

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

Tong LI\*

tong.li1@sciencespo.fr

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## I. Introduction

There is a significant decreasing trend in total crime in the US over the past two decades. To What extent 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 the changes in crime rates in non-gentrified tracts resulting from the effect of gentrification displacement on a tract level in 2009-2022 for the City of Chicago.

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.

On the contrary, an influx of wealthier newcomers becomes easy targets, which could encourage more property crimes as the transportation cost on crime reduces. Moreover,

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\*Master's in Economics, School of Research, Sciences PO Paris

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 crimes 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 investigates whether such a change in crime rates is due to the displacement effect on the surrounding neighborhoods. Our key research interest is to understand whether 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 topics widely studied 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 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 the displacement effect of gentrification 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<sup>1</sup>

The theoretical groundwork of this paper lies on Becker’s (1968) rational choice model and Galiani’s structural model.

The novelty of this paper is the incorporation of distance into individual trade-off considerations, thus introduce rooms to discuss the effect of spillovers of gentrification.

The key assumption would be allowing a resident faces the choice of being as household or as a criminal at the same time, unlike other game theory model to have household versus criminal.

The equilibrium idea is summarized as follows:

In equilibrium, individual with different skill endowment chooses the 1) occupation, 2) location, 3) consumption that maximize their utility, such that there exists a spatial equilibrium where individuals have no incentive to relocate. Firm produces consumption goods and housing, in equilibrium, there should be no more under-valued land that could be used to build houses for additional profit.

Individuals are endowed with different levels of skills, from high, medium to low, where these endowments could be used in productive activities or to commit crimes. Only the low endowment individuals have the incentive to deviate from working to crime, and when gentrification occurs as an exogenous shock, they should consider the marginal benefit of crime and the possible new job created due to gentrification.

The spillover idea comes in when gentrification could create jobs, as we assume an opening of new coffee shop in gentrified tract should require new staffs, the high-skilled households could provide jobs to the low-skilled works. Thus, the proximity to a gentrified tract becomes the game-changer.

An individual’s utility function is designed as follows:

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

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<sup>1</sup>The structural model is still under drafting

**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  $Y$ ,  $\delta$  illegal gain from criminal activity, a fine  $f$  imposed by the state if a person has been caught, a fixed cost of land<sup>2</sup>  $c$ , 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.

A household would only commit a crime if:

$$pU(\delta(d) - f(d) - c(d)) + (1 - p)U(\delta(d) - c(d)) > U(Y - c(d)) \quad (2)$$

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:

$$Pr[|d' - d| > 0 | g = 1, Y(d) - c(d) < 0] + Pr[|d' - d| = 0 | g = 1, Y(d) - c(d) < 0] = 1 \quad (3)$$

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

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:

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

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

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<sup>2</sup>interpreted as rent or mortgage

the inequality flips its sign  $U(\text{crime}, d, d', g = 0) > U(\text{crime}, d', d', g = 1)$  and conditioning on  $E[|d' - d| = 0 | g = 1, Y(d) - c(d) < 0] = 1$ , 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.  $\lambda$  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  $\lambda$  could affect one person's willingness to move out due to a change in rent affordability. When  $\lambda$  is 0, it means that a person does not care about the change in the neighborhood and could accept to move out following Assumption 3.

## III. Data

If this paper focuses on Chicago, crime data from 2001 to the 2024 is publicly available online. I have spatially merged the crime centroids on Chicago's tract in 2010.

Defining gentrification may be a bit difficult. Gentrification has two components: an increase in rent and a change in demographics. The both data are publicly available from the American Community Survey (ACS) since census tract-level data are accessible. I am able to obtain the demographic composition, income, and also median housing value for a tract-level.

The technical difficulty would be the census tract is remeasured every 10 year, thus, directly merging tract-id could lead to a huge loss of data. I have converted the ACS-5 year data in 2009 and ACS-5 year data in 2020 with the 2010 standard crosswalk. In the end, we have 801 census tract for 14 years data. Notably, we drop 6 tracts as they do not have the information on total population.

A census tract is defined from a minimum of 1200 residents to 8000 residents. Tracts often less than 1200 are special tracts that are national resort or public park. We do not drop any tracts based on the number of resident, as we would amenity for the IV regression as described in the latter section.

**Gentrification:** A tract is gentrified if it satisfies one of the following criteria: i) the per capita income growth has increased faster than the median city level, ii) median housing value increase is also larger than the median level, i) the aggregate income growth at a tract has increased faster than the median level. We also constructed a lagged 2 year growth rate, as lagged rate could smooth out the short run shock and reflect the nature of gentrification as a gradual process.

Unlike policy shock where we know the exact occurrence time, I manually constructed the treatment. In this model, gentrification happens when the a tract's past 3 year growth rate is below the city median, and above or equal on the fourth year. The first treatment year is 2013 for 1 year growth rate, and 2014 for lagged growth rates. Recursively, we computed gentrification for each 3 year window, thus the treatment year ranges from 2013 to 2022.

**Spillover:** Once we have defined the gentrified tract, we could now identify the neighboring tracts. The strategy is constructing a 1 km buffer zone from the centroid of a gentrified tract. The control group would be all tracts that could be gentrified but has failed, which are the tracts having their growth rates below the median level. I will draft the output on QGIS to illustrate the spillover selection.

**Crime:** Crime is coded as 0 or 1. I have first aggregated crime at a tract level, and then divided by area to obtain density of crime. As the incentive to crime are different, I further classified crime based on 2 categories. First, crime against person, according to the FBI UCR handbook, it includes homicide, forcible rape, and aggravated assault. The second category is crime against property, it includes robbery, burglary, larceny-theft, motor vehicle theft, and arson.

The third category would be total crime, as it include all other crimes plus crime against person and against property.

## IV. Empirical Method

My identification strategy is based on a CSDID design.<sup>3</sup> The treated group consists of tracts that meet any of the criteria specified in the data classification on gentrification during the years 2010 to 2022. Gentrification is a staggering treatment, implying that once gentrification has started, a gentrified neighbor will be distinguishable from control groups.<sup>4</sup> Moreover, housing leases are signed for long periods, and the construction period of new houses is time-consuming. The control group comprises potentially possible gentrified tracts but has failed to meet any criterion of gentrification. Since the design does not only

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<sup>3</sup>However, in dealing with reverse causality issue, I have adopted an IV model which is more significant and innovative. I am considering to use DID only for measuring the spillover, but it could still serve as for the robustness check purpose.

<sup>4</sup>It seems to be a convention to assume gentrification is absorbing, however, in data I found out it may not be. I would have to think of it.

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  $\beta^{TWFE}$  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:  $H_a : Crime_{it} \neq 0$ .

First, the effect of gentrification on crime could be positive when  $E[Y(d)|g = 1] < E[Y(d)|g = 0]$ . 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 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  $\lambda$ , 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:

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

Where  $\beta_0$  is a constant,  $\beta_1 * Treat_i * post_{it}$  is the treatment effect of gentrification on crime,  $\tau_t$  is the time fixed effect,  $\mu_i$  is the individual fixed effect, and  $\epsilon$  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:

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

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.

## iii. IV to address endogeneity

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 values. I calculate the distance from each centroid of a tract to the nearest river, and constructed a categorical variable based on the approximaty to waterway. Category 1 if the waterway is in a tract, to category 5 where the nearest waterway is 2km away.

I have instrumented my treatment variable by the water category, and the result is very promising.

## 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 certain the way that I have constructed the treatment is correct. I would have to rethink if the CSDID command is not addressing, but the reghdfe command returns good result.

## **iii. Robustness check**

Treatment based on median housing value growth is not robust to crime, but the intersection term is. I have 6 treatment variables, which could be over redundant at this point.

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