Turning the Tide: Could gentrification bring peace in a neighborhood and its surroundings?

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I. Introduction

There is a significant decreasing trend in total crime in the US over the past two decades. Could this reduction be the result of well-educated and middle-class individuals moving into underdeveloped neighborhoods? This paper aims to analyze the correlation between crime and gentrification. Specifically, I intend to explain changes in crime rates in non-gentrified tracts resulting from gentrification's displacement effect on an intra-county level[1] in 2010-2019.

The relationship between gentrification and crime could be contentious. Gentrification is the process of upper and middle-class, college-educated individuals replacing incumbent underprivileged households in relatively poor neighborhoods. From a hedonistic point of view, the entry of prosperous households could exert positive externalities over the neighborhood, reducing the probability of crime, as the benefits from working outweigh the risks of committing a crime. The transformation of a block via gentrification alters the demographic composition and diversity in amenity, as the arrival of newcomers changes the local demand (Couture and Handbury, 2020; Waldfogel, 2008). For example, Glaser et al. (2020) find that gentrification could offer financial opportunities that increase overall social welfare, with the replacement of pre-existing idiosyncratic shops. Moreover, Aliprantis and Hartley (2010) demonstrate that the demolition of public high-rise housing, formerly occupied by low-income households, resulted in a reduction in the crime rate. Consequently, it is compelling to claim that gentrification may offer an alternative pathway for individuals-at-risk, besides the aberrant road of crime.

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[1]The particular city has not been decided yet; it could be Chicago, Boston, LA, etc., depending on data accessibility.

On the contrary, an influx of wealthier newcomers are easy targets, which could encourage more property crimes as the transportation cost on crime reduces. Moreover, a change in the demographic composition breaks the balance of social cohesion. Violent crime could soar as social tension due to inequality between residents increases in a newly gentrified block (Boggess and Hipp, 2016). The effect of gentrification on crime could be analyzed differently if we break down the categories of crime. violent and economic crime could be due to different incentives. For example, violent crime related to a drug cartel or gang fights might react differently compared to a burglar when affluent individuals move in. Smith (2012) finds that crime related to gang homicide increases in a gentrified tract. This goal of this paper thus seeks to first find an the direction of gentrification effecting crime within tracts.

Based on the definition of gentrification, we could anticipate the underprivileged households being forced to relocate and compete in other neighborhoods that share similar characteristics with the pre-gentrified area. A gentrified block surrounded by non-gentrified blocks could also provide financial incentives that motivate the incumbents from non-gentrified blocks to engage in criminal activities in the gentrified block. The displacement effect could be the possible reason behind the change in crime rates in gentrified areas. Thus, it raises our second question of whether the change in crime rates within a gentrified neighborhood exerts a spillover effect on the surrounding neighborhoods.

In other words, this paper aspires to find the correlation of gentrification on different levels of crime in a gentrified area. After knowing the sign of the effect, this paper investigate whether such a change in crime rates is due to the displacement effect on the surrounding neighborhoods. Our key research interest is to understand if gentrification increases the well-being of a gentrified neighborhood but at the expense of sacrificing the safety of the surrounding neighborhoods.

Gentrification and crime are widely studied topics in the fields of criminology and urban economics, while the effect of gentrification and crime displacement is an important factor explaining the change in crime rates in a gentrified area but has been underexplored. To the best of my knowledge, only two authors attempted to address the issue of omitting the spatial spillovers in gentrification and crime analysis. Boggess and Hipp (2016) constructed a spatial weight matrix on the tracts that are within a radius of 2 km of the focal gentrified tract. Instead of estimating the spatial spillovers from the focal tract on neighboring tracts, they provide new insights into how neighbor's characteristics affect a gentrified tract's crime rate. In fact, their findings confirm our hypothesis of a positive spillover effect on property crime. A newly transformed gentrified block, surrounded by less affluent blocks, does provide lucrative motivation to incentivize close residents to commit a crime. Porreca (2023) is the first to directly estimate the correlation between gentrification's displacement effect on crime. He uses an event study model and identifies nodes using a nearest-neighbor analysis to the gentrified block in Philadelphia. The main results show that the crime related to gun violence and drugs increases in the neighboring blocks but reduces in the gentrified block. This

research proposal aims to contribute to the existing literature on crime and gentrification by first enriching the finding on the relationship of crime rates in a gentrified tract due to gentrification, especially on measuring the spatial spillover on crime rates. Secondly, this paper attempts to use a DID design identification for neighboring blocks and to provide a theoretical explanation based on Becker's model on gentrification's displacement and crime, which could fill in the research gap.

The rest of the paper will be organized as follows: in section II, I attempt to provide a theoretical ground on crime and gentrification, and crime displacement; section III entails data source and data definitions; section IV explains the identification strategy; and section V addresses current limitations and my plans to refine them.

II. Theoretical Model on Crime and Gentrification[2]

The theoretical groundwork of this paper lies on Becker's (1968) rational choice model. In short, a rational agent would only commit a crime if the benefits of committing a crime outweigh the its costs. The novelty of this paper is incorporating distance into individuals' trade-off considerations. My innovative part would be allowing a resident to be as household and criminal at the same time unlike other game theory model to have household versus. criminal.

An individual's utility function is designed as follows:

$$U(Y, \delta, f, c, d) \tag{1}$$

Assumption 1: All households are risk-averse. This implies the utility function should be concave and twice differentiable. The utility function is a function of income Y, δ illegal gain from criminal activity, a fine f imposed by the state if a person has been caught, a fixed cost of land[3] c, and d, distance relative to an individual's resident.

Assumption 2: $Y' \geq Y$. The income proposed by businesses in the gentrified zone Y' will be greater than or equal to Y, the income without gentrification. This follows from Glaser et al.'s (2020) finding where social welfare increases after gentrification. Furthermore, the longer the distance to work, the lower the utility. Su (2022) shows one important reason pushing for gentrification would be households' disutility in commuting and congestion. This is a relatively fair assumption to make as I focus on the 2010-2019 window when urban revival is occurring in major US cities (Diamond, 2016; Couture and Handbury, 2020). Higher-earning households have high incentives to move back from suburban areas to centers due to work or amenity reasons. Gentrification also increases the fine f. Think of when rent c increases, the residents could install dual-layer glasses and hire full-time house stewards.

[2]The functional forms and FOCs are in the process of conceptualization.

[3]interpreted as rent or mortgage

A household would only commit a crime if:

$$pU(\delta(d) - f(d)\text{–}c(d)) + (1-p)U(\delta(d) - c(d)) > U(Y - c(d)) \tag{2}$$

where p is the probability that a person will be convicted. We assume p is independent of gentrification for all individual. The incumbent households in a gentrified area will have a criminal incentive driven by the increase in rent.

Assumption 3: Individuals may have an incentive to change their domicile from d to d' in response to the rising rent c driven by gentrification ($g = 1$), where g is binary and follows a random distribution:

$$Pr\left[|d' - d| > 0 | g = 1, Y(d) - c(d) < 0\right] + Pr\left[|d' - d| = 0 | g = 1, Y(d) - c(d) < 0\right] = 1 \tag{3}$$

An individual who decides to stay even if one's current income could not cover the rent increase $Pr\left[|d' - d| = 0 | g = 1, Y(d) - c(d) < 0\right] = 1$ might commit a crime if the income after gentrification does not increase: $E\left[Y(d) | g = 1\right] < E\left[Y(d) | g = 0\right]$.

For close households living in non-gentrified tracts, they now face a trade-off of an increase in utility due to a wage increase $Y'(d) > Y(d)$ and a loss of utility due to the disutility of commuting. Conversely, this could also imply the potential gain from crime:

$$\begin{aligned} &U(crime, d', d, g = 1) = pU(\delta(d') - f(d') - c(d)) + (1-p)U(\delta(d') - c(d)) \\ &\qquad\qquad > \\ &U(crime, d, d, g = 0) = pU(\delta(d) - f(d) - c(d)) + (1-p)U(\delta(d) - c(d)) \end{aligned} \tag{4}$$

From equation (4), we could classify a spillover effect. When the strict inequality holds, it is incentive-compatible for a neighbor to commit a crime in a gentrified neighborhood. When the inequality flips its sign $U(\text{crime}, d, d', g = 0) > U(\text{crime}, d', d', g = 1)$ and conditioning on $E\left[|d' - d| = 0 | g = 1, Y(d) - c(d) < 0\right] = 1$, households in a gentrified block would prefer to commit a crime in the surrounding area, suggesting a positive spillover of gentrification on crime. In order to derive a simple relation of spatial spillover found in (4), this model neglects the compounding factor related to crime, such as the existence of a local crime network.

i. Modeling Violent Crime in Progress

I have only considered thus far the financial incentive to commit a crime. The theoretical model on violent crime should follow the same fashion but with an additional component measuring the favor in social cohesion before gentrification, therefore, resulting in a dynamic framework. For instance, the locals (as compared to newcomers) might have a favor for community culture, $\lambda(\bar{e} - e)$. Where $\bar{e}$ could be a characteristic of the original neighborhood, and e is the deviation from the original neighborhood due to gentrification. λ is between 0

and 1. 1 refers to a person who has a strong attachment to the original neighborhood, thus committing violent crime has one lower tolerance level for newcomers and λ could affect one person's willingness to move out due to a change in rent affordability. When λ is 0, it means a person does not care about the change in the neighborhood and could accept to move out following assumption 3.

Fortunately, most of the relevant data could be found via the US government's open-source data.

III. Data

If this paper focuses on Chicago, crime data from 2001 to the present is available.

Defining gentrification may be a bit difficult. Gentrification has two components: an increase in rent and a change in demographics. The latter part would be relatively easier to compute from the American Community Survey (ACS) since census tract-level data are accessible. I am able to obtain the demographic composition and also the income information for individuals living in a tract. However, ACS does not include the longitude and latitude pair. I would need to convert each tract ID into polygons so that I could perform the spatial join with the crime data. Taking Chicago as an example, in 2010, it has approximately more than 800 census tracts, while only 77 community areas. To compute a change in rent, to the best of my knowledge, the Department of Housing in Chicago does not publish relevant rent and housing value from 2002 to the present, and the rent control data are only available at the community area level. ACS do provide the gross rent each individual is paying under a tract area, and I could use it as a substitute. A caveat would be there might be large missing data.

Due to the current data limitation, I would presumably capture the change in rent by using ACS's data. However ACS's one year report down to the county level observations is published only after year 2005. I would have to decided what to include comparing to the richer crime data.

Gentrification: A tract is gentrified if it satisfies one of the following criteria: i) a significant influx of households that are between 24-35 years old during 2010-2019, ii) growth of college-degree residents iii) the median income in the tract has increased and approximates the average city level. Depending on the data quality, iv) has an abnormal increase in property price or rent. The reference point of comparison is based on the tract's characteristics from the last five years.

Crime: Crime is coded as 0 or 1. I would have to first reshape the crime based on three general categories, as the data provides very detailed convictions. The first category would be violent crime, including homicide and rape, to capture the effect of social cohesion in the crime setting. The second category would be organized crime, to control for the displacement effect due to gentrification. Lastly, economic crime including burglary and robbery to control

for people's financial incentive in committing a crime.

Noticeably, I discard the year of 2020 from the analysis, as the outbreak of COVID-19 might add other factors that are endogenous to gentrification and crime.

IV. Empirical Method

My identification strategy is based on a DID design. The treated group consists of tracts that meet any of the criteria specified in the data classification on gentrification during the years 2010 to 2019. Gentrification is a staggering treatment, implying that once gentrification has started, a gentrified neighbor will be distinguishable from control groups.[4] Moreover, housing leases are signed for long periods, and the construction period of new houses is time-consuming. It would be unlikely that gentrification could be appealed in a 10-year window. The control group comprises potentially possible gentrified tracts but has failed to meet any criterion of gentrification. Since the design does not only include 2 periods, I adapt Callaway and Sant'Anna's (2021) CSDID method. There are two advantages to using a time-varying TWFE model. First of all, I would like to know how crime changes based on each year's level; adding more time periods allows us to observe the saturation effect of gentrification on crime. It would be rational to assume the reduction in crime is diminishing, as we do expect a relocation of individuals and, thus, a change in dynamics at a tract. Furthermore, we could anticipate the treatment effect on crime would be heterogeneous due to differences in tract dynamics. Secondly, by using the CSDID method, we could solve potential problems, such as β^{TWFE} not being significant or significant in a reverse sign, rising directly from a TWFE regression. Their method classifies the treated group to match with not-yet treated group and never-treated group stratified based on each time group, and within each subgroup, we perform a canonical TWFE regression, then they weight all of the results from each subgroup stratification.

In order to perform a CSDID specification, one important assumption—parallel trend between the treated and control group—has to hold. It relates to the reverse causality issue behind gentrification and crime. We would have to run a parallel trend test to see whether the treated and control groups share the same trend before the 2010-2019 window.

i. Gentrification and crime within gentrified tracts:

The treatment and control group assignment follows the identification design.

Our Alternative Hypothesis is tested on two tails: $Ha : Crime_{it} \neq 0$.

First, the effect of gentrification on crime could be positive when $E\left[Y(d)|g=1\right] < E\left[Y(d)|g=0\right]$. This implies that an incumbent resident living in a gentrified tract who did not move out after the change in rent has not experienced an increase in wage. The only

[4]It seems to be a convention to assume gentrification is absorbing.

way to cover one's rent would be via crime. Additionally, gentrified tracts attract neighboring residents to commit crime. On the other hand, when the population has a large proportion of individuals with high λ, the probability of violent crime due to social cohesion incentives could increase. Thus, the change in crime due to gentrification in gentrified tracts could be positive.

Conversely, gentrification could have a negative effect on crime. We would expect a displacement effect of locals in the treated tract moving out. Since individuals-at-risk are being relocated, the crime rates would fall in the treated tract. The increase in earnings in the gentrified tract raises the opportunity cost to commit any crime.

The specification can be written as the simple from:

$$Crime_{it} = \beta_0 + \beta_1 * Treat_i * Post_{it} + \mu_i + \tau_t + \epsilon_{it} \tag{5}$$

Where β_0 is a constant, $\beta_1 * Treat_i * post_{it}$ is the treatment effect of gentrification on crime, τ_t is the time fixed effect, μ_i is the individual fixed effect, and ϵ is the idiosyncratic risk. i represents each census tract within a city and t is the time subscript.

ii. Spatial spillover due to gentrification on neighbor's crime:

In this section, we change the definition of the treated group and control group but follow the same CSDID structure.

The treated group is now defined as census tracts that are adjacent to gentrified tracts. I will draw from different levels of a buffer zone on gentrified tracts, with 1-km, 2-km, and 5-km radii, respectively, to test the spatial diffusion of crime displacement. The control group will consist of potential gentrified tracts that have failed to gentrify within the time window and are not adjacent to any gentrified tract. A tract will not be considered as a control group if, at a 2km radius level, it is adjacent to a 1-km gentrified tract.

The specification follows a similar fashion as crime within gentrified tracts:

$$Crime_{it} = \beta_0 + \beta_1 * Treat_i^{jkm} * Post_{it} + \mu_i + \tau_t + \epsilon_{it} \tag{6}$$

I intend to run this regression at least three times, as I have defined three mutually exclusive benchmarks for a tract to be classified as a treatment group. The upper script j denotes the radius of the buffer zone.

I will assume a two-tailed hypothesis test as the spillover effect could be both positive and negative on crime according to the theoretical model. The spillover effect may be negative if the wage increase in gentrified tracts attracts neighboring residents to engage in economic activities other than crime. Conversely, it may be positive if neighboring tracts experience an influx of individuals-at-risk due to the rising rent in gentrified areas.

V. Discussions

There are some limitations that I am currently building on:

i. theoretical model

I've outlined the theoretical model under II, and I will consider adding components to refine the problem. It could be more contingent if i consider violent crime and economic crime as crime per se.

ii. data and specification

I am not able to put any IV on the RHS. As the traditional IVs are using neighbor's characteristic, they are considered to be endogenous under my design.

Furthermore, coffee shop as an IV for gentrification could not satisfied the exclusion restriction assumption, and air quality due to data limitation (it is not on tract or community level) also fails.

However, for the case of Chicago, it is possible to use distance to waterway as an IV as oppose to access to park or other social amenity. The logic would be lake is uncorrelated with crime but its correlated with gentrification, as it poses high social amenity value. I would have to calculate the distance from each centroid of a tract to the nearest river. This should be doable once I have obtain a list of unique id (census tract 2000 and 2010).

I considered using probit and RDD design. Yet the former may not be robust as due to many fixed effects, and RDD to test the spatial spillover may fail due to no enough data. Thus, this paper proceed with the TWFE model. I could test the robustness via a event study design.

I would like to know the detailed property price at street-level published via real-estate agency, but it might be hard to find.

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