0.705	0.65	5.39	537	7.94	1178	10.6	42,900	0.39

Table 9: Counterfactual - Equalizing Proportion of Blacks and Whites in Metropolitan Population

Panel B: Results by Income Quartile	*Neighborhood and Housing Consumption Measures*								
	Percent Black	*Percent White*	*Home Ownership*	*House Size*	*Average Test Score*	*Crime Rate*	*House Value*	*Commute*	*Avg. N'hood Income*
Black - Lowest Income Quartile									
Pre-Simulation	0.467	0.302	0.31	4.08	445	21.29	612	9.8	33,100
Post-Simulation	0.763	0.102	0.31	4.21	489	13.56	741	8.6	25,800
Black - Highest Income Quartile									
Pre-Simulation	0.240	0.516	0.72	5.96	502	11.53	1,261	10.0	53,100
Post-Simulation	0.683	0.194	0.82	6.10	526	7.43	1,428	9.6	48,400
White - Lowest Income Quartile									
Pre-Simulation	0.058	0.718	0.46	4.36	521	8.42	838	9.9	46,700
Post-Simulation	0.178	0.695	0.40	4.35	522	10.08	842	9.8	30,100
White - Highest Income Quartile									
Pre-Simulation	0.026	0.807	0.87	6.56	565	4.18	1,607	11.2	71,800
Post-Simulation	0.089	0.716	0.89	6.42	551	5.79	1,529	11.4	55,000

Table 10. Enhanced Cutler-Glaeser Regressions: The Effect of Metropolitan Segregation on Individual Outcomes

Coefficients on interactions between black and metropolitan segregation (dissimilarity index) and proportion college-educated blacks in

	Age 20-24				Age 25-30			
	HS Graduate	*Ln(Earnings)*	*Idle*	*Any Child Born*	*HS Graduate*	*Ln(Earnings)*	*Idle*	*Any Child Born*
Cutler-Glaeser Regressions								
Black*Metro Dissimilarity Index (Segregation)	-0.269*** (0.041)	-0.788*** (0.140)	0.340*** (0.031)	0.189*** (0.032)	-0.201*** (0.039)	-0.433*** (0.094)	0.310*** (0.038)	0.131*** (0.035)
Adding Interactions with (% Metro Black and College-Educated)								
Black*Segregation	-0.412*** (0.080)	-1.123*** (0.260)	0.387*** (0.070)	0.218*** (0.071)	-0.241*** (0.072)	-0.505*** (0.164)	0.394*** (0.083)	0.217*** (0.046)
Black* Segregation* (% Metro Black and College Educated)	**13.60*** (4.32)**	**20.06* (12.25)**	**-5.26* (3.09)**	**-4.61 (3.79)**	**6.21* (3.67)**	**6.07 (7.93)**	**-7.45** (3.06)**	**-9.83*** (2.87)**