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Gentrification and crime

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Abstract

Low-income and high-income agents compete for space in an inner city, which has more crime but better access. The spatial equilibrium is characterized by income mixing, a result of the assumption that agents differ in the marginal disutility of travel time. Gentrification, defined as the displacement of low-income households, results from a decrease in crime or an increase in the frequency of travel to the center. Changes in the income mix are self-reinforcing because the crime rate is increasing in the number of low-income agents, and the prices of local goods are decreasing in the population of the relevant group (the Starbucks effect). A case study of Portland, Oregon provides an example of gentrification in the 1990s.

1. Introduction

The term "gentrification" typically refers to a variety of changes in inner cities caused by the displacement of low-income households by high-income households. This paper develops a model of competition between two income groups for city land. In contrast with the traditional urban model of income segregation, the equilibrium is characterized by income mixing, a result of the assumption that agents differ in the marginal disutility of travel time. The victim cost of city crime increase with income, so the city is initially dominated by low-income agents. A decrease in the crime rate generates a more balanced population mix as high-income agents displace low-income agents—gentrification. Displacement is self-

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reinforcing because a zero-sum change in population in favor of high-income households decreases the crime rate, decreases the price of a local good consumed by high-income agents (the Starbucks effect), and increases the price of a low-income good.

The inner city area of Portland, Oregon provide a case study of gentrification over the period 1990–2000. At the start of the decade, half the inner-city census tracts had black majorities; by the end of the decade, none had a black majority. The average inner-city census tract lost 285 blacks but gained 507 non-blacks, and lost 176 poor persons but gained 450 persons in households with income at least twice the poverty level. In the rest of the city, the typical tract gained 9 blacks and lost 25 poor persons. The inner city also experienced relatively rapid increases in housing prices, with the median house price increasing by a factor of 3.38.

The remainder of the paper is organized as follows. The next section summarizes the literature on gentrification and income mixing, and Section 3 provides a case study of gentrification in Portland, Oregon, describing the changes in racial and income composition, as well as changes in crime rates. Section 4 uses a simple model of competition for inner-city land to show the effects of changes in crime rates and travel frequency on the population mix of the inner city. Section 5 discusses the implications of relaxing the assumption of income-inelastic demand for land, and Section 6 concludes.

2. Literature review

Kern [8] examined the changes in the high-income population of New York City in the 1960s. He extended the standard urban location model to consider variation in tastes for land and non-commuting travel to the city center, and identified the circumstances under which the high-income population is split between city and suburbs: The city dwellers have relatively low demand for land and high demand for trips to the center. Kern shows that the increase in New York City's high-income population resulted from rapid growth in the segment of the metropolitan population that had relatively large demands for central-city goods and cultural amenities—young adults, unmarried individuals, and childless couples.

The policy and planning literature on gentrification documents more recent demographic changes in inner city areas, with emphasis on changes in income, race, and education level. Some examples are Vigdor [14], Smith and DeFilippis [13], and Atkinson [1]. In addition to documenting the demographic changes in inner-city Boston, Vigdor proposes two possible explanations for a shift in the inner city toward households with higher income and education: a shift in the preferences of high-income agents toward inner-city amenities, and an increase in the income of high-income agents relative to that of low-income agents.

By definition, a model of gentrification features a mixture of different income groups in the inner city, as opposed to income segregation. In contrast, there is income sorting in the traditional Mills–Muth model [11,12], with the location of the high-income territory being determined by the income elasticities of commuting costs and land. Similarly, in a Tiebout model, income sorting facilitates the matching of citizens with different levels of local public goods. In a model of income mixing, LeRoy and Sonstelie [9] introduce two travel modes, an inexpensive but slow mode (the bus) for short distances, and an expensive

but fast mode (the automobile) for long distances. The inner bus district accommodates both poor and rich bus riders; the rich occupy the inner part of the bus district because the demand for land is income-inelastic. The same income pattern emerges in the more remote automobile district.

De Bartolome and Ross [6] incorporate a public sector into a spatial model, and income mixing is one possible outcome. There are two income groups and two jurisdictions (city and suburb), with majority rule determining the provision of local public goods. The demand for land is income-inelastic, so when the two income groups share a jurisdiction, the rich occupy the land closer to the city center. In one equilibrium, the poor have a majority in the city, and choose a low level of the public good. The rich are indifferent between the city and the suburb (with a high level of the public good) because land prices reflect the differences in commuting costs as well as local public goods.

In this paper, income mixing occurs because agents differ their marginal disutility of travel. As in the earlier models of income mixing, the demand for land is income-inelastic, so high-income agents tend to locate closer to the center, ceteris paribus. But a high-income agent with a relatively low disutility will be outbid for a more accessible land by a low-income agent with a relatively high marginal disutility. The inclusion of central-city crime, with victim costs increasing with income, presents an opportunity for gentrification: initially, the central city will be dominated by low-income agents, and a reduction in crime generates a more balanced population mix.

This paper incorporates some of the insights from the suburban flight literature, which explores the effects of central-city problems on the location decisions of high-income agents. Papers by Frey [7] and Cullen and Levitt [5] show that inner-city crime encourages the suburbanization of high-income households, and a paper by Brueckner et al. [2] shows that the presence of central-city amenities discourages suburbanization. In this paper, gentrification is triggered by a reduction in crime or an increase in the frequency of travel to the central city.

3. A case study of Portland, Oregon

Data from the US Census and the Portland Police Bureau allows us to compare the changes in an inner-city area to the changes in the rest of the municipality over the decade 1990–200. The inner-city area is a cluster of 11 census tracts close to downtown Portland, an area that historically has contained a disproportionate share of the city's poor and minority populations. Over the decade, this area experienced many of the changes associated with gentrification, including population shifts in favor of households with higher income and more education, a decrease in the black population, and higher housing prices.

Table 1 shows the changes in the inner-city area and the rest of the municipality over the period 1990–2000. Consider first the changes in income. The share of the population living in households below the poverty level decreased but increased elsewhere. For the city as a whole, the poverty share was virtually unchanged. The share of the population with income at least twice the poverty income increased by 37% in the inner city, compared to a 6% increase in the rest of the city. The median income of the inner city increased by a factor of 1.97, compared to 1.55 elsewhere.

Table 1
Portland inner city versus rest of the city, 1990–2000

	1990	2000	2000 value/ 1990 value
Share poor			
Inner city	0.256	0.187	0.73
Rest of the city	0.034	0.041	1.21
Share income > twice poverty income			
Inner city	0.445	0.609	1.37
Rest of the city	0.748	0.796	1.06
Median income			
Inner city	17,108	33,721	1.97
Rest of the city	25,962	40,307	1.55
Share black			
Inner city	0.424	0.288	0.68
Rest of the city	0.0496	0.0505	1.02
Share not completing high school			
Inner city	0.239	0.16	0.67
Rest of the city	0.17	0.136	0.80
Share college degree			
Inner city	0.261	0.383	1.47
Rest of the city	0.324	0.404	1.25
Share graduate or professional degree			
Inner city	0.068	0.113	1.66
Rest of the city	0.092	0.123	1.34
Median house value			
Inner city	45,173	152,582	3.38
Rest of the city	70,541	180,415	2.56
First quartile house value			
Inner city	34,355	123,291	3.59
Rest of the city	54,724	149,146	2.73
Median rent			
Inner city	403	642	1.59
Rest of the city	429	681	1.59

Consider next the changes in racial composition. For the inner city, the black share of population dropped from 0.424 to 0.288, while elsewhere, the black share was virtually unchanged around 0.05. In six of the eleven inner-city tracts, the black population went from the majority to a minority. Among these tracts, the average black share dropped from 0.63 to 0.42.

Another facet of gentrification is an increase in educational attainment. The share of the adult population that had not completed high-school decreased by one third in the inner city, compared to a reduction of one fifth elsewhere. The share of adults with college degrees increased by 47% in the inner city, compared to 25% elsewhere. Similarly, the inner city experienced a larger percentage increase in the share of the adult population with a graduate or professional degree.

Housing prices increased throughout the city, with the largest increases in the inner-city area. The median house value increased by a factor of 3.38 in the inner city, compared to 2.56 elsewhere. In the lower range of house values, the value at the 25th percentile

increased by a factor of 3.59 in the inner city, compared to 2.73 elsewhere. The increases in median rents were much smaller, and virtually the same in percentage terms in the two areas.

Table 2 shows crime rates for different groups of census tracts for 1992 (the first year for which police data listed the census tract of each offense) and 2000. The crime rates are computed as the number of reported offenses per 1000 persons. For all four crimes (motor-vehicle theft, burglary, assault, and robbery), the inner city experienced larger decreases in crime. For the four crimes added together, the drop in the frequency in the inner city (49 fewer crimes) was nearly ten times the reduction elsewhere (5 fewer crimes). The probability of being a victim of these four crimes dropped from 0.1006 to 0.0520 in the inner city, compared to a reduction elsewhere from 0.0394 to 0.0344.

The last row of Table 2 shows the per-capita cost of the four crimes together. Miller et al. [10] estimate the victim cost per crime (for lost work time, injuries, and monetary losses) as follows: $4000 for auto theft, $15,000 for assault, $1500 for burglary, and $13,000 for armed robbery. In the inner city, the per-capita crime cost dropped by $460, compared to a reduction of $37 in the rest of the city.

Table 3 shows the changes in the racial and income composition of the inner city and the rest of the municipality. The numbers are the changes in the average number of persons per census tract, computed as the change within the area (the inner city or elsewhere) divided by the number of census tracts in the area. For the inner city, the average number of blacks and poor persons per tract decreased, while the number of non-blacks and the number of people in households with at least twice the poverty income increased. Elsewhere, the number of black persons increased, while the number of poor persons decreased by smaller amounts. For mature tracts outside the inner city (defined as tracts that did not grow by 20% or more over the decade), the numbers of non-black and non-poor persons increased by even smaller amounts.

Table 2
Crime rates in Portland inner city and rest of the city, 1992–2000

	Inner city			Rest of the city		
	1992	2000	Change	1992	2000	Change
Motor vehicle thefts per 1000	25.0	19.9	−5.1	13.4	17.0	3.6
Burglaries per 1000	27.1	13.1	−13.9	15.1	9.5	−5.6
Assaults per 1000	30.4	13.3	−17.1	7.4	5.9	−1.5
Robberies per 1000	18.1	5.7	−12.5	3.6	2.0	−1.6
Total crimes per 1000	100.6	52.0	−48.6	39.4	34.4	−5.0
Cost per capita ($)	833	373	−460.2	234	198	−36.6

Table 3
Change in persons per tract, inner city and rest of the city, 1990–2000

	Inner city	Rest of the city	Rest of the city: mature
Black	−285	+15	+9
Non-black	+507	+224	+146
Poor	−176	−11	−25
Income > Twice poverty income	+450	+305	+231

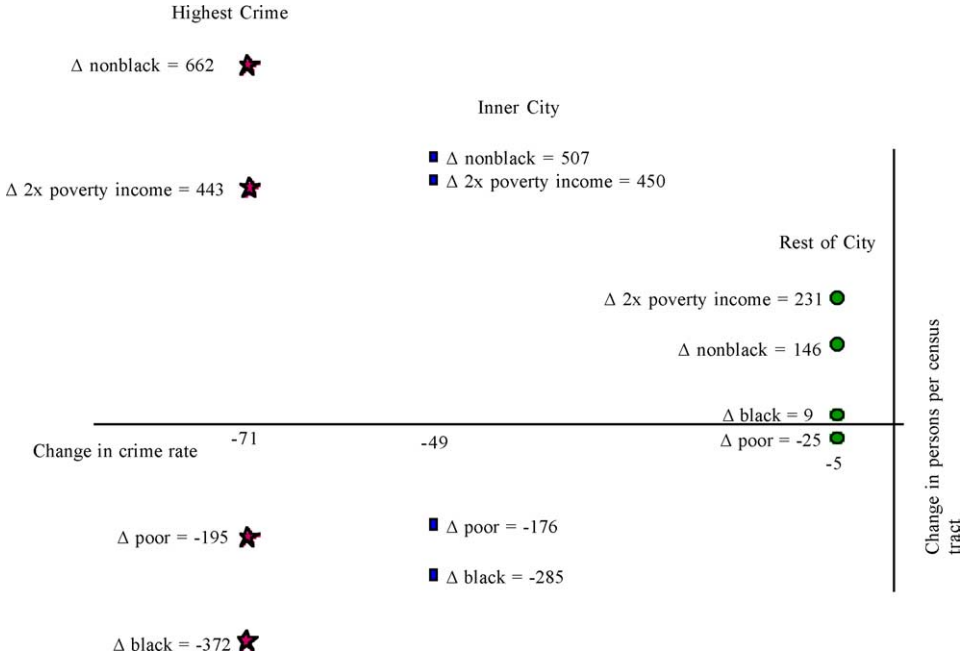

Fig. 1. Changes in crime and population.

Figure 1 plots the population changes against the change in crime rates for three groups of census tracts. In addition to the 11-tract inner city area and the rest of the city, the figure shows the changes for a group of five high-crime tracts in the inner city. These tracts had the highest initial crime rates and experienced the largest reductions in crime between 1992 and 2000. The crime rate decreased from 127 (about 1.3 times the inner-city rate and about 3.3 times the rate for the rest of the city) to 56 (about 1.1 times the inner-city rate and 1.6 times the rate for the rest of the city). Compared to the rest of the inner city, the high-crime area experienced larger changes in racial composition (larger changes in black and non-black populations) and roughly the same changes in income composition. Compared to the entire inner-city area, the high-crime area also experienced a larger increase in median housing values.

4. A model of crime and gentrification

Consider a monocentric city with two areas of unit size, a city and a suburb. Two groups, low income (l) and high income (h), compete for space in the two areas. The agents consume land and one of two local goods (one for each income group), with perfectly inelastic demands for each. Each agent travels to the city center for work and other activities.

The travel cost is zero for a city resident, but positive for a suburban resident. Travel from the suburb comes at the expense of leisure time, and agents spend part of their income to compensate for the disutility of travel time. Agents differ in the marginal disutility

of travel θ, defined as the fraction of the wage that is spent per unit of travel time to compensate for travel. Agents spend part of their income to ease the burden of commuting (buying leather seats and sound systems) and offset its negative effects (homecoming martinis). The wage net of suburban travel cost is

$$w(1 - st\theta) \tag{1}$$

where s is the travel time per trip and t is the number of trips. I assume that the disutility measure θ is distributed $F[\theta]$ on support $[0, 1]$, with a uniform distribution $F[\theta] = \theta$. The F distribution applies separately within each income group.

The cost of crime is zero for a suburban resident, but positive for a city resident. A victim of crime incurs a loss B, which is increasing in income: B_h (the loss for a high-income agent) $> B_l$ (the loss for a low-income agent). The probability of being a crime victim is $c(\delta)$, where δ is the low-income share of city population. The wage net of losses from crime is

$$w - c(\delta)B. \tag{2}$$

I assume that the crime rate is increasing in the low-income share of the population. This represents an empirical regularity, presumably a result of the lower opportunity cost of low-income agents and a lower willingness to pay for crime control. This regularity is observed in Portland: A simple regression of crime rates (1992 police data) on the low-income share (1990 census data) across census tracts generates an estimated elasticity of crime with respect to the low-income share of 0.74 (t-statistic = 8.87; adjusted $R^2 = 0.39$).

The two income groups compete for land in the city, with land allocated to the highest bidder. The suburban rent is anchored by the opportunity cost of land, m. Assume for the moment that the prices of local goods are unitary in both areas. For a high-income agent with $\theta = \theta_h$, city rent equals the suburban rent m, plus the savings in travel costs relative to living in the suburb, minus city crime costs:

$$r_h = m + w_h st\theta_h - c(\delta)B_h. \tag{3}$$

As shown in Fig. 2, the bid for city land is negative for $\theta = 0$ because of city crime, and increasing in θ because the travel cost to the suburb is increasing in θ. Similarly, for a low-income agent with $\theta = \theta_l$,

$$r_l = m + w_l st\theta_l - c(\delta)B_l. \tag{4}$$

4.1. Equilibrium conditions

In an interior solution, both income groups occupy city land and pay the same rent. In Fig. 2, for city rent r^*, the threshold disutilities are θ_h and θ_l. High-income agents with a larger travel disutility $\theta > \theta_h$ strictly prefer the city, while those with lower θ prefer the suburb. Similarly, θ_l is the threshold disutility for low-income agents.

The second equilibrium condition is that the sum of the agents in the city equals its fixed unit area. There are $1 - \theta_l$ low-income agents and $1 - \theta_h$ high-income agents, so

$$1 = 1 - \theta_h + 1 - \theta_l. \tag{5}$$

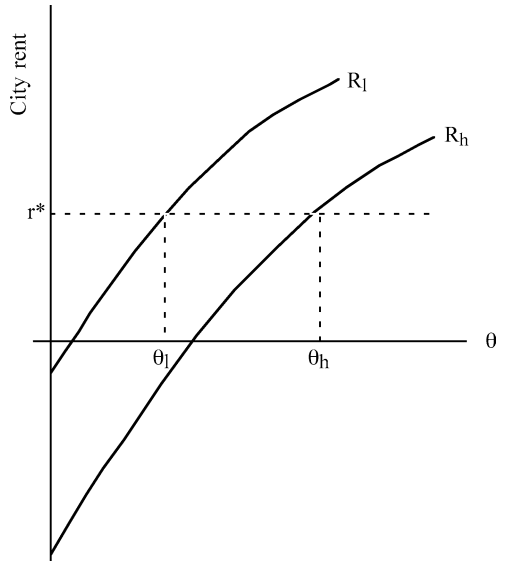

Fig. 2. City rent and travel disutility.

This implies $\theta_h = 1 - \theta_l$. The low-income share of the city population is $1 - \theta_l$. Equating the land rents of the two groups and solving for θ_l, the equilibrium disutility threshold is

$$\theta_l = \frac{w_h}{(w_h + w_l)} - \frac{c(1-\theta_l)(B_h - B_l)}{st(w_h + w_l)}. \tag{6}$$

Consider next the effect of endogenous local prices. The two income groups consume different local products (x_h and x_l), and the price of each product is decreasing in the relevant population group. The endogenous prices reflects scale economies in production: the larger the population consuming a local good, the lower the price. Clemmer [3] shows that gentrifying areas typically experience increases in the number of establishments catering to high-income households (coffee shops, florists, restaurants, and bookstores), while the number of establishments catering to low-income households decreases. Define P_h as the difference between the city price and suburban price of the high-income local good and P_l as the city-suburb gap for the low-income good. Equating the land rents of the two groups and solving for the equilibrium threshold disutility,

$$\theta_l = \frac{w_h}{(w_h + w_l)} - \frac{c(1-\theta_l)(B_h - B_l) + x_h P_h(\theta_l) - x_l P_l(1-\theta_l)}{st(w_h + w_l)}. \tag{7}$$

4.2. Fixed-point interior solutions

The equilibrium in the model is described by the threshold disutility level θ_l. The equilibrium value θ_l is the solution to (7), i.e., the fixed point of the mapping $\phi(\theta_l)$,

$$\phi(\theta_l) = \frac{w_h}{(w_h + w_l)} - \frac{c(1-\theta_l)(B_h - B_l) + x_h P_h(\theta_l) - x_l P_l(1-\theta_l)}{st(w_h + w_l)}. \tag{8}$$

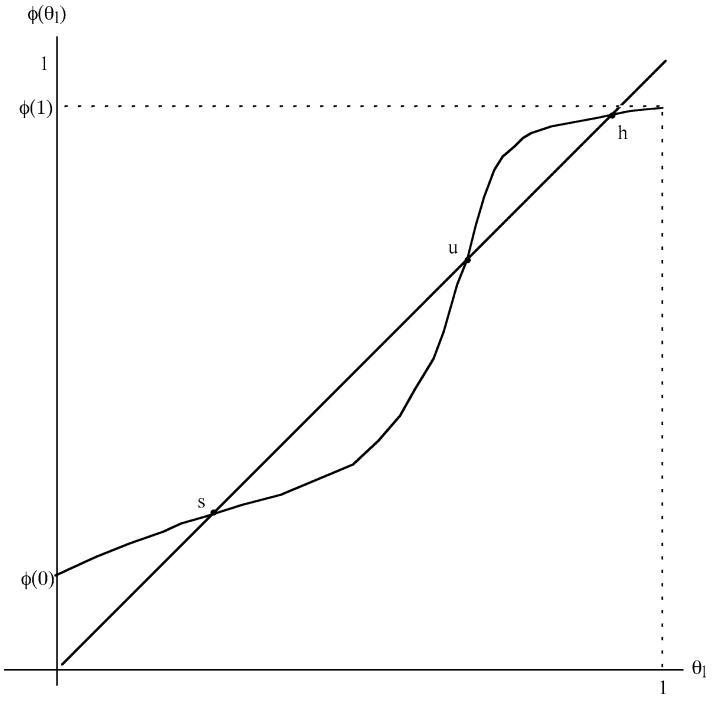

Fig. 3. Stable and unstable solutions.

In Fig. 3 the possible equilibria are shown by the intersections of $\phi(\theta_l)$ and the 45° line. Since $\phi(\theta_l)$ is a composition of continuous functions, it is continuous on the interior of $[0, 1]$. If $\phi(0) > 0$ and $\phi(1) < 1$, then by continuity, $\phi(\theta_l)$ must have at least one interior fixed point.

Consider first $\phi(0)$, the outcome with a conjecture that the city will have only low-income agents. When $\theta_l = 0$, the city is full of low-income agents, so crime is at its maximum level $c(1)$, as is the price of the high-income good. In contrast, the price of the low-income good is at its minimum. For $\phi(0) > 0$, at least one high-income agent must choose the city under the worst of conjectured circumstances (for high-income agents). Using (8), this will occur if

$$stw_h > c(1)(B_h - B_l) + x_h P_h(0) - x_l P_l(1). \tag{9}$$

The right side shows the disadvantage of city living for a high-income agent relative to a low-income agent. The high-income agent is at a disadvantage because of higher victim cost ($B_h > B_l$) and a higher local price ($P_h(0) > P_l(1)$). If the maximum disadvantage (which occurs with $\theta_l = 0$) is small relative to the travel-cost benefit of city living, there will be a high-income "pioneer" in the city. In other words, if the travel-cost parameters (t and s) are large relative to the maximum crime rate, the gap in victim cost, and the maximum price gap, a conjecture of an exclusive low-income city will not be realized, i.e., $\phi(0) > 0$.

Consider next $\phi(1)$, the outcome with a conjecture of an exclusive high-income city. When $\theta_l = 1$, the city is full of high-income agents, so crime is at its minimum level $c(0)$, as is the price of the high-income good. In contrast, the price of the low-income good is at its maximum. For $\phi(1) < 1$, at least one high-income agent must not choose the city in the best of conjectured circumstances, meaning that at least one low-income agent must choose the city in the worst circumstances. Using (8), this will occur if

$$c(0)(B_h - B_l) + x_h P_h(1) - x_l P_l(0) > -st w_l. \tag{10}$$

If there were no spatial differences in the prices of local goods ($P_h = P_l = 0$), this condition would always be satisfied because the left side would always be positive.

Matters are more complex when local prices vary with the size of the relevant population group. In an exclusive high-income city, $P_h(1) < P_l(0)$, and the left side of (10) will be negative if the price gap is large relative to the gap in the expected crime cost, $c(0)(B_h - B_l)$. A sufficient condition for $\phi(1) < 1$ is

$$c(0)(B_h - B_l) > x_l P_l(0) - x_h P_h(1), \tag{11}$$

i.e., the gap in the expected crime cost is large relative to the gap between $P_l(0)$ and $P_h(1)$. This condition will be satisfied if the minimum expected crime cost is large relative to the maximum price gap $P_l(0) - P_h(1)$. The price gap will be relatively small if the elasticities of local prices with respect to the relevant population groups are sufficiently small. If (11) is satisfied, a low-income "pioneer" will outbid a high-income agent for city land. In this case, a conjecture of an exclusive high-income city will not be realized, i.e., $\phi(1) < 1$.

The intuition behind (11) is as follows. A low-income pioneer happens when the low-income agent with the highest travel disutility outbids the high-income agent with the lowest travel disutility. In the absence of endogenous local prices, this will happen because a high-income agent with zero disutility has nothing to gain from a city location, but more to lose from crime. When local prices are endogenous, lower prices provide an additional advantage to city living. Consequently, a high-income agent with zero travel disutility (and a lower local price) may outbid the low-income agent with highest travel disutility (and a higher local price). To prevent an exclusive high-income city, local prices cannot be too elastic with respect to the relevant population group.

As shown in Fig. 3, there may be multiple equilibria, e.g., points s, u and h. The slope of $\phi(\theta)$ is positive:

$$\phi'(\theta_l^*) = \frac{c'(B_h - B_l) - x_h P_h' - x_l P_l'}{st(w_h + w_l)} > 0. \tag{12}$$

The positive slope reflects three self-reinforcing effects of changes in the population mix. First, $c' > 0$: crime is increasing in the low-income population share. An increase in θ_l decreases the low-income population share, decreasing the crime rate. Given the higher victim cost for high-income agents, their bid for city land increases in relative terms, and the high-income population increases. Second, $P_h' < 0$: the price of the high-income good is decreasing in the high-income population. An increase in θ_l increases the number of high-income consumers in the city and decreases the price of their local good; at the margin, high-income agents outbid low-income agents for city land (the Starbucks effect).

Third, $P_l' < 0$. An increase in θ_l decreases the number of low-income consumers in the city and increases the price of the low-income good; at the margin, high-income agents outbid low-income agents.

Figure 3 shows two stable equilibria and one unstable equilibrium. The stability condition is that the slope of $\phi(\theta_l)$ is less than 1. This condition is satisfied at points s and h, but not at point u. The stability condition $\phi(\theta_l) < 1$ will be satisfied if the self-reinforcing effects are sufficiently weak, i.e., the crime rate is not too responsive to changes in the low-income share and local prices are not to responsive to changes in the relevant population group.

4.3. Sources of gentrification

The derivatives of $\phi(\theta_l)$ reveal the potential sources of gentrification. A positive derivative indicates an upward shift in $\phi(\theta_l)$ and, for a stable solution, an increase in the equilibrium θ_l. From (8), the derivative of $\phi(\theta_l)$ with respect to the crime rate (c) is negative:

$$\frac{\partial\phi(\theta_l)}{\partial c} = -\frac{(B_h - B_l)}{st(w_h + w_l)} < 0. \tag{13}$$

High-income agents experience a larger loss per crime ($B_h > B_l$), so their bid for city land is more sensitive to the crime rate. An autonomous increase in the crime rate decreases θ_l, increasing the low-income population at the expense of the high-income population. In the opposite direction, an autonomous decrease in the crime rate increases θ_l, and high-income agents displace low-income agents—gentrification.

Consider next the effects of changes in the travel-cost parameters. The derivative of $\phi(\theta_l)$ with respect to the frequency of travel is

$$\frac{\partial\phi(\theta_l)}{\partial t} = \frac{c(1-\theta_l)(B_h - B_l) + x_h P_h(\theta_l) - x_l P_l(1-\theta_l)}{st^2(w_h + w_l)}. \tag{14}$$

In the absence of endogenous local prices ($P_h = P_l = 0$), the derivative would be unambiguously positive. With endogenous local prices, the numerator is decreasing in θ_l because the crime rate and the high-income price are decreasing in θ_l, while the low-income price is increasing in θ_l. The numerator reaches its minimum when $\theta_l = 1$. If (11), the sufficient condition for $\phi(1) < 1$, is satisfied, the numerator of (14) will always be positive, so the derivative will be positive.

A positive derivative of ϕ with respect to t means that more frequent travel causes gentrification. An increase in travel frequency increases the relative attractiveness of the city for both income groups. Because the cost of travel is increasing in income, the bid of high-income agents increases in relative terms, and at the margin they outbid low-income agents for city land. Similarly, an increase in the time per trip (s) increases the bid of high-income agents in relative terms, increasing θ_l and causing gentrification.

5. Extension: land as a normal good

In the model developed in the previous section, the demand for land is income-inelastic. In the absence of crime, a high-income agent with a particular θ has more to gain from a city location because travel costs are increasing in income, but land consumption is not. Consequently, the city has a relatively large number of high-income agents. Crime disrupts this pattern because high-income agents have more to lose from crime, and are displaced by low-income agents. A decrease in crime causes gentrification as the city moves closer to the crime-free mix of income groups. The assumption of income-inelastic land demand makes the results transparent, but of course land is a normal good, with positive income elasticity.

In a model in which land is a normal good, the location pattern is determined by the relevant income elasticities. Wheaton's [15] results suggest that the income elasticity of land is close to the income elasticity of commuting costs, so in the absence of other income-related spatial features, we would expect income mixing. In this paper, central-city crime is the spatial feature that inhibits mixing. The key parameter is the elasticity of crime cost with respect to income. If the crime-cost elasticity is relatively large, city crime exerts a stronger repelling effect on high-income agents, so the city will have a relatively small number of high-income agents. Because the marginal disutility of travel varies across agents, crime reduces the number of high-income city residents, but does not drive all of them out. In this case, central-city crime provides an opportunity for gentrification—a decrease in crime will increase the number of high-income agents.

If the crime-cost elasticity were relatively small, a decrease in crime will cause reverse gentrification. Suppose the land elasticity and the travel-cost elasticity are equal to unity, and the crime-cost elasticity is less than one. In this case, city crime exerts a stronger repelling effect on low-income agents, and the city will have a relatively large number of high-income agents. A decrease in crime will move the income mix closer to the crime-free mix, with more low-income agents.

Although there are no direct estimates of the income elasticity of crime cost, there is suggestive evidence that it is positive. A recent study using contingent valuation techniques suggest that the willingness to pay for crime reduction is increasing in income (Cohen et al. [4]). The results of Cullen and Levitt [5] are consistent with a crime-cost elasticity that exceeds the income elasticity of demand for land. They measured the repelling effect of crime as the number of households that leave the central city for each additional crime. The repelling effect for household heads with some college education was roughly twice as large as the effect for household heads not completing high school and roughly 20% greater than the effect for high-school graduates.

6. Summary

This paper presents a model of competition between different income groups for inner-city land. The model generates income mixing rather than sorting because agents differ in their marginal disutility of travel. Crime distorts the city's population mix in favor of low-income agents, who have less to lose from crime. A decrease in crime reduces this

distortion, causing gentrification by increasing the number of high-income agents in the city. Gentrification is self-reinforcing because the displacement of low-income agents decreases the crime rate, decreases the consumer prices paid by high-income agents, and increases the prices paid by low-income agents.

A case study of Portland, Oregon documents changes in racial and income composition over the decade 1990–2000. These changes satisfy the conventional definition of gentrification, with the displacement of low-income and black households, as well as a shift toward more highly educated households. The tracts with the highest crime rates in 1992 experienced the largest reductions of crime, as well as the largest changes in housing prices, racial and income composition, and educational attainment.

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