Inequality and Segregation*

Rajiv Sethi[†] Rohini Somanathan[‡]

September 4, 2001

Abstract

This paper explores the manner in which race and income interact to determine patterns of residential location in metropolitan areas. We use a framework in which individuals care about both the level of affluence and the racial composition of their communities, and in which there are differences in income both within and between groups. Three main findings emerge. First, *conditional on income*, black households experience lower neighborhood quality relative to whites at any stable equilibrium. Second, extreme levels of segregation can be stable when racial income disparities are either large or negligible, but unstable in some intermediate range. Third, there exist multiple stable equilibria with very different levels of segregation when racial income disparities are sufficiently small. These results hold even when preferences are pro-integrationist, in the sense that racially mixed neighborhoods within a certain range are strictly preferred by all households to homogenous neighborhoods of either type.

---

*An earlier version of this paper was entitled "Race, Income and Neighborhood Sorting."

[†]Department of Economics, Barnard College, Columbia University (rs328@columbia.edu).

[‡]Department of Economics, University of Michigan, and Planning Unit, Indian Statistical Institute - Delhi (rohinis@umich.edu).

1 Introduction

Several decades have elapsed since the landmark Civil Rights Act of 1964 outlawed discrimination in employment and public education, and the 1968 Open Housing Act extended these protections to the sale and rent of housing. Over this period racial disparities in educational attainment and household income have narrowed, a significant population of middle class African Americans has emerged, and the attitudes of white Americans towards integrated schools and neighborhoods have softened considerably.[1]

Despite these changes, a high degree of racial segregation remains a striking feature of the urban landscape. The average black resident of metropolitan America lives in a neighborhood that is only 33% white and 54% black, while the average white resident lives in one that is 83% white and 7% black (Lewis Mumford Center, 2001). The contrast is even sharper in cities with significant black populations. If each census tract in the New York metropolitan area were to reflect the racial composition of the city as a whole, 82% of black residents would need to move to a different location; the corresponding figure for 1990 was also 82%. According to this measure of residential unevenness, metropolitan segregation in the nation as a whole declined by 3.6 percentage points during the 1990's, and the decline in areas with significant black populations (in excess of 10%) was just 3.1 percentage points. These recent findings are consistent with the pattern of gradual and uneven declines in residential segregation has been documented for earlier decades (Massey and Denton, 1993, Farley and Frey, 1994, Cutler et al., 1999). In comparison with changes in laws, attitudes and the racial composition of the middle class, the pace of change in residential patterns has been glacial.

There is a broad consensus in the empirical literature that racial income disparities play a relatively minor role in accounting for observed levels of segregation. The levels of segregation experienced by black households are uniformly high across all income categories (Denton and Massey 1988, Farley and Frey 1994). As Farley et al. (1994, p. 751) note, "if residential segregation were a matter of income, rich blacks would live with rich whites and poor blacks with poor whites. This does not happen."[2] Consequently, segregation has been largely

[1] Approximately one-half of black Americans now live in midlle or upper income households as compared with about one-fifth in 1960. The black-white gap in high school completion rates for 25-29 year olds dropped from 20 percentage points in 1967 to 7 points in 1996. Median black household income rose by 41% between 1967 and 1999 while the median white household income rose by 24% (U.S. Census Bureau, 2000, Council of Economic Advisors, 1998). In 1963 only 39% of white respondents disagreed with the statement that whites had a right to keep blacks out of their neighborhood; by 1996 this had risen to 86% (Schuman et al., 1997). Additional evidence on attitudes is discussed in Section 2 below.

[2] In Sethi and Somanathan (2001) we propose a method for the decomposition of segregation measures into

attributed to the combined effects of preferences over neighborhood racial composition and discrimination in real estate and mortgage lending markets.

While the measured effect of racial inequality on residential segregation may be small, it would be a mistake to conclude that inequality is unimportant in understanding the determinants of segregation. This paper is concerned with the manner in which racial income disparities *interact* with preferences over neighborhood racial composition to determine patterns of residential location in metropolitan areas. Intuition might suggest that a narrowing of racial income disparities, increasing acceptance of integration in racial attitudes, and laws against overt discrimination, should all act to induce a steady reduction in levels of segregation. We argue that this view of the determinants of segregation is overly simplistic. The relationship between neighborhood racial preferences and segregation is complex and depends in subtle ways on both intraracial and interracial disparities in income.

To explore this relationship, we analyze a model in which incomes vary both within and between groups, and individuals care about both the level of affluence and the racial composition of the communities in which they reside. This concern with racial composition may be pro-integrationist, in that households prefer some degree of mixing to homogenous neighborhoods of either type. Individuals are able to locate in any neighborhood, provided that they are willing and able to outbid others to do so.[3] In equilibrium, the profile of rents and the allocation of households across neighborhoods must be such that no household would strictly prefer to live elsewhere. We focus on equilibrium allocations that are *stable* in the sense that small perturbations in the neighborhood of the equilibrium are self-correcting under the dynamics of decentralized neighborhood choice.

We obtain three main results. First, *conditional on income*, black households experience lower neighborhood quality than white households at any stable equilibrium. This has implications for the transmission of racial inequality across generations. In the presence of neighborhood peer effects, the income of black households will underpredict the future economic success of their children relative to white households. This effect, which arises even when preferences over neighborhood racial composition are strongly pro-integrationist, could not occur if location decisions were based on income alone.

two components, one of which can be interpreted as the effect of racial income disparities alone. Applying this to thirty major metropolitan areas, we find that between one-tenth and one-quarter of the observed segregation in 1990 can be attributed to the direct effect of racial income disparities.

[3] This may not be possible in practice due to racial steering by real estate agents or discrimination in mortgage lending markets (Yinger, 1995). We abstract from such overt discrimination because its effects on segregation are well understood, and because doing so allows us to better focus on the questions at hand.

Second, extreme levels of segregation can be stable if racial income disparities are either very great or very small, but unstable in some intermediate range. A narrowing of racial income disparities is therefore consistent with *increasing* segregation. From a cross-sectional perspective, one ought not to expect cities with the smallest racial income disparities to be the ones with the lowest levels of segregation. The intuition underlying this result is as follows. When income disparities are large, high income black households are not significantly wealthier than lower income white households. When affluent neighborhoods are overwhelmingly white, lower income whites are willing and able to outbid (slightly) higher income blacks for housing in such neighborhoods. On the other hand, when racial income disparities are negligible, differences in mean income across segregated neighborhoods are also small. Since higher income black households have less to gain in terms of improved neighborhood quality by moving to a white neighborhood, they are again outbid by lower income whites for housing there.

Third, when racial income disparities are sufficiently small, multiple equilibria exist, and these equilibria can differ dramatically in their corresponding levels of segregation and welfare. The existence of multiple equilibria suggests that although stable integration may become viable as racial income disparities lessen, history may trap a city in a segregated equilibrium. This is where social policy may be most effective: temporary incentives for integration may give rise to permanent effects. Integration comes at the cost of higher stratification by income, however, so integrationist policies need not be unambiguously welfare enhancing even when preferences are strongly pro-integrationist.

Our work is closely related to two literatures which deal with the decentralized dynamics of neighborhood choice. The idea that extreme levels of segregation can arise under a broad range of preferences over neighborhood composition was developed in seminal work by Schelling (1971, 1972). This analysis contains the important insight that even when all individuals prefer integrated neighborhoods to highly segregated ones, integration may be unsustainable in that a few random shocks can tip the system to a segregated equilibrium. It is difficult, therefore, to deduce anything about individual preferences from aggregate patterns of residential location.[4] While Schelling's analysis neglects the role of prices in rationing housing demand, broadly similar conclusions hold in models that take full account of adjustments in rents (Yinger, 1976, Schnare and McRae, 1978, Kern, 1981). This litera-

[4] "People who have to choose between polarized extremes ... will often choose in a way that reinforces the polarization. Doing so is no evidence that they prefer segregation, only that, if segregation exists and they have to choose between exclusive association, people elect like rather than unlike environments." (Schelling, 1978, p.146).

ture neglects the fact that individuals consider both race and income when making location choices, and that forces acting to produce stratification by income can substantially mitigate the amount of racial segregation that results. While extreme levels of segregation are consistent with pro-integrationist preferences in our model, it is also the case that, under certain circumstances, stable equilibria can entail greater *integration* than any individual, black or white, considers ideal.

There is also an extensive literature on neighborhood sorting when individuals differ with respect to their incomes and sort themselves across jurisdictions on the basis of neighborhood characteristics such as local taxation, redistribution, public education, or peer-effects (De Bartolome, 1990, Epple and Romer, 1991, Benabou, 1992, Fernandez and Rogerson, 1996, Durlauf, 1996, Epple and Platt, 1998). Stratification by income occurs in many such models. The concern of this literature is not with stratification *per se*, but rather its effects on redistribution, the provision of local public goods, efficiency, growth, and the intergenerational transmission of inequality. What is missing from this body of work is the possibility that individuals care about certain intrinsic characteristics of others with whom they share their neighborhoods, that such preferences are themselves related to group membership, and that there is inequality both within and between groups. Adding these components to the analysis yields significant new insights that appear neither in the segregation literature descended from Schelling, nor in the literature on neighborhood sorting in the Tiebout tradition.

The paper is organized as follows. Section 2 provides some discussion and justification for our key assumption that individuals care about both the racial composition and the level of affluence in their communities. The model is developed in Section 3, and its equilibrium properties characterized in Section 4. Section 5 examines the relationship between racial income disparities and residential segregation, and Section 6 concludes. All proofs are in an Appendix.

2 Preferences

Extensive survey evidence on the racial attitudes of Americans has been collected for more than half a century (Schuman et al., 1997). Several studies have specifically attempted to ascertain the preferences of respondents over neighborhood racial composition (Farley et. al., 1978, 1993, Bobo et al., 1986). The best recent evidence comes from a vast 'Multi-City Study of Urban Inequality' funded jointly by the Ford Foundation and the Russell Sage Foundation.

Subjects drawn from the Los Angeles and Boston metropolitan areas were asked to construct an "ideal neighborhood that had the ethnic and racial mix" that the respondent "personally would feel most comfortable in". They did so by examining a card depicting three rows of five houses each, imagining their own house to be at the center of the middle row, and assigning to each of remaining houses an ethnic/racial category using the letters A (Asian), B (Black), W (White) and H (Hispanic). The study found overwhelming evidence that "all groups prefer both substantial numbers of co-ethnic neighbors and considerable integration" (Zubrinsky Charles, 2001, p.257). On average, the ideal neighborhood consisted of a plurality of the respondent's own type (ranging from 40% for black respondents to 52% for whites) together with significant representation from other groups. Only 2.5% of blacks to 11.1% of whites considered homogeneous neighborhoods populated only with their own type to be ideal. Overall, this reflects a clear desire for some degree of integration on the part of all groups, with a bias towards members of one's own group. This is consistent with prior studies of attitudes towards racial composition and motivates the specification used in this paper.

Why might individuals care about the racial composition of their neighborhoods? Farley et al. (1994) trace white attitudes to negative racial stereotypes, and black attitudes to anticipated hostility from whites. Ellen (2000) argues that white households hold an exaggerated view (relative to black households) of the association between changes in racial composition and structural decline in neighborhood quality. Whites are consequently less willing than blacks to settle in neighborhoods which have recently experienced increases in the share of the black residents. O'Flaherty (1999) has argued that interracial transactions of many kinds are rendered difficult because the signals blacks and whites send each other through their actions and words "are garbled by stereotypes and the possibility of animosity." The fact that communication is easier and less ambiguous when it does not cross racial lines could account for a desire to live with a substantial number of co-ethnics. Signals also play a key role in the search-theoretic model of Lundberg and Startz (1998), where signals from members of one's own group are interpreted with less noise than signals from others. Again this can lead endogenously to a desire to associate primarily with co-ethnics. While we take preferences over neighborhood racial composition to be exogenously given, our specification is consistent with these interpretations. In addition, we allow for the possibility that there may be a preference for some degree of integration on the part of both blacks and whites, as suggested by the survey evidence.

In addition to a concern about neighborhood racial composition, we assume that individuals also care about the level of affluence in their communities. There are a number of reasons why this might be the case. The quality of public schools is liable to be better in more affluent neighborhoods even if government per-pupil expenditures are uniform across the city. This is the case because voluntary contributions to parent-teacher associations increase with income, and because human capital transfers that occur in the home have spillover effects in school. The presence of positive role models (and the absence of negative ones) is correlated with the degree of affluence of a community. Living an a more affluent community provides entry into social networks which can be lucrative. And if the external upkeep of one's residence is a normal good with positive external effects, more affluent communities will be more desirable. Each of these effects have been discussed extensively in the literature (Bond and Coulson, 1984, De Bartolome, 1990, and Benabou, 1992). Although the desire to live in a more affluent community can be endogenously derived on the basis of any of the above concerns, we shall treat it simply as a primitive of the model in order to better focus on the main questions of interest.

3 The Model

Consider a city with a continuum of households and two disjoint neighborhoods of equal size. Households differ along two dimensions, income and race. There are two races, black and white, each with equal population shares in the city as a whole. Income is assumed to lie within the unit interval and is denoted by $y \in [0,1]$. Within each racial group the income distribution is represented by the distribution functions $F^b(y)$ and $F^w(y)$.

Any allocation of households across neighborhoods will imply both a racial composition and a distribution of income within each neighborhood. Let $\bar{y}_j$ denote the mean income in neighborhood $j \in \{1,2\}$, β_j the share of neighborhood j's population that is black, and $\omega_j = 1 - \beta_j$ the proportion of neighborhood j's population that is white. Housing units are identical, and rents are accordingly uniform within each neighborhood. Let ρ_j denote the rent in neighborhood j. We shall assume that households care about both the mean income and the racial composition of the neighborhood in which they reside. Neighborhoods will generally not be identical with respect to these criteria, so rents for housing will typically differ across neighborhoods in equilibrium. All income not spent on rent is used for private consumption.

Apart from their private consumption, individuals care about the general affluence and racial composition of their communities. Neighborhoods with higher mean incomes are more desirable than those with lower mean incomes for all members of the population. Additionally, black and white households differ systematically with regard to their preferences over neighborhood racial composition. We shall assume for simplicity that the preferences of blacks and whites are symmetric in a sense to be made clear below. We do not assume, however, that preferences are monotonic in neighborhood racial composition. In particular, we allow for the possibility that households strictly prefer an integrated neighborhood to one in which their own group is numerically dominant, and that being part of a sizeable minority may be more attractive than being part of an overwhelming majority.

Preferences are represented by the following simple, separable utility function

$$u(y-\rho, \bar{y}, r) = \log(y-\rho) + \bar{y} + v(r),$$

where $y - \rho$ is private consumption, $\bar{y}$ is neighborhood mean income, $r \in \{\beta, \omega\}$ is the neighborhood population share of the individual's own race, and $v(r)$ is given by

$$v(r) = r\left(1 - r + \eta\right). \tag{1}$$

The parameter $\eta \in [0, 1]$ measures the degree to which residence with co-ethnics is desired. When $\eta = 0$ each individual's ideal neighborhood racial composition consists of a equal shares of blacks and whites. More generally, the ideal racial composition for an individual is to have a share $\frac{1}{2}(1+\eta)$ of her own type in the neighborhood. Larger values of η therefore correspond to a greater bias towards one's own group. Except in the extreme case $\eta = 1$, such preferences are nonmonotonic: all individuals prefer some degree of integration to complete segregation. For any value of $\eta < \frac{1}{2}$, the range of neighborhood compositions that are strictly preferred to complete segregation includes allocations in which the individual is in a minority.

Our interest in this paper lies in the relationship between income disparities and the extent of segregation. We approach this question by considering a family of uniform income distributions that depend on a single parameter, which captures the extent of racial income disparities. Specifically, the income distribution among black households is uniform with support $\left[0, \frac{1}{2}(1+\alpha)\right]$ and that among white households is uniform with support $\left[\frac{1}{2}(1-\alpha), 1\right]$. The parameter $\alpha \in [0, 1]$ represents racial income disparities, with $\alpha = 0$ corresponding to a completely hierarchical distribution of income and $\alpha = 1$ corresponding to identical income distributions. Given values of the parameters η and α, there exists some set of equilibrium household allocations. We next characterize the structure of equilibrium allocations, and proceed to discuss the effects of changes in the underlying parameters.

4 Equilibrium Allocations

Equilibrium in this model is an allocation of households across neighborhoods and a pair of rents (ρ_1, ρ_2) such that no household strictly prefers a neighborhood different from its own. In other words, equilibrium requires that for any household with income y residing in neighborhood j, it must be the case that for all neighborhoods k,

$$u(y - \rho_j, \bar{y}_j, r_j) \geq u(y_i - \rho_k, \bar{y}_k, r_k),$$

where $r = \beta$ for black households, $r = \omega$ for white households. We shall refer to an allocation in which each neighborhood contains only a single race as *segregated*, and all other equilibria as *integrated*.

We say that an allocation is *intraracially stratified* if there exist threshold income levels $\tilde{y}^b$ and $\tilde{y}^w$ such that all black households with income above (below) $\tilde{y}^b$ and all white households with income above (below) $\tilde{y}^w$ reside in the same neighborhood. At any intraracially stratified allocation, one neighborhood is populated by a combination of black households with income below $\tilde{y}^b$ and white households with income below $\tilde{y}^w$, while the other is populated by a combination of black households with income above $\tilde{y}^b$ and white households with income above $\tilde{y}^w$. This is consistent with complete segregation (if $\tilde{y}^b = 1$ and $\tilde{y}^w = 0$), with pure stratification by income (if $\tilde{y}^b = \tilde{y}^w$), and a variety of other patterns of neighborhood sorting including equal neighborhood racial compositions and equal neighborhood mean incomes. We shall refer to the neighborhood containing households above the two threshold income levels as the *upper-tail neighborhood*.

At any intraracially stratified equilibrium, the mean incomes and racial compositions in each neighborhood can all be expressed as a function of the threshold income level for white households. Let $z = \tilde{y}^w$ denote the threshold income for whites. Then, since each neighborhood must accommodate half the population and the distribution functions are symmetric, we have $\tilde{y}_b = 1 - z$. The share of black households in neighborhood 1 is therefore

$$\beta_1(z) = \frac{F(\tilde{y}_b)}{F(\tilde{y}_b) + F(\tilde{y}_w)} = \frac{2\tilde{y}_b}{1+\alpha} = \frac{2(1-z)}{1+\alpha}. \tag{2}$$

Since each group is of equal size, we have $\beta_1 = 1 - \omega_1 = 1 - \beta_2 = \omega_2$, all of which can be expressed as functions of z. Finally, mean incomes in the two neighborhoods are

$$\bar{y}_1(z) = \frac{2}{1+\alpha}\int_0^{1-z} ydy + \frac{2}{1+\alpha}\int_{\frac{1}{2}(1-\alpha)}^{z} ydy \tag{3}$$

$$\bar{y}_2(z) = \frac{2}{1+\alpha}\int_{1-z}^{\frac{1}{2}(1+\alpha)} ydy + \frac{2}{1+\alpha}\int_{z}^{1} ydy \tag{4}$$

both of which are also fully determined by z.

Figure 1 shows how the mean income in the two neighborhoods varies with z for a numerical example.[5] When $z = z_{\min} = 1/4$ (the lower bound of the support of the white income distribution), there is complete residential segregation by race, with the second (all-white) neighborhood having higher mean income. As z rises from this minimum value, the lowest income whites in the second neighborhood are replaced by the highest income blacks from the first, which leads to greater income disparities across neighborhoods. The point at which neighborhood income disparities are greatest occurs when $z = 1/2$, since $\tilde{y}_b = \tilde{y}_w$ at this point. This would be the outcome if sorting were based on income alone. As z rises beyond this point, overall stratification begins to decline. When $z = z_{\max} \approx 0.90$ the two neighborhoods have identical mean incomes; beyond this point the second (upper-tail) neighborhood has lower mean income since it consists of all but the poorest segments of the less affluent race together with a few of the wealthiest members of the more affluent race. While it is possible for the upper-tail neighborhood to have lower mean income at an intraracially stratified allocation, we show below that this cannot occur in equilibrium.

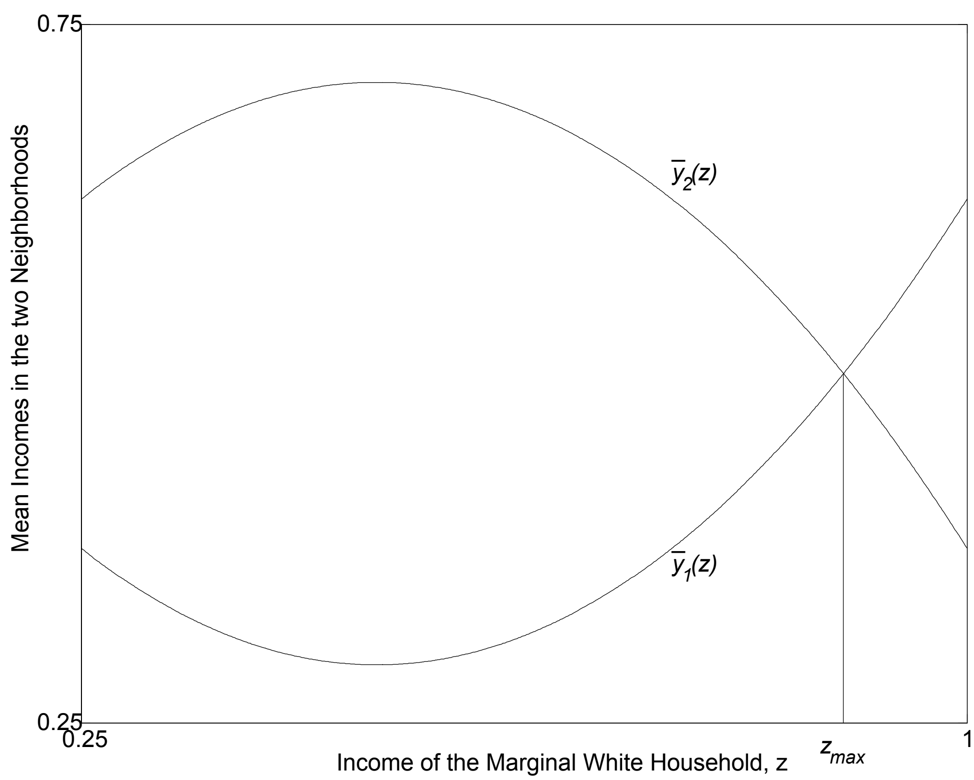

Figure 1. Mean neighborhood income as a function of the marginal white household.

[5] For this and all other numerical examples in this section, $\alpha = 1/2$.

It is trivially the case that an allocation of households in which the two neighborhoods have identical racial compositions, mean incomes, and rents is an equilibrium, since all individuals are indifferent between the two neighborhoods. Such an allocation will be unstable under the dynamics of decentralized location choices. For instance, a small perturbation that raises both the white population share and the mean income of one neighborhood relative to the other will lead to cumulative divergence from the equilibrium, as wealthier white households (and possibly also wealthier black households) outbid poorer ones to locate in the more affluent community. In order for an equilibrium to be stable, therefore, the neighborhoods must differ either with respect to racial compositions or with respect to mean income. In general, as we show below, they will differ along both dimensions.

If we disregard the trivial and unstable equilibrium in which neighborhoods are identical, the structure of equilibrium allocations is described by the following result.

Proposition 1 *Any equilibrium in which the neighborhoods are non-identical is intraracially stratified. The upper-tail neighborhood has higher rents and higher mean income if the equilibrium is integrated.*

This states that equilibria must be stratified by income *within each race* though not necessarily at the level of the population as a whole. Furthermore, rents must be higher in the wealthier neighborhood under integration (though this need not be the case under segregation). Accordingly, we may assume without loss of generality that the second neighborhood is the upper-tail neighborhood and has higher mean income and higher rents whenever segregation is incomplete.

To simplify notation, set $\rho_1 = 0$ and $\rho_2 = \rho$. Any equilibrium (other than the one with identical neighborhoods) may then be described by the pair (z, ρ). In order for a particular value of z to be an equilibrium, blacks with income $\tilde{y}_b = 1 - z$ and whites with income $\tilde{y}_w = z$ must indifferent between the two neighborhoods. These indifference conditions are

$$\log(1-z) + \bar{y}_1 + v(\beta_1) = \log(1-z-\rho) + \bar{y}_2 + v(\beta_2) \quad (5)$$

$$\log(z) + \bar{y}_1 + v(\omega_1) = \log(z-\rho) + \bar{y}_2 + v(\omega_2) \quad (6)$$

The two indifference conditions yields two function $\rho^b(z)$ and $\rho^w(z)$ which identify the rent at which the corresponding marginal household will be indifferent between the two neighborhoods, given the racial compositions and neighborhood income distributions induced by z. We shall refer to these as the marginal bid-rent curves for black and white households respectively.

A numerical example (with $\eta = 1/5$) is shown in Figure 2. Only values of z below $z_{\max} \approx 0.90$ are consistent with equilibrium since values of z above this imply lower mean income in the upper-tail neighborhood, violating Proposition 1. At $z = 1/4$, the second neighborhood is entirely white. Despite the fact that the marginal white household is considerably poorer than the marginal black household, the former is willing to pay more than the latter to live in the second neighborhood: $\rho^b(1/4) < \rho^w(1/4)$. Hence for any rent ρ between $\rho^b(1/4)$ and $\rho^w(1/4)$ complete segregation is an equilibrium. As z rises, the income differential between the two neighborhoods also rises, making it more attractive to both groups. Furthermore, the increasing share of black households in the second neighborhood reinforces this effect, again for *both* groups. However, the rise in the share of black households in the second neighborhood has a disproportionately larger impact on the rent that black households are willing to pay and hence ρ^b rises more rapidly than ρ^w. Eventually as z rises above $1/2$, the income differential between the two neighborhoods starts to narrow. At this point the second neighborhood is still majority white. At some point the two neighborhoods have the same racial composition, beyond which the upper-tail neighborhood becomes majority-black. This causes ρ^w to decline sharply and eventually intersect ρ^b. This point of intersection constitutes an integrated equilibrium.

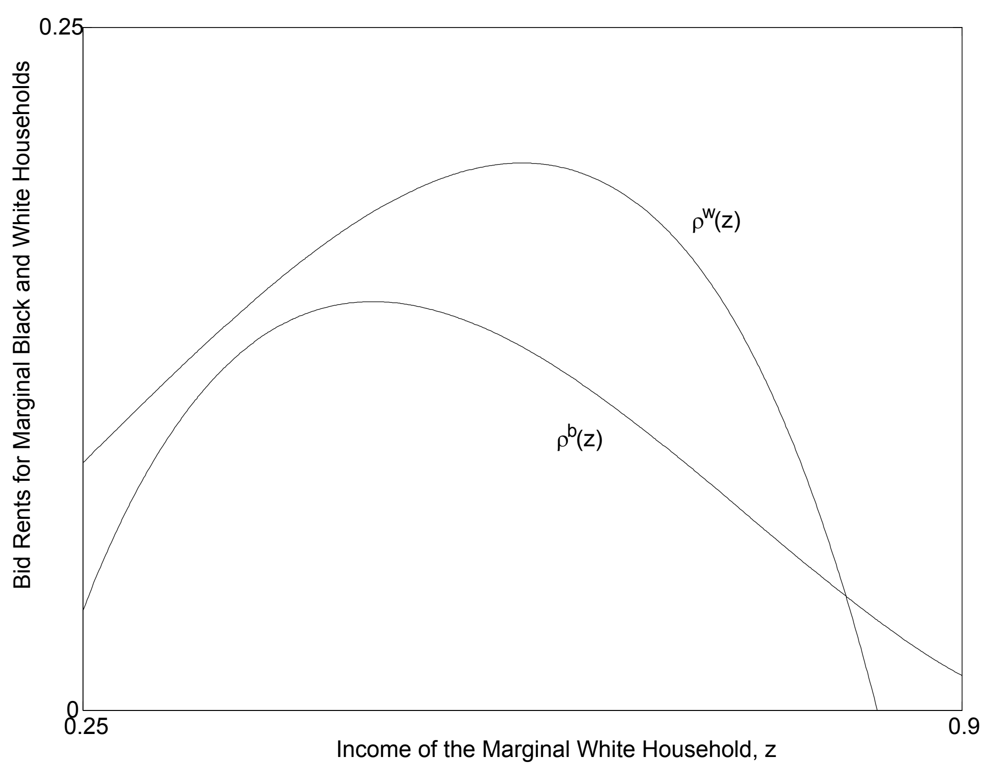

Figure 2. Marginal Bid Rent Curves: Stable Segregation

The integrated equilibrium in Figure 2 is unusual in that the upper-tail neighborhood, despite being slightly more affluent, is predominantly occupied by members of the less affluent race. In fact, it is easy to see that this equilibrium must be *unstable*: a small perturbation in the allocation of households would lead to cumulative divergence away from this allocation. For z slightly below the equilibrium value z^*, $\rho^w(z) > \rho^b(z)$. Hence the marginal white household is willing to pay more than the marginal black household to live in the upper-tail neighborhood. This would lead to an inflow of whites into the second neighborhood, further reducing z. Since there is no other point at which $\rho^w(z) = \rho^b(z)$, the only *stable* equilibrium involves complete segregation. More formally, we define the stability of equilibrium as follows:

Definition 1 *An integrated equilibrium allocation z is stable if $d\rho^w/dz > d\rho^b/dz$ at z. The segregated equilibrium allocation $z = 0$ is stable if there exists some $\bar{\varepsilon} > 0$ such that for all $\varepsilon < \bar{\varepsilon}$, $\rho^b(\varepsilon) < \rho^w(\varepsilon)$.*

This definition states that an integrated equilibrium is stable if a small increase in z (which lowers the share of white households in the upper-tail neighborhood) results in a larger increase (or smaller decline) in the bid rent of the marginal white household relative to that of the marginal black household. In other words, the equilibrium is stable if a rise in z causes the marginal white household to outbid the marginal black household to live in the upper-tail neighborhood, thus driving z back down.[6] Similarly, the segregated equilibrium ($z = 0$) is stable if a small increase in z results in the marginal white household willing to pay more than the marginal black household to live in the upper-tail neighborhood, again driving z back down. If an equilibrium is not stable, we shall say that it is *unstable*.

[6] This definition of stability implicitly assumes that when individuals relocate, they do so in a manner that maintains intraracial stratification: the marginal households are the first to move.

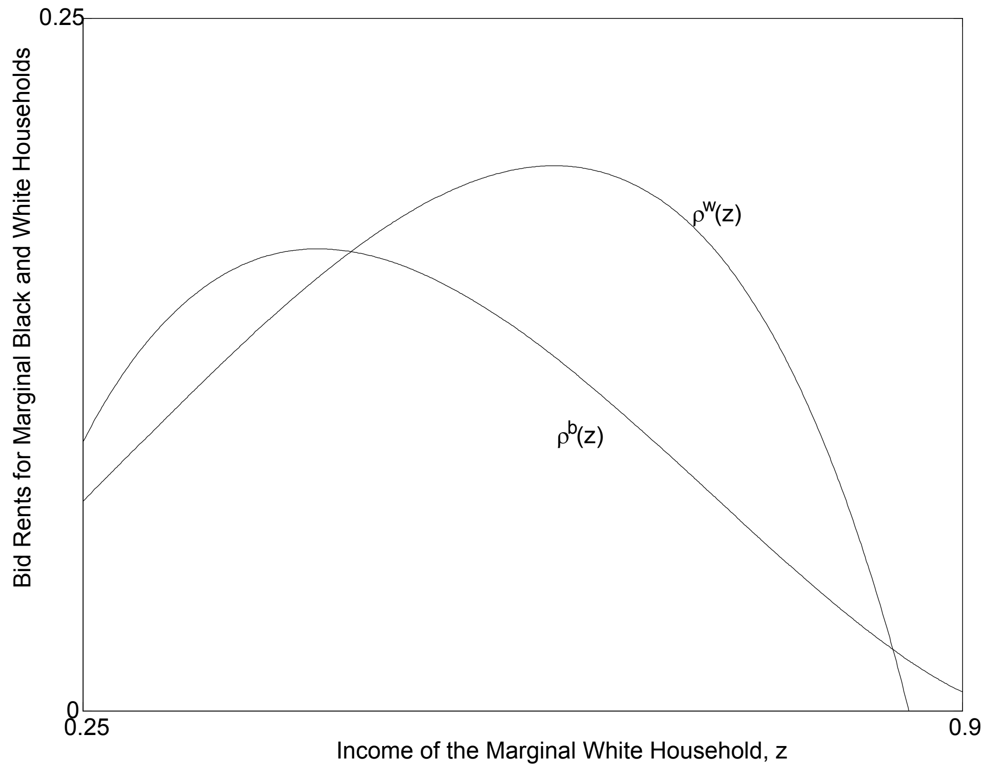

Figure 3. Marginal Bid Rent Curves: Stable Integration

The marginal bid-rent curves for a second example (with $\eta = 1/9$) are shown in Figure 3. This time ρ^b exceeds ρ^w when $z = z_{\min} = 1/4$. The wealthiest black households are now willing to outbid the poorest white households to live in an all-white neighborhood, in order that they may benefit from the higher mean income. The unique stable equilibrium is now integrated, and there is a second integrated equilibrium which is unstable. Socioeconomic stratification in the stable equilibrium is higher than in the previous example but still falls short of the maximum possible stratification. Increasing tolerance leads to greater integration, as one might expect, but it also leads to greater disparities in mean income across neighborhoods.

The purpose of the above examples is to shed some light on the structure of equilibria and to introduce the definition of stability. The following result shows that a stable equilibrium does indeed exist in the model, and characterizes one of its properties.

Proposition 2 *There exists at least one stable equilibrium. If $\alpha \neq 1$, then $\tilde{y}^b > \tilde{y}^w$ at any stable equilibrium.*

This states that the wealthiest households in the lower income neighborhood will be black. In other words, there exists a range of incomes lying between $\tilde{y}^w$ and $\tilde{y}^b$ such that households falling within this range will be in the poorer neighborhood if and only if they are black. This group of households will also have higher levels of private consumption than white households with comparable incomes, since a smaller share of income is spent on housing. White and black households with the same income will therefore experience systematically different levels of neighborhood quality. Note that Proposition 2 holds no matter how close to perfectly pro-integrationist ($\eta = 0$) preferences happen to be, and no matter how much integration occurs in equilibrium: there will always be a set of households who experience lower neighborhood quality *conditional on income* if they are black. In the presence of human capital externalities, the income of this group of black households will underpredict the future economic success of their children relative to the income of white households, an effect that could not occur under stratification alone. This is a sobering thought. Even in a world without overt discrimination, and one in which the desire for integration is strong, the advantage of being born to affluence is magnified if one is also born to an affluent race.[7]

5 Income Disparities and Segregation

Racial disparities in the distribution of income can be tracked in this model by looking at changes in the parameter α. When $\alpha = 0$ we have a completely hierarchical distribution of income, with the poorest white household being wealthier than the most affluent black household. Increases in α correspond to declines in racial income disparities. In the limiting case $\alpha = 1$, the two income distributions are identical. The following result identifies conditions under which complete segregation is a stable equilibrium.

Proposition 3 *For any $\eta > 0$, there exist $\alpha_l \in (0, 1]$ and $\alpha_h \in [0, 1)$ such that and complete segregation is stable if $\alpha \in [0, \alpha_l] \cup [\alpha_h, 1]$.*

Proposition 3 states that complete segregation is stable whenever racial income disparities are either negligible or extremely high. When racial income disparities are large, even allocations involving pure stratification by income will be highly segregated, and preferences over neighborhood racial composition reinforce and exacerbate this effect. Hence the stability of complete segregation in this case is not surprising. Less obvious is the second part of the result, which states that complete segregation must be stable if racial income disparities are sufficiently *small.* This occurs because, when the two income distributions are virtually

[7] For a model of the process by which residential segregation shapes the intergenerational transmission of racial inequality, see Loury (1977).

identical, complete segregation does not result in substantial income disparities across neighborhoods. This in turn implies that the benefit to wealthier black households from moving to higher income, predominantly white neighborhoods is small. Even a slight preference for all-black over all-white neighborhoods can overwhelm this effect and lead to stable patterns of extreme segregation. Consequently, the relationship between racial income disparities and the stability of segregated equilibria is nonmonotonic: segregation may be inconsistent with intermediate values of α while it is consistent with values of α lying at either extreme.

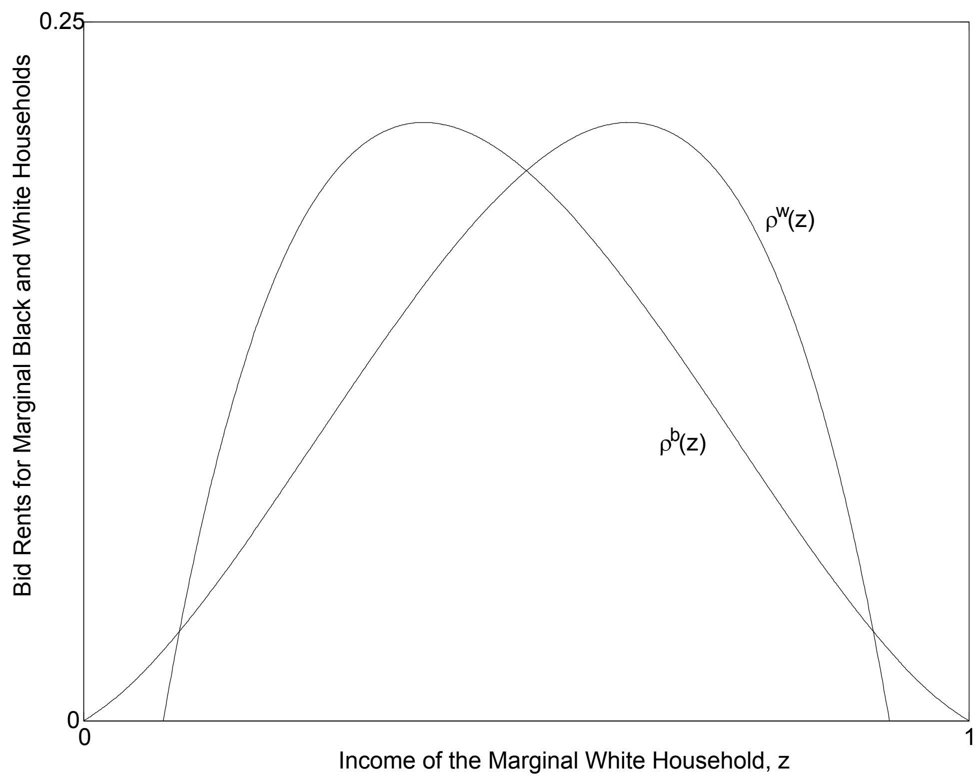

Figure 4. Marginal Bid Rent Curves: Multiple Stable Equilibria

Stability of complete segregation does not imply that integrated equilibria cannot also be stable. Figure 4 illustrates this for the special case of $\alpha = 1$ and $\eta = 1/5$. The marginal bid rent functions are symmetric and there are two stable equilibria, one involving complete segregation (with $z = 0$) and the other involving complete stratification (with $z = 0.5$).[8] More generally, it is the case that when racial income disparities are negligible, multiple equilibria exist:

[8] The equilibrium with $z = 1$ is identical to that with $z = 0$, with the neighborhoods relabeled.

Proposition 4 *Suppose η is sufficiently small. Then there exists $\tilde{\alpha} \in (0,1)$ such that a stable and integrated equilibrium exists for all $\alpha \in (\tilde{\alpha}, 1]$. When $\alpha = 1$ this equilibrium involves identical neighborhood racial compositions and complete stratification by income.*

Proposition 4 states that as long as preferences over neighborhood racial composition are not too extreme, there is a second stable equilibrium when racial disparities in the distribution of income are small. In the limiting case when such disparities disappear, there is a stable equilibrium in which there is effectively no racial segregation in residential patterns.

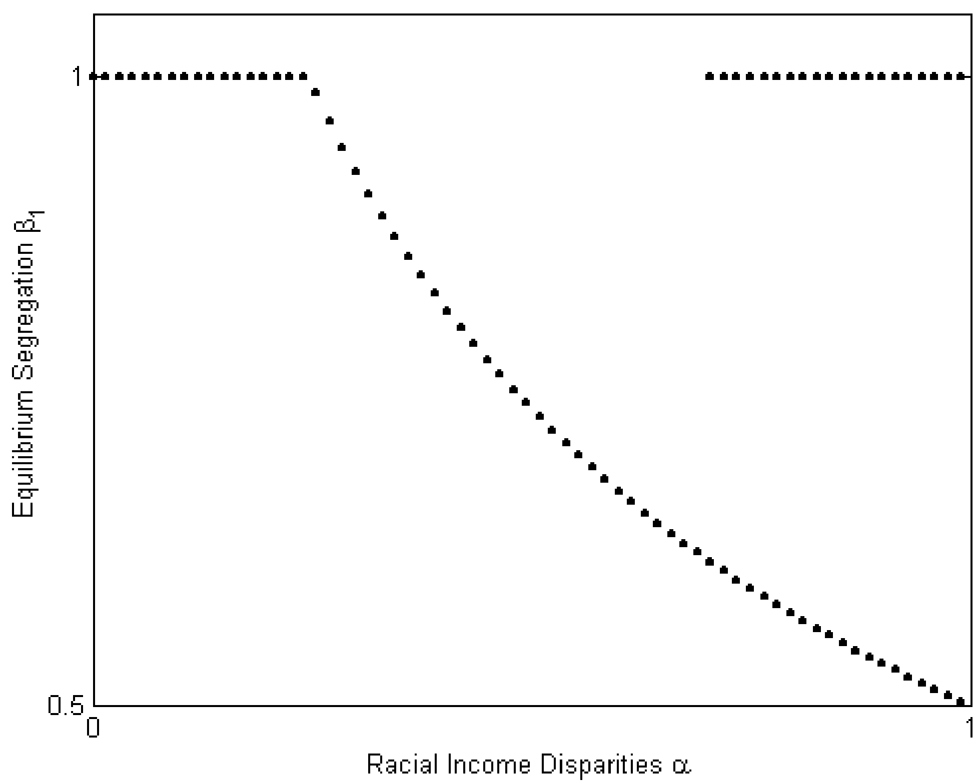

Figure 5. Racial Income Disparities and Stable Segregation

Figure 5 shows how the set of stable equilibria varies with changes in racial income disparities for a numerical example ($\eta = 1/9$). When racial income disparities are extreme (α close to zero) complete segregation is the only stable outcome. As racial income disparities narrow there comes a point when the segregated equilibrium loses stability and the unique stable equilibrium involves some degree of mixing. Beyond this point, convergence of incomes goes hand in hand with greater integration. Eventually α crosses a threshold and multiple equilibria arise, with complete segregation becoming stable. Further convergence of incomes can lead to persistent segregation or to increasing integration: depending on which of the equilibria is selected.

One implication of Proposition 4 is that stable equilibria can exist which involve higher levels of integration than any household, black or white, considers ideal. For example, if $\eta = 1/2$, the ideal neighborhood for each household requires that it be in a 75% majority. Yet if $\alpha = 1$, a stable equilibrium exists in which the threshold income is $1/2$ for each race, there is complete stratification by income, and exactly half the households in each neighborhood are black. To see why this is stable, suppose that random perturbations cause z to rise so that the second neighborhood is now majority black. Based on preferences over neighborhood composition alone, the marginal black household would outbid the marginal white household for housing in the second neighborhood, leading to cumulative divergence from the equilibrium. But with z exceeding $1/2$, the marginal black household is less affluent than the marginal white household. Based on preferences for neighborhood mean income alone, the latter would outbid the former for housing in the second neighborhood. The combined effect of these two forces determines whether integration is stable. If preferences over neighborhood racial composition are not too strong, the latter effect dominates and integration is stable.

Combining the two previous results, we see that racial disparities in the distribution of income play a subtle and important role in determining patterns of segregation. Even when preferences are strongly pro-integrationist and the ideal neighborhood for all individuals is close to perfectly mixed, complete segregation can result if racial income disparities are negligible or extreme. Multiple equilibria are inevitable when racial income disparities are small. The existence of multiple equilibria suggests that although stable integration may become viable as racial income disparities lessen, a city may remain trapped in the basin of attraction of the segregated equilibrium due to historical patterns of segregation. This is where social policy may be most effective: temporary incentives for segregation may give rise to permanent effects.

In the simple model considered here, the integrated equilibrium results in greater social surplus if preferences are sufficiently pro-integrationist. Integration comes at the cost of greater stratification, however, and this conclusion need not hold once the efficiency effects of stratification are accounted for. These effects can arise because the quality of one's neighborhood affects incentives for human capital accumulation, and hence also aggregate production and growth (Benabou 1996). There are conditions under which stratification by income can be efficiency-reducing, in which case integrationist policies need not be unambiguously welfare improving even when preferences are pro-integrationist. In addition, a shift to an equilibrium with greater integration (and correspondingly greater stratification) lowers neighborhood quality in the poorest neighborhood, which consists disproportionately of black households. The movement of upper-income black households to more affluent communities worsens the conditions for those left behind; a point that has been emphasized by Wilson (1987).

Finally, our results imply that one cannot expect a narrowing of racial income disparities to lead inevitably to lower segregation. While the convergence of incomes might imply greater integration at integrated equilibria, it may also cause segregated allocations to become stable. From a cross-sectional perspective, cities with lower levels of racial inequality need not be the least segregated. And from a historical perspective, the march towards greater integration may be halted and reversed in some cities as racial inequality *declines*.

6 Conclusions

Given the long history of slavery and legally enforced segregation in the United States, race has a degree of salience in American life that far exceeds that of any other socially designated attribute. Nowhere is this more apparent than in the composition of our communities. Although racial attitudes will doubtless continue to evolve, preferences over neighborhood racial composition will remain an important factor affecting household location decisions in the foreseeable future. Such preferences are reflected in the patterns of segregation and stratification that prevail in our cities, but in subtle and sometimes unexpected ways.

The main results of our analysis may be summarized as follows. First, when preferences over neighborhood racial composition influence household location decisions in the manner specified, black households will experience lower neighborhood quality conditional on income than white households. This does not arise from overt discrimination, and is consistent with a desire on the part of all households to live in highly integrated communities. Second, segregated allocations will be stable when racial income disparities are either very great or very small, but may be unstable when racial inequality lies in some intermediate range. And third, multiple equilibria arise when racial income disparities are narrow, with extreme segregation and high levels of integration both being consistent with stability.

Our analysis is abstract enough to permit other interpretations. If, instead of race, the dominant attribute governing location decisions were linguistic preference, religious affiliation, or any other observable trait, our basic findings would continue to apply. It is also not necessary to interpret neighborhoods in a spacial sense: interaction in clubs or other voluntary associations will be subject to the same kind of dynamics. One could consider wealth rather than income disparities, and owned rather than rented housing without substantive modification to the model.

The most obvious extensions of this work would be to allow for multiple neighborhoods, a range of overall racial compositions in the city, broader classes of income distributions and preferences, intrinsic differences in neighborhood quality, and multiple racial or ethnic groups. Exploring these extensions will yield answers to new questions, generate additional insights, and determine the extent to which the basic insights emerging in this paper hold under more general conditions.

Appendix

Proof of Proposition 1

If the equilibrium is segregated then the result is immediate. Accordingly, suppose that we have integration. Consider first the case in which the neighborhoods have the same mean income. Without loss of generality, suppose $\rho_2 \geq \rho_1$. Then no black household would reside in the second neighborhood unless $v(\beta_2) \geq v(\beta_1)$ and no white household would reside there unless $v(\omega_2) \geq v(\omega_1)$. Since $\beta_1 = 1 - \omega_1 = 1 - \beta_2 = \omega_2$, these conditions imply $v(\beta_1) = v(1-\beta_1)$ and hence $\beta_1 = \frac{1}{2}$. But this contradicts the hypothesis that neighborhoods are non-identical. Hence the neighborhoods cannot be integrated if they have the same mean income.

We may therefore assume, without loss of generality that $\bar{y}_2 > \bar{y}_1$. We begin by showing that $\rho_2 > \rho_1$. Suppose, by way of contradiction, that $\rho_2 \leq \rho_1$. Since the second neighborhood has higher mean income and lower rents, no black household would reside in the first neighborhood unless $v(\beta_1) > v(\beta_2)$. But is this is satisfied, then $v(\omega_2) > v(\omega_1)$, so no white household would reside in the first neighborhood. This contradicts the hypothesis that the equilibrium is integrated. We have therefore proved that $\rho_2 > \rho_1$.

Next consider a black household with income $\tilde{y}$ which chooses the first neighborhood. We therefore have

$$\log(\tilde{y} - \rho_1) + \bar{y}_1 + v(\beta_1) \geq \log(\tilde{y} - \rho_2) + \bar{y}_2 + v(\beta_2)$$

For any income y define $f(y) \equiv (y - \rho_1) / (y - \rho_2)$ and $\delta = \bar{y}_2 - \bar{y}_1 + v(\beta_2) - v(\beta_1)$. The above inequality may therefore be written $f(\tilde{y}) \geq e^{\delta}$. Note that since $\rho_2 > \rho_1$,

$$f'(y) = -\frac{\rho_2 - \rho_1}{(y - \rho_2)^2} < 0.$$

Hence for any $y < \tilde{y}$, we have $f(y) > e^{\delta}$ and any black household with income $y < \tilde{y}$ will have a strict preference for the poorer neighborhood. Exactly the same argument (replacing β with ω) can be used to prove that the result holds for white households. We have therefore proved that there must be two threshold income levels $\tilde{y}^b$ and $\tilde{y}^w$ such that the second neighborhood is populated by a combination of black households with income above $\tilde{y}^b$ and white households with income above $\tilde{y}^w$.

To show that the second neighborhood must be more affluent than the first, suppose, by way of contradiction, that $\bar{y}_2 < \bar{y}_1$. Then, since the most affluent black household resides in the second neighborhood, all black households must also reside in this neighborhood.

The same argument shows that all white households must also reside in this neighborhood, contradicting the fact that each neighborhood can accommodate only half the population. ■

Proof of Proposition 2

If $\rho^w(0) > \rho^b(0)$ complete segregation is stable and the result is immediate. Furthermore, if $\alpha = 1$ then complete segregation is stable by Proposition 3 (proved below). Accordingly, suppose that $\rho^w(0) < \rho^b(0)$ and $\alpha \neq 1$. Since $\alpha \neq 1$ the second (upper-tail) neighborhood has a higher share of whites than the first and is also more affluent when $z = 1/2$ (complete stratification). Since the marginal white and black households have the same income, $\rho^w(1/2) > \rho^b(1/2)$. By continuity of the marginal bid rent functions and $\rho^w(0) < \rho^b(0)$, there must be some $z \in (0, 1/2)$ which at which $\rho^w(z) = \rho^b(z)$. This is an equilibrium.

To prove the second claim consider an integrated equilibrium in which the marginal black and white households have income $\tilde{y}^b$ and $\tilde{y}^w$ respectively and the equilibrium rent is ρ. Note from (1) that $v(r) - v(1-r) = \eta\left(2r - 1\right)$. Hence the indifference conditions (5-6) may be written

$$
\begin{aligned}
\rho &= \tilde{y}_b\left(1 - e^{\bar{y}_1 - \bar{y}_2} e^{\eta(2\beta_1 - 1)}\right) \\
\rho &= \tilde{y}_w\left(1 - e^{\bar{y}_1 - \bar{y}_2} e^{-\eta(2\beta_1 - 1)}\right)
\end{aligned}
$$

Now suppose, by way of contradiction, that $\tilde{y}_b < \tilde{y}_w$. Then the above implies $e^{\eta(2\beta_1 - 1)} < e^{-\eta(2\beta_1 - 1)}$ and hence $2\beta_1 - 1 < 0$. (The upper-tail neighborhood must be majority black). Let $\phi^b(z)$ and $\phi^w(z)$ be the bid rents for black and white households with incomes $\tilde{y}_b$ and $\tilde{y}_w$ respectively, when the allocation is shifted to z.

$$
\begin{aligned}
\phi^b(z) &= \tilde{y}_b\left(1 - e^{\bar{y}_1(z) - \bar{y}_2(z)} e^{\eta(2\beta_1(z) - 1)}\right) \\
\phi^w(z) &= \tilde{y}_w\left(1 - e^{\bar{y}_1(z) - \bar{y}_2(z)} e^{\eta(1 - 2\beta_1(z))}\right)
\end{aligned}
$$

Let $z = \tilde{y}_w + \varepsilon$ where $\varepsilon > 0$. Note that $2\beta_1(z) - 1 < 2\beta_1(\tilde{y}_w) - 1 < 0$ and $\bar{y}_1(z) - \bar{y}_2(z) > \bar{y}_1(\tilde{y}_w) - \bar{y}_2(\tilde{y}_w)$. Hence

$$
\begin{aligned}
\phi^b(z) - \phi^w(z) &= \tilde{y}_b - \tilde{y}_w + e^{\bar{y}_1(z) - \bar{y}_2(z)}\left(\tilde{y}_w e^{\eta(1 - 2\beta_1(z))} - \tilde{y}_b e^{\eta(2\beta_1(z) - 1)}\right) \\
&> \tilde{y}_b - \tilde{y}_w + e^{\bar{y}_1(\tilde{y}_w) - \bar{y}_2(\tilde{y}_w)}\left(\tilde{y}_w e^{\eta(1 - 2\beta_1(\tilde{y}_w))} - \tilde{y}_b e^{\eta(2\beta_1(\tilde{y}_w) - 1)}\right) = 0
\end{aligned}
$$

Hence $\phi^b(z) > \phi^w(z)$. By continuity, if ε is sufficiently small, $\rho^b(z) > \rho^w(z)$ and the equilibrium is unstable. ■

Proof of Proposition 3

Under complete segregation $\beta_1 = \omega_2 = 1$ and $z = (1-\alpha)/2$. Mean incomes are given by

$$\begin{aligned}
\bar{y}_1 &= \frac{2}{1+\alpha}\int_0^{\frac{1}{2}(1+\alpha)} y dy = \frac{1}{4} + \frac{1}{4}\alpha \\
\bar{y}_2 &= \frac{2}{1+\alpha}\int_{\frac{1}{2}(1-\alpha)}^{1} y dy = \frac{3}{4} - \frac{1}{4}\alpha
\end{aligned}$$

The indifference conditions for the marginal households are

$$\begin{aligned}
\log\left(\frac{1}{2}(1+\alpha)\right) + \frac{1}{4}(1+\alpha) + \eta &= \log\left(\frac{1}{2}(1+\alpha) - \rho\right) + \frac{1}{4}(3-\alpha) \\
\log\left(\frac{1}{2}(1-\alpha)\right) + \frac{1}{4}(1+\alpha) &= \log\left(\frac{1}{2}(1-\alpha) - \rho\right) + \frac{1}{4}(3-\alpha) + \eta
\end{aligned}$$

which yields

$$\begin{aligned}
\rho^b(z_{\min}) &= \frac{1}{2}\frac{e^{\frac{1}{2}-\frac{1}{2}\alpha-\eta} + e^{\frac{1}{2}-\frac{1}{2}\alpha-\eta}\alpha - 1 - \alpha}{e^{\frac{1}{2}-\frac{1}{2}\alpha-\eta}} \\
\rho^w(z_{\min}) &= -\frac{1}{2}\frac{-e^{\frac{1}{2}-\frac{1}{2}\alpha+\eta} + e^{\frac{1}{2}-\frac{1}{2}\alpha+\eta}\alpha + 1 - \alpha}{e^{\frac{1}{2}-\frac{1}{2}\alpha+\eta}}
\end{aligned}$$

Taking limits

$$\begin{aligned}
\lim_{\alpha\to 0}\rho^b(z_{\min}) &= \lim_{\alpha\to 0}\frac{1}{2}\frac{e^{\frac{1}{2}-\frac{1}{2}\alpha-\eta} + e^{\frac{1}{2}-\frac{1}{2}\alpha-\eta}\alpha - 1 - \alpha}{e^{\frac{1}{2}-\frac{1}{2}\alpha-\eta}} = \frac{1}{2}\left(1 - e^{-\frac{1}{2}+\eta}\right) \\
\lim_{\alpha\to 0}\rho^w(z_{\min}) &= \lim_{\alpha\to 0} -\frac{1}{2}\frac{-e^{\frac{1}{2}-\frac{1}{2}\alpha+\eta} + e^{\frac{1}{2}-\frac{1}{2}\alpha+\eta}\alpha + 1 - \alpha}{e^{\frac{1}{2}-\frac{1}{2}\alpha+\eta}} = \frac{1}{2}\left(e^{\frac{1}{2}+\eta} - 1\right)e^{-\frac{1}{2}-\eta}
\end{aligned}$$

Subtracting,

$$\lim_{\alpha\to 0}\left(\rho^w(z_{\min}) - \rho^b(z_{\min})\right) = \frac{1}{2}\left(e^{\frac{1}{2}+\eta} - 1\right)e^{-\frac{1}{2}-\eta} - \frac{1}{2}\left(1 - e^{-\frac{1}{2}+\eta}\right) = \frac{1}{2}\left(e^{2\eta} - 1\right)e^{-\frac{1}{2}-\eta} > 0$$

Hence, regardless of η complete segregation is stable. Next take limits

$$\begin{aligned}
\lim_{\alpha\to 1}\rho^b(z_{\min}) &= \lim_{\alpha\to 1}\frac{1}{2}\frac{e^{\frac{1}{2}-\frac{1}{2}\alpha-\eta} + e^{\frac{1}{2}-\frac{1}{2}\alpha-\eta}\alpha - 1 - \alpha}{e^{\frac{1}{2}-\frac{1}{2}\alpha-\eta}} = 1 - e^{\eta} < 0 \\
\lim_{\alpha\to 1}\rho^w(z_{\min}) &= \lim_{\alpha\to 1} -\frac{1}{2}\frac{-e^{\frac{1}{2}-\frac{1}{2}\alpha+\eta} + e^{\frac{1}{2}-\frac{1}{2}\alpha+\eta}\alpha + 1 - \alpha}{e^{\frac{1}{2}-\frac{1}{2}\alpha+\eta}} = 0
\end{aligned}$$

Hence again complete segregation is stable. Since the marginal bid rent functions are continuous in α, the result follows. ■

Proof of Proposition 4

Define the functions

$$\begin{aligned} F^b(z,\rho) &\equiv \log(1-z)+\bar{y}_1+v(\beta_1)-\log(1-z-\rho)-\bar{y}_2-v(1-\beta_1) \\ F^w(z,\rho) &\equiv \log z+\bar{y}_1+v(1-\beta_1)-\log(z-\rho)-\bar{y}_2-v(\beta_1) \end{aligned}$$

The indifference conditions for the marginal households then imply that an equilibrium, $F^b(z,\rho)=F^w(z,\rho)=0$. Since these functions are differentiable, the implicit function theorem may be used to define the two continuous and differentiable functions $\rho^b(z)$ and $\rho^w(z)$ which satisfy

$$\begin{aligned} \frac{d\rho^b}{dz} &= -\frac{\partial F^b(z,\rho)/\partial z}{\partial F^b(z,\rho)/\partial \rho} \\ &= -(1-z-\rho)\left(-\frac{1}{1-z}+\bar{y}_1'+\beta_1'v'(\beta_1)+\frac{1}{1-z-\rho}-\bar{y}_2'+\beta_1'v'(1-\beta_1)\right) \quad (7) \\ \frac{d\rho^w}{dz} &= -\frac{\partial F^w(z,\rho)/\partial z}{\partial F^w(z,\rho)/\partial \rho} \\ &= -(z-\rho)\left(\frac{1}{z}+\bar{y}_1'-\beta_1'v'(1-\beta_1)-\frac{1}{z-\rho}-\bar{y}_2'-\beta_1'v'(\beta_1)\right) \quad (8) \end{aligned}$$

at the equilibrium rent ρ. From (2–4) we obtain

$$\begin{aligned} \beta_1'(z) &= -\frac{2}{1+\alpha} \\ \bar{y}_1'(z) &= \frac{4z-2}{1+\alpha} \\ \bar{y}_2'(z) &= \frac{2-4z}{1+\alpha} \end{aligned}$$

From (1), we have $v'(r)=1-2r+\eta$. When $\alpha=1$, there is an integrated equilibrium with $\beta_1=z=\frac{1}{2}$. At this equilibrium we therefore have $\beta_1'=-1$, $\bar{y}_1'=0=\bar{y}_2'$, and $v'(\beta_1)=\eta=v'(1-\beta_1)$. Substituting these values in (7–8) yields after simplification

$$\left.\frac{d\rho^b}{dz}\right|_{z=\frac{1}{2}}-\left.\frac{d\rho^w}{dz}\right|_{z=\frac{1}{2}}=2\eta-4\rho(1+\eta)$$

Using the indifference conditions at the equilibrium, we get $\rho=\frac{1}{2}\left(1-e^{-\frac{1}{2}}\right)$. Hence at equilibrium,

$$\left.\frac{d\rho^b}{dz}\right|_{z=\frac{1}{2}}-\left.\frac{d\rho^w}{dz}\right|_{z=\frac{1}{2}}=2\eta-2\left(1-e^{-\frac{1}{2}}\right)(1+\eta)$$

This is negative if and only if $\eta<e^{\frac{1}{2}}-1\approx 0.65$. Hence, for η sufficiently small and $\alpha=1$, the integrated equilibrium is stable. By continuity, the same applies when α is sufficiently close to 1. ■

References

[1] Benabou, R. (1992). "Workings of a City: Location, Education, and Production." *Quarterly Journal of Economics* 108: 619-52.

[2] Benabou, R. (1996). "Heterogeneity, Stratification, and Growth: Macroeconomic Implications of Community Structure and School Finance." *American Economic Review* 86: 584-609.

[3] Bobo, L., H. Schuman, and C. Steeh (1986). "Changing Attitudes Toward Residential Segregation." In *Housing Desegregation and Federal Policy*, edited by J.M. Goering. Chapel Hill: University of North Carolina Press.

[4] Bond, E.W and E.N. Coulson (1889). "Externalities, Filtering, and Neighborhood Change" *Journal of Urban Economics* 26: 231-49.

[5] Council of Economic Advisors (1998). *The Economic Report of the President*. Washington: U.S. Government Printing Office.

[6] Cutler, D.M., E.L. Glaeser and J.L. Vigdor (1999). "The Rise and Decline of the American Ghetto." *Journal of Political Economy* 107: 455–506.

[7] de Bartolome, C.A.M. (1990). "Equilibrium and Inefficiency in a Community Model with Peer Group Effects." *Journal of Political Economy* 98: 110-33

[8] Denton, N.A. and D.S. Massey (1988). "Residential Segregation of Blacks, Hispanics and Asians by Socioeconomic Status and Generation." *Social Science Quarterly* 69: 797–817.

[9] Durlauf, S.N. (1996). "A Theory of Persistent Income Inequality". *Journal of Economic Growth* 1: 75-93.

[10] Ellen, I.G. (2000). *Sharing America's Neighborhoods: The Prospects for Stable Racial Integration*. Cambridge: Harvard University Press.

[11] Epple, D. and G.J. Platt (1998). "Equilibrium and Local Redistribution in an Urban Economy When Households Differ in Both Preferences and Incomes." *Journal of Urban Economics* 43: 23-51.

[12] Epple, D. and T. Romer (1991). "Mobility and Redistribution" Journal of Political Economy 99: 828-58.

[13] Farley, R., M. Krysan, T. Jackson, C. Steeh, and K. Reeves (1993). "Causes of Continued Racial Residential Segregation in Detroit: 'Chocolate City, Vanilla Suburbs' Revisited" *Journal of Housing Research 4*: 1-38.

[14] Farley, R., H. Schuman, S. Bianci, D. Colasanto, and S. Hatchett (1978). "'Chocolate City, Vanilla Suburbs': Will the Trend Toward Racially Separate Communities Continue?" *Social Science Research* 7: 319-44.

[15] Farley, R., C. Steeh, M. Krysan, T. Jackson, and K. Reeves (1994). "Stereotypes and Segregation: Neighborhoods in the Detroit Area." *American Journal of Sociology* 100: 750-80.

[16] Farley, R. and W.H. Frey (1994). "Changes in the Segregation of Whites from Blacks during the 1980: Small Steps toward a more Integrated Society." *American Sociological Review* 59: 23–45.

[17] Fernandez, R. and R. Rogerson (1996). "Income Distribution, Communities, and the Quality of Public Education." *Quarterly Journal of Economics* 111: 135-64.

[18] Kern, C.R. (1981). "Racial Prejudice and Residential Segregation: The Yinger Model Revisited" *Journal of Urban Economics* 10: 164-72.

[19] Lewis Mumford Center for Comparative Urban and Regional Research (2001). "Ethnic Diversity Grows, Neighborhood Integration Is at a Standstill." *Metropolitan Racial and Ethnic Change: Census 2000 Reports.* State University of New York at Albany (http://www.albany.edu/mumford/census).

[20] Loury, G.C. (1977). "A Dynamic Theory of Racial Income Differences." In *Women, Minorities and Employment Discrimination*, edited by Phyllis Wallace and Annette LaMond.

[21] Lundberg, S. and R. Startz (1998). "Race, Information, and Segregation." Mimeo, University of Washington.

[22] Massey, D.S. and N.A. Denton (1993). *American Apartheid: Segregation and the Making of the Underclass.* Cambridge: Harvard University Press.

[23] O'Flaherty, B. (1999). "Troubled Transactions and their Consequences: Race in the United States." Mimeo, Columbia University.

[24] Schelling, T.C. (1971). "Dynamic Models of Segregation." *Journal of Mathematical Sociology* 1: 143–86.

[25] Schelling, T.C. (1972). "A Process of Residential Segregation: Neighborhood Tipping." In *Racial Discrimination in Economic Life*, edited by A.H. Pascal. Lexington, MA: Lexington Books.

[26] Schelling, T.C. (1978). *Micromotives and Macrobehavior*. New York: W.W. Norton.

[27] Schnare and McRae (1978). "The Dynamics of Neighborhood Change." *Urban Studies* 15: 327-331.

[28] Schuman, H., C. Steeh, L. Bobo, and M. Krysan (1997). *Racial Attitudes in America: Trends and Interpretations*, Revised Edition. Cambridge: Harvard University Press.

[29] Sethi, R. and R. Somanathan (2001). "Racial Income Disparities and the Measurement of Segregation." Mimeo, Barnard College, Columbia University.

[30] U.S. Census Bureau (2000). *Current Population Reports, P60-209, Money Income in the United States: 1999.* Washington: U.S. Government Printing Office.

[31] Wilson, W.J. (1987). *The Truly Disadvantaged: The Inner City, the Underclass, and Public Policy*. Chicago: University of Chicago Press.

[32] Yinger, J. (1976). "Racial Prejudice and Racial Residential Segregation in an Urban Model." *Journal of Urban Economics* 1: 21-47.

[33] Yinger, J. (1995). *Closed Doors, Opportunities Lost: The Continuing Costs of Housing Discrimination*. New York: Russell Sage Foundation.

[34] Zubrinsky Charles, C. (2001). "Processes of Racial Residential Segregation." In *Urban Inequality: Evidence from Four Cities*, edited by Alice O'Connor, Chris Tilly, and Lawrence D. Bobo. New York: Russell Sage Foundation.