Economics Bulletin

Volume 34, Issue 2

What drove gentrification in Chicago community areas in the 2000s?

Laudo M Ogura
Grand Valley State University

Abstract

Gentrification can be defined as the process of upper income households settlement in poor neighborhoods. While the overall population in Chicago has gone down in the 2000s, some neighborhoods experienced a growth in their upper income population. This paper presents a study of factors associated with this growth, based on the analysis of data for the 77 community areas in Chicago. Taking into account spatial dependence across areas, changes in the upper income population were found to be related to past population growth, youth, college attendance, employment opportunities, crime, and housing characteristics. Among the noticeable results were the negative effects of murder rates and the positive relation with the location of major public housing projects, which were renovated or demolished during the 1990s and 2000s.

The author is grateful for comments received from session participants in the 2013 meetings of the Midwest Economic Association and from a referee. Usual disclaimers apply.
Citation: Laudo M Ogura, (2014) "What drove gentrification in Chicago community areas in the 2000s?", *Economics Bulletin*, Vol. 34 No. 2 pp. 1045-1054.
Contact: Laudo M Ogura - ogural@gvsu.edu.
Submitted: November 11, 2013. **Published:** May 11, 2014.

1 Introduction

Gentrification is the process by which higher income households gradually move into a relatively poor neighborhood. It is often characterized by the relocation of college students, young professionals, and/or empty nesters into certain areas that become attractive with visible improvements in urban conditions: better housing, growing retail activities, and often a more diverse population in terms of race, age, and income. The improvements attract more gentrifiers, leading to a virtuous cycle. On the other hand, critics argue that gentrification excludes poor households, typically from minority groups, who are forced to move away as housing costs increase (Freeman 2005, 2009).

As previous studies have shown, gentrification does not happen in any neighborhood, but where there are certain factors that make it attractive to gentrifiers. These factors range from accessibility and amenities (Helms 2003) to demographic preferences (Kern 1984), crime (O'Sullivan 2005), the aging of the housing stock (Brueckner and Rosenthal 2009), etc.

In Chicago, an important factor might be the demolition or redevelopment of large public housing projects starting in the 1990s. For decades, these projects were known for contributing to crime and poverty concentration. Hartley (2010) finds that the demolition of vertical public housing led to significant declines in crime rates, which should make neighborhoods more attractive to upper income people.

While the total population of Chicago decreased during the 2000s, some community areas fared much better. To help understand gentrification factors, the current paper presents a study of the changes in the upper income population in the 77 community areas in Chicago during the 2000s. The analysis takes into account variables like demographics, employment, crime, housing, and local amenities. Due to the possibility of spillover effects, spatial dependence is also considered.

The results show that upper income population was more likely to increase in areas with greater past population growth, younger population share, college attendance, employment, and management occupation of resident workers. Housing characteristics also had noticeable effects. For instance, areas where major public housing projects were located experienced larger gains of upper income households, a likely result of the improvements resulting from recent demolition, redevelopment, or renovation of these projects. On the other hand, murder rate had strong negative effects. A negative relation was also found with the initial mean income of the population, perhaps a sign of increasing difficulty to find desirable housing or services demanded by upper income people.

The remaining of the paper is organized as follows. In Section 2, the data and the empirical methodology used are described. In Section 3, results are discussed. Last, concluding remarks are offered.

2 Data and Methodology

There are 77 community areas in the city of Chicago, divided for administrative purposes based on the historical development of neighborhoods. With the exception of the O'Hare airport area (a predominantly business area), community areas corresponded to the existing neighborhoods in early 20th century. Currently, with an average land area of 7.6 square kilometers (2.9 square miles), each community area typically encompasses more than one

neighborhood. Nonetheless, each community has general characteristics that are widely known among residents in the region, influencing relocation decisions. For the analysis of household mobility, community areas are especially convenient due to population size. The average population in 2000 was 13.8 thousand households (only 13 communities had fewer than 5 thousand households). Smaller geographic units have less reliable income estimates and changing borders, making comparisons across years difficult. For instance, margins of errors for the 2010 estimates are relatively large at the census track level.

Description and statistics for variables used in the analysis are presented in Table 1.

Because gentrification is a process of upper income household settlement, the analysis focuses on uncovering factors that are associated with the growth of the upper income population. This growth would not be considered gentrification if the area was already affluent, but few community areas in Chicago were rich compared to suburban places in the region.[1]

The main dependent variable used in this study is the change in the upper income household population from 2000 to 2010. To make it comparable across areas, the change is calculated as the rate per 1,000 households residing in 2000. The annual income thresholds used are $40,000 for 2000 and $50,000 for 2010, with the difference accounting for inflation during the 2000s.[2] Based on these thresholds, upper income population increased in 19 community areas, but only six of them had an initial share of upper income households higher than 50%.

Recent college graduates are often one of the largest group of gentrifiers. Hence, as an alternative dependent variable, the change in the population of college graduates is also used in the analysis.

The empirical model adopted is based on the following regression equation:

$$Y_{i,t} = \sum_{m=1}^{M} \beta_{mi} X_{mi,t-1} + \mu_{i,t}, \tag{1}$$

where $Y_{i,t}$ represents the dependent variable in the community area i in period t (i.e., the change in the upper income or college educated population from 2000 to 2010) and $X_{mi,t-1}$ are explanatory variables representing characteristics of area i in t-1 (there are M such variables, indexed by m, and t-1=2000 in the estimations). The independent variables are related to characteristics of the population, housing, crime, and location. The use of lagged independent variables attempts to reduce the extent of potential endogeneity biases. As usual, βs are the parameters of the model and $\mu_{i,t}$ is the unexplained residual.

[1]The share of households with income at or above $40,000 in the non-Chicago areas of Cook and DuPage counties, where Chicago is located, was 68.4% in 2000. In contrast, only six community areas in Chicago had larger shares, but even in those areas the growth of the upper income population can still be a reflection of gentrification as income distribution is not homogeneous across neighborhoods.

[2]The 2000 income corresponds to earnings in 1999 (U.S. Census Bureau 2000), while the 2010 income refers to earnings in the past 12 months at the time of interview (2010 ACS 5-year estimates, in 2010 dollar-adjusted values). The income thresholds chosen are close to the Chicago median household income ($38.6 thousand in 2000 and $46.9 thousand in 2010). The thresholds are also convenient to account for the inflation rate, which was 26.7% in the 2000s (Consumer Price Index, Bureau of Labor Statistics 2013).

Table 1: Variables

Variable	Description	Mean	St.Error	Min.	Max.
HHyhigh	household population in 2000, income $\geq$ \$40,000 in 1999	6,703.9	6,191.3	305	36,618
HHyhigh2010	household population in 2010, income $\geq$ \$50,000 in past 12 months	6,486.9	6,485.0	87	35,464
ΔHHyhigh_rate	(HHyhigh2010-HHyhigh) per 1,000 households in 2000	-12.6	177.5	-172.2	1,240.0
BA	population in 2000, age 25 or older, bachelor degree or higher	6,010.2	8,953.7	113	53,143
BA2010	population in 2010, age 25 or older, bachelor degree or higher	7,479.4	10,297.8	152	54,770
ΔBA_rate	(BA2010-BA) per 1,000 people in 2000	48.0	120.6	-35.3	934.2
pop	population	37,610.6	24,443.8	3,294	117,527
HH	household population in 2000	13,791.7	10,386.2	958	57,007
HH1990	household population in 1990	13,571.4	9,738.0	947	53,234
ΔlnHH1990s	100*(ln(HH) - ln(HH1990))	0.4	10.5	-34.0	45.2
age17underpc	population, age 17 or under, percentage	26.7	7.7	4.4	45.9
age65overpc	population, age 65 or older, percentage	11.4	4.0	4.0	23.1
nhblackpc	population, one race, black, non-Hispanic or Latino, percentage	40.7	40.9	0.1	97.9
Hispanicpc	population, Hispanic or Latino origin, percentage	21.8	25.2	0.0	88.9
nhAsianpc	population, one race, Asian, non-Hispanic or Latino, percentage	4.4	8.4	0.0	59.0
density	density per square km, in thousand people	5.3	2.8	0.3	14.0
HHymean	mean household income, in thousand dollars	50.1	16.5	22.0	114.1
BApc	population, age 25 or older, bachelor degree or higher, percentage	21.5	17.5	2.7	78.0
collegepc	population, enrolled in college, percentage	7.3	4.1	3.4	29.6
jobworkerratio	employees per resident worker (from CTPP)	1.4	4.0	0.2	30.8
lunemployedpc	labor force, unemployed, percentage	11.7	7.3	2.8	33.5
lmanufpc	labor force, manufacturing industry, percentage	11.5	6.4	2.9	28.7
lmanagepc	labor force, management occupation, percentage	10.2	6.0	2.8	31.6
murder_rate	murder rate per 1,000 people	0.2	0.2	0	1.2
property_rate	property crime rate per 1,000 people	60.5	50.4	16.2	421.0
hvalue	mean owner-occupied housing value, in thousand dollars	168.8	73.7	59.1	442.7
hbuilt1939pc	housing units in 2000 built in 1939 or earlier, percentage	50.5	15.3	1.3	78.5
hbuilt1980pc	housing units in 2000 built in 1980 or later, percentage	7.8	7.3	0.7	37.8
hmultifamilypc	housing units, multifamily building, 5 or more units, percentage	31.6	27.1	1.4	94.5
hownerpc	occupied housing units, owner-occupied, percentage	45.1	22.0	7.1	88.8
hvacantpc	housing units, vacant, percentage	8.2	5.4	1.9	27.4
d_publichousing	dummy variable for presence of major public housing project	0.2	0.4	0	1
distance_Loop	distance to the Loop area between geographic centers, in km	12.4	5.8	0	25.4
d_LakeMichigan	dummy variable for Lake Michigan coastal area	0.2	0.4	0	1

Number of observations: 77. Data for year 2000, unless otherwise noticed. Percentage rate reported in the 0-100 scale.
Sources: US Bureau of Census, except for crime (Chicago Police 2000) and public housing (Hartley 2010).

Economics Bulletin, 2014, Vol. 34 No. 2 pp. 1045-1054

2.1 Independent variables

Gentrification factors are those that make neighborhoods more attractive to upper income households.

In the basic monocentric city model (Alonso 1964, Mill 1967, Muth 1969), job accessibility is the most important factor of residential location, so distance to the center (the Loop area in Chicago) and job availability (the ratio of jobs to resident workers and the rate of unemployment) are taken into account in the analysis.

Since accessibility is important, transportation should matter. For instance, Helms (2003) finds a positive relation between proximity to train stations and housing renovations at the parcel level in Chicago. However, at the community area level, public transportation is widely available, resulting in little differences in accessibility. In the case of highways, Helms (2003) find negligible results, likely because the advantages from proximity to highways are offset by the additional pollution and traffic congestion.[3]

Households also look for amenities. Brueckner *et al.* (1999) show that upper income households should be attracted to central areas if there are significant topographical or historical amenities (e.g., parks, rivers, and historical buildings). In fact, Helms (2003) finds that proximity to parks and the Lake Michigan are important predictors of housing renovation in Chicago. Hence, in addition to the distance to the Loop area, accessibility to the Lake Michigan is also taken into account in the estimations.

Demographic characteristics are included as households consider the local population diversity and trends when making location decisions (Kern, 1984). Age distribution can also affect the education level and income earning ability of households. Population growth and the presence of richer and educated residents may indicate better neighborhood conditions, although it might be harder for incomers to find decent and affordable housing available in the area. Occupation of residents may also matter as it affects the composition of social peers (London *et al.* 1986).

Last, housing characteristics should affect the desirability of relocating into the area. Helms (2003) finds that low-density housing and absence of public housing projects were especially relevant to explain renovation expenditures in Chicago. Thus, the recent demolition and redevelopment of public housing projects should be a positive factor as neighborhoods become safer and better housing is offered. Hartley (2010) finds that violent crime rates declined by 10% to 20% after the demolition of major public housing projects in Chicago, while studies suggest that crime hinders gentrification (O'Sullivan 2005, Lee 2010, Papachristos *et al.* 2011, and others). Moreover, the aging of the housing stock may eventually stimulate redevelopment, providing an opportunity to improve housing quality (Brueckner and Rosenthal 2009). Vacancy may also stimulate redevelopment when it reflects the need for better housing. Therefore, gentrification can be positively related not only to new buildings, but also to very old and vacant initial housing stock.

[3]In the current work, a dummy variable for highway presence was included in preliminary estimations, but results were negligible.

2.2 Spatial dependence

For close geographical units, it is important to consider the possibility of spatial autocorrelation. Businesses and residents are mobile, so developments in one place affect activities in nearby areas. Building renovations and retail activities are highly sensitive to neighborhood changes as benefits vary with property values and consumer traffic. Pollution, congestion, and crime activities can also have spillover effects on people in neighboring areas.

Two types of spatial autocorrelation (spatial lag and spatial error) are considered in this work. An overview of these two cases is presented next (based on Anselin 1988, 2005).

In the spatial lag case, each observation is directly correlated to the observations of neighboring spatial units. Formally, the model can be written as:

$$y = X\beta + \rho W y + u, \tag{2}$$

where y is the vector of observations of the dependent variable, W is the spatial weight matrix (which defines the relations between spatial units), X is the matrix of independent variables, u represents the vector of i.i.d. error terms, and β and ρ are estimated parameters.

The spatial weight matrix W is typically defined so that the influence of each neighboring area is standardized, with equal weight for each neighbor. For instance, if place i has two neighbors, a 0.5 weight is assigned to each neighbor, so that the sum of weights in the corresponding row of W is one. Neighborhood is usually defined based on shared border. The case that includes common vertices is called "queen" contiguity, while the case that excludes vertices is called "rook" contiguity. When borders are irrelevant, the inverse of the distance between places is commonly used as the weight for spatial autocorrelation. In the current work, queen contiguity weights are used because there is high mobility of people across neighboring community areas in Chicago.

In the spatial error case, the error terms are spatially correlated. The assumption is that unmodeled effects spill over across neighboring spatial units. The model can be represented by a system of two equations:

$$y = X\beta + u, \tag{3}$$
$$u = \lambda W u + v, \tag{4}$$

where the first equation is the regression model to be estimated and the second represents the residual autocorrelation process. λ denotes the autocorrelation parameter, W is the weight matrix computed as before, and v is a vector of i.i.d. error terms.

To choose between the two spatial dependence models, Lagrange Multiplier (LM) test statistics are used. Anselin (2005) suggests the selection of the model that produces the LM test with the highest level of significance, reminding that misspecification might be due to other reasons. The statistical significance of the coefficients of Wu or Wy might provide additional evidence of spatial dependence.

3 Results

Results are shown in Table 2. The first three columns of results correspond to the estimations of the change in upper income population in the 2000s. The remaining columns present results for the change in the college graduate population. Columns noted with "OLS" refer to results of standard ordinary least square regressions. "Lag" indicates results that take into account spatial lag autocorrelation, while "error" indicates results for the spatial error model. Maximum likelihood method is used in the estimation of spatial models.

Notice that spatial dependence seems to have little impact on the results. A possible reason is that spillover effects from gentrification are very localized, observed only across blocks or streets. Test statistics indicate that spatial autocorrelation is negligible, although the coefficients for the spatial lag and error terms (Wy and Wu, respectively) are significant in three of the four estimations.

The results indicate that changes in the upper income population were positively related to recent population growth (**ΔlnHH1990s**), which likely reflect improving neighborhood conditions. The greater presence of youngsters (**age17underpc**) and college students (**collegepc**) were also positively related, perhaps reflecting a more active social environment associated with these demographic traits.

Greater job availability (**jobworkerratio**) and management occupation of workers (**lmanagepc**) seem to have made areas more attractive to richer households. Unemployment (**lunemployedpc**) had the opposite effect.

Housing factors were noticeably important. Greater housing value (**hvalue**) and home-ownership rate (**hownerpc**) may reflect better and stable communities. Older housing stock (**hbuilt1939pc**), recent housing development (**hbuilt1980pc**), and housing vacancy (**hvacantpc**) seem to indicate more or better options for upper income residents.

Two of the most interesting results are the estimates for public housing and crime. Property crime had no significant effect, but murder rate had a large negative impact. The location of a major public housing project (**d_publichousing**) was largely related to the change in the population of richer households. These projects were mostly demolished or renovated during the 1990s and 2000s, leading to improvements in neighborhood conditions like less cirme (Hartley 2010).[4]

The last comments are on other variables related negatively to changes in the upper income population. Higher initial mean income of the population (**HHymean**) was such a case, which might suggest an increasing difficulty to find desirable housing or other services as more affluent households reside in the area. Larger initial population share of minority groups were also negatively related, perhaps indicating preferences of higher income households for areas where there is a smaller concentration of such groups, although the statistical significance was generally low.[5]

Results were mostly negligible for other explanatory variables (population density, share of older people, occupation in manufacture, multifamily housing, distance to the Loop, and proximity to the Lake Michigan). It is possible that the spatial scale of the analysis (at

[4]The effect was even larger if the dummy variable was restricted to community areas that had demolition of public housing projects. Results are available upon request.

[5]Stronger statistical significance was found with the share of Asians, but excluding the Armour Square community area, which has a predominant Asian population, makes the relationship insignificant.

Table 2: Results

	ΔHHyhigh_rate (per 1,000 households)			ΔBA_rate (per 1,000 people)		
	(OLS)	(lag)	(error)	(OLS)	(lag)	(error)
ΔlnHH1990s	5.76**	5.58***	5.39***	5.98***	5.84***	5.89***
	(2.49)	(1.94)	(1.77)	(1.94)	(1.51)	(1.27)
age17underpc	16.82***	17.82***	17.13***	8.00**	8.85***	6.38**
	(4.38)	(3.43)	(3.44)	(3.39)	(2.65)	(2.73)
age65overpc	-4.10	-4.68	-3.39	-4.26	-4.49*	-3.52
	(4.05)	(3.37)	(3.97)	(3.15)	(2.59)	(2.92)
nhblackpc	-0.69	-0.64	-0.39	-0.27	-0.22	0.43
	(0.73)	(0.59)	(0.73)	(0.46)	(0.37)	(0.53)
Hispanicpc	-1.22	-1.66*	-1.34	-0.76	-1.07	-0.15
	(1.17)	(0.97)	(0.95)	(0.82)	(0.69)	(0.89)
nhAsianpc	-3.64**	-4.19***	-4.52***	-2.08*	-2.53**	-3.26***
	(1.37)	(1.19)	(1.53)	(1.13)	(0.98)	(0.87)
density	1.27	1.96	-1.58	0.71	1.05	-3.74
	(5.86)	(4.73)	(5.37)	(4.43)	(3.56)	(4.38)
HHymean	-13.50***	-13.73***	-12.25***	-8.30***	-8.54***	-6.43***
	(2.73)	(2.18)	(2.35)	(1.99)	(1.57)	(1.55)
BApc	-2.42	-2.13	-2.90	-2.69	-2.39	-2.52*
	(3.22)	(2.54)	(2.33)	(2.10)	(1.66)	(1.45)
collegepc	12.16**	11.83***	13.67***	4.96	4.82*	5.35*
	(4.93)	(3.86)	(4.22)	(3.48)	(2.77)	(2.92)
jobworkerratio	9.08*	7.38*	6.39	4.79	3.75	0.61
	(5.40)	(4.48)	(5.39)	(3.58)	(2.87)	(4.32)
lunemployedpc	-5.57	-7.55**	-7.26**	-2.38	-4.09	-4.10*
	(4.38)	(3.31)	(3.70)	(3.32)	(2.49)	(2.26)
lmanufpc	-1.06	0.06	0.82	-0.01	0.79	0.56
	(6.02)	(4.81)	(5.45)	(4.31)	(3.46)	(3.25)
lmanagepc	36.06***	36.17***	33.54***	22.95***	23.01***	18.94***
	(9.11)	(7.38)	(7.52)	(6.58)	(5.34)	(4.64)
murder_rate	-153.02**	-163.24***	-181.42***	-61.51***	-67.45**	-114.04**
	(0.65)	(0.51)	(0.69)	(0.43)	(0.34)	(0.54)
property_rate	0.00	0.01	0.16	0.32	0.30	0.55
	(0.54)	(0.43)	(0.50)	(0.35)	(0.28)	(0.34)
hvalue	0.74*	0.70**	0.73*	0.65**	0.61***	0.37
	(0.44)	(0.35)	(0.41)	(0.29)	(0.23)	(0.40)
hbuilt1939pc	2.51**	2.39**	1.67	1.86**	1.77***	0.86
	(1.16)	(0.94)	(1.49)	(0.78)	(0.63)	(0.73)
hbuilt1980pc	8.73**	8.39***	8.44***	3.53	3.25	3.86**
	(3.77)	(2.70)	(2.58)	(3.15)	(2.33)	(1.88)
hmultifamilypc	1.59	1.32	1.46	1.46	1.27*	0.84
	(1.29)	(1.08)	(1.03)	(0.92)	(0.75)	(0.72)
hownerpc	6.14***	5.77***	5.21***	4.62***	4.35***	3.21***
	(1.85)	(1.52)	(1.65)	(1.35)	(1.11)	(1.03)
hvacantpc	10.00*	9.92**	10.43**	8.72*	8.88**	9.87**
	(5.62)	(4.19)	(4.77)	(4.72)	(3.48)	(3.88)
d_publichousing	41.42**	41.51**	42.26**	16.62	16.97	32.61*
	(20.33)	(16.17)	(18.43)	(17.27)	(13.99)	(16.69)
distance_Loop	0.86	2.26	0.54	2.34	3.13*	2.54
	(3.21)	(2.77)	(3.02)	(2.29)	(1.80)	(2.53)
d_LakeMichigan	-51.41	-52.99*	-44.89	-25.86	-26.00	-10.58
	(35.07)	(28.96)	(35.07)	(24.99)	(20.53)	(23.63)
constant	-722.07***	-688.41***	-676.21***	-452.92**	-437.40***	-314.05*
	(251.89)	(202.57)	(199.18)	(200.04)	(159.62)	(170.30)
Wy or Wu		0.19*	0.48		0.21*	0.74***
		(0.10)	(0.41)		(0.11)	(0.18)

Significance level: * p<0.10, ** p<0.05, *** p<0.01
Number of observations: 77. Robust standard errors reported inside parentheses.

the community area level) is too large to capture the true effects of these variables on the changes in the upper income population.

Last, note that the results regarding the changes in the college graduate population, shown in the last three columns of Table 2, are qualitatively similar, supporting the results discussed above.

4 Concluding remarks

In this work, data for Chicago community areas is used to analyze the changes in the upper income population of households. Spatial dependence was taken into account, but there was weak evidence of autocorrelation, perhaps because spillover effects are only relevant across smaller spatial units.

In the results, it is especially noticeable that housing characteristics were relevant. Home value, ownership rate, very old housing stock, new housing development, vacancy rate, and public housing projects (which were demolished or renovated during the 1990s and 2000s) were all positively related to changes in the upper income population.

On the negative side, murder rate was strongly related to the growth of the upper income population. Lower growth also seen in areas with higher initial income, indicating possible congestion effects or preferences for areas that are still in earlier stages of gentrification.

For future research, it would be interesting to study gentrification factors at a smaller spatial scale using measures that are visible at the street level like property redevelopment or retail activities that cater to gentrifiers. For instance, Papachristos *et al.* (2011) uses the increasing number of coffee houses as an indicator of gentrification.

References

Alonso, W. (1964) *Location and land use: toward a general theory of land rent*, Harvard University Press: Cambridge, MA.

Anselin, L. (1988) *Spatial econometrics: methods and models*, Kluwer Academic: Dordrecht, The Netherlands.

Anselin, L. (2005) *Exploring spatial data with GeoDa^{TM}: a workbook*, Center for Spatially Integrated Social Science.

Bureau of Labor Statistics (2013) Consumer Price Index for All Urban Consumers: All Items, U.S. City Average. U.S. Department of Labor. Retrieved from http://www.bls.gov/cpi.

Brueckner, J.K. and S.S. Rosenthal (2009) "Gentrification and neighborhood housing cycles: will America's future downtowns be rich?" *The Review of Economics and Statistics* **91**, 725-743.

Brueckner, J.K., J. Thisse, and Y. Zenou (1999) "Why is central Paris rich and downtown Detroit poor? An amenity-based theory" *European Economic Review* **43**, 91-107.

Chicago Police Department (2000) *Biennial Report 1999 / 2000*, Research and Development Division. Retrieved from https://portal.chicagopolice.org.

Freeman, L. (2005) "Displacement or succession? Residential mobility in gentrifying neighborhoods" *Urban Affairs Review* **40**, 463-491.

Freeman, L. (2009) "Neighbourhood diversity, metropolitan segregation and gentrification: what are the links in the US?" *Urban Studies* **46**, 2079-2101.

Hartley, D.A. (2010) "Blowing it up and knocking it down: the effect of demolishing high concentration public housing on crime" Federal Reserve Bank of Cleveland, working paper 10-22.

Helms, A.C. (2003) "Understanding gentrification: an empirical analysis of the determinants of urban housing renovation" *Journal of Urban Economics* **54**, 474-498.

Kern, C. (1984) "Upper income residential revival in the city" in: R. Ebel, J. Henderson (Eds.), *Research in Urban Economics, Vol. 4*, JAI Press: Greenwich, CT, 79-96.

Lee, Y.Y. (2010) "Gentrification and crime: identification using the 1994 Northridge earthquake in Los Angeles" *Journal of Urban Affairs* **52**, 549-577.

London, B., B.A. Lee, and S.G. Lipton (1986) "The determinants of gentrification in the United States: a city-level analysis" *Urban Affairs Review* **21**, 369-387.

Mills, E. (1967) "An aggregative model of resource allocation in a metropolitan area" *American Economic Review* **57**, 197-210.

Muth, R. (1969) *Cities and Housing*, University of Chicago Press: Chicago, IL.

O'Sullivan, A. (2005) "Gentrification and crime" *Journal of Urban Economics* **57**, 73-85.

Papachristos, A.V., C.M. Smith, M.L. Scherer, and M.A. Fugiero (2011) "More coffee, less crime? the relationship between gentrification and neighborhood crime rates in Chicago, 1991 to 2005" *City & Community* **10**, 215-240.

U.S. Census Bureau (2000) Census 2000: Summary Files 1 and 3. US Department of Commerce. Retrieved from http://factfinder2.census.gov.

U.S. Census Bureau (2000) Census Transportation Planning Package (CTPP) 2000. US Department of Commerce. Retrieved from http://www.transtats.bts.gov.

U.S. Census Bureau (2010) Census 2010: Summary File 1. US Department of Commerce. Retrieved from http://factfinder2.census.gov.

U.S. Census Bureau (2010) American Community Survey (ACS) 2010 - 1-year and 5-year estimates. US Department of Commerce. Retrieved from http://factfinder2.census.gov.