INCOME INEQUALITY AND RACIAL SEGREGATION:

JURISDICTIONAL FRAGMENTATION OR EXCLUSIONARY ZONING LAWS?

by

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Abstract

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Adviser: Professor Howard Chernick

This paper examines the extent to which jurisdictional fragmentation and/or exclusionary zoning laws contribute to spatial segregation of the US population by income and race. While there is vast literature on the efficiency properties of the Tiebout equilibrium, the focus here is on equity - the spatial distribution by race and income of tax costs and access to public services. Empirical work analyzes both all MSA's in the U.S., and the NY CMSA in depth. The empirical work shows that jurisdictional fragmentation generally has greater effects on racial segregation for higher income households than for overall racial segregation, without distinguishing income levels. Dissimilarity by race is highly prominent in Southern states, where racial-separation laws are still on the books. Income segregation is also found to be higher when there are more communities.

The empirical model using the New York-New Jersey-Connecticut CMSA data shows that zoning measures such as the minimum lot size increase the degree of racial and income dissimilarity among school districts. However, the impact from exclusionary

zoning appears relatively weaker than that of jurisdictional fragmentation on residential segregation. A two standard deviations increase in Tiebout choice or minimum lot size leads to 0.08% and 0.06% increase in racial segregation respectively. If the magnitudes of the effects from jurisdictional fragmentation (measured by the number of school districts in relation to the population) and zoning ordinance are comparatively plausible, jurisdictional fragmentation, hence may be a relatively more important cause of spatial stratification by income and color. Segregation attributed to exclusionary zoning ordinances per se is hard to detect, and can be a by-product of jurisdictional fragmentation.

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Introduction

There is vast literature that seeks to explain and measure the importance of Tiebout choice in the production of neighborhood outcomes. However, for the most part of empirical work, researchers have sidestepped a major issue: residential segregation of Tiebout sorting. This paper attempts to investigate the equity (in terms of income and race) of the Tiebout solution or how residential segregation can be impacted by jurisdictional fragmentation and enforcement of zoning ordinances.

Number of Communities and Tiebout Model

The concept of sorting by preference for public good is presented by Tiebout (1956:418) as follows:

> The consumer-voter may be viewed as picking that community which best satisfies his preference pattern for public goods. At the central level, the preferences of the consumer-voter are given, and the government tries to adjust to the pattern of those preferences, whereas at the local level various governments have their revenue and expenditure more of less fixed. Given these revenue and expenditure patterns, the consumer-voter moves to that community where local government best satisfies his set of preferences.

In making the choice of residential location, Tiebout argued that the consumer-voter indirectly reveals preferences for public goods and that there is no way in which the consumer can avoid revealing his preferences in a spatial economy (Tiebout 1956:422). Tiebout assumed that there are a large number of homogeneous communities, from which a consumer can choose. "*The greater the number of communities and the greater the* *variance among them, the closer the consumer will come to fully realizing his preference position*" (Tiebout 1956:418). This highly abstract assumption plays a crucial role in the Tiebout framework and has ever since become a central focus in many literatures.

Economists often view that the number of communities has facilitated competition for the desired package of fiscal bundle and led to an efficient provision of public goods. And theoretical models of the Tiebout competition theory such as Epple and Romer (1991); Epple and Platt (1998) have implied homogeneous sorting. As such, increasing the number of communities leads to a reduction in heterogeneity within each community. Goodspeed (1989)[1] simulates the Tiebout equilibrium for different number of communities. He finds that both compensating and equivalent variation measures rise with the number of communities. More people live in the poor community under a head tax than the income tax case. In addition, such pattern of people sorting is found to be more prominent as the number of communities increases.

On the demand-side analysis, household income has been widely believed to be an important determinant of the demand for local public services. It reveals the ability to pay for fiscal bundles, which differ among communities but complete reliance on income

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[1] Goodspeed (1989) computes the equivalent (EV) and compensating (CV) variations to evaluate the equity and efficiency properties of two tax structures namely income and head tax. The CV is the amount of money one would have to take away from the consumer after the change to a head tax (income tax) to leave the consumer at the same level of utility that he had attained under income tax (head tax). EV is the amount of money one would have to give to the consumer before the change to a head tax (income tax) that would just allow him to achieve the level of utility he would have attained under a head tax (income tax). Both CV and EV are positive if the consumer is better off under head tax (income tax). Goodspeed's results reveal that both EV and CV, as a percent of tax revenue aggregated across communities are 1.21%, 1.88% and 2.39% for the two-community, six-community and twelve-community model respectively. As he noted, the aggregate welfare loss is small as the budget share of the public good relative to the budget share of housing is small.

as the only measure of preference is contestable. Each household may have lifestyle concerns, tastes or preferences that may be reason for them to choose to live within certain community. As indicated in Colwell 1991, segregated neighborhoods may be explained by a preference for segregation on the part of one of the two groups such as white and black. Epple and Platt (1998), who study a model with property taxation, show that the introduction of heterogeneous tastes for residential choice predicts a more realistic incomplete segregation of population. There is no doubt that income defines a household's budget constraint but it reveals little about a household's true preferences. For example, two families with the same level of income but at different stage of the life cycle such as one with school-aged children while the other a married couple near retirement, will likely demand different bundles of public goods. Other studies such as Pack and Pack (1977) who analyze data from the metropolitan areas of Pennsylvania, discover less compelling evidence on income homogeneity than homogeneity of other characteristics such as education. They find only 11% of all suburban towns being homogeneous by household income while substantially more, about 40% of suburban towns, exhibit homogeneous distribution in terms of occupation, education and household type.

The relation between preference and racial segregation is profound. Tiebout himself had acknowledged in his famous 1956 literature that aside from fiscal bundles, other non-economic factors have also entered the consumer's preference function. Although Tiebout had made no mention of race, he expresses that "*not only is the consumer-voter concerned with economic patterns, but he desires, for example, to associate with* <u>*nice*</u>

people" (Tiebout 1956:418). The word "nice" is vague and is no doubt questionable (Berry 2001). In terms of local economic equilibrium framework, the social welfare implications of realizing preferences for segregation by sorting and realizing preferences for public goods by sorting differ. Racial composition is sometimes viewed as a public good in itself and people sort into jurisdictions that offer the desired level of racial diversity.

Although sociologists have, in the past and current, made concerted efforts surveying households on their preferences and willingness to pay to reside in a white or black neighborhood, economic models lack the mechanism that directly describes households' budget share of the public goods in terms of racial segregation. The use of income or other wealth indicators such as home values as a proxy for taste and sometimes race, fails to distinguish between race and income effects. Instead, this paper proposes empirical models to test if race or income is the proxy for taste and the separating criteria in metro areas with more Tiebout choice.

In spite of the scholarly attention zoning received, particularly in the 1970s, little empirical evidence has been produced to demonstrate the extent to which residential segregation is attributed to zoning. Extending the Tiebout choice model, this literature incorporates zoning ordinances into the empirical model, to understand if residential segregation is influenced by bindingly restrictive zoning practices.

Zoning Ordinances and Tiebout Equilibrium

Land use restrictions provide the real-world constraints that are missing in the Tiebout model, which suggests that the free-rider problem can be overcome when public good provision is confined to small geographic areas. Hamilton (1975) extends the Tiebout model by adding the local property tax and authorizing each community to enact a zoning ordinance, which forbids households to reside in a community unless it consumes some minimum amount of housing. He argues that zoning could reduce or eliminate the divergence between tax payments and the costs of providing public services that arise from financing local public services through property taxes. Thus, efficiency depends on there being enough jurisdictions to satisfy all preferences. To the extent that such a condition is not met, there will be a deadweight loss as those with different preferences are forced to mix and tax payments diverge from benefits received.

Nevertheless, is exclusionary zoning binding? Binding in terms of being successfully enacted and being able to influence the equilibrium characteristics of people living in each jurisdiction or being able to demonstrate power in segregating consumers' residential choice. One may ask if the pattern of community composition by income or race in the absence of zoning powers differ and a survey of literatures will shed some light.

In retrospect, exclusionary zoning remains well enacted amidst several prominent court cases that challenge its abolition. The famous New Jersey Mount Laurel and Mount

Laurel II[2] decisions made by the New Jersey Supreme Court have had negligible impact on the practice of exclusionary zoning in New Jersey as well as other states. As William Fischel remarks "*If the wood fiber in all books and papers written about the original Mount Laurel decision were converted into construction materials, it would conceivably amount to more low-income housing than was built as a result of decision*" (Fischel 1985:320). Some other court decisions following Mount Laurel, defeat any move to dismantle exclusionary zoning. Examples are the 1974 Village of Belle Terre v. Borras where court's verdict reinforces the ability to use zoning to segregate by family type and the 1977 Warth v. Seldin, which decision limits standing for low-income household in challenging exclusionary zoning ordinances (Berry 2001). Indeed, today many municipalities still enforce zoning regulations such as the minimum lot size, which remain in effect and in print on planning decree.

Zoning is widely used and was an important part of Jim Crow, despite racial zoning being explicitly declared unconstitutional in 1971. As Silver writes: "*the racial zoning movement is not just an historical aberration of the pre-civil rights era but a central feature of American planning history throughout the twentieth century*" (Silver 1997:27). There are general notions that zoning laws affect where people live and that fiscal considerations affect what zoning laws are adopted. If local citizens are not dependent on local funds to finance local public services, there should be less incentive for fiscal

[2] NAACP v. Township of Mount Laurel, 336 A.2nd 713 (N.J, 1975) (Mount Laurel I) (Pashman, J., concurring), cert. denied and appeal dismissed, 423 U.S. 808 (1975). The supreme court requires each community in the state to rezone to accommodate a "fair-share" of low-income housing. This landmark decision, followed by Mount Laurel II, earmarked the end of complete judicial defense in the autonomy of local municipalities. By declaring the exclusionary practices of a New Jersey municipality as unconstitutional, and attacking similar zoning ordinances throughout the state, the Mount Laurel Doctrine was the earliest forceful attempt by a court to remedy the exclusion of minorities in suburban housing.

zoning. However, residential segregation might be an outcome of jurisdictional fragmentation and zoning a tool, which may not be effectively enforced. Every household has a strong incentive to locate in a community with relatively higher average income or fiscal base than its own. Households that buy below average value housing will consume more in public services than they pay in taxes. To restrict access of the poor households, communities adopt zoning techniques to prevent low-income housing from being available in their community (Fischel 1992). In a more recent article, Fischel (2000) remarks that zoning is the most important land use regulation undertaken by local governments. "*Zoning confers an interest in the property of each landowner to those who control the political power of the locality. This allows municipalities to shape their residential environments and their property tax base*" (Fischel 2000:403). Fischel regards zoning as a collective property right that is being used by municipality to maximize the net worth of those in control of the political apparatus (Nelson 1977; Fischel 1985; Fischel 2000).

Fiscal zoning, thus, aims to maximize fiscal base and minimize fiscal costs. For a given allocation of households, zoning affects the tax base available to that school district. White[3] (1975) explains that strategic community zoning benefits a few suburban residents who at one time had monopoly power in determining zoning requirements for other, more recent residents. Newcomers have to buy large houses on large lots and pay higher property taxes than the older residents, subsidizing the local public services consumption of older residents. Furthermore, large lot zoning rules make small lots

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[3] White (1975) points the use of fiscal-squeeze zoning undermines Hamilton's equilibrium and ensures a non-optimal distribution of local services (Dowding and John 1994)

scarce and may lead to older residents enjoying a capital gain on their land when they sell their small lots. Zoning enables suburban households to select their neighbors, restraining households who may exert adverse external effects from entering the community and thus ensuring similar income, taste for housing and demand for public services between oneself and his neighbors. This benefits both new and old residents, who can afford housing in the community as the ability to buy large house and lot can be a second best policy tool since direct screening by income or race is illegal. (White 1975:290). Therefore, via the Tiebout voting mechanism, only those who can afford large lots move in and the communities maintain their desired fiscal base. For this reason, the practice of exclusionary zoning power establishes minimum limits on the cost of housing and can be seen as a way that indirectly screens people by income, fostering economic segregation. As race is often regarded as being highly correlated with income, exclusionary zoning could possibly be a tool that screen people by race in an indirect manner since direct screening is unlawful.

As widely proclaimed, zoning may undeniably promote efficiency in the provision of public goods but at the same time, it has been criticized on equity grounds. For example, Nancy Burns boldly writes:

> The research presented in this work (Burns 1994) suggests that citizens are not, as the Tiebout model assumes, interested in zoning simply in order to eliminate free riders from local politics. Citizens are also interested in zoning for its power to exclude African-Americans, not because African-Americans are poor but simply because they are African-Americans. That function is different from simply eliminating free riders and thus carries

> different weight when it is translated into a normative prescription (Burns 1994:167).

The problems created as a result of being excluded to live and consume in a desired community can be serious and costly. In some situations, the planning authority and local government and agencies may need to revise or formulate policies to deal with the imminent social welfare problems.

Since the goal of zoning is implicitly income segregation, we would expect it to have some effect on the degree of income segregation. The question is, how much and in what direction? Racial segregation could be the by-product of property base zoning, or it could be the primary goal. To what extent, if any, does zoning requirement lead to racial segregation for a given income class? A way to test this is to control for income. If the Tiebout model reveals some truth about the equilibrium residential choice of households, we would expect to find more sorting in areas where there are more jurisdictions (Tiebout choice).

In short, the purpose of this paper is to test the following sorting implications of the Tiebout model:

(1) A greater number of communities is hypothesized to lead to greater Tiebout sorting and hence more homogeneity or segregation. Homogeneity is defined as being uniform in the composition of income and race; and the empirical work tests if there will be more homogeneity by income or by race.

(2) Stronger zoning laws (that is, an increase in the minimum lot size) are hypothesized to lead to more homogeneity within jurisdictions and greater heterogeneity across jurisdictions as the tighter zoning laws zone out the poor.

Here, I address the relationship between racial/income segregation and Tiebout-Hamilton sorting model by developing an empirical model using a large sample of metropolitan areas and the school district as an unit of observation. Note that the proposed test in this thesis is to control for the expected relation between zoning and income segregation, and ask to what extent, if any, does zoning requirement lead to racial segregation for a given class? In addition, the empirical models are designed to understand if jurisdictional fragmentation or consolidation plays a more dominant role than zoning ordinances, in creating the social mix prevailing in today's society. If the major implication of jurisdictional fragmentation is greater racial and ethnic segregation, the welfare implications of the Tiebout model are attenuated.

This paper is organized such that Section I provides some basic facts about residential and school segregation. Section II surveys literatures on fiscal zoning model and jurisdictional structure. Building on work completed by various authors, the next section establishes the conceptual model with two scenarios, namely Case One where there is no zoning and Case Two, which introduces zoning. Section IV discusses the data sources, econometric framework and implications while Section V summarizes the findings. The last section concludes the paper.

I. Background

Residential segregation:

Cutler, Glaeser and Vidgor find, in their 1999 paper "The Rise and Decline of the American Ghetto[4]", that at the city level, there was segregation but had been declining since 1970 as blacks moved into formerly all-white communities. Their paper examined segregation in America from 1890 to 1990, using an index of dissimilarity[5], which measures the average concentration of black in census tracts of a city and an index of isolation[6], which measures the exposure of blacks to whites. The Census 2000 special report (Iceland, Weinberg and Steinmatz, 2002) similarly showed a trend of desegregation from 1980 to 2000. The index of dissimilarity (D index) fell from 0.727 in 1980 to 0.678 in 1990 and by 2000, the D index dropped to 0.64[7].

According to the US Census Bureau statistics, less than one-fifth across of MSAs in United States indicates rising racial dissimilarity index. In some cities, both residential and school-mix appear to indicate a trend of re-segregation. The dissimilarity index

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[4] See Appendix A for the summary statistics for measures of segregation studied by Cutler, Glaeser and Vigdor, 1999.

[5] Index of dissimilarity = $(½)\sum_{i=1\ldots N} \left| black_i/black_{total} - nonblack_i/nonblack_{total} \right|$,where $black_i$ is the number of blacks in an area i (tract in this case), $black_{total}$ is the total number of blacks in the city and so forth. It measures the share or percentage of black or white population that would need to change areas for the races to be evenly distributed within a city (that is, for the neighborhoods to have the same percentage of that races as the metropolitan area overall).

[6] Even if blacks are disproportionately located in particular neighborhoods relative to whites, blacks and whites might still have contact. The index of isolation measures the exposure of blacks to whites. It is represented by: $\sum_{i=1\ldots N}(black_i/black_{total} - black_i/persons_i) - (black_{total}/persons_{total})$ / min $(black_{total}/persons_i$, 1)-($black_{total}/persons_{total}$). $persons_i$ refers to the total population of tract i and $persons_{total}$ is the total population in the city.

[7] Typically, a dissimilarity index of less than 0.3 (30%) is considered low, an index between 0.3 and 0.6 is considered moderate, and an index above 0.6 is considered high. (Massey and Denton, 1993)

(computed using census tract observations) for New York, for instance, has increased marginally from 81.8 in 1990 to 82.5 in 2000 (Table IA). Racial segregation between black and white of the same income class in the New York MSA, has also become more prominent and has risen over the decade.

Table IA Racial and Income Segregation Indices (D Index[8]); New York, NY PMSA

D Index[8]	Poor		Middle Income		Affluent	
	1990	2000	1990	2000	1990	2000
Poor	*	*	22.6	21.4	41.7	42
Middle Income	22.6	21.4	*	*	25.8	26.8
Affluent	41.7	42	25.8	26.8	*	*

Source: Lewis Mumford Center for Comparative Urban and Regional Research, 2002. *na

Segregation of one Group from another:	All Households		Poor Households		Mid-income Households		Affluent Households	
	1990	2000	1990	2000	1990	2000	1990	2000
D Index								
White from Black	81.8	82.5	81.8	83.2	81.4	83.4	81.9	83.5
White from Hispanic	63.4	64.9	66.8	67.4	60.2	62	57.5	58.9
White from Asian	45.6	46.7	53	50.8	50.6	50.8	45.5	45.9
Black from White	81.8	82.5	81.8	83.2	81.4	83.4	81.9	83.5
Black from Hispanic	56.5	56.6	55.7	60.6	59	64.4	61.2	64.7
Black from Asian	77.8	78.5	81.6	83.2	78	80.7	77.7	78.5
Hispanic from White	63.4	64.9	66.8	67.4	60.2	62	57.5	58.9
Hispanic from Black	56.5	56.6	55.7	60.6	59	64.4	61.2	64.7
Hispanic from Asian	53.4	56	62.4	63.8	52.7	55.8	49	49.3
Asian from White	45.6	46.7	53	50.8	50.6	50.8	45.5	45.9
Asian from Black	77.8	78.5	81.6	83.2	78	80.7	77.7	78.5
Asian from Hispanic	53.4	56	62.4	63.8	52.7	55.8	49	49.3

Source: :Lewis Mumford Center for Comparative Urban and Regional Research, 2002

[8] Lewis Mumford computes the D index based on census tract observations.

Public schools have struggled with their responses to the 1954 US Supreme Court ruling in the case of Brown v. Board of Education. At least 1,094 school districts, two thirds of which are in the South have been ordered to desegregate by the courts. The dissimilarity index that measures school segregation by school district, fell from 80.5 in 1968 (before most plans were implemented) to below 50 by 1990. However, progress has halted since then and the dissimilarity index rose by one percent by year 2000 (Logan and Oakley, 2004). School segregation has increased dramatically in a number of major school districts around the country, including districts that were never under court order like East Orange, NJ and Cleveland, OH. Districts such as Forsyth County, NC and Seattle, WA, which have been released from court orders, have similarly experienced an intensified level of school segregation (Logan, 2004). In terms of overall population segregation by race (between black and white) in the entire country, Table IB shows that the South remains the most segregated census region. In 2000, the mean Southern region has a Dissimilarity Index of 52.08 and a standard deviation of 6.54 compare to the West, which has an index of 41.58 and a standard deviation of 6.78.

As can be seen from the dissimilarity indices, residential segregation persists in modern America but much attention continues to be paid to intrajurisictional differences in services. Whether segregation has worsened or improved in respective cities, it is important to understand the fiscal-zoning theory of metropolitan residential segregation. If fiscal advantages are completely capitalized in housing prices, higher income whites are more able to pay the competitive rate for fiscal advantages unlike poorer blacks[9].

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[9] If there are future unanticipated capital gains in the desirable communities that exceed the average capital gains, then those purchasing in the desirable communities are favored.

Hence, the blacks or the low-income households are prohibited from consuming relatively more superior or enough education and thus leading to their inability to realize high return on their human capital. Local public finance and social welfare implications therefore are contingent upon how the society is made up and the existence of binding policy tools that exhibit influential impacts on how people choose and can choose to reside. Income and race may be proxies to taste and the racial or income composition in a society, to some degree, may sway people's choice and thereby consumption of public services provided at their choice residence.

Table IB: Selected Summary Statistics by Census Regions

	Mean	Standard Deviation	Minimum	Maximum
All Regions				
Index of Dissimilarity 1990*	52.50475	10.93688	28.2841	72.06015
Index of Dissimilarity 2000*	47.84492	11.27857	27.20129	68.35947
SD/Logpop: Jurisdictional density	26.1468	21.80063	1.3076	91.0036
SD: Number of jurisdictions	344.8980	298.5938	18	1219
Density: Population density	181.7645	252.7528	1.096128	1134.413
East				
Index of Dissimilarity 1990*	53.55989	14.84963	28.28421	66.90729
Index of Dissimilarity 2000*	51.37853	13.05778	31.07852	63.34095
SD/Logpop: Jurisdictional density	26.2854	19.79	1.746491	55.19394
SD: Number of jurisdictions	347.9091	274.8074	24	779
Density: Population density	501.3031	373.5258	41.31105	1134.413
MidWest				
Index of Dissimilarity 1990*	52.08698	11.21177	37.37773	72.06015
Index of Dissimilarity 2000*	45.2637	13.02056	27.20129	68.35947
SD/Logpop: Jurisdictional density	32.75483	20.5745	3.36887	75.73107
SD: Number of jurisdictions	426.8235	285.2344	46	1055
Density: Population density	77.01726	83.945	5.085279	277.2548
South				
Index of Dissimilarity 1990*	55.87152	7.904931	34.9	63.77957
Index of Dissimilarity 2000*	52.08303	6.541166	35.9	61.13219
SD/Logpop: Jurisdictional density	11.07464	5.938965	4.410754	26.35798
SD: Number of jurisdictions	144.7692	75.23203	55	328
Density: Population density	117.9386	72.701289	1.096128	296.3716
West				
Index of Dissimilarity 1990*	46.47067	6.776583	34.15998	56.30482
Index of Dissimilarity 2000*	41.58435	7.340301	30.75254	51.85334
SD/Logpop: Jurisdictional density	36.40636	32.01544	1.3076	91.00368
SD: Number of jurisdictions	491.875	438.6767	18	1219
Density: Population density	68.70415	65.44943	14.9894	217.1826

*Racial segregation between black and white population by census tract level. Indices are uploaded from Lewis Mumford Center for Comparative Urban and Regional Research, University at Albany, 2004

Average values per state are computed

Source: Lewis Center for Comparative Urban and Regional Research, 2004; US Census 2000, NCES 2004

II. LITERATURE

Since Charles M. Tiebout (1956) wrote his widely cited paper "A Pure Theory of Local Expenditures", many empirical studies have tested the mechanism of Tiebout sorting. But in general, they all narrow down to two different dominant sorting implications in Tiebout. The first touts that the greater the number of communities, the more homogeneous each will be. Dowding, John and Biggs (1994) who survey more than 200 articles and books testing the assumptions and implications of the Tiebout family of models, term this implication the statistically generated sorting: "*We call this the statistical implication on the grounds that even if households randomly locate, for each subset which is more heterogeneous than the totality there will be at least one subset more homogeneous than the totality. Further, the greater the number of subsets, the more probable that each will be more homogeneous than the totality. So the greater the number of jurisdictions the more homogeneous they are likely to be*" (Dowding, John and Biggs 1994). The second implies that households will move to jurisdictions which best satisfy their preference for fiscal bundles and jurisdictions become more homogeneous. This is called the Tiebout-competition or Tiebout sorting. As assumed by Tiebout (1956), there should be a large number of communities in which the consumer-voters may choose to live so the Tiebout mechanism works. Greater number of communities allows public goods to be provided and allocated more efficiently. There is also sorting due to non-Tiebout factors. Households may locate via other mechanism that is not related to the demand for fiscal bundles, forming groupings that to some extent share similar characteristics such as income, race, education and occupation. Empirical work such as that of Pack and Pack (1977) has investigated this.

Examining data from the metropolitan area of Pennsylvania, Pack and Pack (1977)[10] find weak evidence for homogeneity by at least three of the five characteristics studied: age, years of education, occupation, income and household type. Only 15% of all Pennsylvania suburban towns can be considered homogenous on at least three characteristics, though for some single variables there is greater homogeneity. Additionally, there is substantially more homogeneity with respect to occupation, education and household type. Overall, approximately 40% of suburban towns are homogeneous on at least one of these. Income homogeneity, on the other hand, is far much lesser – only 11% of all suburban towns exhibit homogeneous income distributions. "… *the substantial sorting of population by socio-economic characteristics (whether or not homogeneity is achieved) may permit people to come closer to achieving their desired public goods package than they could in an undifferentiated metro areas*" (Pack and Pack 1977:199). Stein (1987) tests the Tiebout sorting mechanism by regressing service-bundle differentiation against mean municipal heterogeneity. He discovers little evidence or virtually insignificant results to support the Tiebout hypothesis of municipal competition and voting with one's feet. Instead, choosing where to live may be based on issues of race and class.

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[10] Pack and Pack computes the homogeneity index developed by Leik (1966): $C=1-[2(\sum d_i)/(n-1)]$ where $d_i=CF_i$, if $CF_i\leq 1/2$ and $d_i=1-CF_i$, if $CF_i\geq 1/2$; $CF_i=(1/N)\sum f_i$ (cumulative relative frequency); N=the number of observations; and n=the number of class intervals or categories. The minimum value of C is 0 which occurs when the community is evenly divided among its extreme classes and the maximum value is 1, which occurs when all individuals fall in one class. They first calculate C index to describe all communities with population of 1,000 or more which are located in metropolitan areas (very small rural towns were excluded) and then they report findings separately for each SMSA in Pennsylvania.

There are researchers who capitalize commuting advantages and costs into housing prices, when they study income sorting. de Bartolome and Ross (2003) place the model of fiscal competition inside a spatial model. They consider a metropolitan area that comprised of a circular inner city surrounded by a suburb, that is a two jurisdictions model and assume two income classes namely, poor and rich households. In their model, all households commute to a central business district situated at the center of the inner city. Commuting advantages and costs are capitalized into property prices and households take into consideration of such commuting cost together with government service bundles, which they can consume when determining where they should reside. At equilibrium, they find income sorting between jurisdictions and across space, and a monotonic relationship between income and distance from the metropolitan center, which holds when land demand is either income elastic or unresponsive to income. Rich households outbid the poor for homes closer to the city's center when land is perfectly inelastic but with an elastic land demand, rich households save by residing further from the city center due to the more favorable trade-off between the relatively greater savings attributed to land purchase and commuting cost.

According to de Bartolome and Ross, there exists a second equilibrium termed as income mixing between jurisdiction and across space. Here, the capitalization of fiscal differences and commuting cost, which increases with income, into land prices underlies the equilibrium condition and land prices adjust to make all households indifferent between jurisdictions. "*For the rich households, land prices plus commuting costs are higher in the suburb than in the inner city, and the higher price offsets the benefit of the* *higher suburban public service. For the poor households, land prices plus commuting costs are lower in the suburb, and the lower price compensates for the disadvantage of the higher public service*" (de Bartolome and Ross 2003:18).

As can be seen from the above literatures analyzing how people sort, sorting among communities is important and it can determine the intensity of residential stratification. The rest of this section reviews selected literatures in two broad areas namely, number of communities and zoning.

Tiebout choice/number of communities

This paper is related to a strand of literature that studies the effect of racial heterogeneity on the number of communities. With a variety of jurisdictions from which to choose, households are more able to sort among districts on the basis of preference. Large districts might be able to benefit from economies of scale but many families have to mix their children and agree on common educational policies. "*If families in an area are homogeneous, an increase in size may be purely beneficial (unless there is a point where diseconomies of scale set in). If, instead, an increase in size implies an increase in heterogeneity, there may be a tradeoff*" Alesina, Baqir and Hoxby (2002:1). The authors seek to understand from empirical evidence how the number and size of local political jurisdictions respond to the benefits of economies of scale and heterogeneity in income, race, ethnicity and religion. They consider three types of jurisdictions, namely school districts, municipalities and special districts, with variables measured at county level.

The Gini coefficient is the measure of income heterogeneity while the index of racial heterogeneity is computed by:

$$\text{Race} = 1 - \sum_i (\text{group}_i)^2$$

where group_i denotes the share of the population[11] who identify themselves as race i.

They find that racial and income heterogeneities have statistically significant positive effects on the number of school districts in a county. The tradeoff between economies of scale and heterogeneity is an important determinant of the number and size of local jurisdictions. And heterogeneity creates pressure for secession or (more often) resistance to consolidation. "*Since 1960, there has been strong pressure on jurisdictions to consolidate, but we (authors) find that less consolidation took place in counties that are more diverse racially*" (Alesina, Baqir and Hoxby, 2002:35). The trade-off between racial heterogeneity and economies of scale (EOS) is more robust than the trade-off between income heterogeneity and EOS. The authors also find evidence that people avoid heterogeneity as they do not want to mix with different people and also because different people prefer different public goods. People are willing to give up economies of scale in order to avoid being in a jurisdiction with significant racial or income heterogeneity. The authors suggest that diverse preferences and avoidance of interaction perhaps play a more important role than income segregation in models of local jurisdictions. Their results indicate that race and ethnicity are important determinants of such preferences.

[11] Both school-aged population and the entire population counts have been explored and modeled.

Zoning

Local public finance or choice evolved around Tiebout's provocative assertion that a quasi-market process can solve the local public goods problem. For the Tiebout mechanism to work, some conditions have to coexist[12]. As the source of revenue for local government is largely derived from property taxation, which does not satisfy the marginal-cost pricing assumed in the Tiebout model, some authors suggest the use of exclusionary zoning to promote homogeneity of housing within a community to help maintain a stable pareto efficient equilibrium. Hamilton (1975) argues that the property tax is effectively a benefit tax, which provides the marginal-cost pricing mechanism presumed in the model. Although this appears plausible, exclusionary zoning tends to restrict residential mobility and may limit and reduce the housing choices of an excluded group.

Early work, particularly Harrison (1982), has explored the relationship between exclusionary zoning laws and housing cost as well as residential segregation. Harrison finds exclusionary zoning laws being positively correlated with housing costs in New Jersey in 1970. The greater the minimum lot size, the greater the median value of owner-occupied single-family homes. If blacks are poorer than whites, blacks will be less able to afford more expensive houses found particularly in suburbs that allow only large lots or houses. This is important because blacks generally have less wealth and less stable

[12] The conditions detailed in Tiebout's original article are 1) Individuals are fully mobile, 2) Consumer-voters are assumed to have perfect information with respect to each community's public services and taxes, 3) There are a large number of communities in which the consumer-voters may choose to live, 4) Restrictions due to employment opportunities are not considered, 5) The cost per unit of public service is constant, 6) There is an optimal number community size in terms of the number of residents for which a bundle of services can be produced at the lowest average cost. There is a fixed factor, which determine the number of communities and 7) Communities below the optimum size seek to attract new residents to lower average costs. (Tiebout 1956)

income than whites, therefore blacks with identical current income as whites may have lower permanent income. Zoning thus excludes people by income but also leads to residential segregation by income and/or color. Harrison also reports a statistically significant positive correlation between zoning laws and the patterns of racial imbalance in housing opportunities. In his empirical work, the minimum lot size restriction is partially correlated with the percentage increase in residential segregation by race from 1960 to 1970[13]. His minimum lot size variable is estimated by first computing the average minimum lot size for each municipality and then multiplying the latter by the average number of residential zones for each municipality. Instead of the index of dissimilarity, the measure for racial segregation is simply the coefficient of variation for the percentage of black in each municipality of each of the 21 New Jersey counties.

Oates (1969) establishes the link between fiscal packages and housing values. The median number of rooms per owner-occupied house is one of the control variables in his model. The latter independent variable has a coefficient of 1.7 and is statistically significant at 5 percent level of test. If the number of rooms is affected by zoning measure that planning authorities adopted, this would imply that zoning raises the price of housing. Note that this coefficient may just suggest that larger houses are more valuable, not that zoning necessarily causes houses to be larger and dearer.

[13] The partial correlation coefficient, controlling for (1) percentage minority in county (both blacks and hispanics), (2) percentage revenues raised by local governments in count from intergovernmental aid (proportion of total local revenues that is financed by state and federal aid) and (3) number of municipalities in each county, was 0.49. Data came from 567 municipalities in New Jersey, which were later grouped into their respective county. Only 21 units of analyses since there were only 21 counties in New Jersey.

Very often, in models of local public good provision with housing markets, the slopes of indirect indifference curves (Marginal Rate of Substitution) through any point in the (public good, home price) plane are assumed to increase with income. Epple, Cassidy and Calabrese (2002) remark that this regularity condition on the income elasticity demand for public services or the "single-crossing" assumption, is enough to produce income segregation. The single-crossing condition: $\partial[(\partial U/\partial G)/(\partial U/\partial y)]/\partial y > 0$ where public good is denoted by G; U being utility for an individual and y the disposable income, corresponds to an income elasticity of demand for public good G that is positive at all levels of services. To obtain more public goods and to reside in the community, the high-income households are willing to pay a higher price for a housing unit than the low-income group. Goodspeed (1989) explains the strong influence price of housing exerts on the pattern of migration among communities, using results from his simulation models that account for both head and income tax cases. "*In the head tax case, the price of housing is practically identical in all communities. The price of housing can differ among communities only because of demand. Thus, with equal populations and a positive income elasticity, richer communities would have higher aggregate demand and therefore higher prices for housing. Other things equal, this tends to make poorer communities more attractive. Consequently, in the head tax case, people tend to move to the community with a lower price for housing until an equilibrium is established in which housing prices are equalized. In the income tax case, rich communities are more attractive than poor communities, relative to the head tax case. Consequently, the price of housing is lower in poor communities and higher in rich communities in the income tax case as compared to the head tax case. The strong influence of the housing market is* *probably due to the fact that people spend a substantial proportion of their budget on housing*" (Goodspeed 1987:24).

Nevertheless, there is evidence that high-income minorities are denied access to credit and homeownership in high-income districts. Massey, Condran and Denton (1987)[14] find in their sociological study that while 23% of black families earn middle-class income, only 4% of these blacks live in a predominantly white or racially mixed neighborhood. These middle-income blacks have to endure living conditions below those of whites at comparable income levels. A number of sociologists have attributed such circumstance to racial prejudice, which contributes to the inability of African Americans to translate their economic earnings into middle-class housing. Given the correlation between income and race, economic segregation, which is an anticipated outcome of exclusionary zoning, that is necessary for the operation of the marginal cost pricing mechanism, has implied racial segregation.

In many states, municipal zoning whether in terms of land use (residential, commercial, industrial, etc) or bulk requirements (setback, number or size restrictions) is well

[14] Using the 1980 Census data and the OLS, the authors attempt to test if blacks, like other racial groups, maximize their spatial position in society by choosing communities with greater amenities and resources. However, unlike other groups, the blacks face persistent barriers to racial integration. Their predictor variables include the median education and household income for each racial group, namely the blacks and whites. The 33 dependent variables such as percentage of families below poverty line, % of families on assistance, median housing value, mortality, crime rate and % of black students, can be separated into 5 groups (social, physical, health, crime and high school environments). The authors then compare the difference between the strength of each coefficient for both whites and blacks. They find that in 27 out of the 33 comparisons, the absolute value of the white coefficient exceeds that of the blacks by a significant margin. Blacks are found to be able to convert household income into spatial separation from families on assistance at 58% of the white rate, and area able to translate income into housing value at a mere 13% of the rate of the whites (Massey, Condran and Denton, 1987). For any desirable spatial outcome, blacks begin the process of spatial assimilation at a much more disadvantaged position than whites, and achieve less benefit per unit of income attained.

maintained in planning doctrines and utilized widely. According to Fischel (2000), there are more than 25,000 local jurisdictions in the US that have the power to adopt zoning laws. These local jurisdictions' authority to regulate land use is derived from the legislatures and constitutions of 50 states and not from the federal government. Though mandated in many places, does zoning matter? Would residential segregation be different in the absence of zoning? In Fischel's view: "*The proposition that zoning does not matter … is a direct application of the Coase Theorem. Coase argued that as long as entitlements were fully defined, assigned , and tradable at zero cost, the allocation that was ultimately reached would be the same regardless of how entitlements were initially distributed*" (Fischel 1985:232). Again in Fischel (2000), Fischel clarifies that "*the efficiency of zoning depends on the transaction costs of making mutually advantageous trades between existing voters and development-minded landowners. High transaction costs of selling zoning plus the endowment effect that zoning confers probably create land-use patterns with excessively low densities in American metropolitan areas*" (Fischel 2000:403). Thus zoning is a municipal property right and zoning-like outcomes might be produced through private market exchanges of property rights. Berry (2001)[15] explains his thought by comparing patterns of residential segregation in Houston, which is the nation's only unzoned large city, and Dallas, a zoned city. He finds no significant differences in residential segregation between the two cities and that private voluntary institutions such as private deed covenants in Houston leads to residential segregation patterns identical to Dallas, which enforces zoning. Berry points that zoning entitlements

[15] Berry (2001) uses the 1990 Census of population and Housing (US Department of Commerce, Bureau of the Census, 1990, Summary Tape Files 1 and 3a) data by census tract. The number of bedrooms proxies for building size and the index of dissimilarity measures segregation.

are not tradable and if tradable, it will happen at high transaction costs. Hence, political allocation of entitlements may differ substantially from market allocation.

Since zoning is embedded in local government politics, there is a possibility that the median voter controls zoning at the municipal level. However, is zoning a reflection of preference for density or race that would have been satisfied? Nancy Burns' (1994) study concludes that: "*City formation … were in part prompted by white citizens interested in forming new city that could provide racially exclusive zoning. With their own city, these citizens would be better able to ensure that African-Americans-at least those without a good deal of money-would not move into the neighborhood*" (Burns 1994:86). So, zoning regulations may be adopted by existing residents or local interest groups who exhibit phenomenal influence on how and what zoning tool will be devised. Adding to Burns, Dowding et al's (1994) literature survey reveals that the strategic manipulation of zoning regulations by communities can exploit in-migrants (potential new residents) by current inhabitants. Based on these literatures, zoning thus may indirectly mirror the residents' preference.

The outcome pertaining to the extent of sorting in relation to the fragmentation of metropolitan governance and/or zoning is mixed. Using the 100 largest metropolitan areas in 1970, Harrison (1982) finds that where there are a larger number of local governments in a metropolitan area, there is more residential segregation. Furthermore, his partial correlation results indicate that where there are a larger number of school systems, there is greater inequality in expenditures among the school systems in the metropolitan area. However, there are some researchers who deny that governmental consolidation could improve the equity of service distribution in metropolitan areas and that governmental fragmentation is not a significant source of student segregation. For example, Hoxby (2000) points to her empirical results that per pupil spending is lower where there is more choice among districts. Her district level choice index[16] is based on a Herfindahl index of school districts shares of the metropolitan area's total student enrollment and is given by:

$$1 - H_m = 1 - S^2_{km} ,$$

$$S_{km} = \text{enrollment}_{km} / \text{enrollment}_m$$

m = schools or educational markets

k = school districts

In addition, Hoxby also finds significant Tiebout choice effects on household sorting across districts and this sorting has little effect on academic achievements. Racial heterogeneity of a student's peers is related to the number of schools, but not to the number of districts, in the metropolitan area. She finds intra-district sorting through school attendance areas inside districts.

Several authors refute the claim that exclusionary zoning laws have any independent effect on income or home values. Fiscal zoning could not fairly be considered as a cause

[16] Hoxby (2000) choice index indicates the probability that a student would find himself in another district if he were to switch places with another, randomly selected, student in his metropolitan area. It varies between 0 and 1, where 0 means that one school district monopolizes the entire metropolitan and a value close to 1 indicates that there are many relatively equal-sized districts in the metropolitan area. As this measure is prone to be endogenous to school's observed productivity, which Hoxby has also modeled, Hoxby employs a first stage regression using the number of natural boundaries – streams as instruments, to estimate the number of school districts. She shows that areas with more streams have more jurisdictions, all else equal.

of residential segregation or of differences in public services observable in most metropolitan areas (Orr 1975, Rose 1979, Harrison 1982). Larry Orr (1975) presents a cross-sectional 2SLS regression model using data for 31 cities and towns in contiguous to the Boston urbanized area. He tests five hypotheses, one of which investigates if restrictive density-zoning ordinances in suburban communities exclude low-income families. Orr regresses gross residential density[17] by income class on subsets of 13 variables, which include the minimum residential lot sizes and concludes that the main effect of density zoning is to uniformly reduce the net residential density for all income classes.

Thus far, the above has reviewed residential segregation and sorting, and the role of number of communities and zoning in the Tiebout model framework. The authors compute residential segregation using various measures such as the Leik (1966) index, coefficient of variation, Gini index and the Herfindahl index. Their units of observation also varied. Note that segregation indices derived using identical formula but different units of observation can generate different segregation figure. Smaller areal of geographic units usually yield higher level of segregation because they are more homogeneous. "…, *the choice of an areal unit does affect the size and variability of segregation indices*" (Massey and Denton, 1998:299). Stein (1987) uses municipalities as a unit of analysis in his attempt to study the relationship between the number of local governments and within-community heterogeneity measured with respect to personal

[17] The gross residential density of a given industry is the product of net density of the industry and its areal share of the total land area. Residential industries categorized by income class and retail trade, manufacturing and wholesale, professional and government service industries..

income, race, housing, occupation and age. He did not find any relationship between the predictor and regressor variables.

The Tiebout theory generally predicts that there are a large number of communities and each offers a highly differentiated fiscal package. Communities tend to be homogeneous, reflecting significant similarity in demand and affordability. However, the relationship between Tiebout sorting and the outcome of residential distribution by income and/or color is relatively unexplained. This paper relates to the equity of the Tiebout solution; that is it seeks to understand the equity consequences attributed to multiple jurisdiction local public finance.

III. THEORETICAL APPROACH

An empirical analysis of Tiebout choice is important. Despite a large literature on the allocative efficiency aspects of Tiebout choice, much less has been done concerning its equity implications. The following explains how exclusionary zoning and jurisdictional fragmentation relates to residential segregation in a theoretical approach, drawing assumptions and work discussed in literatures.

As in Cutler, Glaeser and Vigdor (1999), I define social (income or racial) dissimilarity to be equal to:

$$\theta_{\check{R}} = 1 - \phi_B - \phi_W \qquad \text{(i)}$$

where,

ϕ_B is the fraction of blacks (minority) that live in a white neighborhood (majority)

ϕ_w is the fraction of white (majority) that live in a black neighborhood (minority)

The functional form of (i) is assumed to be:

$$\theta_{\check{R}} = Ł(\gamma_i, \varphi_{\check{R}}, \text{others}) \qquad \text{(ii)}$$

where

γ is the urban zoning policy variable such as the minimum lot size

φ is the number of jurisdictions or school districts. Boundary Ř can be a MSA, school district, county or a specific area boundary

i represents the ith jurisdiction

$\theta_{\check{R}}$ is bounded such that:

$$0 \leq \theta_{\check{R}} \leq 1 \qquad \text{(iii)}$$

where, $\theta_{\check{R}} = 1$ or 100% means full racial segregation such as 100% white or 100% black

$\theta_{\check{R}} = 0$ or 0% means complete mixing

Zoning

$\theta_{\check{R}}$ is a segregation index, which measures the mix in a community. It can be explained by the three theories discussed in Cutler, Glaeser and Vigdor (1999). The port of entry theory relates to the new migrant's strong taste for living among members of the same racial/ethnic group. The second theory, "collective action racism" is that segregation is a result of collective actions taken by the majority to enforce separation from minority or blacks. Residents may want to exclude people and they vote or appeal for tight zoning rules, which may inhibit blacks' mobility such that $\partial\theta_{\check{R}} / \partial\gamma_i \geq 0$ ($\check{R}$ equals to i in this case). "*Indeed, Weaver (1948) and Massey and Denton (1993) argue that these covenants, and other explicit legal barriers, were instrumental in creating ghettos*[18]" Cutler, Glaeser and Vigdor (1999:476). Even if blacks are able to afford large lots and homes, zoning regulation might have forced them to consume too much and led to a deadweight loss. Such over-consumption also applies to other racial/ethnic group.

The condition of $\partial\theta_{\check{R}}/\partial\gamma_i \geq 0$ may continue to hold when municipalities relax zoning requirements such as reducing lot sizes that allows denser single family homes in the jurisdiction. In this situation, the price for single-family homes may fall as the supply of

[18] The authors describe ghettos as areas where the dissimilarity index D is greater than 0.6. The areas have a high concentration of Blacks.

homes increases, ceteris paribus. More people and perhaps a greater mix of prospective residents in terms of race may be able to afford these homes. This is particularly possible if income elasticities with respect to housing of the white and poor potential homebuyers are near similar. However, in reality, economic segregation prevails in most parts of the United States and given the correlation between race and income, economic segregation implies racial segregation. In addition, the strategic manipulation of zoning regulations by communities makes exploitation of in-migrants by current residents possible and thus $\partial\theta_{\check{R}} / \partial\gamma_i \leq 0$.

The effects of zoning can be illustrated by simple demand and supply curves, depicted in Figure 1 below. Total land supply SS* within a jurisdiction is assumed inelastic and there is no shift in the demand schedule.

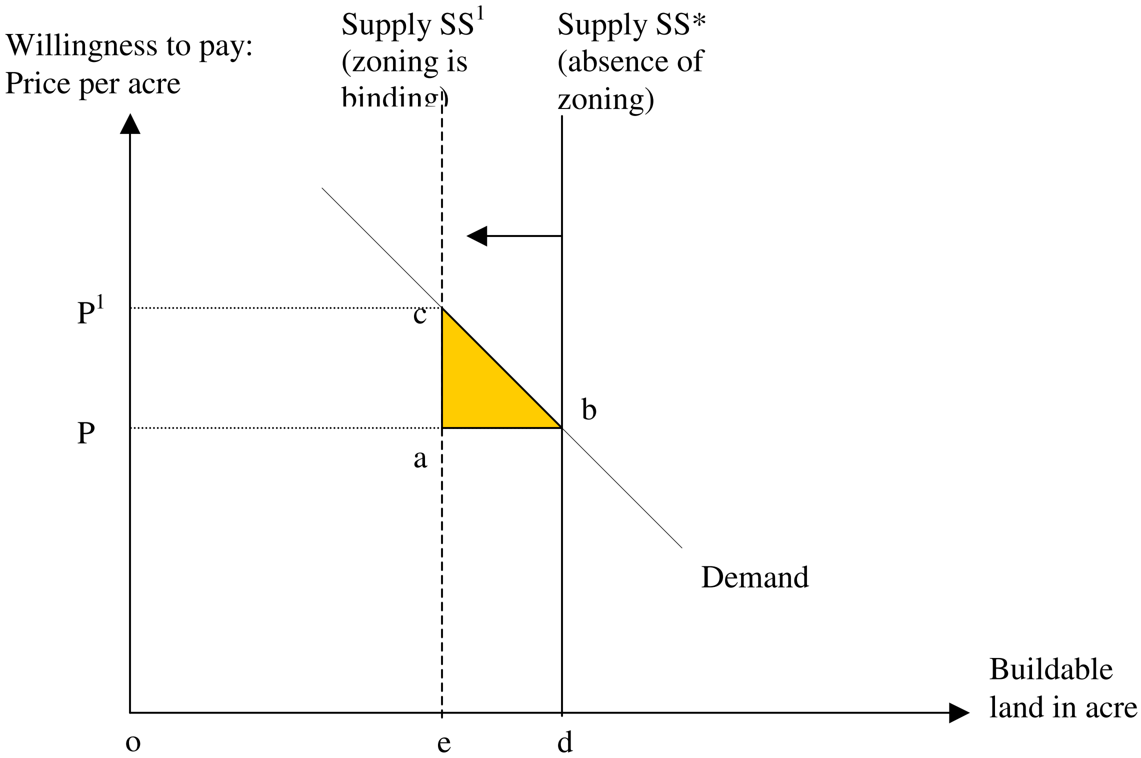

Figure 1

Bindingly zoned communities will experience a fall in the supply of buildable lots, thereby reducing the supply of homes and pushing home and land prices upwards (from OP to OP^1). Home developers have less incentive and their revenue from the sales of housing units is hurt as fewer units can be sold unless they raise housing price. Zoning cuts part of the demand from od to oe and creates deadweight loss equivalent to the shaded area abc. Buyers may have paid a higher price for residential property but their desired level of public services remains the same. In some areas, zoning eliminates most low cost housing and leaves the excluded group at a disadvantage. For example, the inability to enroll in quality public schools, the difficult access to good public libraries and employment opportunities. This is evident in Harrison (1982), who has shown empirically that home prices are positively correlated with the minimum lot size. Note that the exclusionary zoning regulation in one community may lead to an increase in demand for housing in another jurisdiction, resulting in higher home prices in the latter jurisdiction.

A change in the minimum lot size requirements thus alters the supply of land and/or housing units. This influences the price and level of housing H affordable and preferred by a household. Suppose a household maximizes its utility given by:

$$\text{Max } U^h_i = f^h(G_i, H^h, B \mid \gamma_i, \varphi_{\check{R}}) \qquad \text{(iv)}$$

where G is a publicly provided good or service

H is units of housing

B units of private good, which are assumed to be the numeraire bundle

h = household 1, 2, 3, …..n

i = jurisdiction 1, 2, 3,.... s, such as school district

γ_i is the urban zoning policy variable such as the minimum lot size bindingly mandated in jurisdiction i

$\varphi_{\check{R}}$ is the number of jurisdictions or school districts in a MSA, county or a specific area with boundary Ř

For households that can afford large housing units, the conditional function of housing $f^h(H^h \mid \gamma_i)$ is positive in the presence of effective exclusionary zoning, which increases the minimum lot size of buildable land. Households that are unable to afford $P^h.H$ (price of home) may have to exit the community. Therefore, the marginal utility for an individual who remains in jurisdiction i can be higher in more bindingly zoned areas as the ordinance has excluded households who spend less on housing but are able to consume the same level of public goods:

$$\partial^2 U^h_i / \partial \gamma i \partial H^h > 0$$

Communities employ varying degrees of zoning restriction and attain a particular level of fiscal base. In high-income jurisdiction, the property tax rate tends to be low, as the level of property values tends to be high such that the jurisdiction has enough tax revenue to finance a given amount of G. In the absence of MLS or if there is mitigated zoning requirements, low-income families see this as an incentive to move into the rich community and build smaller houses, yet taking advantage of the attractive public service. As more low-income families move in, the tax base per family falls and if tax rate is not raised or aid is not approved, the supply of G per capita will likely fall. Some households will move out or those who stay may not be consuming enough. Overcrowding and congestion likely arise and cause much dissatisfaction, reducing utility of some households. Harrison (1982) associates such exclusionary zoning practice with an increase in fiscal disparities among local jurisdictions as the taxable resources among metropolitan communities become more inequitably distributed. Alesina, Baqir and Easterly (1999) find that ethnic conflict is an important determinant of local public finance. Their productive public goods are inversely related to an area's ethnic fragmentation.

The last theory in Cutler, Glaeser and Vigdor (1999) that explains segregation is decentralized racism. This argues that segregation is enforced by individual whites' decisions to live with other whites as opposed to collective actions excluding blacks. Generally, whites are willing to pay more than minority families to live in predominantly white neighborhoods either due to strong preference for assimilation or better capability in paying for relatively more expensive housing. Whites would also like to minimize the price they need to pay for segregation. The cost to this qualified (rich/white) group can be higher transportation costs and a higher level of housing prices. Their cost is a more restricted supply function for housing, therefore a higher cost and a higher tax price per quality adjusted unit of public good.

Jurisdictional Fragmentation

The creation of jurisdictions offers the population wider choice of fiscal packages and sometimes voters can find a club [jurisdiction] that matches their needs better. Therefore, when there are more school districts, it is easier for families to sort themselves into groups that are relatively homogeneous in terms of their preferences for public services and place to live. If income or race is a good and valid proxy for taste, and Tiebout's assumptions hold, the following may occur:

$$\partial\theta_{\check{R}} / \partial\varphi_{\check{R}} \geq 0$$

where, as explained earlier, $\varphi_{\check{R}}$ is the number of jurisdictions or school districts in a MSA, county or a specific area with boundary Ř and $\theta_{\check{R}}$ is a segregation index.

Aside from sorting households, Tiebout-competition could also lead to less redistributive policies and lower spending, allowing bureaucrats to maintain their budget-maximizing power over their core budgets without channeling much of their resources to redistributive programs. And the utility derived by majority of the households whose preferences are similar may be raised :

$$\partial^2 U^h{}_i / \partial \varphi_{\check{R}} \partial G_i > 0$$

Using both cross-section and panel data, Alesina, Baqir and Hoxby (2002) find that racial heterogeneity has a positive and statistically significant effect on the number of school districts. A two standard deviation (36 percent) increase in racial heterogeneity raises the number of school districts in a county by 10 percent. The authors argue that residents may respond to heterogeneity increases by creating a new district[19]. That is, the higher the heterogeneity in a county, the larger the optimal number of jurisdiction and smaller the size; per unit cost of public services hence becomes higher. In another model, which dependent variable is the ratio of actual to possible heterogeneity experienced and the number school district as one of the predictor variables, Alesina, Baqir and Hoxby, (2002) find strong evidence that people actually experience disproportionate homogeneity when they live in a county with a greater number of jurisdictions. Their results suggest that people, who live in a county with twice as many districts, reduce their probability of interracial encounters by 2.6 percent. They find very strong effect on homogeneity from the availability of more school attendance areas and a significant but weaker effect from more school districts.

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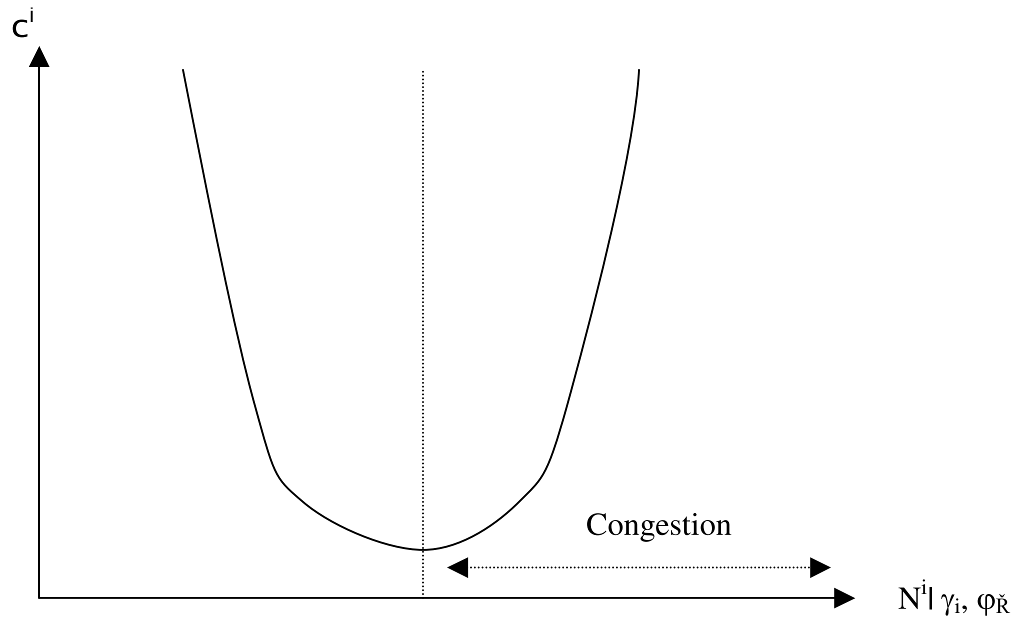
[19] Authors discuss the two choices residents have if heterogeneity increases. The options are (1) the more radical but more expensive choice of creating a new district and (2) the less independent but cheaper choice of building a new school (Alesina, Baqir and Hoxby 2002:10).

Residential Segregation, Production Function and Tax Price

Figure 2 illustrates how the effects of exclusionary zoning and jurisdictional fragmentation work through the public good production function. Here, the limit of

Figure 2



zoning is analogous to a U-shaped average cost function, which is specified as:

$$c^i = C(G^i) / f(N^i | \gamma_i, \varphi_{\check{R}}) \qquad \text{(iv)}$$

where,

c^i : the average cost of public good G per household

$C(G^i)$: total cost for producing public good G in district i

N^i : total households in district i

γ_i : the urban zoning policy variable such as the minimum lot size bindingly mandated in jurisdiction i

$\varphi_{\check{R}}$: the number of jurisdictions or school districts in a MSA, county or a specific area with boundary Ř

Instead of population density, I use households in the average production cost function. And because the empirical work involved in this paper focuses on school district level observations and state-to-local revenue spent on education, property tax revenue deemed to be a very appropriate source of tax base to finance the production of such goods.

According to Tiebout (1956), there exists an optimum size of community given the fixed resources and demand conditions of current inhabitants. Consumer-voters are fully mobile and that communities seek to grow or shrink to the optimum size. The incentive to minimize tax burdens for given levels of public services will lead individuals to choose communities which are closer to the optimal (lowest cost) size. If the creation of new jurisdictions or an increase in minimum lot size requirement reduces community size below the optimal size for the view of sharing in public good costs, the marginal average cost of c^i is higher in more homogeneous community:

$$\partial^2 c^i/\partial N^i \partial \varphi_{\check{R}} > 0$$

Furthermore, a smaller community may be useful in relieving congestion cost if the prevailing production has passed the minimum cost $\hat{C}$ such that it is impossible for the community to reap further economies of scale. However, bigger units of government may sometimes be more efficient if there are economies of scale. As the number of district decreases, community size expands and thus the number of property tax paying households or population (N^i) grows larger. But if the community grows in excess of optimal size, the marginal congestion cost exceeds the reduction in cost shared in producing G. It is also worthy to note that heterogeneity is can also be costly if individuals prefer live among people like themselves, regardless of preferences over public goods (Alesina, et al 2002).

The impact of jurisdictional fragmentation or zoning ordinance is also captured in the tax price:

$$P_G = (ß^h/\text{Average}ß) \qquad (v)$$

where,

$ß^h$: Household's taxable base

Averageß : Average tax base in the community

Zoning can sometimes be used as a tool to adjust local fiscal tax rate by influencing the community tax base and demand for public services. Large lot zoning excludes the poor who cannot afford the high home price, thus maintaining a fair share of tax[20] payable among residents who enjoy the same level of public services. High level of services is also sometimes used to exclude those with low "taste" or cannot afford the level of taxation. The level of public services G may change with the base and result in tax rate changes, attaining the fiscal motive of zoning. However, forcing people to buy more public services or goods than they want creates a deadweight loss. If segregation, a probable outcome of harsh zoning or jurisdictional fragmentation, is viewed by people not as a good in and of itself but as a way of lowering the cost per unit of education

[20] Tax rate depends on the level of G and base. Tax rate=cost of G/base

quality, by maximizing advantageous peer group effects, segregation could be a cost-reducing phenomenon for the restricted community. In contrary, segregation may raise costs in other communities.

Conceptually, the analysis of exclusionary zoning can be presented in two cases.

Case ONE: No Zoning or Ineffective Zoning

If there is income segregation, it could be due to the preferences for certain public services. Epple and Platt (1998) argue that if people have regular downward sloping demand or taste for public services, people would segregate by income even without zoning. "*We have shown that in any such equilibrium, we will find low income consumers with high taste parameters living with high income consumers with low taste parameters* (Epple and Platt 1998:36)". Where there is higher income, there is a greater demand for services. The equilibrium in their people-sorting model has the desirable property of partial, but not complete, sorting by income. Absent zoning or where zoning is not binding, sorting of people by other criteria such as race, ancestry origin, occupation and preference for education other than income is also conceivable. The questions: if race is as good a proxy for taste as income and if the predicted degree of racial segregation outweighs income segregation are debatable.

Residential segregation may still prevail in the absence of zoning. This can be due to further fragmentation of government structure and a decentralized system. With single-crossing indifference curves between housing and public goods, the larger the number of jurisdictions; the smaller the slice of the income distribution contained within a single jurisdiction. Therefore,

$$\partial\theta_{\check{R}} / \partial\varphi_{\check{R}} > 0.$$

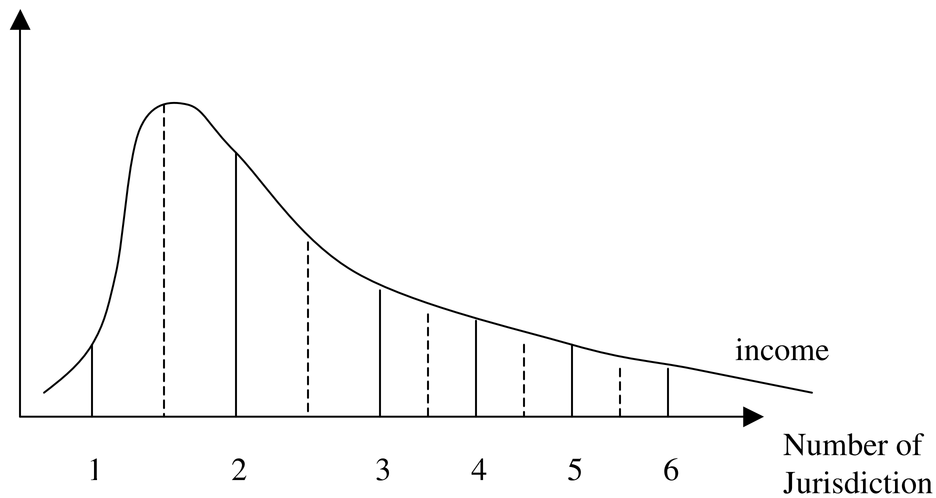


Figure 3

The dashed lines in Figure 3 represent more jurisdictions.

Case TWO: Effective Zoning

$$\partial\theta_{\check{R}} / \partial\gamma i > 0 \qquad \text{(a)}$$

$$\partial\theta_{\check{R}} / \partial\varphi_{\check{R}} > 0 \qquad \text{(b)}$$

$$\partial^2\theta_{\check{R}} / \partial\varphi_{\check{R}}\, \partial\gamma i \geq 0 \qquad \text{(c)}$$

The notion behind the empirical work of this paper is to test if

1) increasing the minimum lot size creates more segregated or homogeneous communities as indicated by the derivative in (a).

   Tiebout (1956) assumed that commuter-voters are fully mobile and that a fixed factor is necessary for the choice model to work. "*The factor may be* *limited land area of a suburban community, combined with a set of zoning laws against apartment buildings*" (Tiebout 1956:419). Robust and significant results that support partial derivative (a) may suggest that zoning creates residential segregation and that the excluded group of people is inhibited from residing in the community either due to the lack of ability to afford residential units or skin color difference. This way, consumers are not fully mobile.

2) jurisdictional fragmentation or an increase in the number of communities or districts leads to more residential segregation by income or color as in (b) and (c) and

3) $\partial\theta_{\check{R}} / \partial\varphi_{\check{R}} \geq \partial\theta_{\check{R}} / \partial\gamma i$ OR $\partial\theta_{\check{R}} / \partial\varphi_{\check{R}} \leq \partial\theta_{\check{R}} / \partial\gamma i$.

That is, if zoning is a by-product or if governmental fragmentation or policy implications play a more significant role in Tiebout sorting.

IV. ECONOMETRIC MODEL

Empirical study on the interjurisdictional differences in public services should be pursued to clarify problems exclusionary zoning and residential segregation created in metropolitan areas. "*In particular, it would seem desirable to test the fiscal-zoning theory of metropolitan residential segregation, which predicts that defective pattern of local-government organization and finance lead to interjurisdictional differences in private resources and public services"* (Harrison 1982:87). Unlike most empirical work, which specifically analyzes the operational efficiency of local governments, this paper tests if jurisdictional fragmentation, affects residential segregation. Further breakdown of jurisdictions likely creates more homogeneous communities such that income sorting may be intensified. Greater Tiebout choice may also work through school districts, dividing the jurisdictions and residents by color.

Using 2SLS models, I examine quantitatively if Tiebout choice has a more profound impact on income or racial segregation. Whether the effects are different if race and income of the people are being factored is, in this context, an issue to be investigated. In addition, local policy tool such as the zoning ordinance, is being captured to understand if policy measures or jurisdictional consolidation / fragmentation play a more dominant role in determining how much the society is divided.

Older policy research into the equity of service distribution as well as the results of such distributive structure, have focused on intrajurisdictional differences among neighborhoods within a specific state or a MSA. For example older literature by Harrison (1982) studies New Jersey. Recent work completed, such as Hoxby 2000, is comprised of 316 metropolitan areas. It is important to extend the scope to a national level, as residential segregation tends to be more prominent in one region or state than another. Also, the size of jurisdiction differs, for example, the largest school district in the United States has 1.4 million school-aged children, the smallest has 2[21]. (Alesina et al 2002). Here, all MSAs in the United States are included and explored to investigate if size by the number of school districts in a MSA, matters.

There are two parts in this empirical work. The first entails an analysis of the entire country by Metropolitan Statistical Area (MSA[22]) and the other specifically on a single Consolidated Metropolitan Statistical Area (CMSA[23]), which encompasses the State of New Jersey, New York, Pennsylvania and Connecticut. The use of metropolitan area rather than the state or the central city as the primary unit of analysis was based on the argument that MSA boundaries identify the geographic area that is economically

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[21] The largest districts in the United States are the New York City district (which includes all 5 boroughs), the Los Angeles Unified district, and the Chicago school district. There are approximately 50 school districts in the United States that have 1 to 3 students in a typical year. They include districts such as Main's Isle au Haut district and Montana's Upper Crackerbox district. (Alesina, Baqir and Hoxby, 2002)

[22] The Census Bureau uses a standard set of definitions of the area included in each "metropolitan statistical area" (MSA) or "primary metropolitan statistical area" (PMSA). In most cases both a central city (or sometimes two or more central cities) and the ring of surrounding suburbs are included. The current standards provide that each newly qualified MSA must include at least: one city with 50,000 or more inhabitants, or a Census Bureau-defined urbanized area (of at least 50,000 inhabitants) and a total metropolitan population of at least 100,000 (75,000 in New England).

[23] CMSA is defined as an area that meets the requirements for recognition as an MSA and also has a population of one million or more if separate component areas can be identified within the entire area by meeting statistical criteria specified in the standards and local opinion indicates there is support for the component areas.

integrated. This is a relevant focus for a study of the Tiebout mechanism and public finance.

The following subsections discuss the data sources and empirical functions for the MSA and CMSA models.

A. MSA level analysis

<u>Data</u>

Most of the data for this study are drawn from the National Center for Education Statistics (NCES[24]), US Department of Education, School District Demographics (SDD), US Census Bureau, and The Lewis Mumford Center for Comparative Urban and Regional Research at The University of Albany and respective town planning departments. The full 2000 NCES Common Core of Data (CCD) covers 16,793 school districts in 401 MSAs. The SDD's School District Tabulation (STP 2) comprises data compiled from questions asked of a sample of people or housing units for Census 2000[25]. SDD's data is reported by state, county and school district level, which boundaries are provided by the US Census Bureau's Census Mapping Project. NCES's CCD recognizes additional school districts that the Census Mapping Project does not, the number of school districts thus differ between NCES and SDD. Compared to NCES's CCD, School District Demographics reports data for 14,406 school districts. As this study concentrates

[24] NCES is the federal entity responsible for collecting data on all public schools in the United States. The analysis in this paper was conducted using data mainly for the 1999-2000 school year. In some cases, where data for one of these years was missing, estimates were drawn from the closest available year. There were a few such cases only.

[25] The 2000 Census School District Tabulation basically follows the design of Census Bureau Summary File 3 (SF 3). SF 3 consists of 813 detailed tables of Census 2000 social, economic and housing characteristics compiled from approximately 19 million housing units (about 1 in 6 households) that received the Census 2000 long-form questionnaire. The tables are repeated for nine major race and Hispanic or Latino groups (Census Bureau Demographic Profiles 2000)

on school districts that serve a metropolitan statistical area (MSA)[26], there are 8,223 CCD observations that meet the criterion[27]. The latter matches 6,548 school districts compiled in the SDD database. Hawaii and the District of Columbia are made up of a single school district and due to the all-state finance structure, both states appear to be outliers and therefore is omitted from the analysis. As a result, 6,547 school districts were analyzed. These districts are further grouped into their corresponding MSAs and relevant dissimilarity indices, primarily the Index of Dissimilarity[28] (D) and Variance of Logarithm of Income indices per MSA (Varlog), were derived.

The Index of Dissimilarity (D) is represented by the following formula:

$$\theta^j_R = (½)\sum \left| b_i/B_j - w_i/W_j \right| \qquad \text{(I)}$$

where b_i is number of blacks in a school district

B_j is the black population in a MSA

w_i is the number of whites in a school district

W_j is the white population in a MSA

i is school district i

j is MSA j

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26 In the Common Core Data, school districts are categorized as (1) Central city of an MSA, (2) Serves an MSA but not primarily its central city or (3) Does not serve an MSA. (2) Was renamed as suburbs.

27 See Appendix B for the summary count of school districts not serving a MSA or has MSA ID of zero (0), tabulated by state.

28 The dissimilarity index is the most widely used measure of evenness and conceptually, it measures the percentage of a group's population that would have to change residence for each neighborhood (school district in this study) to have the same percentage of that group as the metropolitan area overall (U.S. Census Bureau, Housing and Household Economic Statistics Division, Housing Patterns, Appendix B Measures of Residential Segregation, May 2003).

If $\theta^j_R = 0$ or 0%, this means there is no racial dissimilarity among school districts. The largest possible value of θ^j_R is 1 or 100%, which indicates complete segregation, that is, an area is comprised of either all whites or all blacks. Despite school district being the unit of observation, racial composition is calculated using the Census measures of the aggregate population, rather than school enrollment, since enrollment decisions are presumed endogenous to zoning policy and home buying decisions. As African Americans are the most residentially segregated racial or ethnic group in America, this paper focuses on the “Black” instead of Asian or Hispanic as the minority group. In all of the segregation indices calculated and referenced, non-Hispanic Whites are considered the majority (reference) population.

In assessing how much income account for racial/ethnic segregation, the above D Index was redefined slightly. The new index θ^j_{RI} is:

$$\theta^j_{RI} = (½)\sum \left| b_{i,I}/B_{j,I} - w_{i,I}/W_{j,I} \right| \qquad \text{(II)}$$

where

$$I = \text{family income} \begin{cases} <\$50{,}000 \\ \geq\$50{,}000 \end{cases}$$

$b_{i,I}$ is number of black families in a school district with family income I

$B_{j,I}$ is the number of black families in a MSA, with family income I

$w_{i,I}$ is the number of white families in a school district with family income I

$W_{j,I}$ is the number of white families in a MSA, with family income I

i is school district i,

j is MSA j

Note that the \$50,000 threshold is the US national median family income, which is \$50,046, according to the 2000 census report.

Varlog (variance of the logarithms of income) measures income segregation or inequality. The formula is as follow:

$$\text{INC } \theta^j_I = V_{inc} = (1/s)\sum_{i=1 \text{ to } s} (Z^i - Z)^2 \qquad \text{(IIIa)}$$

where

Z^i = log(median income^i)

Z denotes the mean of Z^i for a MSA

j is MSA j

i is school district i

Income segregation indices, controlling for race are also similarly computed using the Varlog formula above. The SDD data file provides income by race as well as home values of blacks and white owners. The revised Varlog index is represented by:

$$\text{INC } \theta^j_{IR} = V_{inc,R} = (1/s)\sum_{i=1 \text{ to } s} (Z^{i,R} - Z)^2 \qquad \text{(IIIb)}$$

where

$Z^{i,R}$ = log(median income^{i,R})

Z denotes the mean of $Z^{i,R}$ for a MSA

j is MSA j

i is school district i

R represents race, which is either the minority group of blacks or the majority white. For example INC $\theta^{j}_{IR=B}$ will illustrate the extent of income segregation among black families in respective MSA.

There are a couple of instances where there are no blacks in a school district, thus making it impossible to derive a segregation index. For instance school district #3604650 (Berne-Knox-Westerlo Central School District) in the Albany-Schenectady-Troy, NY MSA is 98.5% populated by whites and there is not a single head count of black resident. Instead of an infinite index, several assumptions and scenarios have been tested. The first is the removal of school districts without black population or those that have no median income value for Black families. The alternate scenario assumes full segregation in those school districts with no Blacks. As there is no significant and noteworthy difference found, the empirical work continue with omitting such school districts.

In addition to the Index of Dissimilarity tabulated using school district level of data, this empirical work also utilizes the Census Bureau and the University of Albany's Lewis Mumford research center segregation indices, which are calculated using census tract[29] level of observations. These indices include the Gini coefficient and the Atkinson index, which involve the differential distribution of the subject population. The formulas are shown below:

Gini Index $\Sigma_{i=1\ldots n}\Sigma_{j=1\ldots n}\,[t_i t_j\,|(p_i - p_j)|\,] \,/\, 2T^2P(1\text{-}P)$

Atkinson (parameter b) $1\text{-}\{P/(1\text{-}P)\}\,|\,1/PT.\ \Sigma_{i=1\ldots n}[(1\text{-}p_i)^{(1\text{-}b)}p_i^{\,b}t_i]|^{\{1/(1\text{-}b)\}}$

[29] See appendix C for the geographic types of the Census data

Definitions

Term	Definition
N	The number of areas (census tracts) in a metropolitan area, ranked smallest to largest by land area
xi	The minority population of area I
yi	The majority population (non Hispanic White in this report) for area i
yj	The majority population of area j
ti	The total population of area I
tj	The total population of area j
X	The sum of all xi (the total minority population)
Y	The sum of all yi (the total majority population)
T	The sum of ti (the total population)
Pi	The ratio of xi to ti (propotion of area i's population that is minority)
P	The ration of X to T (proportion of the metropolitan area's population that is minority)
B	A shape parameter that determines how to weight the increments to segregation contributed by differenct portions of the Lorenz curve.

Like the index of dissimilarity, the Gini can be derived from the Lorenz curve. It varies between 0 and 1, with 0 indicating complete mix. The Gini coefficient is the mean absolute difference between minority proportions weighted across all pairs of areal units, expressed as a proportion of the maximum weighted mean difference (Massey and Denton, 1988).

Both the Gini index and the Atkinson index are the only evenness measures that satisfy the four criteria established by James and Taeuber (1985) for an ideal segregation index[30]. The Atkinson index (Atkinson, 1970) allows the researcher to differentially

[30] The four criteria are: 1) the "transfer principle", which states that a measure should be sensitive to the redistribution or "transfer" of minorities among areal units with minority proportions above or below the metropolitan area's minority proportion (and not just transfers from areas above to areas below that proportion); 2)"compositional invariance", which states that the relative size of minority population should not affect the index; 3)"size invariance", which states that the measure should not be affected if the number

weight areal units at different points along the Lorenz curve, allowing, for example, areal units where minorities are under- or over-represented to contribute more heavily to the overall index. For values of the shape parameter of b=0 or more but less than 0.5, areal units where the proportion of minorities is smaller than the metropolitan area's average (that is, where minorities are "underrepresented") contribute more to the segregation index; for large values of the shape parameter (more than 0.5 up to 1.0), the reverse is true—areas of "overrepresentation" contribute more. When the shape parameter is 0.5, such areas contribute equally. For values of the parameter between 0 and 1, the Atkinson index also varies in that range, with 1 indicating maximum segregation (US Census Bureau, 2000). Three shape parameters, 0.1, 0.5 and 0.9 are used in this study.

The Lewis Mumford Center for Comparative Urban and Regional Research publishes racial/ethnic and income segregation indices[31], tabulated at census tract level. Aside from the D index, there are also income segregation (such as poor vs. affluent) measures and racial dissimilarity index, which have been controlled for income class for example the segregation of white poor households from black poor households. Their income classes are defined as follow:

Poor: Income which is 175% of the poverty line or below. Based on a family of 4, income should be less than $30,000

Middle: Income over 175% but less than 350% of the poverty line. Based on a family of 4, income is in the range from $30,000 to $60,000

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of people in each group is multiplied by a constant; and 4)"organizational equivalence", which holds that an index should be unaffected by aggregating units with the same minority composition.

[31] Their D index is similar to the formula used in this empirical study. Lewis Mumford Center tabulated indices for cities, which have a least 10,000 inhabitants. The indices range from 0 to 100.

Affluent: Income over 350% of the poverty line. Based on a family of 4, income should be over $60,000

Private schools and education are not taken into account in this study as the bulk of local tax revenue is reportedly channeled to public academies. However, it is crucial to acknowledge that private institutions may play plausible roles on residential segregation and that the trade-off between public-private school choice is important for policy decisions. The support for education could possibly be highly impacted if a district is comprised of families who have strong taste for education and who enroll their children at private schools. Hoxby's (2000) results suggest that metropolitan areas with more Tiebout choice have more productive schools and less private schooling. An increase in her choice index[32] causes the share of students in private schools to fall by 4.2 percentage points. Therefore, policies that reduce choice among districts are deemed likely to increase the share of students in private schools and reduce the share of voters who are interested in the general well being of public education (Hoxby 2000).

The 6,547 school district observations[33] are also separated into their respective Suburb and Central City clusters. Priori, larger MSA means bigger city and central city tend to have a relatively more predominant group of minority. According to the Lewis Mumford Center for Comparative Urban and Regional Research in The Suburban Advantage (June, 2002), there exists a persistent economic gap between cities and their suburbs. Over the last century, many regions have experienced a deterioration of central cities as people and

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[32] See footnote 16 to refresh Hoxby's Index of Tiebout choice.

[33] The datasets have been tested for normality and effort has been made to identify any outlier.

jobs moved outward to the surrounding suburbs, leaving the poorer residents in the cities[34]. It may be useful to model separate clusters to help understand if jurisdictional fragmentation will disable desegregation in central cities more than the suburban areas. Also, are city residents, who tend to be primarily poorer households than the suburbanites, more responsive to greater Tiebout choice? Note that from the NCES Common Core Data, there are some cities that are classified as "Principal/Central City of a CBSA/MSA" such as Aurora, IL, Bakersfield, CA and Battle Creek, MI[35], which have more than one school district.

Due to the need to match data from several sources (US Census Bureau, SDD and NCES) as well as removing anomalies and filtering observations by a threshold income level, some central cities were omitted. As a result, there are fewer MSA-central city only (N=201) data points than MSA-suburbs (N=323), in assessing racial segregation. Dissimilarity and income variation indices are computed separately for central cities and suburbs, and similar empirical models calibrated using these two data clusters. The dissimilarity indices are next weighted by population size to tell the extent to which the fraction of the overall minority population in urban areas in the US is segregated. It also gives a different picture of the extent to which the minority group overall is segregated. Suppose there is moderate segregation in most metro areas but very high segregation in

[34] There are some cities such as Houston, TX, Denver, CO, Cleveland, OH and Chicago, IL where upscale residents are moving into the cities, the influx is not sufficient to offset the number leaving central cities.

[35] For example: Aurora, IL is comprised of Aurora East Unified School District 131, Aurora West Unified School District 129 while Battle Creek, MI includes Battle Creek Public Schools, Lakeview School District (Calhoun) and Pennfield School District.

the largest, which governmental structure is different, this may imply that fiscal sorting, zoning-discrimination model works differently in large areas.

MSA empirical models

Alesina, Baqir and Hoxby (2002) show empirically that counties that experienced increasing racial heterogeneity between 1960 and 1990 are more likely to resist direct consolidation over that period. Their model comprises of 2,670 county level observations. All variables are first-differenced (1990 minus 1960) and the dependent variable is the change in ln(number of school districts in a county). Their coefficient on the change in racial heterogeneity is marginally higher than 1, implying that a county that experienced an increase of two standard deviations in racial heterogeneity lost 36 percent fewer districts between 1960 and 1990 than a county that experienced no change in racial heterogeneity. Income diversity, measured by the change in Gini coefficient (household income) has a larger coefficient than the change in racial mix, as illustrated in their multiple regression models.

Unlike Alesina et al (2002), the empirical equations to be discussed below investigate the segregation impacts Tiebout choice can create in the American society. A strong postulation will be that greater Tiebout choice is anticipated to create some form of income sorting and more homogeneous communities. In controlling for the variation in number of communities by metro area and MSA size, the model uses the number of school district per log of population. Taking logarithm of the population transforms the non-linear variable into a linear form and the reciprocal of the latter weight Tiebout choice in highly urbanized areas closer to less dense metropolitan areas, compared to weighting by the inverse of population count. Besides this functional form fitting the data best throughout the empirical work in this paper, the other rationale for the use of log of population concerns the distribution of the number of school districts across MSAs. School districts vary greatly in size (as measured by the number of students in membership) but metropolitan statistical areas do not vary as much in terms of the number of school districts per se. In 1999, 32.8% of students were enrolled in large school districts, districts that serve 25,000 or more students but there were only 1.7% of such large districts in the country. Hence, weighting Tiebout choice, as proxied by the number of school districts by the logarithm of population prevents excessive under-weighting of MSAs with large school districts.

The models remain robust to alternate specifications of Tiebout choice. Specifications of alternate MSA models include the number of school districts (SD) as Tiebout choice and Density, a regressor, which is defined as the number of people per square mile of land area.

Models (IV)

Weighted Segregation Index (θ^j_R ; θ^j_{RI} ; INC θ^j_I or INC θ^j_{IR}) =

A0 + A1•SD/Logpop + A2•Statelocal$ + A3•D1990 + A4•%Hisp + A5•%Black +

A6•Medinc + A7•Dcounty + A8•Dregion

Models (V)

Weighted Segregation Index (Gini; Atkin(0.1); Atkin(0.5); Atkin(0.9), DMUMFORD, RPOOR, RMIDDLE, RAFFLUENT, INCPOORMID, INCPOORAFFL, INCMIDAFFL) = B0 +B1•SD/Logpop + B2•D1990 + B3•Medinc

Dregion dummies are included to test if segregative effects diminish as certain MSAs reportedly have less residential segregation than others, not due to particular state finance structure, but simply because they are in region which segregation has unknown fixed effect. Regional categories follow the Advisory Commission on Intergovernmental Relations' "State Intergovernmental Expenditures report FY 1991". Regions comprise East, Mid-West, South and West[36].

There are several states where the school districts are primarily county-based (Dcounty=1)[37]. Some states have a mixture while many have mostly smaller districts. Due to such jurisdictional boundary difference, we can expect Dcounty=1 to have a negative effect on segregation. The larger an unit of observation, the higher the anticipated mixing will be. A county is generally equal or larger than a school district in terms of population density and geographic boundary. In many cases, a county have more than one school district and there are many counties that have more than twenty or thirty school districts. Therefore, the geographic boundary for tabulation of dissimilarity

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[36] See Appendix E for the states grouped into the different Regions.

[37] Examples are Delaware (DE), Maryland (MD), West Virginia (WV), Virginia (VA), North Carolina (NC), South Carolina (SC), Georgia (GA), Florida (FL), Tennessee (TN), Alabama (AL), Mississippi (MS), Louisiana (LA), Nevada (NV) and Missouri (MO).

indices is crucial in explaining the overall impact of government structure/exclusionary measures.

"*Further, a broadly defined fiscal-zoning theory allows for the possibility that various social and economic pressures may also precipitate both exclusionary zoning and residential segregation. For example, it has often been argued that areas with larger concentrations of minority groups will tend to display greater racial discrimination* (Harrison 1982:92)". In line with Harrison's thought, empirical work herein takes into account racial discriminatory level and the proportion of minority group, using %Hispanic and %Black. On average, one can expect positive coefficients (A4 and A5) for the percentage of Hispanic and %Blacks[38] in model (IV).

As an additional control for racial/income segregation, this empirical work looks into the role of State-to-Local revenue[39]. Intuitively, when the non-local aid is higher, there is less metropolitan racial segregation and less incentive for fiscal zoning, which may or may not be associated with less racial segregation. A local government may prefer land to be used for commercial developments because of the large sales tax revenue possibly generated by commercial activities. Thus by zoning land specifically to commercial use, the local government raises its tax base, particularly for areas where the traditional

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[38] White and blacks referenced in this study are White Alone, Not Hispanic or Latino and Black Alone, Not Hispanic or Latino.

[39] According to the NCES, State Revenue is defined as revenue received by the LEAs (Local Education Agencies) from the state and includes unrestricted and restricted grants-in-aid, revenue in lieu of taxes, and payments for, or on behalf of, LEAs. These data are taken from the Common Core Data (CCD) National Public Education Financial Survey. Local Revenue is the subtotal of all Local Revenue categories, but does not include tuition from other LEAs within the state or transportation fees from other LEAs within the state.

mechanism for raising local revenue has eroded and the reliance on sales revenue is acute. For instance, in San Marcos which is situated in the northern section of San Diego county, CA, per capita sales tax revenue was $200 in 2002 while the per capital property tax revenue was much lower at $74 for the same year (City of San Marcos, CA). The incentive of fiscal zoning is also illustrated in Fischel (2000:411):

> If development-minded landowners value a rezoning (usually for a more intensive use) more than the municipal voters (or whoever controls the political process) value the parcel's current zoning, economists would expect that an exchange would make both parties better off. Developers would simply pay the community a sum that could be put in the municipal treasury and used to reduce local taxes or spend on additional public services.

Federal aid is not included as voters determine local and state budget. In addition, federal aid is too small a share of total spending to be likely to matter much. State aid as a proportion of local component has been trending upward and in the same pattern for all four regions. In terms of mean state-to-local revenue[40], the Midwest records the highest throughout the span of the years under study, that is, year 1995 to 2000. The West has had reported the highest in median State-to-Local revenue but converged to the level almost similar to all other regions in 1998 before resuming second place for the next few years[41].

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[40] Mean Statelocal$ is calculated by taking the average of Statelocal$ in MSAs that belong to respective Regions.

[41] See Appendix F

Medinc is the family median income of a MSA. This independent income variable is included as a regressor in several regression specifications in which the dependent variables are $\theta^{j}_{R,}$ Gini, Atkinson and DMUMFORD. Controlling for income may help in identifying if racial segregation is an outcome of pure jurisdictional breakdown. If segregation is a normal good, an increase in the standard deviation of median income is expected to elevate the degree of racial segregation. As can be seen in the Bailey Boundary Model[42] illustrated in Figure 4, the white and black households pay equal prices for the parcels along the boundary, assuming that there is no tendency for neighborhood change. If either group prefers segregation, then they will be willing to pay more for the homes located in the interior of the white or black neighborhood than for the sites located at the boundary. As the degree of willingness to pay is closely related to family or household income level, a positive income elasticity or coefficient for the regressor Medinc can be expected. Hence, if segregation is a normal good, then higher income MSAs can be expected to have more segregation.

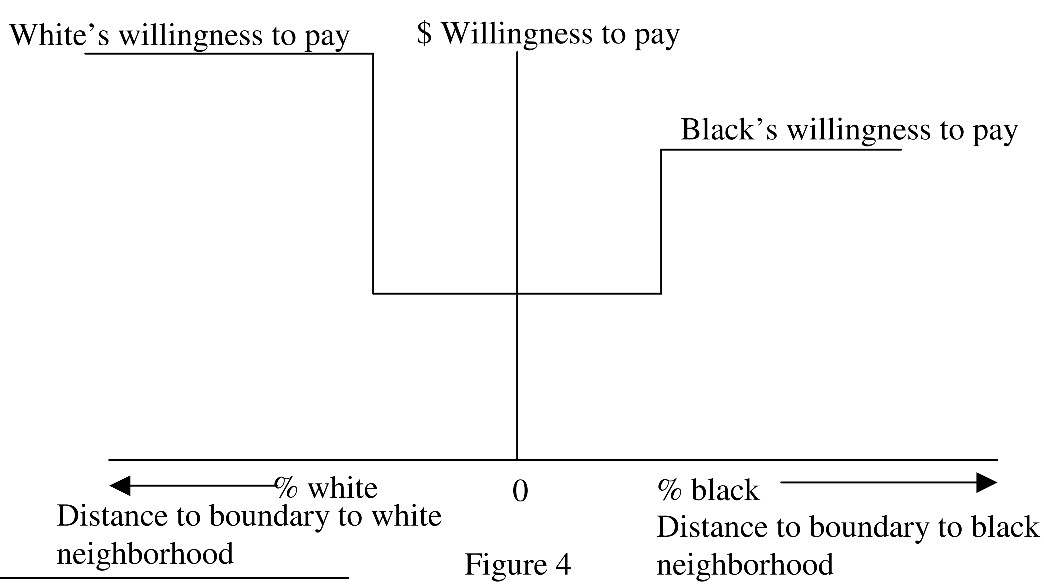

Figure 4

[42] The Bailey Boundary Model is developed by Martin J Bailey in his article "Notes on the Economics of Residential Zoning and Urban Renewal", Land Economics August, 1959.

D1990, which is the MSA Dissimilarity Index tabulated by census tract for year 1990, controls for the history of segregation. Higher D1990 means more segregated situation to start with and it will likely have a positive impact on the year 2000 segregation indices. If the number of jurisdictions is approximately the same in 1990 and 2000, the 2000 cross section analysis can appropriately be interpreted as the long run equilibrium effect, without D1990. According to Alesina, Baqir and Hoxby (2002), the number of local jurisdictions in the United States has fallen substantially between 1990 and 2000 as a result of jurisdictional consolidation. In terms of the number of school districts in the US from 1970 to 2000, there has had been a downward trend with the count shrinking from 17,995 school districts in 1970-1971 to 15,912 in 1980-1981; 15,359 in 1990-1991 and 14,859 in 2000-2001. The drop in the number of school districts since 1980 has been hovering around 3% per decade, thus validating that the 2000 cross section is a sound representative of long run equilibrium. In addition, the rate at which the number of school districts is declining is slower at 3.255% from 1990 to 2000 compared to the marginally higher 3.475% for the period from 1980 to 1990.

B. NY-NJ-CT-PA CMSA analysis

Data

Many researchers and planners posit that zoning ordinance makes community more homogeneous. Similar to the MSA analysis described in the preceding section, the CMSA[43] study entails testing the relationship between residential segregation and zoning

[43] CMSA as defined in the Attachments to OMB Bulletin No. 99-04 "Metropolitan Areas 1999 Lists I-IV", Statistical Policy Office, Office of Management and Budget. See Appendix D for list of towns or cities

policy instruments as well as jurisdictional fragmentation. School district observations are aggregated to derive the Index of Dissimilarity and Varlog for each county. The formulas for tabulating the segregation indices used in this microanalysis are identical to the ones [equations (I) to (IIIb)] adopted to calculate the D and Varlog in the MSA models. Instead of j=MSA, it is j=county in this part of the empirical work.

Zoning measure, namely the minimum lot size (MLS) is compiled from local planning boards and The Ordinance, a data vendor who maintains a regularly updated database of numerous municipalities planning ordinances. The Ordinance keeps a complete record of all planning-related documents, including tax certificate, ordinance for the municipality, escrow, town specific notes, schedule of area lot yard and building requirements, zoning and other maps, for about a dozen states in the U.S. Permitted use for the land parcel such as single-family dwelling, commercial and retail, agriculture-horticulture, townhouses, multi-family, single-family dwelling with churches or professional use are also specified in the bulk requirements schedules. Common regulations or area requirements encountered in this data gathering process, include the minimum lot size, minimum yard setbacks, maximum building height, minimum and maximum floor area ratio and lot frontage.

Some counties or districts do not have minimum lot area enforced while some have only one size or as many as eight categories (such as single family corner units, single family,

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covered. There are 31 counties in the OMB Bulletin. As zoning data for the Dutchess County in the NY PMSA and Pike County in PA are not available, the later are not included in the study. Dataset now covers 29 counties in NJ, NY and CT.

two-family and others) of MLS. Unlike Harrison (1982), who has computed the average minimum lot size for each municipality and then multiplied the latter by the average number of residential zones for each municipality, I adopt the lower limit of the MLS constraint for single-family detached homes. For cases where school districts cross county boundaries and when separation is unclear, the MLS will be weighted by the proportion of population per jurisdiction. The minimum lot size (MLS) restrictions, in square footage per unit of single family home appears to be the most appropriate choice for this research as they have served as the focal point of much exclusionary-zoning litigation.

To gather the MLS data, school district boundaries[44] are first matched against respective planning maps. This was achieved by first downloading the NY, NJ and CT state school district boundary file from the US Census Cartography Boundary Files[45] for Elementary, Secondary and Unified school districts and then mapping the school districts and their respective boundaries using the ESRI Arcview software[46]. The lowest MLS limit within

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[44] School districts boundaries for the 2000 School District Tabulation were collected from states in the fall of 1999 and represent the boundaries for the 1999-2000 academic years.

[45] Files downloaded are in the Arcview shapefile format. School district organization and geographic structure varies by state and region. States provide district boundaries to the Census Bureau as part of a biennial update program, and they classify districts as Unified (primarily serving children of all grade levels), Secondary (primarily serving children in secondary grades), or Elementary (primarily serving children in elementary grades). Some states have small areas (either land or water) that are not covered by a school district. These residual areas are included as a unique record in the tabulation and they may or may not contain population or housing units (US Census Bureau Census 2000 notes on School District Geography).

[46] The NCES map viewer is unable to view streets. Cities, counties and state are only viewable as points. Re-mapping the school districts allows viewing of intersection-to-intersection street and segment level of detail and hence matching with planning/zoning maps.

a school district boundary was then noted[47]. Extensive matching of the school districts with zoning data, CCD's educational financial data and the SDD's demographic profiles revealed that 509 school districts, excluding an outlier, can be adopted for the second part of this empirical work. These valid school district observations yield 23 county level D and Varlog indices.

Table 1 summarizes the variables.

Table 1

Variable Definitions

Variable Name	Definition
θ^{j}_{R}	MSA Index of Dissimilarity (racial) calculated using school district observations[48].
θ^{j}_{RI}	MSA Index of Dissimilarity (racial) controlled for income[48]
INC θ^{j}_{I}	MSA Variance of the logarithm of income[48]
INC $\theta^{j}_{I\,R}$	MSA Variance of the logarithm of income controlled for race[48]. R=Black or White
Gini	MSA Gini Index in US Census Year 2000 report with census tract being the unit of observation
Atkin (0.1)	MSA Atkinson Index with b=0.1 reported in US Census Year 2000

[47] There are several MLS categories such as single-family detached homes, single-family detached homes corner unit, two family homes etc. In addition there can be more than one residential zone in a school district.

[48] Separate Index of Dissimilarity and Varlog Indices were also derived for Central City and Suburb datasets.

Table 1 continue
Variable Definitions

Variable Name	Definition
Atkin (0.5)	MSA Atkinson Index with b=0.5
Atkin (0.9)	Atkinson Index with b=0.9
DMUMFORD	Dissimilarity Index in Lewis Mumford Center for Comparative Urban and Regional Research; census tract being the unit of observation
RPOOR	Mumford's racial dissimilarity index of White and Black poor income households
RMIDDLE	Mumford's racial dissimilarity index of White and Black middle-income households
RAFFLUENT	Mumford's racial dissimilarity index of White and Black affluent income households
INCPOORMID	Mumford's income segregation index between poor and middle-income households
INCPOORAFFL	Mumford's income segregation index between poor and affluent income households
INCMIDAFFL	Mumford's MSA income segregation index between middle and affluent income households
θ^i_R	Racial (Black and White) segregation index per school district. For use in CMSA study. i=school district

Table 1 continue

Variable Definitions

Variable Name	Definition
θ^{i}_{RI}	Racial (Black and White) segregation index per school district, controlling for family income. For use in CMSA study
INC θ^{i}_{IBW}	Indicator of income segregation between Black and White per school district. For use in CMSA study
PERMINC θ^{i}_{I}	Permanent income segregation between Black and White per school district. For use in CMSA study
θ^{c}_{R}	Racial segregation by county c
θ^{c}_{RI}	Racial segregation controlling for income
INC θ^{c}_{I}	Income segregation by county
INC θ^{c}_{IR}	Income segregation in county, controlling for race R
SD	Number of school districts
Logpop	Natural logarithm of population
%Hisp	Percentage of Hispanic
%Black	Percentage of Blacks
Statelocal$	Ratio of State to-Local government revenue
Medhome	Median home value in year 2000

Table 1 continue

Variable Definitions

Variable Name	Definition
Dtransit	0-1 dummy variable that equals one if school district is located in the town where there is a mass transit station or stop
D_{NY}	0-1 dummy variable that equals one if state is NY, that is not NJ and CT
D_{NJ}	0-1 dummy variable that equals one if state is NJ, that is not NY and CT
Dcounty	0-1 dummy variable that equals one if school district is primarily county based
Dregion	4 region dummies. Regions are defined in appendix E
MLS	Minimum lot size in square feet for single detached homes from respective local planning authority
PredictMedhome	Predicted median home values with state and train station dummies as instruments
MLSHat	Predicted minimum lot size
MedMLS	Median minimum lot size
WorkCounty	Percentage of population who work in county of residence
Density	Population per square miles of land area

NJ-NY-CT-PA CMSA empirical model

The level of median home value observed in the market can be a response to racial mix, signaling potential endogeneity issue. Blacks or whites may be willing to pay a premium to live among neighbors of the same race or they may value being close to religious, recreational or business establishments catered toward their own race. Referring to the Bailey Model depicted in Figure 4, suppose there is a change in population count such that a relatively higher expansion in the black population causes an increase in housing demand among black households. Prices in the black neighborhood then exceed those at the white neighborhood at the boundary as illustrated in Figure 5 (Colwell, 1991:10). Depending on the degree of increase in black buyers' demand, prices for home in the interior may surpass those prevailing in the white neighborhood. As properties are bid away from the white neighborhood, the boundary shifts and causes a fall in supply of homes in the white neighborhood, which consequently leads to an increase in price. Within the black neighborhood, home prices fall accompanying an increased supply of housing available. Adjustments continue until a stable allocation, whereby boundary prices become equal and interior home prices in neither market exceed the cost of new construction, is reached. A household's preference for homogeneity therefore may have a positive impact on home values. An analysis conducted by The Brooking Institution Center on Urban and Metro Policy, in 2001 has confirmed a wider black/white gap in home value per dollar of income when segregation is higher. Some researchers such as John Powell from the University of Minnesota and Jacob Vigdor of Duke University, have also shown a wealth of evidence that race plays a major role in the home-value equation[49].

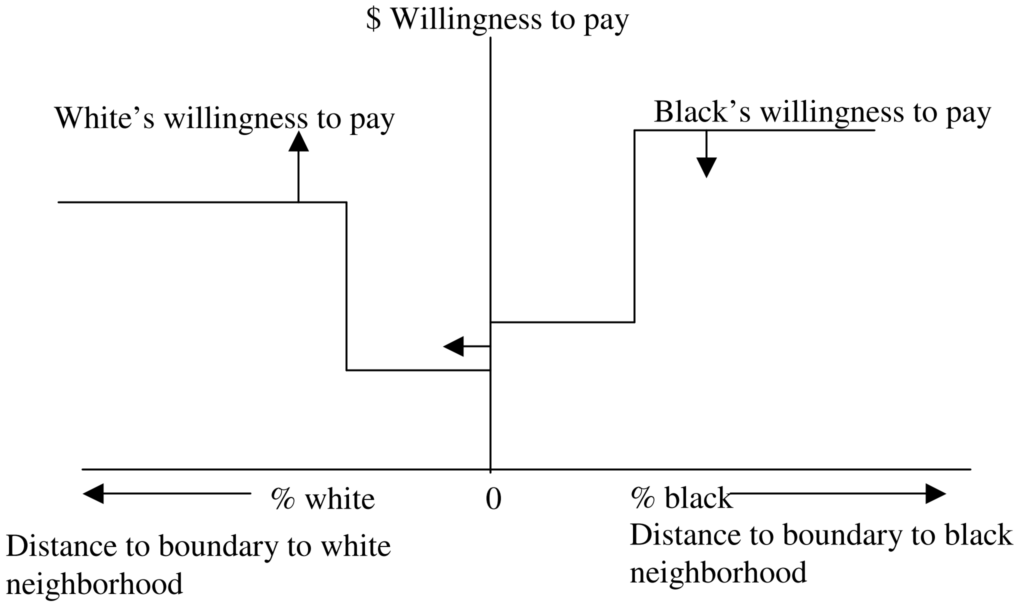

Figure 5

In addressing the potential endogeneity problems that median home values create, an instrumental variable equation (VI) is constructed. The instruments employed are state dummies D_{NY}, D_{NJ} and Dtransit, which denotes the availability of a train station[50] in the city where the school district is also located. The existence of a train station in the city where people reside tends to be a positive factor that appreciates land and home values.

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[49] The Detroit News 01/21/2002, Lewis Mumford Center for Comparative Urban and Regional Research, University at Albany

[50] Train stations as per Metro-North Railroad, Long Island Railway Road, New York metro subway, Amtrak and NJ Transit Rail lines. Efforts have been made in using air miles or linear distance and drive-time from school district addresses to Manhattan, NY City Hall as instruments but the latter did not show up significantly at 5% and 10% level tests. The spatial measurements are very weak instruments such that they become omitted in the subsequent process.

The Instrument Variable model is:

Models (VI)

Medhome = C0 + CI•D_{NY} + C2•D_{NJ} + C3•Dtransit

And the model to test the relative impacts exclusionary zoning develops on racial and income mix is represented by:

Models (VII)

Segregation Index (θ^i_R; θ^i_{RI}; INC θ^i_{IBW} or PERMINC θ^i_I) =

D0 + D1•MLS + D2•Statelocal$ + D3•Medinc + D4•PredictMedhome

The above equation (VII) is the second stage model for estimating the relationship between racial/income segregation by school district in NJ-NY-CT-PA CMSA and several independent variables. Unlike the MSA Index of Dissimilarity, racial segregation θ^i_R and θ^i_{RI} (read as racial segregation controlling for income) are purely simple ratios/differences calculated by taking the absolute difference between black and white population in each school district and the absolute difference between the percent of black and white families with income $50,000 and above respectively. INC θ^i_{IBW}, the income inequality between black and white is the absolute difference of the median income of a black and a white family. In view of the frequently commented significant difference between blacks and whites permanent income, this CMSA micro model included a "Permanent Income" segregation index. The absolute difference between the median home prices for black and white occupant-owners is the proxy for PERMINC θ^i_I.

Suppose certain groups, likely the rich and white, are willing to pay for segregation, they can achieve this via two ways:

(a) By outbidding the poor for houses in segregated communities.

If there is a preference for similarity, hence a market for segregated jurisdictions, the price of this attribute can be reflected in the housing prices. In such case, we would expect the parameter of Predictmedhome D4 in equation (VII) to be positive and significant. Note that a regression of segregation indices on home value has shown a positive and significant relationship.

(b) Zoning.

In this zoning case, the cost of segregation may be lower to the rich. If D1 in model (VII) is statistically significant, the lot size or zoning law is restrictive. In other words, a positive and significant coefficient D1 on zoning would mean that zoning lowers the cost of achieving segregation. If there is no zoning or the latter is ineffective, that is when D1 is insignificant at 5% level test, then under the Epple single crossing model, there could still be income segregation. In addition, in Alesina, Baqir and Easterly (1999), there will still be ethnic-racial dissimilarity. Income segregation will be achieved by the rich willingness to pay higher tax rates for a given house and ethnic segregation will be attained by having more jurisdictions, perhaps with higher average costs. If the Epple single crossing model holds, the zoning coefficient may be smaller and less significant than if zoning is a necessary tool for producing segregation.

Additional models that utilize the D and Varlog indices illustrated in equations (I) through (IIIb) by county instead of MSA are also formulated for the NY-NJ-CT study. Racial and income segregation indices proxied by the absolute difference between black and white population in each county and the absolute difference of median income for black and white family respectively, are tabulated and modeled. This is done to reflect consistency in the simple ratios used for calculating fragmentation indices like the one regressed in model (VII).

Potential endogeneity problem requires the CMSA analysis to involve a 2 stage least square model. Local governing authorities may choose the level of zoning restriction to maintain a desired level of tax base. Burns (1994), for instance, argues that land developers (who presumably had an interest in maximizing the value of their land) are important in the creation of jurisdictions (Alesina, Baqir and Easterly, 1999). Communities may choose stricter zoning if they are more "at risk" of integration. They may respond to different levels or types of demand for land in their boundaries by using more or less restrictive zoning, despite the fact that jurisdictions have other means of excluding lower income households and/or minorities. Zoning can be a cheaper way to price the poor out of the community compared to choosing a high level of public expenditures and taxes that raise tax prices.

Instruments for MLS included the state dummies and WorkCounty, which is the percentage of population who work in the county of their residence. WorkCounty is expected to be negatively related to MedMLS (median MLS of school districts in each county). A high concentration of local residents working in the county where they reside seems to indicate commercial zoning ordinances that are in favor of securing and attracting business establishments. Therefore, with higher section of county land devoted to commercial urban developments, less will be allocated for residential and there may be a call for smaller residential units. The zoning restriction in each county refers to the median minimum lot size (MedMLS). The instrumental variable estimator represented by:

Model (VIII)

$$MedMLS = E0 + E1 \bullet WorkCounty + E2 \bullet D_{NJ} + E3 \bullet D_{CT}$$

Predicted values of MLS (MLSHat) are then used in the second stage regression, defined below.

Second stage **Model (IX)**:

$$\text{Segregation Index } (\theta^{c}_{R};\ \theta^{c}_{RI};\ INC\ \theta^{c}_{I} \text{ or } INC\ \theta^{c}_{IR}) = F0 + F1 \bullet MLSHat + F2 \bullet SD/Logpop + F3 \bullet \%Hisp + F4 \bullet \%Black + F5 \bullet Statelocal\$ + F6 \bullet Medinc$$

In addition to the specification as illustrated in Model (IX), alternate New York Metro models with SD per Capita (SD/Population) instead of SD/Logpop as one of the independent variables, are also being formulated and tested. Results proved to be robust to how population is being accounted or controlled for in the models.

Some authors deny that exclusionary laws have any independent effect on housing prices or residents' incomes. Thus land-use laws or "fiscal zoning" cannot fairly be cited as a cause of residential segregation or of differences in public services observable in most metropolitan areas (Rose 1979, Harrison 1982). Coefficients of MLSHat, namely, D1 and F1 in equations (VII) and (IX) respectively would be insignificant. There are researchers who doubt that any governmental consolidation can improve the equity of service distributions in metropolitan areas. "*Even if they [literatures] allow for the possibility of consolidation, they [literatures] deny that governmental fragmentation is a significant source of metropolitan residential segregation* (Harrison, 1982:97)." This would similarly imply statistically insignificant parameters for SD/Logpop.

If the further breakdown of jurisdiction and/or tightening of zoning regulations have significant effect on residential segregation, would the CMSA be more divided by income or race? This empirical work has also investigated if racial segregation is relatively more intense among families earning certain amount of income. If there were some form of income segregation due to jurisdictional fragmentation, would such income segregation be more significant among minority (black) families than that among white families?

V. FINDINGS

MSA Level Analysis

Selected Descriptive Statistics

Panel A: Summary Statistics for MSA

Variable	Mean	Standard Deviation	Minimum	Maximum
D1990	0.5300997	0.1311389	0.22701	0.82153
SD/Logpop	1.458722	1.707841	0.76396	14.40505
Medinc	46867.82	6443.879	26009	65450
Weighted Segregation Indices				
Gini	0.0027581	0.0037436	0.0001953	0.0283066
Atkinson (0.1)	0.0004219	0.0006559	0.00000906	0.0048415
Atkinson (0.5)	0.0017443	0.0026278	0.0000428	0.020214
Atkinson (0.9)	0.0026005	0.0037898	0.0000733	0.292608
DMUMFORD	0.2406114	0.3073512	0.0161470	2.236967
RPOOR	0.2503794	0.3211416	0.0200719	2.244025
RMIDDLE	0.2530252	0.3181777	0.0246924	2.183958
RAFFLUENT	0.2587823	0.324992	0.2235730	2.212229
INCPOORMID	0.776763	0.1004509	0.0074028	0.7350539
INCPOORAFFL	0.1459708	0.1978214	0.015203	1.395896
INCMIDAFFL	0.0912237	0.1268814	0.0093357	0.9223514

Table 1

Model V: Weighted Segregation Index (Gini; Atkin(0.1); Atkin(0.5); Atkin(0.9), MUMFORD, RPOOR, RMIDDLE, RAFFLUENT, INCPOORMID, INCPOORAFFL, INCMIDAFFL) = B0 +B1 ●SD/Logpop + B2 ●D1990 + B3 ●Medinc

	National (N=252)				
	Independent Variables				
	SD/Logpop	D1990	Medinc	R Square	Adj R Square
Dependent variable: Weighted segregation Index					
Gini	0.0011246**	0.006025**		0.4391	0.4346
	0.0001082	0.0014092			
Gini	0.0010295**	0.0082973**	0.0000000945**	0.4633	0.4568
	0.0001098	0.0013843	2.83E-08		
Atkinson (0.1)	0.0001792**	0.0018903**		0.4576	0.4532
	0.0000186	0.0002428			
Atkinson (0.1)	0.0001639**	0.0018412**	0.0000000152**	0.478	0.4717
	0.000019	0.0002392	4.88E-09		
Atkinson (0.5)	0.0007321**	0.0072111**		0.4501	0.4456
	0.0000752	0.00009795			
Atkinson (0.5)	0.000667**	0.0070019**	0.0000000647**	0.4731	0.4667
	0.0000764	0.0009627	1.97E-08		
Atkinson (0.9)	0.0010808**	0.0096425**		0.4379	0.4334
	0.0001097	0.0014281			
Atkinson (0.9)	0.0009847**	0.0093343**	0.0000000954**	0.462	0.4555
	0.0001113	0.001403	2.86E-08		

Table 1 (continue)

Model V: Weighted Segregation Index (Gini; Atkin(0.1); Atkin(0.5); Atkin(0.9), MUMFORD, RPOOR, RMIDDLE, RAFFLUENT, INCPOORMID, INCPOORAFFL, INCMIDAFFL) = B0 +B1 ●SD/Logpop + B2 ●D1990 + B3 ●Medinc

	National (N=252)				
	Independent Variables				
	SD/Logpop	D1990	Medinc	R Square	Adj R Square
Dependent variable: Weighted segregation Index					
DMUMFORD	0.0969901**	0.6198371**		0.4388	0.4343
	0.0088864	0.1157287			
DMUMFORD	0.0898346**	0.5968673**	0.00000711**	0.4591	0.4526
	0.0090503	0.1140906	0.00000233		
RPOOR	0.1039383**	0.5955514**		0.4386	0.4341
	0.0092866	0.1209411			
RMIDDLE	0.1067903**	0.577693**		0.4603	0.456
	0.0090212	0.1174851			
RAFFLUENT	0.1099281**	0.5455868**		0.4521	0.4477
	0.0092842	0.120909			
INCPOORMID	0.0326278**	0.1451071**		0.4014	0.3966
	0.0029995	0.0390627			
INCPOORAFFL	0.0645946**	0.2698149**		0.3976	0.3927
	0.0059259	0.0771742			
INCMIDAFFL	0.0403529**	0.1685794**		0.3774	0.3774
	0.0038638	0.0503194			

** significant at 5% level

Standard errors are in italics

In all cases, the coefficient of the historical state of residential segregation (D1990), are positive and statistically significant while the number of communities (SD/Logpop) has a positive and significant impact on all dimension of segregation (Table 1). Model (V: Weighted Segregation Index (Gini; Atkin(0.1); Atkin(0.5); Atkin(0.9), DMUMFORD, RPOOR, RMIDDLE, RAFFLUENT, INCPOORMID, INCPOORAFFL, INCMIDAFFL) = B0 +B1•SD/Logpop + B2•D1990 + B3•Medinc) is robust to the way segregation index is calculated. In terms of income segregation, the effect of jurisdictional fragmentation on income segregation between poor and affluent households as reflected in Table 1, is the greatest. This level is expected to be high as affordability is such an important factor in where people can live. Among the three income classes, racial segregation between white and black population of the "Affluent" income class is most responsive to changes in the number of communities (SD/Logpop).

If racial segregation is mainly a reflection of income segregation, the levels would be much lower when comparison is made on affluent whites against affluent blacks, or poor whites to poor blacks. It turns out that income segregation plays a minor role. MSAs are divided more by race/ethnicity than by income differences when there are more jurisdictions. The statistically significant coefficient (0.1039383 in Table 1) of SD/Logpop for the racial segregation among poor income group, RPOOR, is relatively stronger than that (0.0969901) for DMUMFORD, which is racial segregation without any control for income class. Among the three income classes, the affluent blacks and whites are most divided as indicated by the statistically significant SD/Logpop coefficient (0.109281 in Table 1). When controlled for median family income (Medinc), the coefficient for SD/Logpop, represented by B1 in model (V), exhibits weakened but still significant effect on racial segregation. The parameter of Medinc as represented by B3 in model V, is positive and statistically significant at 5% level of test.

Appendix G summarized the results of a similar model with an alternate specification. The direction and significance of Tiebout Choice variable (SD) are consistent with the results reported in Table 1 above. Density, which controls for difficulties possibly faced by large metro areas, exhibits a statistically significant positive impact on residential segregation, implying higher racial and income segregation. Segregation by jurisdiction may be more highly valued in denser areas because the likelihood of exposure to different races is greater in denser areas.

Jurisdictional fragmentation when statistically significant, is found to have a positive effect on residential segregation. In the MSA analysis using central city observations, SD/Logpop does not seem to display any significant impact on income segregation $INC\theta^{j}_{I}$, unless it pertains to segregation among minority ($INC\theta^{j}_{IB}$). As shown in Table 2C, coefficient of SD/Logpop is only significant at a positive value of 0.0078125 when $INC\theta^{j}_{IB}$ is regressed on SD/Logpop in the central city case. Compared to income segregation among blacks in the suburbs, the coefficient for suburbs SD/Logpop, which is denoted by A1 in equation IV[51], is lower at 0.0003782. A two standard deviation increase in suburb (2.539356) and central city (0.3094884) SD/Logpop augment income disparity among black population by (0.0009603) 0.09603% and (0.0024178) 0.24178%

[51] Equation (IV): Weighted Segregation Index (θ^{j}_{R} ; θ^{j}_{RI} ; INC θ^{j}_{I} or INC θ^{j}_{IR}) = A0 + A1•SD/Logpop + A2•Statelocal$ + A3•D1990 + A4•%Hisp + A5•%Black + A6•Medinc + A7•Dcounty + A8•Dregion

respectively. In terms of racial segregation, Tiebout choice as represented by SD/Logpop is statistically significant at 5% only in central city. Expanding the number of school district per log capita in central city by 28% (2 standard deviation) raises racial segregation by 32% (not controlling for income, as represented by the independent variable Medinc) and 42% (when controlled for Medinc).

Segregation by color is accentuated when the models considered income earned by the families. The coefficients for SD/Logpop on racial segregation between white and black who earn at and more than; or less than $50,000 per family in 2000: $\theta^j_{RI<\$50k}$ =1.152621 and $\theta^j_{RI>\$50k}$ =1.224847 in central city vs. $\theta^j_{RI<\$50k}$ =0.1166962 and $\theta^j_{RI>\$50k}$ =0.1346879 in suburbs (Tables 2S and 2C). Translating into a magnitude, a 2 standard deviation increase in the number of school district per log capita (SD/Logpop) raises central city and suburban racial segregation for families earning at or more than $50,000 per annum by 34.1% and 50.6% respectively, all else equal. The corresponding coefficient for family income less than $50,000 suggests that there is a 32.4% and 43.9% increase in central city and suburban racial segregation for a similar two standard deviation increase in district choice. Thus suburban middle to affluent class (families earning at or above $50,000 in 1999-2000 census year) responds most to jurisdictional creation. While racial segregation impacts attributed to an increase in SD/Logpop are roughly similar between both income clusters (family income below or at and above $50,000) in the central city, outcomes are starkly different in the suburbs. When controlled for race, the number of jurisdictions has less effect on income sorting compared to the effect on the degree of racial sorting accounting for income level. Similar results are also obtained for the central city only, suburb only and aggregate (central city and suburban) models that comprise the number of school districts (SD) and population per square miles of MSA land area (Density) as regressors. Please see Appendix H for results summary.

The unit of observation employed in calculating the index of dissimilarity is important, so is the geographical boundary of a school district. As illustrated by the coefficient of Dcounty=1 (defined as school district is primarily county based), the latter has a negative and significant relationship with racial segregation θ^j_R. Hence areas with county-wide school districts experience less measured segregation. The hierarchical chart in Appendix C shows that there are school districts, which extend over more than one county. The South, represented by Dregion3 exhibits a positive and statistically significant consequence on racial segregation. Overall, a change of the region 3 dummy (Dregion3) from 0 to 1 generates racial segregation including and excluding Medinc regressor that are 3.841 and 3.396 points higher, respectively (see Table 2 CS columns 1 and 2). Region fixed effect is so strong that on an average, school districts in the south (region 3) encounter more segregation despite district boundary being county based. Many Southern states currently still have racial-separation laws on its books, despite the Supreme Court's landmark 1954 Brown v. Board of Education ruling that "separate but equal" schools for black and white students were unconstitutional. The Jim Crow Study Group, Law, Criminal Justice and Security Program in the University of Arizona has recently released their report "Still on the Books: Jim Crow[52] and Segregation Laws Fifty Years After Brown V. Board of Education. A Report on Laws Remaining in the Codes of Alabama, Georgia, Louisiana, Mississippi, Missouri, South Carolina, Virginia and

[52] Jim Crow is a term used for legally enforced discrimination against blacks.

West Virginia" in April 2004. They have called for legislative review and repeal of provisions in eight southern states.

The Jim Crow Study Group members find the presence of the following old laws to exist today (as reported in the Jim Crow Study Group web page):

- The Alabama Constitution allows parents to choose to send their children to schools provided for their race only;
- A Georgia law designed to allow teachers at segregated private schools to join desirable state pension programs is still on the books;
- Louisiana has laws still on the books to authorize the closing of integrated public schools, and the payment of salaries of teachers who are imprisoned for resisting integration;
- Mississippi law retains a provision allowing closure of public school if they are integrated;
- Missouri law refers to a segregated reform school for "Negroes";
- South Carolina law still on the books authorizes tuition grants for students in segregated public schools;

Table 2 CS

Model VI: Weighted Segregation Index (θjR ; θjRI ; INC θjI or INC θjI R) = A0 + A1·SD/Logpop + A2·Statelocal$ + A3·D1990 + A4·%Hisp + A5·%Black + A6·Medinc + A7·Dcounty + A8·Dregion

	Central City + Suburbs (N=330)						
	Dependent variable: Weighted segregation index						
	θ^j_R		INC θ^j_I	$\theta^j_{RI<\$50k}$	$\theta^j_{RI>\$50k}$	INC $\theta^j_{I\ B}$	INC $\theta^j_{I\ W}$
	(1)	**(2)**					
Independent variable:							
SD/Logpop	0.0246126	0.0947798	0.0003211**	0.0101201*	0.0125838*	0.0006829**	0.0003624**
	0.2631077	*0.2561991*	*0.0000365*	*0.0076052*	*0.0076224*	*0.0000668*	*0.0000395*
Statelocal$	-0.0097739	-0.0315628	-0.0000165	(0.0593105)**	(0.0587177)**	-0.000045	-0.0000135
	1755412	*0.1746277*	*0.0000163*	*0.0185862*	*0.0186283*	*0.0000299*	*0.0000177*
D1990	-0.7492422	-0.6444045	0.0001694	0.2089154*	0.2030117*	0.0003781*	0.0001993
	3.439859	*3.440528*	*0.0001227*	*0.1167658*	*0.11703*	*0.0002245*	*0.0001328*
%Hisp	0.2233426	-0.517502	0.0001991	0.2759732**	0.3094187**	0.0006161**	0.0001604
	3.570449	*3.514768*	*0.0001567*	*0.132294*	*0.1325934*	*0.0002865*	*0.0001695*
%Black	4.214741	4.072365	0.0000848	0.7136904**	0.7054629**	-0.0000702	0.0000461
	4.875819	*4.876907*	*0.0001107*	*0.1706465*	*0.1710326*	*0.0002024*	*0.0001197*
Medinc	0.0000632						
	0.0000545						
Dcounty1	(3.775462)**	(3.76323)**	0.0000142	(0.1173067)**	(0.1031297)**	0.0000537	-0.0000186
	1.490975	*1.491672*	*0.0000356*	*0.0538028*	*0.0539246*	*0.0000652*	*0.0000385*
Dcounty2	dropped	dropped	dropped	dropped	dropped	dropped	dropped

Table 2 CS (continue)

Model VI: Weighted Segregation Index (θjR ; θjRI ; INC θjI or INC θjI R) = A0 + A1·SD/Logpop + A2·Statelocal$ + A3·D1990 + A4·%Hisp + A5·%Black + A6·Medinc + A7·Dcounty + A8·Dregion

Central City + Suburbs (N=330)

	Dependent variable: Weighted segregation index						
	θ^j_R (1)	θ^j_R (2)	INC θ^j_I	$\theta^j_{RI<\$50k}$	$\theta^j_{RI>\$50k}$	INC $\theta^j_{I\ B}$	INC $\theta^j_{I\ W}$
Independent variable:							
Dregion1	dropped	dropped	-0.000066	dropped	dropped	-0.0001698	(0.0001171)*
			0.000065			*0.000119*	*0.0000704*
Dregion2	0.1282025	-0.033109	dropped	-0.0046059	0.0056092	dropped	dropped
	1.205274	*1.197872*		*0.043789*	*0.0438881*		
Dregion3	3.840808**	3.396497**	0.00000403	-0.0748509	-0.0908771	-0.0000291	0.0000413
	1.651528	*1.60737*	*0.0000506*	*0.0570466*	*0.0571757*	*0.0000925*	*0.0000547*
Dregion4	0.2696937	0.061346	0.00000383	-0.0092345	-0.0181338	0.00000504	-0.0000259
	1.488102	*1.478022*	*0.0000708*	*0.052906*	*0.0530257*	*0.0001295*	*0.0000766*
R square	0.0325	0.0285	0.5752	0.1433	0.1498	0.6667	0.5863
Adjusted R square	0.0022	0.0011	0.5349	0.119	0.1257	0.6351	0.5472

* significant at 10% level

** significant at 5% level

Standard errors are in italics

Coefficients in parenthesis are statistically significant negative coefficients

Table 2 S

Model IV: Weighted Segregation Index (θjR ; θjRI ; INC θjI or INC θjI R)
=A0 + A1·SD/Logpop + A2·Statelocal$ + A3·D1990 + A4·%Hisp + A5·%Black + A6·Medinc + A7·Dcounty + A8·Dregion

	Suburbs (N=323)						
	Dependent variable: Weighted segregation index						
	θ^j_R (1)	**θ^j_R (2)**	**INC θ^j_I**	**$\theta^j_{RI<\$50k}$**	**$\theta^j_{RI>\$50k}$**	**INC $\theta^j_{I\,B}$**	**INC $\theta^j_{I\,W}$**
Independent variable:							
SD/Logpop	0.0972583	0.1170439*	0.0001087**	0.1166962**	0.1346879**	0.0003782**	0.0001071**
	0.0700291	*0.0685737*	*0.0000077*	*0.070518*	*0.0051792*	*0.0001135*	*8.75E-06*
Statelocal$	-0.0193291	-0.0240081	-0.00000378	-0.0246902	-0.0025859	-0.00000426	-3.39E-06
	0.046928	*0.0468622*	*0.00000521*	*0.0484549*	*0.0035037*	*0.0000281*	*5.93E-06*
D1990	0.044533	0.0834361	0.0001505	0.1391275	0.1373888**	*0.0007718*	0.0001509
	0.8958872	*0.08966122*	*0.0001001*	*0.9179009*	*0.0673114*	*0.000919*	*0.0001145*
%Hisp	-0.2739517	-0.267793	0.0001708**	-0.2762189	0.0499396	0.0005219	0.0001601*
	0.7692555	*0.7702618*	*0.000084*	*0.7960036*	*0.0565232*	*0.0008984*	*0.0000955*
%Black	0.2521556	0.3044412	0.0001346	0.3236016	0.0271378	-0.0001414	0.0000915
	1.130012	*1.130847*	*0.0001275*	*1.168145*	*0.0857807*	*0.0010738*	*0.0001452*
Medinc	0.0000196						
	0.0000145						
Dcounty1	(1.008091)**	(1.006696)**	0.0000496	dropped	0.0302131	0.0001081	0.0000307
	0.3969154	*0.3974403*	*0.0000445*		*0.0299696*	*0.0003208*	*0.0000513*
Dcounty2	dropped	dropped	dropped	1.047071**	dropped	dropped	dropped
				0.4119827			

Table 2 S(continue)

Model IV: Weighted Segregation Index (θjR ; θjRI ; INC θjI or INC θjI R)
=A0 + A1·SD/Logpop + A2·Statelocal$ + A3·D1990 + A4·%Hisp + A5·%Black + A6·Medinc + A7·Dcounty + A8·Dregion

	Suburbs (N=323)						
	Dependent variable: Weighted segregation index						
	θ^J_R (1)	**θ^J_R (2)**	**INC θ^J_I**	**$\theta^J_{RI<\$50k}$**	**$\theta^J_{RI>\$50k}$**	**INC $\theta^J_{I\ B}$**	**INC $\theta^J_{I\ W}$**
Independent variable:							
Dregion1	dropped	dropped	(0.0000986)**	(1.258975)**	dropped	dropped	dropped
			0.0000478	*0.4415837*			
Dregion2	0.1183274	0.068737	-0.0000649	(1.196367)**	0.0721228**	0.0000947	0.0000425
	0.3235168	*0.3218569*	*0.0000441*	*0.4074993*	*0.0243688*	*0.0003887*	*0.0000412*
Dregion3	1.373651**	1.2208**	dropped	dropped	0.1415752**	0.0004453	0.0001242**
	0.4425329	*0.4284304*			*0.0321634*	*0.0004103*	*0.0000548*
Dregion4	0.2072115	0.0982478	0.000066	(1.154216)**	0.1137478**	0.0010431**	0.0001952**
	0.3656725	*0.3571531*	*0.0000471*	*0.4365311*	*0.0271375*	*0.0004057*	*0.0000458*
R square	0.0472	0.0416	0.4775	0.0418	0.7419	0.2377	0.4196
Adjusted R square	0.0166	0.014	0.4625	0.0143	0.7346	0.1663	0.4028

* significant at 10% level

** significant at 5% level

Standard errors are in italics

Coefficients in parenthesis are statistically significant negative coefficients

Table 2 C

Model IV: Weighted Segregation Index (θjR ; θjRI ; INC θjI or INC θjI R)

=A0+A1·SD/Logpop+A2·Statelocal$+A3·D1990+A4·%Hisp+A5·%Black+A6·Medinc+A7·Dcounty+A8·Dregion

	Central City (N=201)						
	Dependent variable: Weighted segregation index						
	θ^j_R (1)	**θ^j_R (2)**	**INC θ^j_I**	**$\theta^j_{RI<\$50k}$**	**$\theta^j_{RI>\$50k}$**	**INC $\theta^j_{I\ B}$**	**INC $\theta^j_{I\ W}$**
Independent variable:							
SD/Logpop	1.530844**	1.138844**	0.0659341	1.152621**	1.224847**	0.0078125**	-0.0049715
	0.4328536	*0.2788418*	*0.0592967*	*0.282922*	*0.2880568*	*0.0011024*	*0.0055343*
Statelocal$	-0.005532	-0.0084379	0.0012749	-0.0082456	-0.0053327	0.0000586	0.0003622
	0.0466645	*0.0231214*	*0.0049553*	*0.0233938*	*0.0238855*	*0.0000771*	*0.000445*
D1990	-0.534016	-0.2710381	-0.0040224	-0.2872666	-0.1812033	0.0030122**	-0.0018987
	0.3862609	*0.3093725*	*0.0659165*	*0.322023*	*0.395965*	*0.0013403*	*0.0064295*
%Hisp	0.2719309	0.1733091	-0.0036316	0.1698474	0.0663249	-0.001034	0.0065661
	0.3695282	*0.3043225*	*0.0647564*	*0.3081141*	*0.3143796*	*0.0012646*	*0.0063979*
%Black	0.1356426	0.169885	0.0187324	0.181774	0.1554591	-0.0013414	-0.0002396
	0.3654156	*0.2936074*	*0.0625136*	*0.3059105*	*0.3033104*	*0.0011361*	*0.0060735*
Medinc	9.67E-06						
	6.18E-06						
Dcounty1	0.0438639	-0.0040219	-0.011582	-0.0112436	-0.0064002	0.000559	0.0000108
	0.159377	*0.1391443*	*0.0298445*	*0.1469823*	*0.1437427*	*0.000501*	*0.0030297*
Dcounty2	dropped	dropped	dropped	dropped	dropped	dropped	dropped

Table 2 C(continue)

Model IV: Weighted Segregation Index (θjR ; θjRI ; INC θjI or INC θjI R)
=A0+A1·SD/Logpop+A2·Statelocal$+A3·D1990+A4·%Hisp+A5·%Black+A6·Medinc+A7·Dcounty+A8·Dregion

	Central City (N=201)						
	Dependent variable: Weighted segregation index						
	θ^j_R (1)	θ^j_R (2)	INC θ^j_I	$\theta^j_{RI<\$50k}$	$\theta^j_{RI>\$50k}$	INC $\theta^j_{I\ B}$	INC $\theta^j_{I\ W}$
Independent variable:							
Dregion1	0.1055089	0.0351952	-0.0023507	dropped	0.0295759	(0.0010419)*	-0.000596
	0.1688554	*0.1320039*	*0.0280966*		*0.1363663*	*0.0005454*	*0.0027259*
Dregion2	0.2362038	0.1737346	0.036138	0.1398246	0.1711174	-0.0007522	0.0005513
	0.1526409	*0.1184069*	*0.0252*	*0.1012845*	*0.12232*	*0.0005416*	*0.0024917*
Dregion3	0.091027	dropped	dropped	-0.0265166	dropped	-0.0009236	dropped
	0.1709691			*0.1371141*		*0.0005517*	
Dregion4	dropped	-0.0548539	-0.0089482	-0.0916941	0.0021242	dropped	0.002689
		0.1402769	*0.029855*	*0.1246701*	*0.1449127*		*0.0028607*
R square	0.1313	0.1154	0.0457	0.1165	0.1212	0.5271	0.0545
Adjusted R square	0.0741	0.0737	0.0002	0.074	0.0798	0.4726	-0.0063

* significant at 10% level
** significant at 5% level
Standard errors are in italics
Coefficients in parenthesis are statistically significant negative coefficients

- Virginia law still contains provisions allowing suspension of compulsory education laws if schools are integrated;
- A West Virginia statute that was used to limit the number of African-Americans hired as public school supervisors is still on the books.

NJ-NY-CT-PA CMSA Analysis

Due to endogenous problem discussed in earlier empirical framework section, median home values are predicted by the following IV equation:

$$\text{Medhome} = 37092.9 + 226886.9 \bullet D_{NY} + 18706.37 \bullet D_{NJ} + 45245.55 \bullet \text{Dtransit}$$

(28332.03)	(12477.99)	(10238.3)
t=8.008	t=1.499	t=4.419

Table 3 indicates that zoning measure has a positive impact on segregation. The tighter and higher the minimum lot size requirement, the higher the segregation level. At 10% level of test, the dependent variable PERMINCθ^{i}_{I}, which is the permanent income inequality between black and white population, is highly responsive to changes in MLS[53]. However, the effect disappears at a higher level of significance test of 5%. While zoning ordinance exhibits statistically significant positive impact on income segregation, stricter MLS also seems to exert positive influence of similar magnitude on racial segregation with and without direct control for income level (see Table 3). The three statistically significant coefficient of MLS are each at approximately 0.000003 [Table 3: θ^{i}_{R} (1) and (2) and θ^{i}_{RI} (2)]. Working in an opposite direction, educational funding and aid reduce

[53] PERMINCθ^{i}_{I} has a mean of 35,142 and a standard deviation of 30,859. MLS has a standard deviation of 12,900 and θ^{i}_{R} has a mean of 0.775 and standard deviation of 0.212.

segregation. Thus a higher ratio of State-to-Local revenue leads to a more diverse mix of residents by race and color. Empirical results indicate that racial segregation not considering income level is more sensitive to Statelocal$ than racial segregation of families with income $50,000 or above, for every dollar increase in education aid.

Prior to turning the discussion to the results (Table 4) generated for the county model (IX: Segregation Index (θ^c_R; θ^c_{RI}; INC θ^c_I or INC θ^c_{IR}) = F0 + F1•MLSHat + F2•SD/Logpop + F3•%Hisp + F4•%Black + F5•Statelocal$ + F6•Medinc), note that the instrumental variables (2SLS) regression generated the following relationship, whereby MLSHat (predicted values for median MLS) is predicted:

$$\text{MedMLS} = 14985.87 - 11718.93 \bullet \text{WorkCounty} - 2291.512 \bullet D_{NJ} + 4034.876 \bullet D_{CT}$$

(-11718.93)	(-2291.512)	(4034.876)
t=-2.170	t=-1.687	t=1.984

Interestingly, the coefficient for WorkCounty is significant and negative as anticipated. Where there is a high number of people who work in the county they reside, buildable residential land lot size is lower as higher portion of the county's land might have been planned for commercial and industrial developments

Table 3

N=509 school districts in NY-NJ-CT-PA CMSA

Model (VII): Segregation Index (θiR; θiRI; INC θiIBW or PERMINC θiI) = D0 + D1·MLS + D2·Statelocal$ + D3·Medinc + D4·PredictMedhome

	Dependent Variables (Simple Proportions as Proxies for Racial and Income Segregation within School District)					
	θ^i_R		**θ^i_{RI} [1]**	**INC θ^i_{IBW}**	**PERMINC θ^i_I**	
	(1)	(2)			(1)	(2)
PredictMedhome	1.27E-08	0.000000287	0.000000386**	0.051494*		0.2516766**
	0.000000203	*0.00000019*	*0.000000185*	*0.0305748*		*0.1207253*
MLS	0.000003**	0.000003**	0.000003**	0.3540014**	0.5932769*	0.5536414*
	0.000000635	*0.000000639*	*0.000000621*	*0.1027565*	*0.4066283*	*0.4057362*
Statelocal$	(0.0870156)**	(0.1033781)**	(0.1004935)**	(6671.223)**	(39339.44)**	(33500.26)**
	0.0117709	*0.011151*	*0.0108317*	*1792.398*	*6520.916*	*7077.316*
Medinc	0.00000149**					
	0.000000382					
R Square	0.2622	0.24	0.2454	0.0773	0.0749	0.0827
Adjusted R Square	0.2564	0.2354	0.241	0.0718	0.0712	0.0773

Notes:

i=school district

[1] segregation between white and black famillies with income $50,000 and above

* significant at 10% level

** significant at 5% level

Standard errors are in italics

Coefficients in parenthesis are negative coefficients which are statistically significant

Results in table 4 show that the fragmentation of governmental units (SD/Logpop) causes some form of racial segregation and income segregation among blacks. A two standard deviation[54] (1.97) increase in school districts per log of population raises racial segregation θ^{c}_{R} by 0.062% to 0.077% (see Table 4 for the respective racial segregation index). At 10% level of test, racial segregation between black and white families, each earning income \$50,000 or more, is aggravated when SD/Logpop increases. These results are in line with Baird and Landon's (1972) arguments that the degree of homogeneity within the urban area increases as the number of jurisdiction increases, upon a Tiebout-type urban system. On the other hand, the role of zoning ordinance, if plausibly measured as MLSHat[55], appears to be insignificant in the micro NJ-NY-CT CMSA county model (IX)[56]. Readers may suspect that the instruments for the instrumental variable model of MLS are weak, thus leads to insignificant results when segregation indices are regressed on MLSHat. To overcome this suspicion, I directly enter the degree of zoning regulation (MedMLS) into the CMSA county regression model (Table 4). A two standard deviation increase in the median minimum lot size leads to less than 0.061% increase in racial or income segregation. Although MedMLS is a significant and positive factor of segregation, its magnitude seems relatively less than governmental fragmentation. Hence, judging from these results, though limited,

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[54] SD/Logpop in the NJ-NY-CT-PA CMSA (county) model has a mean of 1.65 and a standard deviation of 0.987. Racial segregation index represented by θ^{C}_{R} reports a mean of 0.454 and standard deviation of 0.173. Also see summary statistics appended.

[55] MLSHat and MedMLS have very weak correlation with SD/Logpop.

[56] Note that this is true for most of the scenarios empirically tested in this paper, except for one case which dependent variable is racial segregation controlled for income. The MLSHat coefficient of 0.00000016 is significant at 10% level test but its magnitude is weaker than jurisdictional fragmentation (00003542 in Table 4 θ^{i}_{RI}).

governmental fragmentation appears to be the dominant agent for residential segregation, rather than the MLS policies undertaken by their local governments.

Exclusionary zoning law remains statistically insignificant when segregation indices proxied by simple ratios are regressed on minimum lot size (Table 5). The number of school districts per log capita, however, shows positive and significant effect on racial segregation. Harrison (1982), otherwise, finds in his New Jersey municipality study that "zoning laws do seem closely connected with patterns of racial imbalance in housing opportunities". His partial correlation models consistently discover that higher rates of growth in racial segregation are found in those counties in which the average community imposed higher minimum lot size restrictions.

Appendix I summarized regression results of the same New York metro models with SD per Capita, which is the number of school district per person as one of the predictor variables. Parameters of SD per Capita are similarly positive and significant. The predicted zoning measure (MLSHat) demonstrates significant positive effect on racial segregation, however at a weaker magnitude than Tiebout choice. This New York metro area study clearly indicates the dominant role jurisdictional structure, in terms of the number of communities, plays in determining how people vote with their feet. Public good production and distribution efficiency aside, equity in terms of spatial distribution particularly by race is a prominent outcome of multiple jurisdiction local public finance.

Selected Descriptive Statistics

Panel I: Summary Statistics for Counties in the NJ-NY-CT-PA CMSA Model

Variable	Mean	Standard Deviation
MLSHAT	7646.957	1951.657
SD/Logpop	1.652563	0.9874516
MedMLS	7646.957	3158.737
Medinc	71347.43	12379.02
%Black	0.0434783	0.0511369
%Hispanic	0.0860401	0.0859194
State-to-local revenue	0.5369617	0.3418445
Weighted racial segregation for families earning income $50,000 or more θ^{c}_{RI}	0.0014357	0.0008242
Weighted income segregation INC θ^{c}_{I}	0.0001914	0.0001558

Table 4 (weighted segregation indices tabulated using Taeuber formula)

Model (IX): Segregation Index (θcR; θcRI; INC θcI or INC θcIR) = F0 + F1·MLSHat + F2·SD/Logpop + F3·%Hisp + F4·%Black + F5·Statelocal$ + F6·Medinc

N=23 counties	θ^{c}_{R}			INC θ^{c}_{IB}		INC θ^{c}_{IW}	
	(1)	(2)	(3)	(1)	(2)	(1)	(2)
MLSHAT	0.0000001	0.000000133		4.37E-08		1.05E-08	
	0.0000001	*0.000000052*		*6.85E-08*		*1.31E-08*	
MedMLS			0.0000000979**		0.000000069**		0.0000000107**
			2.81E-08		*1.91E-08*		*4.13E-09*
SD/Logpop	0.0003531*	0.0003882**	0.0003143**	0.0002412**	0.0002393**	0.0000213	0.0000173
	0.0000204	*0.0001876*	*0.0001313*	*0.0001349*	*0.0000891*	*0.0000257*	*0.0000193*
% Hisp	(0.00051347)*	(0.0044108)*	-0.0003668	(0.0033175)*	-0.0002426	-0.0001101	0.0003486
	0.0030018	*0.0025804*	*0.002448*	*0.0018565*	*0.0016611*	*0.000354*	*0.0003593*
% Black	0.0000174	-0.0007383	0.0011082	-0.0026464	-0.0012244	0.0005855	0.0007964*
	0.0034951	*0.0030899*	*0.0025626*	*0.002223*	*0.0017389*	*0.0004239*	*0.0003762*
Medinc	1.37E-08						
	2.71E-08						
Statelocal$	0.0010557	0.0005807	0.0002385	0.0005109	0.0002791	-0.0000376	-0.0000741
	0.0011584	*0.0006555*	*0.0005364*	*0.0004716*	*0.000364*	*0.0000899*	*0.0000787*
R Square	0.3769	0.3669	0.588	0.3581	0.6284	0.1844	0.3922
Adjusted R Square	0.1432	0.187	0.4668	0.1693	0.5191	-0.0555	0.2134

Notes:
c=county
[1] segregation between white and black famillies with income $50,000 and above
* significant at 10% level
** significant at 5% level
Standard errors are in italics
Coefficients in parenthesis are negative coefficients which are statistically significant

Table 4 (weighted segregation indices tabulate using Taeuber formula) continue

Model (IX): Segregation Index (θcR; θcRI; INC θcI or INC θcIR) = F0 + F1·MLSHat + F2·SD/Logpop + F3·%Hisp + F4·%Black + F5·Statelocal$ + F6·Medinc

N=23 counties	**INC θ^c_I**		**θ^c_{RI}** [1]	
	(1)	(2)	(1)	(2)
MLSHAT	-7.58E-11 *2.25E-08*		0.00000016* *9.93E-08*	
MedMLS		1.05E-08 *7.81E-09*		0.0000000967** *3.12E-08*
SD/Logpop	0.0000198 *0.0000442*	0.0000263 *0.0000365*	0.0003542* *0.0001957*	0.0002525* *0.000146*
% Hisp	-0.0004748 *0.0006088*	0.0000259 *0.0006804*	(0.0046335)* *0.0026921*	-0.000768 *0.002717*
% Black	0.0003305 *0.0007289*	0.0005642 *0.0007122*	-0.0009089 *0.0032236*	0.000846 *0.0028442*
Medinc				
Statelocal$	0.0000133 *0.0001546*	-0.0000208 *0.0001491*	0.0005846 *0.0006839*	0.0002412 *0.0005954*
R Square	0.0868	0.1752	0.3616	0.5298
Adjusted R Square	-0.1818	-0.0674	0.1738	0.3915

Notes:
c=county
[1] segregation between white and black famillies with income $50,000 and above
* significant at 10% level
** significant at 5% level
Standard errors are in italics
Coefficients in parenthesis are negative coefficients which are statistically significant

Table 5 (weighted segregation indices tabulated by simple ratios)

Model (IX): Segregation Index (θcR; θcRI; INC θcI or INC θcIR) = F0 + F1·MLSHat + F2·SD/Logpop + F3·%Hisp + F4·%Black + F5·Statelocal$ + F6·Medinc

N=23 counties	θ^c_R			INC θ^c_I	
	(1)	(2)	(3)	(1)	(2)
MLSHAT	0.0752494 *0.0880475*	0.0775783 *0.083889*		0.0062666 *0.0043681*	
MedMLS			0.0594687 *0.0437596*		0.0036472 *0.0036348*
SD/Logpop	0.0064694** *0.0025664*	0.006518** *0.0024677*	0.0060517** *0.0024121*	-0.0000465 *0.0001285*	-0.0000836 *0.0001276*
% Hisp	-4533.387 *2985.958*	-4359.8 *2629.221*	-3447.007 *3101.291*	-64.85528 *135.9058*	11.48371 *164.0283*
% Black	-549.275 *3549.178*	-748.6375 *3147.415*	125.2677 *3555.64*	-195.3673 *163.8886*	-122.1888 *188.059*
Medinc	0.0036164 *0.026186*				
Statelocal$	772.7188 *1163.926*	645.9879 *695.0424*	495.6067 *711.0488*	-20.48797 *36.19145*	-32.84166 *37.60862*
R Square	0.3669	0.3661	0.3498	0.3356	0.2968
Adjusted R Square	0.1295	0.1797	0.1585	0.1402	0.09

c=county

[1] segregation between white and black famillies with income $50,000 and above

* significant at 10% level

** significant at 5% level

Standard errors are in italics

Coefficients in parenthesis are negative coefficients which are statistically significant

VI. CONCLUSION & FURTHER STUDIES

The number of jurisdictions in an area, such as the Metropolitan Statistical Area, has a statistically significant role in determining the racial and income distribution in America. There is strong evidence that jurisdictional fragmentation has greater positive effects on racial segregation for higher income households than other income classes. A counter argument for such distinctive segregation results for the affluent group could be there are fewer blacks in such high-income reporting areas. Nevertheless, there is also evidence that the higher the number of school districts in a MSA, the more homogeneous are the school district jurisdictions in the MSA area is, in terms of racial mix among poor or middle income households.

Jurisdictional fragmentation as proxied by SD/Logpop (school district per MSA log capita) did not exhibit any significant impact on income segregation in central cities unless it is income diversity among the black minority group (INC $\theta^{c}_{IR,}$ where R=Black); whereby the parameter of SD/Logpop is a statistically significant positive 0.0078. Compared to the overall MSA, central city income segregation among black population appears to respond more; and at a positive direction to jurisdictional fragmentation. The SD/log pop parameters are especially more significant when income level is being considered. When the models take into account for income, either above or below the $50,000 threshold, suburban racial segregation is greater with more districts. A larger number of jurisdictions thus makes it easier to achieve racial homogeneity. Therefore, in evaluating the efficiency of public goods provision and production in a Tiebout setting, one must prudently weigh the role of the number of communities or clubs on racial segregation and the potential detrimental outcomes of this segregation.

This paper also finds evidence that exclusionary zoning measures have a statistically significant positive effect on sorting of people by race and income. Using a sample from the New York metro area, the stricter or higher the minimum lot size requirement, the higher the racial and income segregation among residents. In a similar direction, jurisdictional fragmentation in the NY-NJ-CT CMSA impacts racial division positively, with and without any control for income. The most striking results from the micro-level CMSA analysis is the relatively weaker effect zoning ordinance exhibits on residential segregation compared to impact coming from the number of school districts per capita.

Future researches ideally shift some focus on the overall restrictiveness of zoning and the policy implications of zoning ordinances on residential choice with a larger set of data that includes Houston, Texas, an unzoned large city. It will be useful to know and research information on when the current zoning requirement was put into place; presumably, the longer the time since it happened, the more homogeneous the housing stock and income. How privately provided academic services can affect choice and residential segregation with zoning laws in play, will be an area worth exploring.

Appendix A: Cutler, Glaeser and Vigdor, "The Rise and Decline of the American Ghetto", 1999, The Journal of Political Economics.

Summary of Statistics for Measure 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	0.485	0.679	0.726	0.559	0.214	0.371	0.421	0.255
Weighted by Black Population	0.455	0.717	0.79	0.659	0.227	0.463	0.612	0.467
Matched Cities	0.390	0.610	0.697	0.559	0.042	0.219	0.363	0.255
By Region (Matched Index):								
Northwest	0.394	0.601	0.678	0.592	0.000*	0.098	0.253	0.215
Midwest	0.431	0.645	0.745	0.621	0.012	0.219	0.39	0.309
South	0.387	0.611	0.689	0.552	0.213	0.385	0.466	0.32
West	....	....	0.683	0.444	....	....	0.23	0.084
	Correlations Over Time							
1890	1.000				1.000			
1940	0.607	1.000			0.309	1.000		
1970	0.362	0.46	1.000		0.229	0.519	1.000	
1990	0.47	0.447	0.676	1.000	0.142	0.501	0.875	1.000
Correlation Between Dissimilarity and Isolation	0.385	0.657	0.633	0.791	....	....	....	....

Note:

Statistics include all cities, except as noted. Indices for 1890 and 1940 are ward-based indices adjusted for comparability to tract-based indices.

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.

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

Source: Cutler, Glaeser and Vigdor, "The Rise and Decline of the American Ghetto", 1999, The Journal of Political Economics.

Appendix B: Number of School Districts by State, not serving a MSA or has a MSA ID of Zero (0)

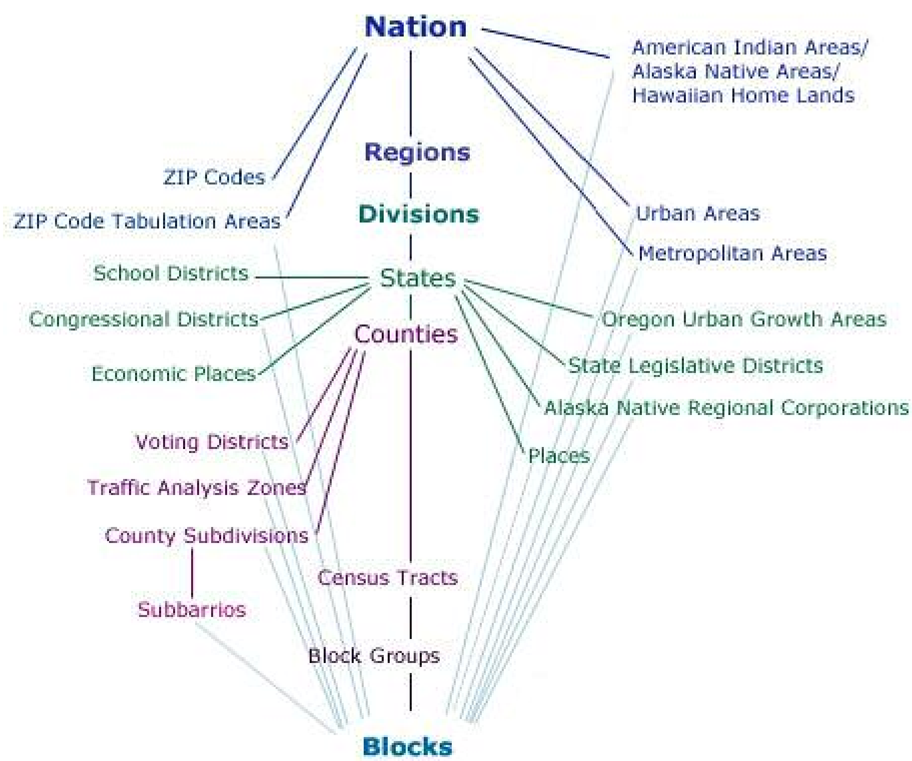
State	# School District	State	# School District
AK	53	MT	480
AL	73	NC	100
AR	255	ND	227
AZ	137	NE	658
CA	239	NH	126
CO	136	NM	75
DE	7	NV	14
FL	31	NY	213
GA	130	OH	271
IA	328	OK	407
ID	99	OR	128
IL	436	PA	168
IN	159	SC	55
KS	250	SD	182
KY	134	TN	96
LA	43	TX	611
MA	11	UT	30
MD	9	VA	89
ME	232	VT	290
MI	285	WA	179
MN	270	WI	253
MO	374	WV	44
MS	130	WY	53
		Total	8570

Source: NCES, 2000

Appendix C:

Census Geography

Through its many surveys, the Census Bureau reports data for a wide variety of **geographic types**, ranging from the entire *United States* down to a *Census Block*. The geographic types that a survey reports on will depend upon the survey's purpose, and how the data were collected.



The diagram shows the many geographic types for which data are available in FactFinder. In general, larger geographic types (e.g., *state*) are shown near the top and smaller geographic types (e.g., *census tract*) are shown towards the bottom.

With connecting lines, the diagram also shows the hierarchical relationships between geographic types. For example, a line extends from *states* to *counties* because a state is comprised of many counties, and a single county can never cross a state boundary. To uniquely name a county, the state name must be included (e.g., Orange County, California; Orange County, Florida).

If no line joins 2 geographic types, then an absolute and predictable relationship does not exist between them. For example, many places are confined to one county. However, some places extend over more than one county, such as New York City. Therefore, an absolute hierarchical relationship does not exist between *counties* and *places*, and any tabulation involving both these geographic types may represent only a part of one county or one place.

Notice that many lines radiate from *blocks*, indicating that most geographic types can be described as a collection of blocks, the smallest geographic unit for which the Census Bureau reports data. However, only two of these lines also describe the path by which a block is uniquely named. That is, the path through the *Block Group* or through the *Tribal Block Group*.

Source: Duplicate from the FactFinder of US Census Bureau, 2004

Appendix D: List of Cities and Towns in the NY-NJ-CT CMSA

FIPS CODE	Area Title	Definition	Central Cities
0875	Bergen-Passaic, NJ PMSA	Bergen County Passaic County	No Central City
1160	Bridgeport, CT PMSA (Former title: Bridgeport-Milford, CT)	Fairfield County (part): Bridgeport city Easton town Fairfield town Monroe town Shelton city Stratford town Trumbull town New Haven County (part): Ansonia city Beacon Falls town Derby city Milford city Oxford town Seymour town	Bridgeport, CT
1930	Danbury, CT PMSA	Fairfield County (part): Bethel town Brookfield town Danbury city New Fairfield town Newtown town Redding town Ridgefield town Sherman town	Danbury, CT

Appendix D:	**Continue**	Litchfield County (part): Bridgewater town New Milford town Roxbury town Washington town	
2281	Dutchess County, NY PMSA (Former title: Poughkeepsie, NY)	Dutchess County	Poughkeepsie, NY
33640	Jersey City, NJ PMSA	Hudson County	Jersey City, NJ Bayonne, NJ
5015	Middlesex-Somerset-Hunterdon, NJ PMSA	Hunterdon County Middlesex County Somerset County	No Central City
5190	Monmouth-Ocean, NJ PMSA	Monmouth County Ocean County	Dover Township, NJ
5380	Nassau-Suffolk, NY PMSA	Nassau County Suffolk County	No Central City
5480	New Haven-Meriden, CT PMSA	Middlesex County (part): Clinton town Killingworth town Bethany town Branford town Cheshire town East Haven town Guilford town Hamden town Madison town Meriden city New Haven city	New Haven, CT Meriden, CT

Appendix D:	**Continue**	North Branford town North Haven city Orange town Wallingford town West Haven city Woodbridge town	
5600	New York, NY PMSA	Bronx County Kings County New York County Putnam County Queens County Richmond County Rockland County Westchester County	New York, NY White Plains, NY
5640	Newark, NJ PMSA	Essex County Morris County Sussex County Union County Warren County	Newark, NJ
5660	Newburgh, NY-PA PMSA (Former code and title: 5950 Orange County, NY)	Orange County, NY Pike County, PA	Newburgh, NY
8040	Stamford-Norwalk, CT PMSA (Former title: Stamford, CT PMSA; includes former Norwalk, CT PMSA)	Fairfield County (part): Darien town Greenwich town New Canaan town Norwalk city Stamford city Weston city Westport town Wilton town	Stamford, CT Norwalk, CT

Appendix D:	**continue**		
8480	Trenton, NJ PMSA	Mercer County	Trenton, NJ
8880	Waterbury, CT PMSA	Litchfield County (part): Bethlehem town Thomaston town Watertown town Woodbury town New Haven County (part): Middlebury town Naugatuck borough Prospect town Southbury town Waterbury city Wolcott town	Waterbury, CT
Source: Metropolitan Areas 1999 Lists I-IV", Statistical Policy Office, Office of Management and Budget			

Appendix E

Region	Area	States
East	New England	Connecticut
		Maine
		Massachusetts
		New Hamsphire
		Rhode Island
		Vermont
	Mideast[1]	Delaware
		Maryland
		New Jersey
		New York
		Pennsylvania
Midwest	Great Lakes	Illinois
		Indiana
		Michigan
		Ohio
		Wisoconsin
	Plains	Iowa
		Kansas
		Minnesota
		Missouri
		Nebraska
		North Dakota
		South Dakota
	Rocky Mountain	Colorado
		Idaho
		Montana
		Utah
		Wyoming

Region	Area	States
South	Southeast	Alabana
		Arkansas
		Florida
		Georgio
		Kentucky
		Louisiana
		Mississippi
		North Carolina
		South Carolina
		Tennessee
		Virginia
		West Virginia
West[2]	Southwest	Arizona
		New Mexico
		Oklahoma
		Texas
	Far West	California
		Nevada
		Oregon
		Washington

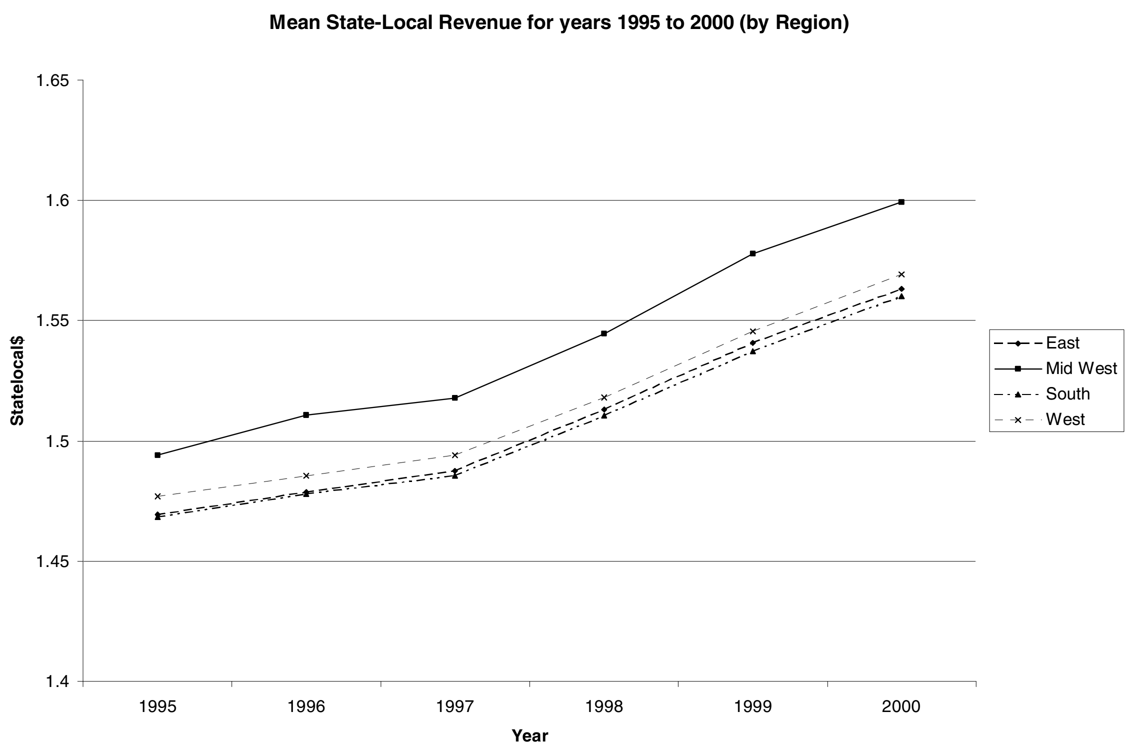
[1]District Columbia is excluded. The Bureau of the Census classifies the District of Columbia as a municipality

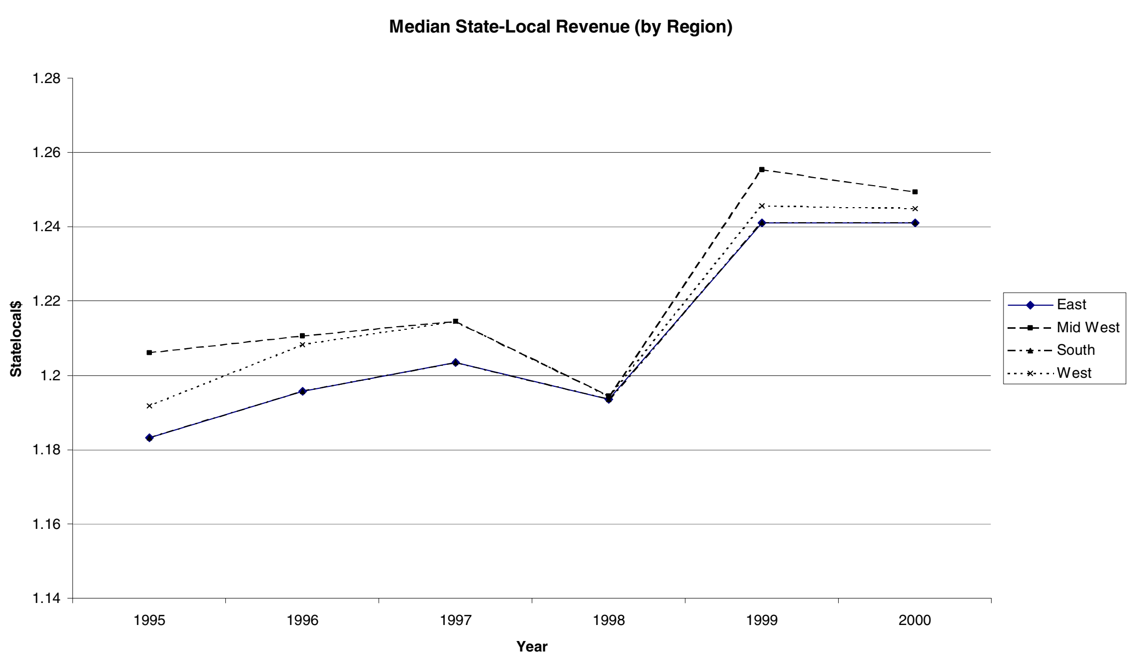
[2]Alaska and Hawaii are excluded from the Far West

Source: Advisory Commission on Intergovernmental Relations

Source: US Census, Office of Management and Budget

Appendix F


Mean State-Local Revenue for years 1995 to 2000 (by Region)
1.65
1.6
1.55
1.5
1.45
1.4
Statelocal$
1995
1996
1997
1998
1999
2000
Year
East
Mid West
South
West


Median State-Local Revenue (by Region)
1.28
1.26
1.24
1.22
1.2
1.18
1.16
1.14
Statelocal$
1995
1996
1997
1998
1999
2000
Year
East
Mid West
South
West

Appendix F

Region: East

Year	*1995*	*1996*	*1997*	*1998*	*1999*	*2000*
Mean	1.469402274	1.478763827	1.487577183	1.512973168	1.540727797	1.563167533
Standard Error	0.122150053	0.119312319	0.119168984	0.122075053	0.130161505	0.130648036
Median	1.18315508	1.195672878	1.203437257	1.193503304	1.241094723	1.241094723
Standard Deviation	2.195305272	2.144304947	2.141728907	2.193957363	2.339288694	2.348032727
Sample Variance	4.819365236	4.598043708	4.58700271	4.81344891	5.472271594	5.513257688
Kurtosis	234.9941622	229.7318695	231.9047771	227.348362	247.177617	242.9189133
Skewness	14.2520662	14.02903379	14.11716371	13.95517761	14.79305136	14.60936213
Range	37.78725178	36.73550797	36.76104557	37.48239581	40.61609979	40.61274865
Minimum	0.034661229	0.051256489	0.075144901	0.057896939	0.147896681	0.151247818
Maximum	37.82191301	36.78676446	36.83619048	37.54029275	40.76399647	40.76399647
Sum	474.6169344	477.6407162	480.4874302	488.6903334	497.6550785	504.903113
Count	323	323	323	323	323	323
Confidence Level(95.0%)	0.240313106	0.234730262	0.234448271	0.240165555	0.256074515	0.257031696

Source: CCD, National Public Education Financial Survey, NCES 2000

Appendix F (continue)

Region: Mid West

Year	*1995*	*1996*	*1997*	*1998*	*1999*	*2000*
Mean	1.494152277	1.510644934	1.517913741	1.544424894	1.577845905	1.599348629
Standard Error	0.138461429	0.135401451	0.135274266	0.138555413	0.148018295	0.148791299
Median	1.20611382	1.210527354	1.21451949	1.194366984	1.255309448	1.249372411
Standard Deviation	2.321036501	2.269741911	2.267609909	2.322611954	2.481238757	2.494196676
Sample Variance	5.387210438	5.151728341	5.142054698	5.394526289	6.156545768	6.221017061
Kurtosis	216.0204324	209.9969411	211.8048289	207.728604	224.0571364	218.8979741
Skewness	13.83635643	13.56453327	13.64380072	13.48947954	14.21869135	13.9815238
Range	37.78725178	36.73550797	36.76104557	37.48239581	40.40232727	40.40571744
Minimum	0.034661229	0.051256489	0.075144901	0.057896939	0.361669199	0.35827903
Maximum	37.82191301	36.78676446	36.83619048	37.54029275	40.76399647	40.76399647
Sum	419.8567897	424.4912265	426.5337612	433.9833951	443.3746993	449.4169647
Count	281	281	281	281	281	281
Confidence Level(95.0%)	0.272557717	0.266534229	0.266283869	0.272742721	0.291370158	0.292891797

Source: CCD, National Public Education Financial Survey, NCES 2000

Appendix F (continue)

Region: South

Year	*1995*	*1996*	*1997*	*1998*	*1999*	*2000*
Mean	1.468489163	1.47789007	1.485418214	1.510538882	1.53730494	1.560254142
Standard Error	0.121482221	0.118661974	0.118497679	0.121381442	0.129407256	0.129894279
Median	1.18315508	1.195672878	1.203437257	1.193503304	1.241094723	1.241094723
Standard Deviation	2.190051883	2.139209167	2.136247292	2.18823507	2.332922485	2.341702422
Sample Variance	4.796327252	4.57621586	4.563552491	4.788372721	5.442527323	5.483570232
Kurtosis	235.7999371	230.5039999	232.8914794	228.3673801	248.4180314	244.1002113
Skewness	14.26669278	14.04271974	14.14033597	13.98048941	14.82591548	14.6400607
Range	37.78725178	36.73550797	36.76104557	37.48239581	40.61609979	40.61274865
Minimum	0.034661229	0.051256489	0.075144901	0.057896939	0.147896681	0.151247818
Maximum	37.82191301	36.78676446	36.83619048	37.54029275	40.76399647	40.76399647
Sum	477.2589781	480.3142729	482.7609197	490.9251367	499.6241053	507.0825962
Count	325	325	325	325	325	325
Confidence Level(95.0%)	0.238993716	0.233445405	0.233122184	0.238795453	0.254584751	0.255542879

Source: CCD, National Public Education Financial Survey, NCES 2000

Appendix F (continue)

Region: West

Year	*1995*	*1996*	*1997*	*1998*	*1999*	*2000*
Mean	1.476867676	1.485576574	1.494041035	1.517962168	1.545516649	1.569296647
Standard Error	0.122160726	0.119321897	0.11915652	0.122055338	0.130132602	0.130704064
Median	1.191728631	1.208196086	1.21451949	1.194366984	1.245535298	1.24492695
Standard Deviation	2.195497098	2.144477081	2.141504892	2.193603035	2.33876925	2.349039683
Sample Variance	4.820207506	4.598781951	4.586043202	4.811894274	5.469841606	5.517987435
Kurtosis	234.714886	229.4767995	231.830492	227.368643	247.2772017	242.3436478
Skewness	14.23841045	14.01640156	14.11268058	13.95520689	14.79687046	14.58333129
Range	37.78725178	36.73550797	36.76104557	37.48239581	40.61609979	40.61274865
Minimum	0.034661229	0.051256489	0.075144901	0.057896939	0.147896681	0.151247818
Maximum	37.82191301	36.78676446	36.83619048	37.54029275	40.76399647	40.76399647
Sum	477.0282594	479.8412334	482.5752543	490.3017802	499.2018778	506.8828169
Count	323	323	323	323	323	323
Confidence Level(95.0%)	0.240334105	0.234749105	0.234423749	0.240126768	0.256017653	0.257141925

Source: CCD, National Public Education Financial Survey, NCES 2000

Appendix G
Alternate MSA Model using Segregation Indices from US Census and Lewis Mumford Center for Comparative Urban & Regional Research
National (N=252)

	Independent Variables					
	SD	Density	D1990	Medinc	R Square	Adj R Square
Dependent variable: Weighted segregation Index						
Gini	0.0000747**	0.00000747**	0.0051627*8		0.583	0.578
	0.00000661	*0.000000928*	*0.0012679*			
Gini	0.0000723**	0.00000709**	0.0051917**	4.01E-08	0.5871	0.5804
	0.00000677	*0.000000956*	*0.0012734*	*2.57E-08*		
Atkinson (0.1)	0.0000119**	0.00000118**	0.0013474**		0.5742	0.569
	0.00000117	*0.000000164*	*0.0002261*			
Atkinson (0.1)	0.0000115**	0.00000126**	0.0013522**	6.63E-09	0.5778	0.571
	0.0000012	*0.000000169*	*0.0002256*	*4.55E-09*		
Atkinson (0.5)	0.0000485**	0.00000497**	0.0049307**		0.5777	0.5726
	0.00000467	*0.000000655*	*0.0009021*			
Atkinson (0.5)	0.0000467**	0.0000047**	0.0049515**	2.88E-08	0.5819	0.5752
	0.00000478	*0.000000675*	*0.0008994*	*1.81E-08*		
Atkinson (0.9)	0.0000717**	0.00000737**	0.0062541**		0.5736	0.5684
	0.00000677	*0.000000957*	*0.0013072*			
Atkinson (0.9)	0.0000692**	0.00000697**	0.0062844**	4.19E-08	0.5779	0.5711
	0.00000693	*0.000000978*	*0.0013033*	*2.63E-08*		
DMUMFORD	0.0064213**	0.0006359**	0.3281133**		0.5919	0.587
	0.000537	*0.0000753*	*0.1037096*			

Appendix G(continue)

Alternate MSA Model using Segregation Indices from US Census and Lewis Mumford Center for Comparative Urban & Regional Research

National (N=252)

	Independent Variables					
	SD	Density	D1990	Medinc	R Square	Adj R Square
Dependent variable: Weighted segregation Index						
DMUMFORD	0.006273**	0.0006131**	0.3298746**	0.00000244	0.5942	0.5876
	0.0005508	*0.0000778*	*0.1036459*	*0.00000209*		
RPOOR	0.0069012**	0.0006646**	0.2897804**		0.5936	0.5887
	0.0005599	*0.0000786*	*0.1081375*			
RMIDDLE	0.0071213**	0.0006391**	0.2824631**		0.6094	0.6047
	0.0005439	*0.0000763*	*0.1050393*			
RAFFLUENT	0.007344**	0.0006526**	0.2434238**		0.6024	0.5976
	0.0005605	*0.0000786*	*0.1082505*			
INCPOORMID	0.0021868**	0.0002027**	0.0508234**		0.5544	0.5491
	0.0001834	*0.0000257*	*0.035418*			
INCPOORAFFL	0.0043436**	0.0003926**	0.0858758**		0.5479	0.5424
	0.0003638	*0.000051*	*0.0702632*			
INCMIDAFFL	0.0023708**	0.0002547**	0.0498896**		0.5294	0.5237
	0.0002381	*0.0000334*	*0.0459789*			

** significant at 5% level

Standard errors are in italics

Summary statistics for Density and SD:	Mean	Standard Deviation	Minimum	Maximum
Density	249.2286	178.8826	5.4	1041.5
SD	19.127	24.56833	1	216

Appendix H.1
Alternate Specification for MSA Model VI

	Central City + Suburbs (N=330)						
	Dependent variable: Weighted segregation index						
	θ^j_R (1)	θ^j_R (2)	INC θ^j_I	$\theta^j_{RI<\$50k}$	$\theta^j_{RI>\$50k}$	INC $\theta^j_{I\,B}$	INC $\theta^j_{I\,W}$
Independent variable:							
SD	0.002437	0.0067666	0.0000236**	0.0007595	0.0009655*	0.0000488**	0.0000267**
	0.0169444	*0.0165137*	*0.00000229*	*0.0005683*	*0.0005694*	*0.00000422*	*0.00000246*
Density	-0.0000234	0.000086	*4.33E-08*	0.00000973	0.00000938	*(0.0000000346)**	*-2.33E-09*
	0.0004959	*0.0004866*	*1.13E-08*	*0.0000171*	*0.0000171*	*2.09E-08*	*1.22E-08*
Statelocal$	-0.0099056	-0.0300002	-0.0000126	(0.0577461)**	(0.0570594)**	-0.0000388	-0.00000916
	0.1758265	*0.1750032*	*0.0000151*	*0.0187227*	*0.0187601*	*0.000028*	*0.0000163*
D1990	-0.782887	-0.7927888	0.0001333	0.1964776*	0.189504*	0.0003475*	0.0001633
	3.468302	*3.469809*	*0.0001141*	*0.1177918*	*0.118027*	*0.0002107*	*0.0001226*
%Hisp	0.2492802	-0.6967514	0.0001273	0.2659283**	0.2988135**	0.0007014**	0.000117
	3.718327	*3.624618*	*0.0001568*	*0.1330978*	*0.1333635*	*0.0002896*	*0.0001685*
%Black	4.220419	3.942903	0.0000756	0.7086166**	0.6993137**	-0.000082	0.0000411
	3.718327	*4.916194*	*0.0001027*	*0.1709107*	*0.1712519*	*0.0001896*	*0.0001103*
Medinc	0.000063						
	0.0000557						
				(0.1174206)**	(0.1031831)**	*0.0000388*	*-0.0000211*
Dcounty1	(3.770706)**	(3.786189)**	0.0000128	0.0538425	0.05395	0.0000605	0.0000352
	1.491028	*1.491618*	*0.0000328*				
Dcounty2	dropped	dropped	dropped	dropped	dropped	dropped	dropped

Appendix H.1(continue)
Alternate Specification for MSA Model VI

	Central City + Suburbs (N=330)						
	Dependent variable: Weighted segregation index						
	θ^j_R **(1)**	θ^j_R **(2)**	**INC** θ^j_I	$\theta^j_{RI<\$50k}$	$\theta^j_{RI>\$50k}$	**INC** $\theta^j_{I\,B}$	**INC** $\theta^j_{I\,W}$
Independent variable:							
Dregion1	dropped	-0.1305936	-0.0000476	dropped	dropped	-0.0000651	-0.0000602
		1.531563	*0.0000711*			*0.0001312*	*0.0000763*
Dregion2	0.1185295	-0.1115995	0.0000147	-0.0005052	0.0095795	0.000026	0.0000419
	1.234905	*1.381517*	*0.0000657*	*0.444006*	*0.0444892*	*0.0001214*	*0.0000706*
Dregion3	3.835901**	3.327153**	0.000015	-0.0696481	-0.0855893	-0.00000528	0.0000798
	1.66714	*1.653331*	*0.0000585*	*0.057653*	*0.0577681*	*0.0001079*	*0.0000628*
Dregion4	0.2525071	dropped	dropped	-0.0042782	-0.0132193	dropped	dropped
	1.534772			*0.0535819*	*0.0536889*		
R square	0.0326	0.0287	0.64	0.1448	0.1518	0.7122	0.6545
Adjusted R square	-0.0009	-0.0018	0.6017	0.1178	0.125	0.6816	0.6177

* significant at 10% level
** significant at 5% level
Standard errors are in italics
Coefficients in parenthesis are statistically significant negative coefficients

Summary statistics for Density and SD:	Mean	Standard Deviation	Minimum	Maximum
Density	437.8882	924.359	5.4	13043.6
SD	19.70303	28.83539	1	316

Appendix H.2
Alternate Specification for MSA Model IV (Suburbs)

	Suburbs (N=323)						
	Dependent variable: Weighted segregation index						
	θ^j_R		INC θ^j_I	$\theta^j_{RI<\$50k}$	$\theta^j_{RI>\$50k}$	INC $\theta^j_{I\ B}$	INC $\theta^j_{I\ W}$
	(1)	(2)					
Independent variable:							
SD	0.0067687	0.0079686*	0.00000719**	0.0079819*	0.0089996**	0.0000282**	0.00000712**
	0.0045773	*0.0044854*	*0.000000483*	*0.0046183*	*0.0003093*	*7.72E-06*	*0.000000545*
Density	0.0000196	0.0000426	0.0000000472**	0.0000449	0.0000247**	4.97E-08	0.0000000629**
	0.0001264	*0.0001253*	*1.35E-08*	*0.0001295*	*0.00000867*	*8.91E-08*	*1.52E-08*
Statelocal$	-0.0192153	-0.023521	-0.00000305	-0.0239993	-0.002192	-3.86E-06	-0.00000243
	0.047001	*0.046939*	*0.000005*	*0.0485334*	*0.0031998*	*0.000028*	*0.00000564*
D1990	-0.0036067	0.0064637	0.0000391	0.055163	0.0947045	*0.0005747*	0.0000597
	0.9053605	*0.9062132*	*0.0000971*	*0.9282335*	*0.0620538*	*0.0009301*	*0.00011*
%Hisp	-0.2843242	-0.2869185	0.0001534	-0.2970734	0.0394211	0.0004816	0.0001368
	0.7713954	*0.7721944*	*0.0000807*	*0.7981021*	*0.0516591*	*0.0008927*	*0.000091*
%Black	0.2458812	0.292607	0.0001249	0.3098845	0.0190218	-0.0000741	0.0000786
	1.131312	*1.131901*	*0.0001224*	*1.16925*	*0.0782818*	*0.0010687*	*0.0001381*
Medinc	0.0000188						
	0.0000146						
Dcounty1	(1.013006)**	(1.012495)**	0.0000429	dropped	0.0202518	0.0001233	0.000026
	0.3965719	*0.3969838*	*0.0000426*		*0.0272802*	*0.0003189*	*0.0000487*
Dcounty2	dropped	dropped	dropped	1.052573**	dropped	dropped	dropped
				0.411324			

Appendix H.2(continue)
Alternate Specification for MSA Model IV (Suburbs)

	Suburbs (N=323)						
	Dependent variable: Weighted segregation index						
	θ^j_R (1)	**θ^j_R (2)**	**INC θ^j_I**	**$\theta^j_{RI<\$50k}$**	**$\theta^j_{RI>\$50k}$**	**INC $\theta^j_{I\,B}$**	**INC $\theta^j_{I\,W}$**
Independent variable:							
Dregion1	dropped	dropped	(0.0001142)**	(1.277299)**	dropped	dropped	dropped
			0.0000463	*0.4415837*			
Dregion2	0.1266394	0.0925906	-0.0000553	(1.188406)**	0.0824341**	0.0001729	0.0000786*
	0.3317994	*0.3310805*	*0.0000422*	*0.407522*	*0.0228473*	*0.000398*	*0.0000402*
Dregion3	1.373088**	1.236874**	dropped	dropped	0.1421988**	0.0004759	0.0001498**
	0.4447747	*0.4323715*			*0.0296156*	*0.0004092*	*0.0000526*
Dregion4	0.2064619	0.1112057	0.0000646	(1.158877)**	0.1149787**	0.0010461**	0.0002173**
	0.3691015	*0.3619357*	*0.0000452*	*0.4366558*	*0.0250733*	*0.0004067*	*0.0000441*
R square	0.0482	0.0431	0.5208	0.0434	0.7858	0.2549	0.4765
Adjusted R square	0.0144	0.0124	0.5055	0.0127	0.779	0.1764	0.4597

* significant at 10% level
** significant at 5% level
Standard errors are in italics
Coefficients in parenthesis are statistically significant negative coefficients

Summary statistics for Density and SD:	Mean	Standard Deviation	Minimum	Maximum
Density	444.8994	934.2881	5.4	13043.6
SD	18.83851	28.44964	1	306

Appendix H.3
Alternate Specification for MSA Model IV (Central City)

	Central City (N=201)						
	Dependent variable: Weighted segregation index						
	θ^j_R (1)	θ^j_R (2)	INC θ^j_I	$\theta^j_{RI<\$50k}$	$\theta^j_{RI>\$50k}$	INC $\theta^j_{I\,B}$	INC $\theta^j_{I\,W}$
Independent variable:							
SD	0.1168086**	0.0839317**	0.0045183	0.085201**	0.0911535**	0.0005893**	-0.000296
	0.031755	*0.0199045*	*0.0042489*	*0.0202115*	*0.0205218*	*0.0000752*	*0.0003932*
Density	0.0000082	0.0000106	*0.00000113*	0.0000108	0.0000178	*-3.47E-08*	*-1.45E-07*
	0.0000384	*0.0000337*	*0.00000718*	*0.000034*	*0.0000347*	*9.68E-08*	*6.13E-08*
Statelocal$	-0.0053647	-0.0069827	-0.001221	-0.0067249	-0.0032217	0.0000615	0.0003593
	0.4031885	*0.023179*	*0.0049874*	*0.0234545*	*0.0238978*	*0.0000752*	*0.0004498*
D1990	-0.5786228	-0.3007602	-0.0057089	-0.3172394	-0.2231048	0.0028543**	-0.001888
	0.3909423	*0.3119536*	*0.00667325*	*0.3246268*	*0.3216275*	*0.0013007*	*0.0064882*
%Hisp	0.1971354	0.1228116	-0.006575	0.117761	-0.002456	-0.0011362	0.0068613
	0.3797491	*0.31074*	*0.0663795*	*0.3146985*	*0.3203763*	*0.0012675*	*0.0066401*
%Black	0.1072958	0.147424	0.0172151	0.1587182	0.1274405	-0.0013742	-5.95E-05
	0.366046	*0.2939508*	*0.628243*	*0.3061826*	*0.3030664*	*0.0010946*	*0.0061125*
Medinc	0.00000831						
	0.00000622						
Dcounty1	0.0404485	-0.0068498	-0.01911	dropped	-0.0086805	0.0005514	dropped
	0.1591027	*0.1388929*	*0.0299058*		*0.1432001*	*0.000482*	
Dcounty2	dropped	dropped	dropped	0.0151394	dropped	dropped	-5.59E-05
				0.1467315			0.0030416

Appendix H.3(continue)

Alternate Specification for MSA Model IV (Central City)

	Central City (N=201)						
	Dependent variable: Weighted segregation index						
	θ^j_R (1)	θ^j_R (2)	INC θ^j_I	$\theta^j_{RI<\$50k}$	$\theta^j_{RI>\$50k}$	INC $\theta^j_{I\,B}$	INC $\theta^j_{I\,W}$
Independent variable:							
Dregion1	dropped	dropped	dropped	0.0904351	dropped	(0.0008786)*	dropped
				0.1277876		*0.0005431*	
Dregion2	0.1241846	0.1414983	0.0392419**	0.2332857**	0.1486918	-0.0006149	0.0009715
	0.1320178	*0.1031036*	*0.0220047*	*0.1178789*	*0.1063009*	*0.0005237*	*0.0020831*
Dregion3	-0.0216755	-0.0283211	0.0033191	0.0725186	-0.0175951	-0.0008122	0.0004044
	0.1645992	*0.1345203*	*0.028746*	*0.1456142*	*0.1386919*	*0.0005325*	*0.0027964*
Dregion4	-0.1171923	-0.0888515	-0.0056307	dropped	-0.0224839	dropped	0.003042
	0.1736103	*0.1264146*	*0.0269813*		*0.1303349*		*0.0026383*
R square	0.1379	0.1218	0.0454	0.1229	0.131	0.5679	0.0534
Adjusted R square	0.0745	0.0755	-0.0053	0.0758	0.0852	0.518	-0.0147

* significant at 10% level
** significant at 5% level
Standard errors are in italics
Coefficients in parenthesis are statistically significant negative coefficients

Summary statistics for Density and SD:	Mean	Standard Deviation	Minimum	Maximum
Density	519.8662	1134.647	5.4	13043.6
SD	2.059701	1.966321	1	18

Appendix I.1 (weighted segregation indices tabulated using Index of dissimilarity formula)

N=23 counties	θ^{c}_{R}			INC θ^{c}_{IB}		INC θ^{c}_{IW}	
	(1)	(2)	(3)	(1)	(2)	(1)	(2)
MLSHAT	0.000000132** *9.06E-08*	0.000000142* *8.47E-08*		5.07E-08 *6.18E-08*		1.12E-08 *1.18E-08*	
MedMLS			5.78E-08 *7.12E-08*		3.46E-08 *4.94E-08*		3.02E-09 *9.58E-09*
SD per Capita	0.0003374** *0.0001862*	0.0003625** *0.0001704*	0.000284* *0.000171*	0.0002359* *0.0001244*	0.0002149* *0.0001185*	0.0000192 *0.0000237*	0.0000123 *0.000023*
%Hisp	(0.0050782)** *0.0029254*	(0.0045317)** *0.0025051*	-0.0036104 *0.0031501*	(0.0033436)* *0.0018288*	-0.0026773 *0.0021826*	-0.0001197 *0.0003489*	-0.0000843 *0.0004237*
%Black	-0.0001158 *0.0034329*	-0.0006925 *0.0030217*	0.0002823 *0.003595*	-0.0026208 *0.0022059*	-0.0019493 *0.0024908*	0.0005891 *0.0004208*	0.0006302 *0.0004836*
Medinc	1.05E-08 *2.69E-08*						
Statelocal$	0.0010076 *0.001137*	0.0006455 *0.0006431*	0.0004474 *0.0006918*	0.0005348 *0.0004695*	0.0004379 *0.0004793*	-0.0000325 *0.000896*	-0.0000452 *0.0000931*
R Square	0.4001	0.3943	0.3206	0.3678	0.3612	0.1958	0.1584
Adjusted R Square	0.1751	0.2162	0.1208	0.1208	0.1733	-0.0407	-0.0891

Appendix I.1 (weighted segregation indices tabulated using Index of Dissimilarity formula) continue

N=23 counties	INC θ^{c}_{I}		θ^{c}_{RI} [1]	
	(1)	(2)	(1)	(2)
MLSHAT	1.83E-07		0.000000164*	
	2.04E-08		*8.84E-08*	
MedMLS		1.45E-08		6.43E-08
		1.58E-08		*7.54E-08*
SD per Capita	0.0000212	0.000022	0.0003185*	0.000226
	0.0000411	*0.000038*	*0.001779*	*0.000181*
% Hisp	-0.0004683	-0.000123	(0.0048001)*	-0.003797
	0.0006041	*0.0007003*	*0.0026147*	*0.003351*
% Black	0.0003354	0.0006677	-0.00087	0.0001976
	0.0007287	*0.0007992*	*0.003154*	*0.0038062*
Medinc				
Statelocal$	0.0000145	-0.0000139	0.0006585	0.0004341
	0.0001551	*0.0001538*	*0.0006713*	*0.0007325*
R Square	0.0872	0.1298	0.3887	0.2945
Adjusted R Square	-0.1812	-0.1261	0.2089	0.087

Notes:

c=county

[1] segregation between white and black famillies with income $50,000 and above

* significant at 10% level

** significant at 5% level

Standard errors are in italics

Appendix I.2 (weighted segregation indices tabulated by simple ratios)

N=23 counties	θ^c_R			INC θ^c_I	
	(1)	(2)	(3)	(1)	(2)
MLSHAT	0.1129817 *0.0921739*	0.1015115 *0.0862388*		0.0058568 *0.0045006*	
MedMLS			0.0594687 *0.0697426*		0.0032916 *0.0036617*
SD per Capita	496.0615** *189.3132*	467.5794** *173.4858*	420.7376** *167.4024*	-4.607613 *9.053763*	-7.381251 *8.789081*
%Hisp	-2037.088 *2974.881*	-2658.833 *2550.502*	-1560.859 *3083.915*	-77.45877 *133.1039*	-17.48816 *161.914*
%Black	-391.8879 *3491.02*	264.2095 *3076.548*	1382.393 *3519.509*	-200.9099 *160.5569*	-139.6345 *184.7838*
Medinc	-0.0119484 *0.0273132*				
Statelocal$	-73.89002 *1156.223*	338.0373 *654.8015*	162.3534 *677.2972*	-19.37081 *34.17235*	-29.24527 *35.55995*
R Square	0.3811	0.3736	0.3504	0.3405	0.3078
Adjusted R Square	0.1489	0.1894	0.1593	0.1466	0.1042

Notes:

c=county

[1] segregation between white and black famillies with income $50,000 and above

* significant at 10% level

** significant at 5% level

Standard errors are in italics

Coefficients in parenthesis are negative coefficients which are statistically significant

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