EC1410 Topic #5

White Flight, Gentrification, and Bid-Rent

Matthew A. Turner
Brown University
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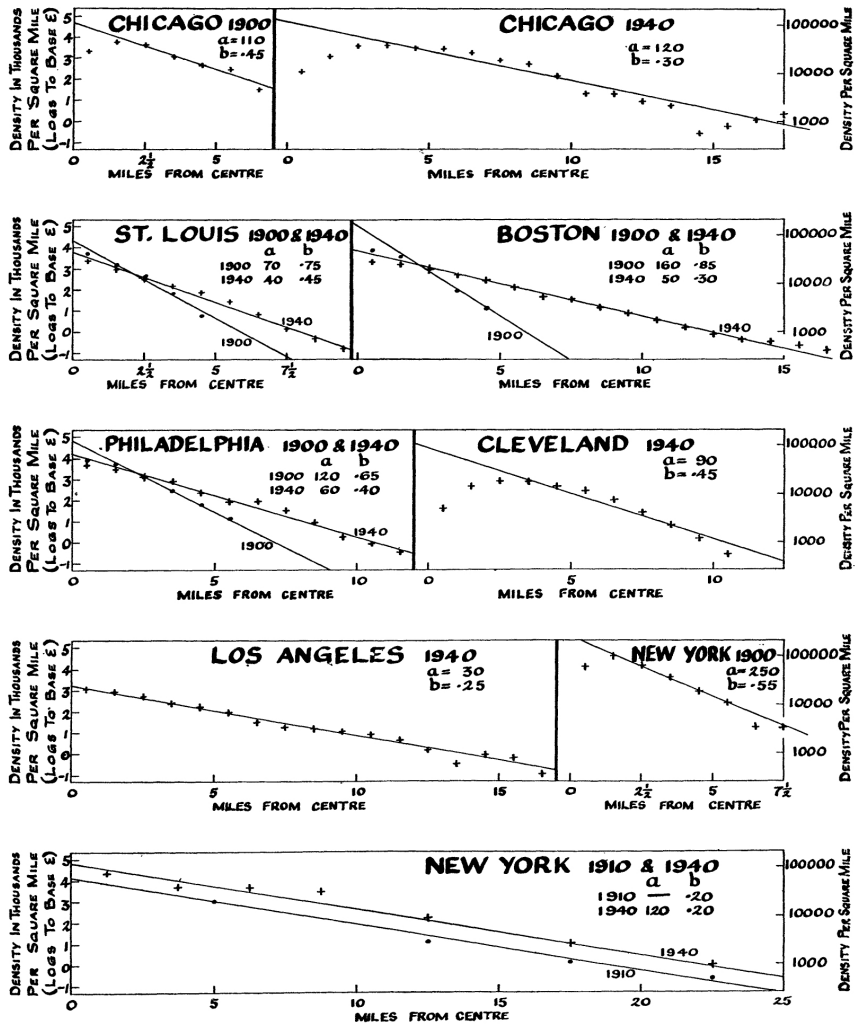
Outline

Decentralization

Decentralization has been an important trend in cities in the US and developed countries over the past 150 years. Cities have been spreading out and getting less dense.

- Clark (1951): population density gradients get flatter over time for a small collection of US and European cites from, more-or-less 1850-1930.
- Boustan et al. (2013): suburbs grow much faster than central cities for a sample of 103 MSAs between 1940 and 2000.
- Baum-Snow (2007): The population share of constant boundary central cities falls 1940-1990, for sample of 139 MSAs.
- Couture and Handbury (2020): the share of Metropolitan population close to the center falls between 1980 and 2010, for a sample of about 350 CBSA's. (Definition: MSA $> 50k$, CBSA$> 10k$, so all MSAs are CBSAs, but not the opposite).



Clark (1951) Cities in the US grow in physical extent and population and the population gradient flattens, from the start of the industrial revolution until the mid-20th century.

Figure 5: City and suburban population growth by decade, 1940–2000

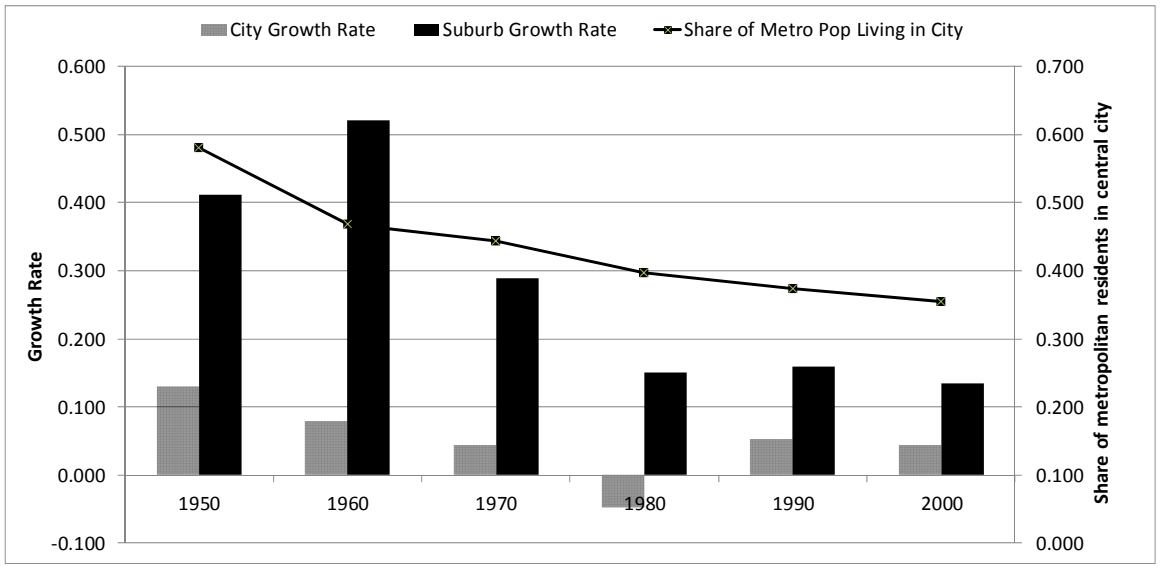


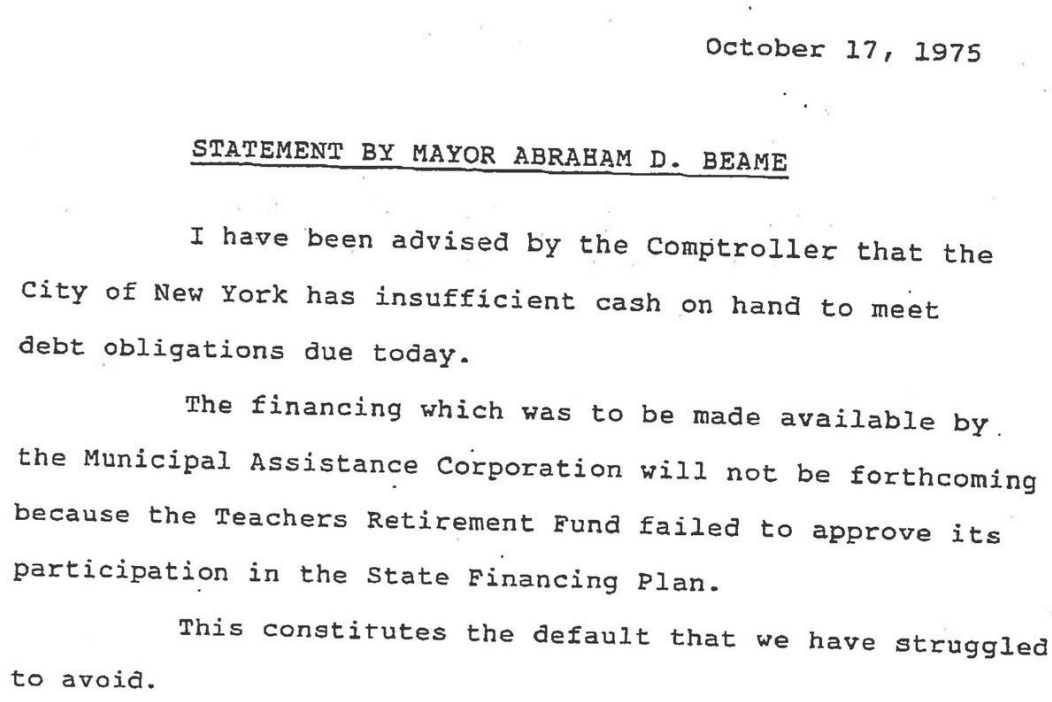
Figure 5: Source is Boustan and Shertzer (2013). Values refer to the decade ending in the census year on the *x*-axis. Sample includes 103 metropolitan areas anchored by a city that had at least 50,000 residents in 1970. City and county population are taken from the City and County Data Books. The 1970 county definitions of metropolitan areas are applied in all years. Suburban population is computed as the total metropolitan area population minus the city population.

Boustan et al. (2013) From 1940 until 2000, most growth of population in metropolitan areas has been suburban. Central cities shrunk in the 1980s.

TABLE I
AGGREGATE TRENDS IN SUBURBANIZATION, 1950–1990

	1950	1960	1970	1980	1990	Percent change 1950–1990
Panel A: Large MSAs						
MSA population	92.9	115.8	134.0	144.8	159.8	72
Total CC population	44.7	48.5	51.3	49.2	51.0	14
Constant geography CC population	44.7	44.2	42.6	37.9	37.1	−17
N for constant geog. CC population	139	132	139	139	139	
Panel B: Large Inland MSAs						
MSA population	39.2	48.9	57.0	65.0	73.5	88
Total CC population	16.8	19.7	22.1	22.1	23.2	38
Constant geography CC population	16.8	16.5	15.4	13.3	12.5	−26
N for constant geog. CC population	100	94	100	100	100	
Total U. S. population	150.7	178.5	202.1	225.2	247.1	64

Baum-Snow (2007) shows that constant boundary central cities lost 17% of their population, on average between 1950 and 1990.



October 17, 1975

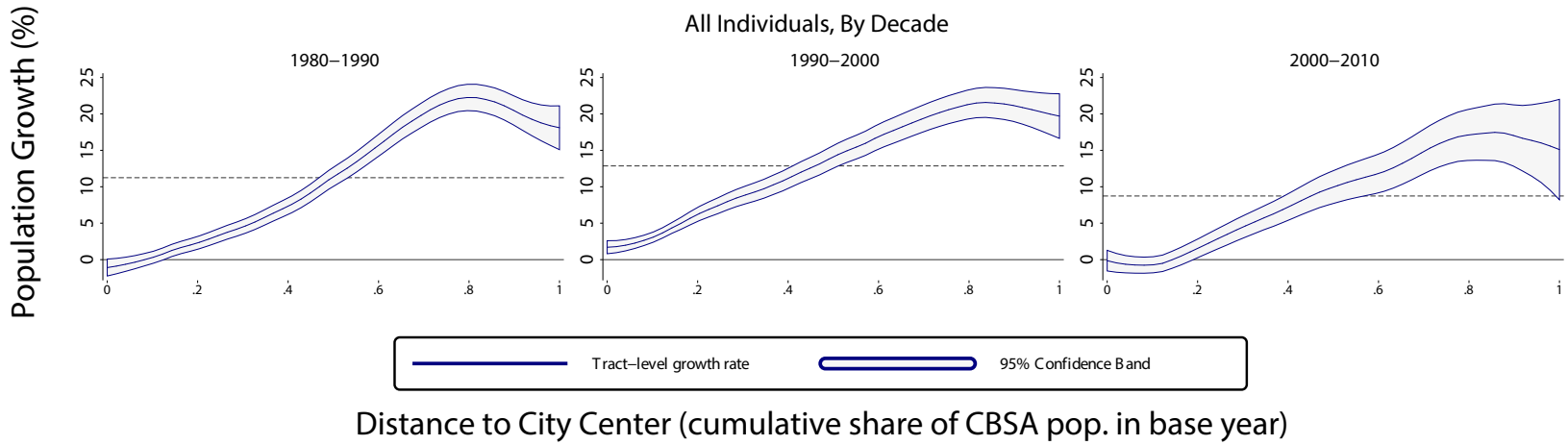
STATEMENT BY MAYOR ABRAHAM D. BEAME

I have been advised by the Comptroller that the City of New York has insufficient cash on hand to meet debt obligations due today.

The financing which was to be made available by the Municipal Assistance Corporation will not be forthcoming because the Teachers Retirement Fund failed to approve its participation in the State Financing Plan.

This constitutes the default that we have struggled to avoid.

Nussbaum (2015). The 1970's and 80's were a pretty scary time for cities.



Notes: (Couture and Handbury, 2020) Percent change in tract population at different distances from the city center. Distance from the city center is measured as the cumulative share of CBSA population in the base year. Percent change in total population between 1980 and 1990, 1990 and 2000, and 2000 to 2010. The shaded region depicts the 95% confidence interval. The dashed row in each plot shows the average population growth rate for the relevant demographic group over the relevant decade.

The suburbanization of population continued through 2010.

The decentralization of cities has been going on for at least 150 years. As we saw earlier, COVID may even have accelerated this process.

This process appears not to be specific to the US. Clark (1951) shows decentralization in a small sample of European cities from 1850-1930, Baum-Snow et al. (2017) shows decentralization of Chinese cities from 1990-2010.

Why?

There are two main candidate explanations for this pattern.

- Falling transportation costs.
- ‘White flight’.

Transportation costs and decentralization I

Transportation costs have been falling and the available evidence strongly suggests this is related to urban decentralization.

- Baum-Snow (2007) documents the relationship between the construction of radial interstate highways and decentralization of US cities.
  - During this period, and average city in Baum-Snow's sample received 2.6 rays.
  - Each (randomly assigned) ray casues about a 9% drop in central city population.
  - Multiplying, interstate rays caused about a 25% decline in central city population.
  - This is slightly more than was actually observed.

Transportation costs and decentralization II

That is, highway construction can explain all decentralization of US cities. N.B.: Small cheat; equilibrium roads are not randomly assigned, so this calculation abuses Baum-Snow's estimates a little.

- Baum-Snow et al. (2017) shows that highways deentralize Chinese cities, too. Garcia-López et al. (2015) and Garcia-López (2019) provides further evidence for Europe.
- Gonzalez-Navarro and Turner (2018) provide similar evidence for the construction of subways in a sample of world cities.

The Great Migration I

- The period from 1890 to about 1980 saw a large black migration from the southern US to the North.
- This migration peaked between 1940 and 1970, when 4m blacks migrated from the South to the North. This increased the black population share of northern cities from 4% in 1940 to 16% in 1970 (Boustan, 2010).
- Between 1890 and 1940 black population of Northern and Midwestern cities grew by about 4% per year, and about 2% per year in the West and South. Part of this migration was purely rural to urban, and part of it was South to North.
- By 1980, 78% of metropolitan blacks lived in central cities, while only 33% of metropolitan whites did so.

The Great Migration II

- Cutler et al. (1999) describe the evolution of US cities over this time. Short answer: this period saw the rise of the black gheto in northern US cities.
- Cutler and Glaeser (1997) analyzes the effects of these ghettos on their black residents: Short answer: Not so good.
- Boustan (2010) analyzes the hypothesis that ‘white flight’ was responsible for the decentralization of US cities we observe over this period. Short answer: almost all.

The American Ghetto, 1890-1990

Cutler et al. (1999) studies the rise and fall of the American Ghetto from 1890 to 1990.

- It is organized around a 1% sample of census tract level data reporting the race of residents.
- One of the main challenges the paper faces is to develop a way to measure ‘segregation’. It does this with two indexes of segregation, an ‘index of dissimilarity’ and an ‘index of isolation’. We just discuss the dissimilarity index in detail.

Dissimilarity I

$$
\begin{aligned}
i &\sim \text{census tract} \\
j &\sim \text{city} \\
B_i^j &\sim \text{Black population of tract } i\text{, city } j \\
W_i^j &\sim \text{non-black population of tract } i\text{, city } j \\
B^j &= \sum_{i \in \text{ city } j} B_i^j \\
W^j &= \sum_{i \in \text{ city } j} W_i^j \\
\text{dissimilarity index} &= \frac{1}{2} \sum_{i=1}^{N} \left| \frac{B_i}{B} - \frac{W_i}{W} \right|
\end{aligned}
$$

dropping j for legibility in the last line.

Dissimilarity II

- The two main terms of this index are the share of the black population in each tract, and share of white population in each tract.
- If races are distributed symmetrically across tracts, then this index is zero. If all of the blacks are concentrated in a single tract, then the index is 1.
- Emprically, 0.3 is ‘low’, 0.3-0.6 is ‘moderate’, and above 0.6 is ‘high’.
- Note that the index is undefined when $B = 0$. The sample in the paper is restricted to cities with more than 100k, and more than 10k black.

Dissimilarity III

The study relies on a sample of 54 cities in 1890 and this increases to 313 by 1990. Post 1940, ‘cities’ are MSAs. Pre-1940, they are municipalities. Pre-1940, census units are ‘wards’, post, they are ‘tracts’. A census tract is about 4k people, wards are bigger.

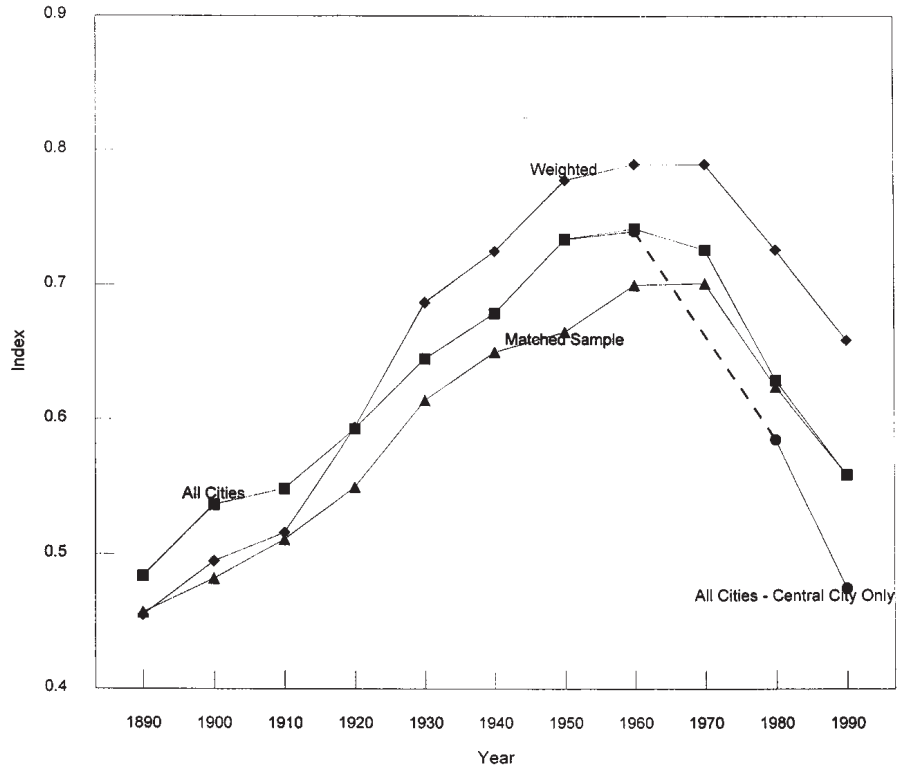


Fig . 1.—Index of dissimilarity, 1890–1990. Matched sample segregation is normalized to unmatched mean in 1990. The 1970 value for central city only segregation is interpolated from 1960 and 1980.

Cutler et al. (1999). American cities became home to populations of increasingly segregated blacks over the first half of the 20th century. This trend flattened out between 1940 and 1970, before falling rapidly until 1990.

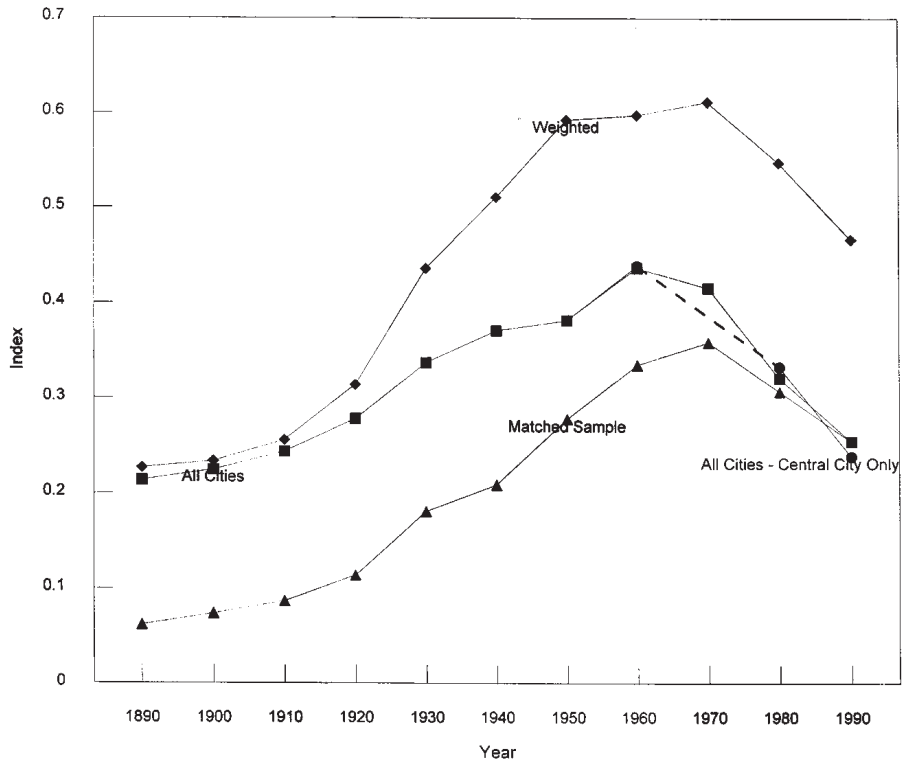


Fig . 2.—Index ofisolation, 1890–1990. Matched sample segregation is normalized to unmatched mean in 1990. The 1970 value for central city only segregation is interpolated from 1960 and 1980.

Cutler et al. (1999). A second, quite different index of segregation behaves in much the same way as the dissimilarity index.

Summary Statistics for Measures of Segregation

	Index of Dissimilarity				Index of Isolation			
	1890	1940	1970	1990	1890	1940	1970	1990
Number of cities	60	109	211	313	60	109	211	313
Average segregation:								
Unweighted	.485	.679	.726	.559	.214	.371	.412	.255
Weighted by black population	.455	.717	.790	.659	.227	.463	.612	.467
Matched cities	.390	.610	.697	.559	.042	.219	.363	.255
By region (matched index):								
Northeast	.394	.601	.678	.592	.000*	.098	.253	.215
Midwest	.431	.645	.745	.621	.012	.219	.390	.309
South	.387	.611	.689	.552	.213	.385	.466	.320
West			.683	.444			.230	.084
	Correlations over Time							
1890	1.000				1.000			
1940	.607	1.000			.309	1.000		
1970	.362	.460	1.000		.229	.519	1.000	
1990	.470	.447	.676	1.000	.142	.501	.875	1.000
Correlation between dissimilarity and isolation	.385	.657	.633	.791				

Note .—Statistics include all cities, except as noted. Indices for 1890 and 1940 are ward-based indices adjusted for comparability to tract-based indices. See App. B for details. Matched cities are those included in the sample as of the year in the previous column. Matched indices are normalized to overall means in 1990 and linked to previous decades by mean differences.

* Estimate slightly below zero because of changes in sample of cities over time.

Cutler et al. (1999). This table tells much the same story as the figures. Increasing until 1940, flat to 1970, then decreasing. Two further points: (1) It was worse in the Northern cities. (2) the correlations at the bottom tell us that segregation was stable over time. Given data issues, this is reassuring.

TABLE 2

Demographic Change and Segregation

	Year				
	1890	1910	1940	1970	1990
Number of ghettos, all cities	1	5	55	127	98
Percentage of sample cities	1.7	7.0	50.5	60.2	29.5
Percentage of sample black population	1.7	4.6	72.4	93.1	72.4
Black population, matched cities:*					
Number (thousands)	874	1,499	3,772	13,945	18,732
Annual growth rate (%)		2.7	3.1	4.4	1.5
Northeast/Midwest		3.7	4.4	4.7	.9
South/West		2.3	2.2	4.0	2.0
Percentage black	7.5	7.1	10.8	13.9	16.2
Percentage black in ward/tract of average black †	20.0	22.6	37.6	69.7	60.9
	Alternative Measures of Dissimilarity, All Cities				
High school–educated black/nonblack				.757	.688
High school–educated black/nonblack				.746	.634
High school–educated black/nonblack				.743	.544

Note. —Ward-based indices up to 1940 have been adjusted for comparability to tract-based indices.
* Constant set of 102 cities/MSAs with population data reported in every year.
† Based on 50 cities in 1890, 55 cities in 1910, 71 cities with ward data in 1940, and 102 cities in 1970 and 1990.

Cutler et al. (1999). (1) Say that a city has a ghetto if dissimilarity index $>$ 0.6 and isolation index $>$ 0.3. (2) By 1970, the average metropolitan black lived in census tract that was 70% black in a metropolitan area that was 14% black.

TABLE 3

Explaining Changes in Segregation over Time

Independent Variable	1910–40 Dissimilarity (1)	1910–40 Isolation (2)	1940–70 Dissimilarity (3)	1940–70 Isolation (4)	1970–90 Dissimilarity (5)	1970–90 Isolation (6)
Constant	.087**	.020	.085**	.025	.055**	.050**
	(.031)	(.034)	(.041)	(.048)	(.024)	(.017)
Annualized Δ ln(black)	2.481**	3.466**	1.556**	3.615**	.149	1.217**
	(.966)	(.897)	(.761)	(.672)	(.731)	(.501)
Annualized Δ ln(nonblack)	.393	1.086	1.148*	.297	2.064**	2.918**
	(1.490)	(1.810)	(.659)	(.984)	(.467)	(.522)
High segregation	.034	.136*	.068*	.029	.042	.050**
	(.047)	(.068)	(.040)	(.053)	(.027)	(.021)
High segregation Δ ln(black)	2.696**	4.006**	1.436*	.499	1.141	1.455**
	(1.238)	(1.477)	(.837)	(1.019)	(.808)	(.728)
Observations	59	59	102	102	203	203
R^2	.149	.245	.304	.402	.285	.369

* Statistically significant at the 10 percent level.
** Statistically significant at the 5 percent level.

Cutler et al. (1999)

$$\text{Index}_t^j = A_0 + A_1 \Delta \ln B_t^j + A_2 \Delta \ln W_t^j + A_3 \text{High segregation} + A_4 \text{High segregation} \times \Delta \ln B_t^j + \varepsilon$$

Segregation is increasing in the migration rate and is persistent. The high segregation indicator is based on initial year data.

TABLE 4

Distribution of Percentage Black in Census Tracts

	1940: City	1960		1990	
		City	Suburbs	City	Suburbs
Number of tracts	6,113	13,310	9,378	16,664	27,183
Percentage of tracts with black share:					
Exactly zero	21.2	19.6	22.3	7.3	14.7
0–1	39.1	36.2	48.0	10.2	25.0
1–5	15.6	12.4	13.3	23.7	30.0
5–15	8.3	8.8	8.2	18.8	15.3
15–25	3.6	4.2	2.9	7.4	5.3
25–50	4.2	5.4	2.9	9.4	4.9
50–75	3.2	4.6	1.3	7.0	2.4
75–90	1.9	3.4	.6	5.0	1.1
90–98	1.8	3.1	.3	6.5	.9
98–100	1.0	2.3	.2	4.8	.4

Note. —The sample is census tracts with at least some population.

Cutler et al. (1999). Another measure of segregation. What share of census tracts have zero, or tiny numbers of blacks? If people are the same, and face the same choice sets, exclusion of blacks is hard to understand. This was worse in 1940 and 1960 than 1990, and worse in the suburbs than the center.

Black and White attitudes towards segregation

It is possible that segregation arises because black people prefer to live near other black people.

To investigate this, Cutler et al. (1999) look at survey data on this issue, the General Social Survey, available from 1970 onward.

The survey asked black people if they would rather live in a majority white neighborhood, and white people a series of questions about their attitudes towards blacks.

TABLE 8

Segregation and Attitudes toward Integration

Independent Variable	Black Attitudes	White Attitudes		
	Prefers Majority-White Neighborhood (1982) (1)	Believes in Right to Segregated Housing (1972–93) (2)	Supports Ban of Interracial Marriage (1972–93) (3)	Would Not Live in 50% Black Neighborhood (1990) (4)
Dissimilarity index, 1980/1990 †	.250	.196**	.104**	.356
	(.462)	(.062)	(.052)	(.221)
South region	.251**	.077**	.152**	.047
	(.060)	(.015)	(.013)	(.053)
Midwest region	.024	.022	.061**	.067
	(.072)	(.015)	(.012)	(.051)
West region	.022	.023	.016	.042
	(.091)	(.015)	(.012)	(.057)
Year effects		yes	yes	
Education, sex, and age controls	yes	yes	yes	yes
Observations	362	8,795	11,111	677
R^2	.112	.113	.204	.042

Note .—Standard errors, corrected for grouped observations, are in parentheses.
* Statistically significant at the 10 percent level.
** Statistically significant at the 5 percent level.
† Dissimilarity in 1980 used in cols. 1–3, 1990 values used in col. 4.

$$\text{survey response} = A_0 + A_1 \text{index} + A_t \text{Year Indicators} + \varepsilon$$

- About 70% of blacks report preferring to live in a majority white neighborhood in 1982. This is not sensitive to the segregation in their home city, but is higher in the South.
- White attitudes do not vary in a consistent way with segregation, but are worse in the South and probably the midwest. They are probably a little better in the west. North is the omitted category.

This does not seem to support the idea that blacks were segregated because they preferred to live near other blacks. There is a little evidence here to support the idea that whites did not want to live near blacks.

Are Ghettos harmful?

To check whether ghettos are harmful, Cutler and Glaeser (1997) look at census data describing demographic outcomes that allow people to be matched to cities. For each city, they calculate the same dissimilarity index as we saw in their other paper on the ghettos.

TABLE II
SUMMARY STATISTICS FOR MICRO DATA

	Age 20–24		Age 25–30	
Variable	White	Black	White	Black
Education				
High school graduate	87.1%	75.4%	88.9%	77.9%
College graduate	13.4%	4.7%	27.2%	11.7%
Work and income				
Idle	6.8%	20.0%	9.5%	19.9%
ln(earnings)	9.1	8.7	9.6	9.1
Social				
Unmarried mother	9.9%	39.2%	11.8%	44.2%
Demographic variables				
Black	15.0%		13.4%	
Asian	1.2		1.0%	
Other nonwhite	0.7		0.6%	
Hispanic	7.6		6.0%	
Female	50.1		51.2%	
N	97,976		139,715	

The data are from the 1 percent Public Use Micro Sample of the 1990 Census. Idleness is defined as not working and not enrolled in school. Earnings are the sum of wage, salary, and self-employment income in 1989. Observations are for native-born people living in one of 204 MSAs where segregation and public finance variables are available and can be matched to the microdata. Earnings data are restricted to 56,627 (people aged 20–24) and 105,997 people aged 25–30 who are working, not enrolled in school, and have nonnegative earnings. Unmarried mother data are restricted to 49,038 women aged 20–24 and 71,531 women aged 25–30.

Black outcomes are worse than non-black for these two age groups in 1990 in 209 MSAs with 100k or more population and 10k or more black population.

Is this at least partly a consequence of segregation?

- Are black outcomes worse in segregated cities?
- What if everyone has worse outcomes in segregated cities? It could be segregation occurs only in bad places, and segregation is not the cause of the problem? To check this, look at whether blacks are harmed more by segregation than whites, i.e., calculate a difference in differences,
- Define Y_L^B , Y_L^W Y_H^B , Y_H^W to be black and non-black outcomes in high and low segregation cities. 'High segregation' is above median dissimilarity index. Calculate difference in differences,

$$(Y_H^B - Y_L^B) - (Y_H^W - Y_L^W)$$

TABLE III
PRELIMINARY EVIDENCE ON THE RELATION BETWEEN SEGREGATION AND OUTCOMES

	Age 20–24					Age 25–30				
	Education		Income		Social	Education		Income		Social
	High school graduate	College graduate	Idle	ln(earn)	Single mother	High school graduate	College graduate	Idle	ln(earn)	Single mother
Black										
Low segregation	79.5%	4.4%	15.4%	8.77	36.7%	80.0%	10.7%	15.8%	9.18	40.4%
High segregation	74.0	4.9	21.6	8.61	39.9	77.2	12.0	21.3	9.13	45.4
Difference	−5.5	0.5	6.2	−0.16	3.2	−2.8	1.3	5.5	−0.05	5.0
Nonblack										
Low segregation	86.7%	10.6%	7.0%	9.03	10.8%	88.1%	23.9%	9.9%	9.53	13.2%
High segregation	87.3	14.7	6.6	9.05	9.4	89.3	28.7	9.4	9.57	11.2
Difference	0.6	4.1	−0.4	0.02	−1.4	1.2	4.8	−0.5	0.04	−2.0
Difference-in-difference (B − W)	−6.1%	−3.7%	6.6%	−0.17	4.6%	−4.0%	−3.6%	6.0%	−0.09	6.9%
	(0.7%)	(0.7%)	(0.6%)	(0.03)	(0.9%)	(0.6%)	(0.8%)	(0.6%)	(0.02)	(0.9%)

High segregation MSAs are MSAs with housing segregation above the mean. Idleness is defined as not working and not enrolled in school. Earnings are the sum of wage, salary, and self-employment income in 1989. The sample for earnings is people who are working, not enrolled in school, and have nonnegative earnings. Standard errors for the difference-in-differences estimates are in parentheses.

From the first column, black high school graduation rates decrease by 6% more than white graduation rates in high segregation cities.

These data suggest that ghettos are harmful. Together with the survey data described above, this does not look good for the hypothesis that ghettos arise because blacks want to live near other blacks (although this surely sometimes occurs).

White flight I

- Do ghettos arise because whites are fleeing neighborhoods populated by blacks? Is this flight responsible for the decentralization of US cities?
- Boustan (2010) examines this hypothesis by estimating the number of whites who leave the central cities per black arrival.
- The data describe a subset of US MSAs between 1940 and 1970. The number of cities increases over time from 59 to 212.

If we observe whites leaving when blacks arrive, what does this mean?

- Blacks are migrating to places whites were leaving anyhow?
- Whites are leaving because the blacks arrive?

White flight II

- To distinguish, we would like to assign blacks to cities at random and see what happens. Boustan tries to approximate such random assignment by focusing attention on blacks who migrate because of short run fluctuations in the economies of their origin, southern counties.
- This will suggest that whites leave central cities because blacks arrive.

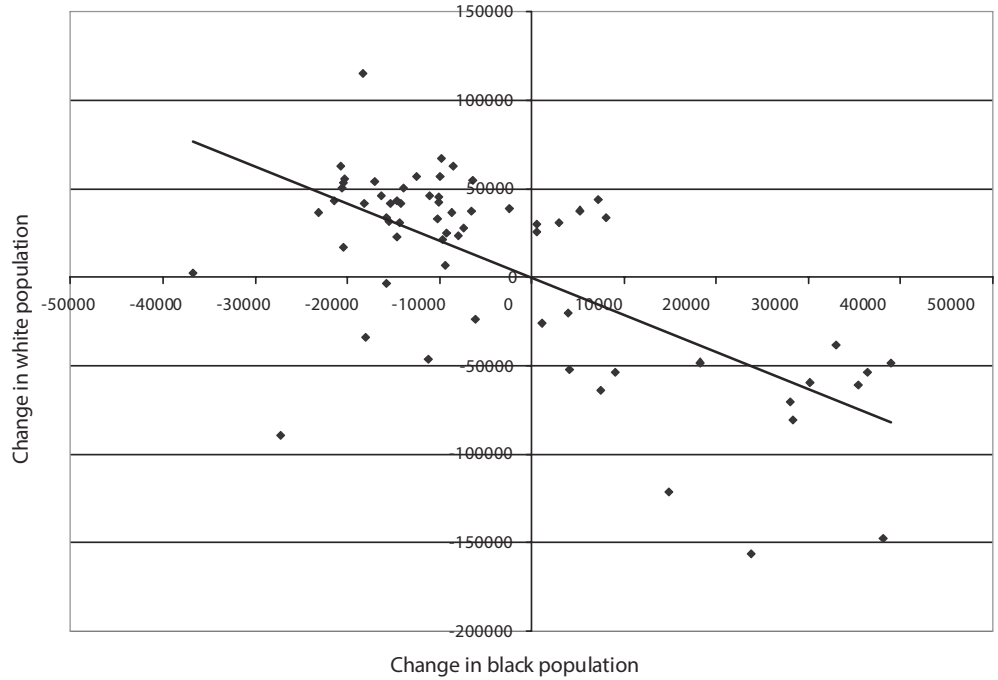


FIGURE I

Change in Black and White Population in Central City, 1950–1960

Each point in the scatter diagram represents the residual change in a city's black and white populations after controlling for region fixed effects and changes in the metropolitan area's population over the decade. The slope of a regression line through these points is −2.010 (s.e. = 0.291). Although the four largest cities—Chicago, IL; Detroit, MI; Los Angeles, CA; and New York City, NY—are omitted for reasons of scale, they fall close to the regression line. With these cities included, the slope is −2.465 (s.e. = 0.132).

$B_i, W_i \sim$ Black/White central city pop

$$W_i = A_0 + A_1 B_i + A_2 \Delta \text{MSA pop} + A_3 \text{Region} + \varepsilon$$

N.B. (1) $A_1 = -2.5$. It's 2.7 in her favorite estimate. (2) Sloppy notation on region fixed effects.

Institutions I

Consistent with the White Flight argument, White dominated governments, city, state local, created legal barriers to black residence in white neighborhoods. This is documented in Rothstein (2017). Some of the more horrifying examples of these institutional barriers were,

- Restrictive covenants
- Restrictions on Federal subsidies for mortgages to; Black Veterans, to white households in integrated neighborhoods, to black households.
- The Oregon State Constitution prohibits residence of blacks in the state.

Institutions II

These institutions compelled blacks to live in black neighborhoods.

Empirically, this will ‘look like’ blacks want to live near other blacks. In a strict sense, they do. Living in black neighborhoods allows them to avoid the penalties attached to violating these laws, e.g., dispossession. These institutions were broadly disallowed with civil rights legislation in the late 1960s and early 1970s.

White flight and decentralization I

- Boustan estimates that the median Northern and Western city received 19k black migrants between 1940 and 1970 and at 2.7 white departures per black arrival, this means that 52,000 left the central city in response.
- Since her regressions condition on metropolitan area population, this is migration from the central city, holding metropolitan population constant. So, it is white suburban migration.
- In her sample, this is a 17% decline in central city population.
- Baum-Snow reports a decline in central city population of exactly 17% between 1950 and 1990. Baum-Snow's results suggest that almost all of this effect can be explained by radial interstate highways.

White flight and decentralization II

This raises an obvious problem. Between highway construction and white flight, we can explain twice as much decentralization as actually occurred. How can we resolve this apparent contradiction?

- There is a secular trend in decentralization. In the absence of highways or white flight, we would have observed about a 17% increase in the central city share of population. This appears to contradict the long history of decentralization documented in Clark (1951)
- Baum-Snow is wrong. The Baum-Snow estimates have been replicated using similar data and methodology in China and Europe.

White flight and decentralization III

- Boustan is wrong. We observe decentralization cities around the world, in particular, in countries less obsessed with skin color.
- Both Baum-Snow and Boustan are right, but both overestimate effects to some degree.
  - The precision of Boustan's estimates does not rule out that only 1.4 whites left the central city per black arrival. This cuts her effect about in half.
  - The precision of Baum-Snow's estimates is about the same as Boustan's.

  ... so it is possible, if unlikely, that both estimates are just a little too high.

White flight and decentralization IV

- Both Boustan and Baum-Snow are about right, but Boustan's results need to be reinterpreted. The rate of decentralization is determined by highways and transportation costs. The identity/color of the people who decentralize is determined by black migration patterns. (I think this one gets my vote.)

Gentrification I

In spite of the continued decentralization of population, there is some evidence that central cities began to change in 1980s.

- Decline of ghettos starting in around 1970, Cutler et al. (1999).
- Increased income of central city residents between 1980 and 1990.
- Migration to the central city of educated young people from about 2000 on, Couture and Handbury (2020).

Decline of the Ghetto (repeat)

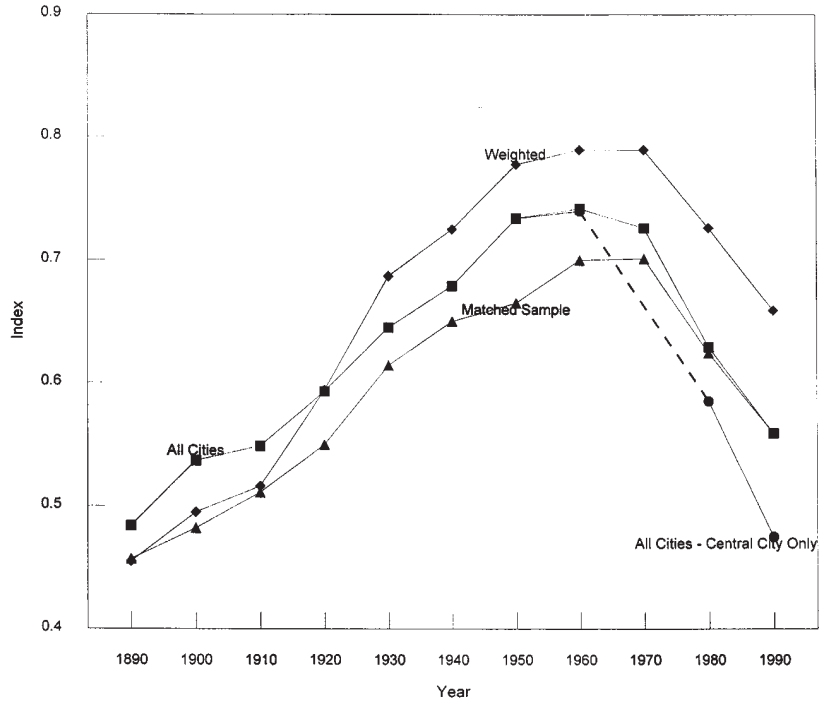


Fig . 1.—Index of dissimilarity, 1890–1990. Matched sample segregation is normalized to unmatched mean in 1990. The 1970 value for central city only segregation is interpolated from 1960 and 1980.

Cutler et al. (1999). American cities became home to populations of increasingly segregated blacks over the first half of the 20th century. This trend flattened out between 1940 and 1970, before falling rapidly until 1990.

Increasing Central City Incomes

TABLE 10
Income distribution within the city

Panel A: All MSAs

Income Relative to City Average	***1980***	***1990***
Within one mile of CBD	89%	94%
One to three miles of CBD	95%	95%
Three to five miles of CBD	101%	100%
Beyond five miles of CBD	109%	107%

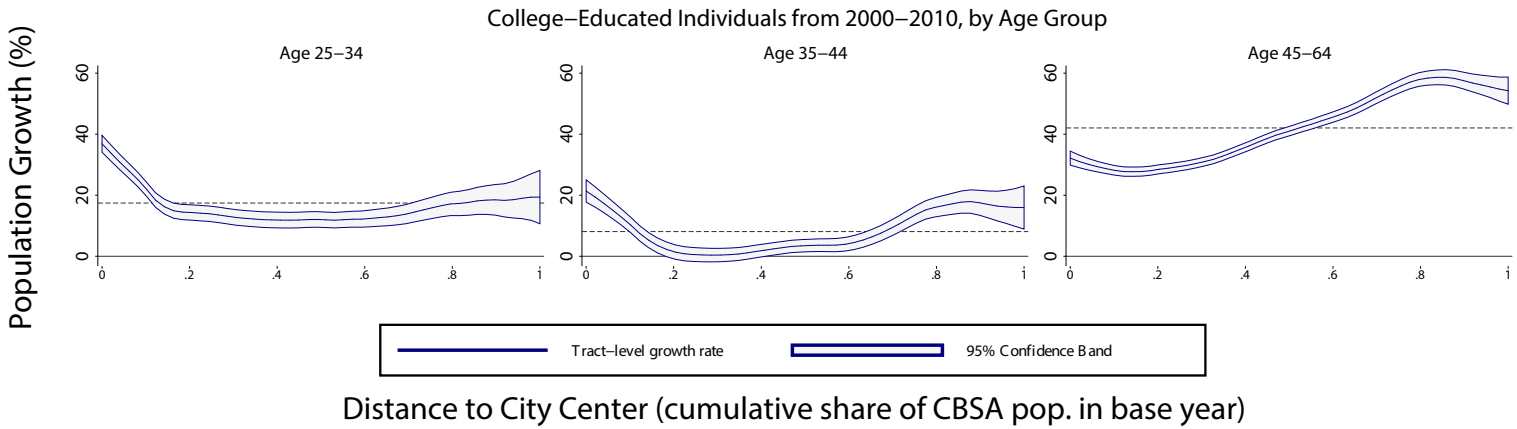
Panel B: 10 biggest MSAs

Income Relative to City Average	***1980***	***1990***
Within one mile of CBD	144%	163%
One to three miles of CBD	88%	97%
Three to five miles of CBD	86%	86%
Beyond five miles of CBD	105%	100%

Notes : See data Appendix for data sources.

Glaeser et al. (2001). The biggest central cities saw relative increases in income between 1980 and 1990. This was less relevant outside the very largest cities.

Central migration of educated young people



Notes: (Couture and Handbury, 2020) 2000-2010 percent change in the college-educated population in three age brackets at different distances from the city center. Distance from the city center is measured as the cumulative share of CBSA population in the base year. The shaded region around kernel fit depicts the 95% confidence interval. The dashed row in each plot shows the average population growth rate for the relevant demographic group over the relevant decade. Data are from the 1980-2000 decennial censuses and the 2008-2012 ACS.

Summing up I

- There has been a long history of decentralization, both in the US and around the world.
- There is good evidence that this decentralization was caused by reductions in transportation costs.
- In the US, decentralization also contributed to (or maybe was caused by) the concentration of blacks in the center city.
- While decentralization of cities is ongoing, the concentration of blacks and poverty in central city, ‘urban blight’, has been on the decline since about 1980, and it’s opposite ‘gentrification’ seems to have been underway early in the 21st century, particularly in big cities (until COVID).
- Can we rationalize this process in the monocentric city model? Does this process look like an equilibrium in our model?

Sorting and bid rent in the monocentric city model I

- Up until now, we have assumed that all households are the same. This is a whopper.
- Suppose there are two types of agents, 'rich' (r) and 'poor' (p). The two types are the same, except that $w_r > w_p$.
- To explain patterns of decentralization and white flight, also suppose that the transportation technology is more complicated.
  - Bus: $(wt^b + c^b)x$.
  - Auto: $f^a + (wt^a + c^a)x$.

  Each mode involves a cost in minutes per unit distance that is valued at the wage rate, and a money cost per unit distance. Cars also involve a fixed cost. Assume $f^a > 0$, $c^b < c^a$ and $t^b > t^a$. That is, cars are faster than buses, but also more expensive.

Everything else the same as standard monocentric model. In particular, $\overline{u}_p = \overline{u}_r = \overline{u}$ and land consumption is the same for both types.

A poor household solves,

$$\begin{aligned} &\max_{c,x} u(c) \\ &\text{s.t. } w_p = c + R(x)\overline{\ell} + (w_p t^b + c^b)|x| \end{aligned}$$

Letting $c^* = u^{-1}(\overline{u})$, this means that (ignoring corners)

$$R_p(x) = \frac{w_p - c^* - (w_p t^b + c^b)|x|}{\overline{\ell}}$$

Another way to state the household's problem is

$$\Psi_p(x) = \max_{c,x} \frac{w_p - c^* - (w_p t^b + c^b)|x|}{\overline{\ell}}$$
$$\text{s.t.} u(c) \geq \overline{u}$$

Solving this maximization problem requires $u(c) = \overline{u}$, so this gives us the same rent function as we got from the household maximization problem.

This function is called a 'bid-rent' function. It is the most a household can pay to occupy a location and still reach the minimum required utility level.

Let's do the same thing for a rich bus rider. A rich bus riding household's problem is,

$$\max_{c,x} u(c)$$
$$\text{s.t. } w_r = c + R(x)\overline{\ell} + (w_r t^b + c^b)|x|$$

In spatial equilibrium, and ignoring corners, this requires

$$R_r(x) = \frac{w_r - c^* - (w_r t^b + c^b)|x|}{\overline{\ell}}$$

Alternatively, their bid-rent is

$$\Psi_r(x) = \max_{c,x} \frac{w_r - c^* - (w_r t^b + c^b)|x|}{\overline{\ell}}$$
$$\text{s.t.} u(c) \geq \overline{u}$$

Suppose cars are too expensive even for the rich. That is, f^a is big compared to w_r. Then we can ignore driving. in this case, what happens?

Note that

$$\frac{w_r - c^*}{\bar{\ell}} = R_r^b(0) > R_p^b(0) = \frac{w_p - c^*}{\bar{\ell}}$$

and

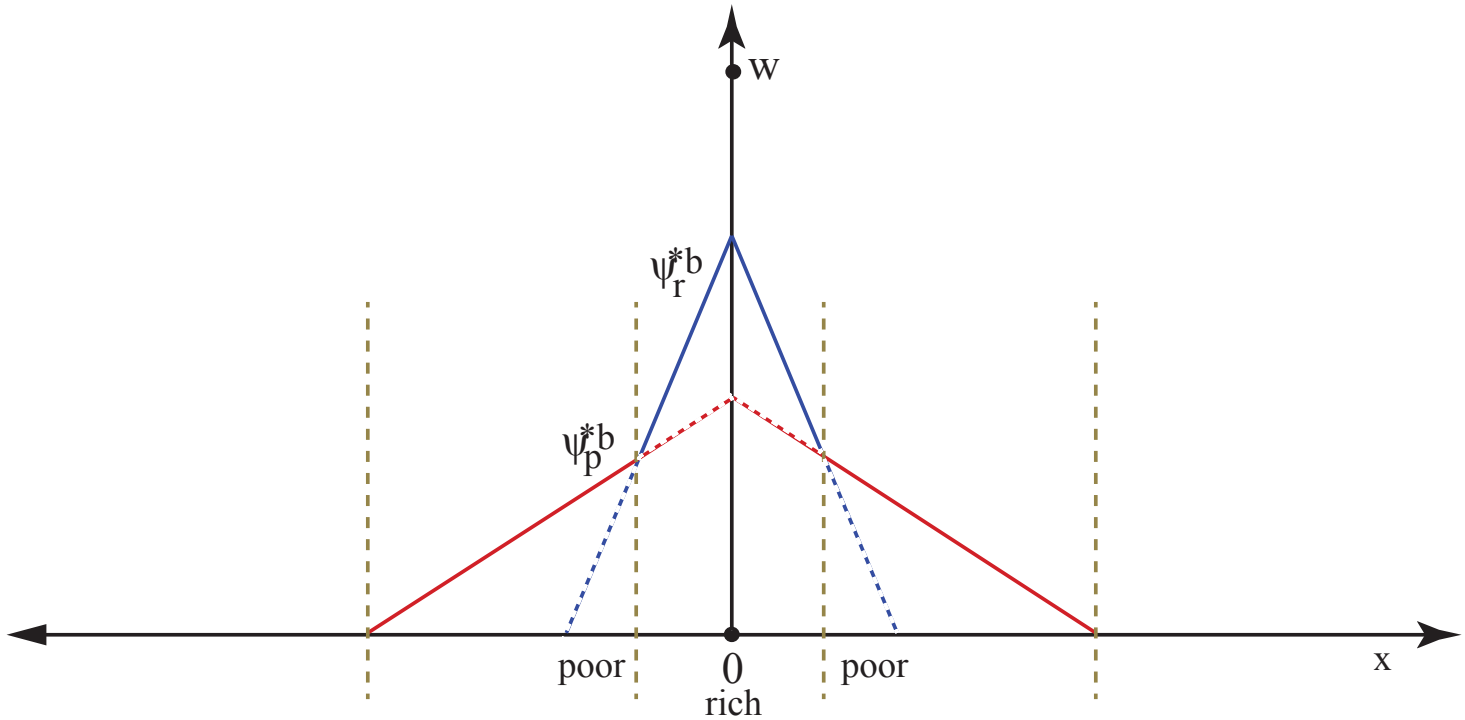
$$\frac{-w_r t^b - c^b}{\bar{\ell}} = \frac{dR_r^b}{dx} < \frac{dR_p^b}{dx} = \frac{-w_p t^b - c^b}{\bar{\ell}}$$

That is, bid-rent for the rich has a larger intercept and slopes down more steeply than does bid rent for the poor.

In equilibrium, we should have each location occupied by the type willing to pay the most for it. That is,

$$R(x) = \max\{R_p^b(x), R_r^b(x)\}$$

or, market rent should be the upper envelope of the bid-rent function for the two types.



This gives us an equilibrium where the rich bus riders live near the center and poor bus riders live farther out.

Suppose that the fixed price of cars falls enough that rich people sometimes buy them. In this case, a rich driving household's problem is,

$$\max_{c,x} u(c)$$
$$\text{s.t. } w_r = c + R(x)\bar{\ell} + f^a + (w_r t^a + c^a)|x|$$

In spatial equilibrium, and ignoring corners, this requires

$$R_r(x) = \frac{w_r - c^* - f^a - (w_r t^a + c^a)|x|}{\bar{\ell}}$$

Alternatively, their bid-rent is

$$\Psi_r^a(x) = \max_{c,x} \frac{w_r - c^* - f^a - (w_r t^a + c^a)|x|}{\bar{\ell}}$$
$$\text{s.t.} u(c) \geq \bar{u}$$

Evaluating at $x = 0$ we get

$$R_r^a(0) = \frac{w_r - c^* - f^a}{\overline{\ell}}$$

and

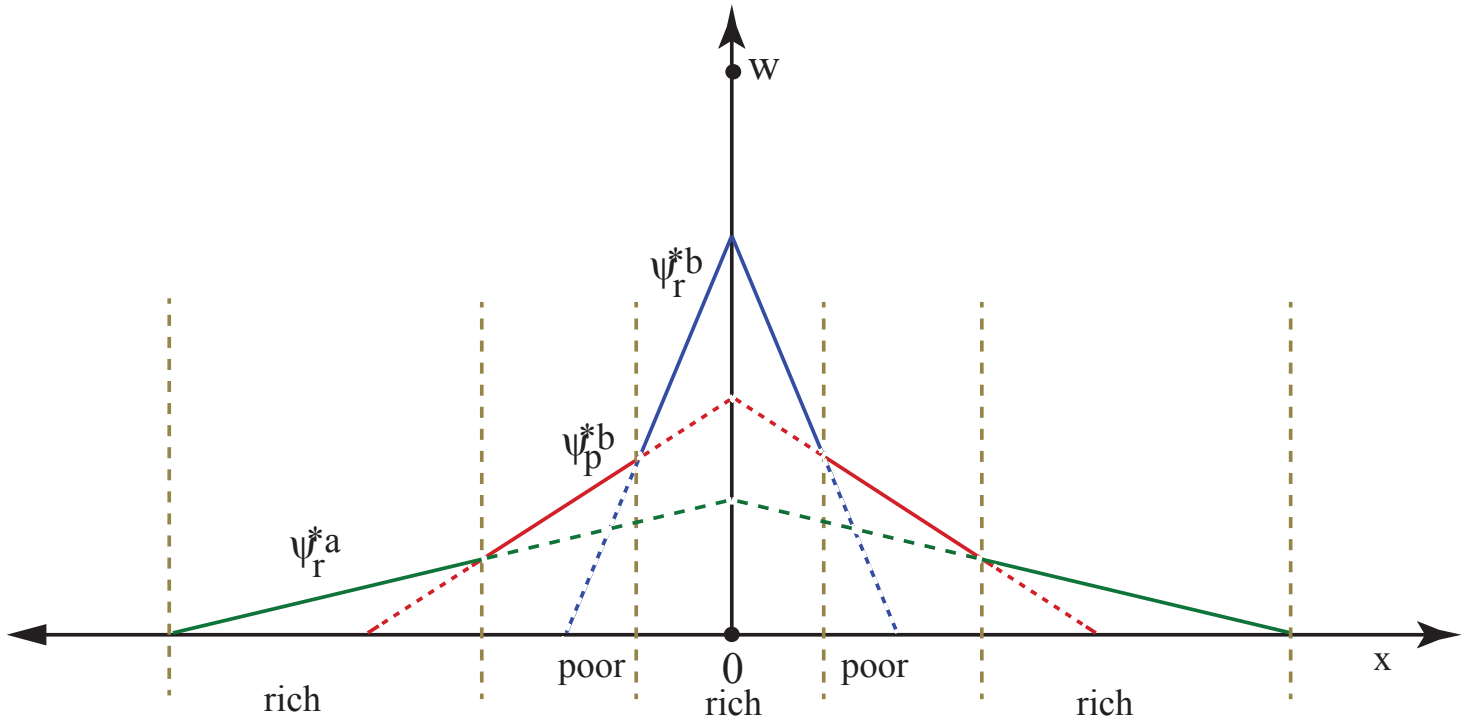
$$\frac{dR_r^a}{dx} = \frac{-w_r t^a - c^a}{\overline{\ell}}$$

Now suppose that cars are expensive enough that $w_r - f^a < w_p$. Then we have

$$\frac{w_r - c^* - f^a}{\overline{\ell}} = R_r^a(0) < R_p^b(0) = \frac{w_p - c^*}{\overline{\ell}}$$

and if cars are 'enough' faster than buses,

$$\frac{-w_r t^a - c^a}{\overline{\ell}} = \frac{dR_r^a}{dx} < \frac{dR_p^b}{dx} = \frac{-w_p t^b - c^b}{\overline{\ell}}$$

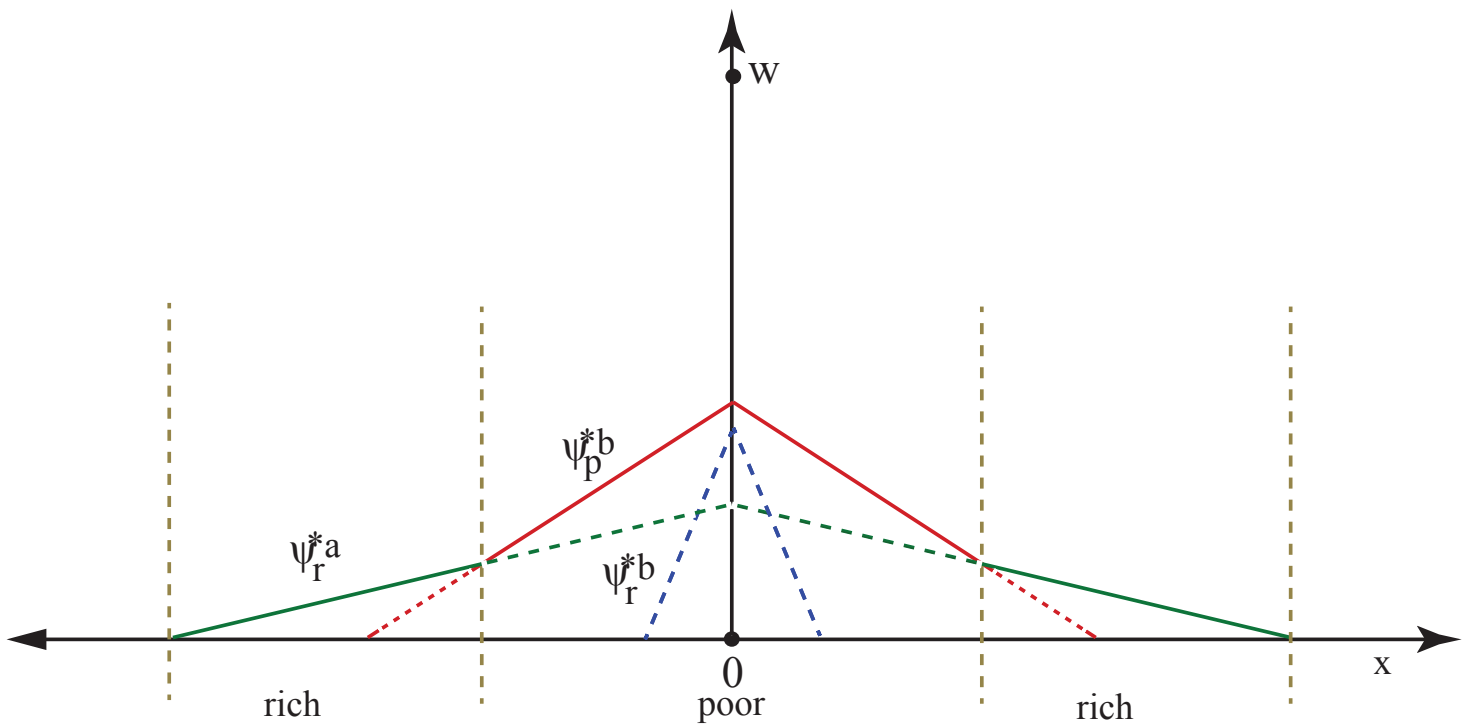


This gives us an equilibrium where the rich drive in from the suburbs, the poor live near the center and take the bus, and more rich people live near the center and take the bus.

What happens if the rich are so rich that $R_r^a(0) > R_p^b(0)$? Then the bid rent for the rich drivers is above that of the poor bus riders everywhere, and no poor bus riders live in the city.

For completeness, suppose that the rich are allowed to choose between bus and car. Then we have $R_r^b(0) > R_p^b(0) > R_r^a(0)$ and

$$\frac{dR_r^a}{dx} < \frac{dR_p^b}{dx} < \frac{dR_r^b}{dx}$$



Finally, suppose the cost of cars falls far enough that the poor also want to use them. What happens? In this case, we will have rich drivers in the center, poor drivers on the edge.

Summing up,

- When rich and poor must both bus, the rich outbid the poor for central locations because they value their time more highly.
- As incomes rise and the price of cars falls, the rich eventually buy cars. When this happens, at least some of the rich suburbanize.
- As incomes rise and the price of cars falls, the poor eventually buy cars, and locate in suburbs more remote than the rich.
- With each expanded adoption of the cars, the city spreads out.

Notice how closely this aligns with the recent history of cities.

Note that the return of the rich drivers to the city center look like gentrification. On the basis of this model, is there any basis to argue that this gentrification is a problem?

What if there was some sort of externality? For example, poor people form social networks that they rely heavily on, and these networks are destroyed when people move away?

Conclusion I

- The long history of cities is one of growth in size and income.
- For at leat the last 150 years, cities have been spreading out.
- In the US, this partly reflected the great migration, which led to the creation of black ghettos and concentration of urban poor.
- Over the past 20 years, this trend towards the concentration of poverty has started to reverse as more affluent people move back to the city center, even as cities continue to spread out.
- The monocentric city model can explain this basic pattern as a consequence of income heterogeneity, rising incomes, and falling relative prices for automobiles.

Conclusion II

- The monocentric city model is well able to describe and predict segregation by income. It does less well predicting segregation by race. This was also an important feature of the development of cities, and likely reflects ‘white flight’ in addition to changes in transportation costs and incomes.

Conclusion III

- The model does not provide a basis for concluding that gentrification is a problem. There is no externality. History suggests that patterns of segregation that emerged during the 20th century partly reflected policies intended to confine blacks to central cities. Viewed in this light, gentrification looks like reversion to the more integrated development that would have occurred otherwise.

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