University of Leiden

Master Thesis

An assessment of the relationship between gentrification and reported neighborhood crime in Amsterdam, 2010-2018

Author:

Maxime Schreurs

Supervisor:

Dr. Marieke Liem

Second reader:

Dr. Pauline Aarten

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Abstract

This study examines the relationship between reported crime and the process of gentrification. The influence of gentrification on reported crime rates has been studied empirically but only for major American cities. The current study used a fixed effects regression analysis to assess whether changes in reported property and violent crime rates in Amsterdam in the time period 2010-2018 were associated with gentrification. Results indicate that the process of gentrification in Amsterdam is associated with a decline in reported burglary and assault rates.

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1. Introduction

Crime rates in the Amsterdam have steadily decreased since the early 2000's (De Jong, 2018). Although De Jong (2018) called this decrease a 'mystery', one possible explanation was overlooked. The decrease in crime rates coincided with changing urban planning strategies that promote gentrification processes through changing housing policies (Van Gent, 2012). Large Dutch municipalities, Amsterdam specifically, started treating gentrification as a mean to revitalize disadvantaged neighborhoods (Hochstenbach, 2017). Revitalization of neighborhoods as a result of gentrification has been associated with a reduction of crime rates (Day et al., 2007; Kreager et al., 2011; Papachristos et al., 2011: Spader et al., 2016;). Policy makers thus hypothesized that the influx of more affluent residents would reduce the degree of disadvantage in a neighborhood, which in turn, would reduce the prevalence of crime (Hochstenbach, 2017).

However, to this date, the empirical evidence to support the claim that gentrification will reduce crime has been contradictory. Some studies found that gentrification led to an increase in crime (Smith, 2014; Lee, 2010; Taylor & Covington; 1989; Covington & Taylor, 1988), while other found that gentrification was linked to a decrease in crime (O'Sullivan, 2005; Papachristos et al., 2011; Smith, 2014; Barton, 2016;) To complicate empirical evidence even further, one study reported that the association between gentrification and crime varied over time (Kreager et al., 2011). These contradictory findings are partially the results of diverging operationalizations of gentrification, and analytical strategies used.

What this prior research does have in common is that they all focused on large metropolitan areas in North-America (Covington & Taylor, 1988; Taylor & Covington; 1989; O'Sullivan, 2005; Lee, 2010; Kreager et al., 2011; Papachristos et al., 2011; Smith, 2014; Barton, 2016). Similar empirical evidence for metropolitan areas in Europe is severely lacking. The contradictory evidence of previous research already makes it difficult for city planners and policy makers to substantiated their choices but even more so for European cases. The cultural and historical difference between American and European cities makes it implausible that findings from former can easily be generalized to apply to the latter, or the other way around. Consequently, more research on the association between gentrification and crime must be done for European metropolitan areas.

To bridge the gap in the research, this thesis will examine the relationship between gentrification and crime in 42 neighborhoods in Amsterdam between 2010 and 2018. This study uses the census measure, housing value, as a measure of gentrification to ensure replicability. Crime rates used in this thesis are a reflection of reported crime provided by official police data. Conclusion put forward in this thesis thus pertain only to the trends present in reported crim data.

A fixed effects regression analysis is used to examine how changes in our measure of gentrification relate to changes in neighborhood levels of robbery, burglary and assault. Fixed effects regression analysis was chosen as the statistical method. Fixed effects regression helps mitigate the issue of omitted variable bias (Barton; 2016). Fixed effects regression analysis recognizes that difference between cases exist and controls for them by employing within case analysis. Moreover, this research recognizes the influence of time for our results. Lastly, three traditional predictors of neighborhood crime, residential instability, racial heterogeneity, and concentrated disadvantage, were added as control variables (Shaw and Mckay, 1969; Kubrin & Weitzer, 2003). Results indicate that gentrification is negatively associated with both burglary and assault but found no significant relationship with robbery.

This thesis will proceed as follows. In the first section a definition of gentrification is given after which the theoretical and empirical research regarding the relationship between gentrification and crime is reviewed. In the second section, the operationalization of gentrification and crime is described and justified as well as the choice for statistical method. In the third section, the results of both the descriptive and statistical analysis are presented. In the last section, the results, limitations, and recommendations for future research are discussed.

2. Literature review

2.1 Definition of Gentrification

Gentrification: Definition

The definition of gentrification used for this thesis is:

> *'a process by which higher income households displace lower income households in a neighborhood, changing the essential character […] of that neighborhood", combined with a capital reinvestment in the neighborhood. (Kennedy & Leonard, 2016, p.31)*

From this definition four conditions are distilled that together constitute the conditions for gentrification. The first condition is a population shift. A process by which middle-upper class people move into a former predominantly lower-class neighborhood (Barton & Gruner; 2016; Kennedy & Leonard, 2016). Though this condition is necessary, it is not sufficient. The population shift must be accompanied by a revitalization of a neighborhood (Mcdonald, 1986; Smith & Williams, 1986: Patrick, 2008). Lyons defines revitalization as a process by which previously devalorized housing is refurbished and revalorized (Lyons, 1996). The revitalization process also involves restoring the prestigious functions of the center of the city, such as a plethora of amenities and facilities (Patrick, 2008). The population shift and revitalization process have an effect on the character of a neighborhood. Scholars suggest that is the alteration of social 'character' and flavor of a neighborhood, as a result of a changing population and revitalization, constitutes an essential condition of gentrification (Marcuse, 1989; Atkinson, 2000; Slater, 2002). The last conditions present in this definition is capital reinvestment. Capital reinvestment is "the flow of capital into a neighborhood primarily to upgrade physical components of the neighborhood, although reinvestment can also be made in human capacity" (Kennedy & Leonard, 2001, p.6).

Conditions for gentrification

1. Population shift
2. Revitalization
3. Changing social character
4. Capital Reinvestment

Figure 1:Neighborhoodlevel conditions for gentrification

The conditions presented in figure 1. have to be present concurrently if one wants to consider a neighborhood gentrified or gentrifying. For example, revitalization and reinvestment can be a government endeavor to increase overall standards of living in disadvantaged neighborhoods without the antecedent influx of high-income incumbents. Capital reinvestment by government could be an indication that gentrification will likely occur in such a neighborhood but if the revitalization is not yet accompanied by the influx higher income incumbents, it cannot be classified as gentrification.

The definition presented above deserves one necessary caveat. Gentrification research up until the mid-1990's displayed a noticeable lack of comparative research that included cases of mainland Europe Carpenter & Lees, 1995). So much so that at the turn of the century researcher Loretta Lees urged fellow researchers to pay greater attention to context and temporality in gentrification research. Lees (2012) determined that despite a new interest in comparative urbanism, an overall research agenda that would adequately assess contextual differences in the gentrification process is still lacking. What does this mean for the definition of gentrification used in this study? Is it applicable to a European case?

I argue that it is. First, comparative research by Carpenter and Lees (1995) and Smith (2002), demonstrates that although local contexts differ, gentrification processes exhibit remarkable conformity. Moreover, the very first definition of gentrification was coined with respect to the process in London by British sociologist Ruth Glass (1964). So, while the European context might have been neglected in gentrification research, it is not absent.

To conclude, gentrification is the process by which low-income central city neighborhoods experience a socioeconomic upgrading, characterized by an influx of investment and an in-migration of middle- and upper-class residents. There are competing theories regarding the process and effects of gentrification. The effect of gentrification that this thesis focuses on is a change in crime rates. The theoretical assumption about the relationship between gentrification and crime rates have garnered diverging

evidence in empirical literature. (Covington & Taylor, 1988; Taylor & Covington; 1989; O'Sullivan, 2005; Lee, 2010; Kreager et al., 2011; Papachristos et al., 2011; Smith, 2014; Barton, 2016). Theories that suggest a positive and negative relationship have both been supported by empirical evidence. In the next sections, a theoretical review will be given first, then empirical evidence to support the outlined theories is reviewed.

2.2a Theoretical review

Many different theoretical approaches explaining the relationship between gentrification and crime rates exist (Barton & Gruner, 2016). These theoretical approaches fall under three umbrella theories. First, *ecological theories* hold that crime rates change in a neighborhood as a result of the displacement of criminal and social problems (Cohen & Machalek, 1988). The base assumption of ecological theories is that our environment and the changes to that environment influence our behavior (Cohen & Machalek, 1988). The shifting socio-economic nature of gentrifying neighborhoods, will be accompanied by a shift in crime rates (Covington & Taylor, 1989). The second theory and third theory, *rational actor theory and crime opportunity theory,* are closely related and both focus on the choice structuring properties that affect the occurrence of crime. Rational actor theory holds that crime rates will change in neighborhoods as a result of changing rational considerations to attempt crimes (Barton & Gruner, 2016). The base assumption for rational actor theories is that is individuals make decision based on a rational calculation to maximize gain (Akers, 1990). Crime opportunity theory holds that the rational choice for offenders is to choose targets that offer high reward with little effort or risk (Hayward, 2007). Crime rates are thus theorized to rise in gentrifying neighborhood because there is more to gain from criminality than there was before (Akers, 1990; Hayward, 2007).

Three main criminological perspectives fall under the ecological theories: civic communities perspective, broken window thesis, and social disorganization theory. These three perspectives make similar assumption about the relationship between gentrification and crime but the casual mechanism behind each perspective is distinctively different. Social disorganization theory and the civic communities perspective both predict an initial increase in crime, followed by a decrease in crime (Barton & Gruner, 2016).

Social disorganization theory was first brought forward by Shaw and Mckay (1969). Shaw and Mckay (1969) hypothesized that crime would be higher in neighborhoods characterized by concentrated

disadvantage, residential instability, and racial and ethnic heterogeneity. In such neighborhoods social networks are unlikely to form, increasing the probability for informal social control and thus increasing the probability of crime (Sampson &G Groves, 1989). Gentrification-crime research embraced the social disorganization perspective as gentrification affects concentrated disadvantage, residential instability, and racial and ethnic heterogeneity (Barton & Gruner, 2016). Most importantly, the influx of affluent household due to gentrification leads to an immediate deconcentration of disadvantage (Triplett et al., 2003). However, initially crime will still increase as a result of rising residential instability and racial heterogeneity. As the gentrification process consolidates, residential instability will decrease again, together with racial heterogeneity (Sampson et al, 1997). Through gentrification eventually all three neighborhoods characteristics are hypothesized to change in a manner that will lead to a decrease in crime (Barton and Gruner, 2016).

The civic communities perspective also focuses on the changes in the social nature of neighborhoods but has a stronger emphasis on the interpersonal relationships that arise in a neighborhood. It is the civic engagement between incumbents that acts as the foundation for trust and cooperation among citizens (Tolbert et al., 2002; Lee, 2008). Residential stability is essential for the development of the type of civic engagement that fosters close knit communities. The civic communities perspective hypothesizes that the breakdown of close knit communities as a result of gentrification disrupts the social order and thereby increasing the opportunity for crime (Lee, 2008; Lee & Shaun, 2010). On the other hand, communities with higher levels of income are more likely to feature locally owned businesses. Locally owned businesses function as integration method as they hire local residents and thus integrate into a preexisting community (Brown et al., 2014). So, the civic communities perspective proposes a similar curve in crime rate development as social disorganization theory but does so by focusing on the opportunity and presence of social interactions. Gentrification will first disrupt social interactions but over time, through increased local business opportunities as a result of higher income incumbent, social interactions will again foster the type of communities that can deter crime (Barton & Gruner, 2016).

The broken windows theory focuses not on the social characters of a neighborhood as an indication of crime but rather on the physical character of a neighborhood (Beckett & Herbet, 2008; Skogan, 2015; Taylor, 2018). The basic argument is that crime is more likely to occur in neighborhoods that display physical disorder because this indicates that incumbents lack the capacity to maintain order or to ensure punishment (Kennedy & Leonard, 2001; Kirk & Laub, 2010). Since gentrification involves the capital reinvestment into a neighborhood, signs of disorder decrease as building are renovated (Taylor, 2018). If

signs of disorder are a root cause of criminal activity, neighborhoods in the process of gentrification should see a decrease in crime rates as properties are renovated (Barton & Gruner, 2016).

Although this brief description of the three main ecological perspectives is not exhaustive, it does elucidate the general idea that socio-economic characteristics of neighborhoods and incumbents affect the levels of crime that occur. Next, two criminological perspectives that fall under rational actor theories are discussed.

Lastly, in this section, two theories that fall under rational actor theory and crime opportunity theory, will be briefly explained. Routine activities theory and defended communities perspective both hypothesize an increase in crime as a result of increased motivations by offenders to commit crime. Routine activities theory is closely related to crime opportunity theory whereas defended communities theory is more cognate to rational actor theory.

The routine activities theory holds that crime increases when motivated offenders and suitable targets, such as high-income resident, converge with the absence of guardianship (Cohen & Felson, 1979). Gentrifiers own higher value possessions and are often not well acquainted with self-protection techniques. When walking down a street, gentrifiers are thus suitable targets (Anderson, 2013). Moreover, if gentrifying neighborhoods are adjacent to disadvantaged neighborhoods, offenders from those nearby neighborhoods also have a new group of suitable targets (Anderson, 2013). As time goes on, gentrifiers find ways to increase guardianship. Affluent residents often possess the ability to make demands on city officials, such as for crime control (Freeman & Barconi, 2004). Routine activities theory suggests an initial increase in crime rates followed by a decrease in crime rates.

The defended communities perspective argues that offenders are motivated to commit crimes as a means to protect the social order of their community (Suttles, 1972). Resistance to change motivates offenders to attempt to scare of new comers by taking illegal actions against them (Nyden et al., 2006). Capital reinvestment that occurs in gentrifying neighborhoods involves establishment of new, expensive shops (Sullivan & Shaw, 2011). Offenders can interpret the influx of new businesses as only serving the new more affluent gentrifiers while harming the original neighborhood character. Additionally, legal action is viewed as ineffective or unavailable (Sullivan & Shaw, 2011). In sum, the influx of new residents signifies a threat to the neighborhood that motivates crime. Again, crimes against new comers are expected to dwindle when the gentrification process consolidates because residents are displaced and crimes would no longer be expected to have the desired effect (Barton & Gruner, 2016).

To summarize, criminological theories regarding the relationship between gentrification and crime predict that crime is highest in the early stages of gentrification, followed by a decline as the gentrification process consolidates. Due to the quantitative nature of this thesis, only tentative assumptions about the causal mechanism of the relationship between gentrification and crime in Amsterdam can be made. More in depth quantitative studies could build upon this research to examine the reasons for the relationship between gentrification and crime

This theoretical review has made it clear that the relationship between gentrification and crime has been aptly studied. In the next section the current state of the empirical research of the relationship between gentrification and crime is presented. The overview of empirical research will reveal the importance of conducting this research in a European city.

2.2b Empirical review

Before we dive into the empirical literature a quick note on the type of cities included in this review is necessary. All of the research on the relationship between gentrification and crime, has been done in North American cities. This might be due to the breadth of data available for most American metropolitan areas. Gentrification in European cities has been studied in relation to concepts such displacement, social movements, housing policies and suburbanization but the relationship to crime is still absent in scientific literature (Uitermark, 2003; Franzen, 2005; De Verteuil, 2011; Thörn, 2012; Van Gent, 2012. This thesis will not only attempt to contribute to the theoretical understanding of the relationship between gentrification and crime rates but will do so for a city that does not yet have a place in the scientific literature.

Figure 2 is an overview of the empirical literature thus far.

Positive Association	**Negative association**	**Association varied over time**
Taylor and Covington (1988)	O'Sullivan (2005)	Kreager et al., (2011)
Smith (2014)	Papachristos et al. (2011)	
Lee (2010)	Smith (2014)	
Covington & Taylor (1989)	Barton (2016)	

Figure 2: Overview Empirical Literature categorized by the direction of reported statistically significant relationship between gentrification and crime.

As figure 2 shows, Studies on the relationship between gentrification and crime have given mixed results. First, there are a number of studies that have reported a positive association (Taylor & Convington, 1988; Covington & taylor, 1989; Lee, 2010; Smith, 2014). A study by Taylor and Covington (1988) of gentrification and crime in Baltimore in the 1970's found a positive association with two types of violent crime, assault and homicide. In a later research of the same city and time period, Covington and Taylor (1989) also reported a positive association between gentrification and robbery. In similar vein, Lee (2010) found that gentrification was positively associated with assault and robbery in Los Angeles, during the 1990's. Lee (2010) also reported a non-significant association with homicide and rape. In a 2014 study, Smith, did find a positive association between a specific type of homicide, gang homicide, and state led gentrification in Chicago during the late 1990's and early 2000's.

All of these studies used official crime data in their operationalization of the dependent variable. Lee (2010) used disaggregated crime rates per 1000 inhabitants as their measure for crime whereas Smith calculated three-year count averages for his measure of crime. Taylor and Covington (1988) and Covington and Taylor (1989) took a different approach by converting the disaggregated crime rates per neighborhood into a percentile score. The operationalization of the gentrification measure was varied. Covington and Taylor (1989) and Lee (2010) chose an economic census measure pertaining to housing value as their measure of gentrification whereas Smith used public housing demolition as a measure.

Despite different operationalization, these studies hypothesized similar outcomes. Covington and Taylor (1989) hypothesized that gentrification would be associated with an increase in crime based on the assumption that rapid social change disrupts social processes that control crime. Smith (2014) hypothesized a positive association between crime and gentrification in the form of public housing demolition as this type of gentrification would likely intensify dissimilarities and grievances. Lee (2010) hypothesized a positive association based on the assumption that gentrification results in short term increases in crime. Lee's (2010) research is the only research that is not longitudinal and only examines development of crime rates in a single year.

Even among this first set of empirical studies that had similar hypotheses and outcomes there is much variation between methodologies. The empirical studies that reported a negative association between gentrification and crime on the other hand, have considerably less variation (O'Sullivan, 2005; Papachristos et al., 2011; Smith, 2014; Barton, 2016).

A quick overview of the second set of empirical studies shows the following results. O'Sullivan (2005) found that gentrification in Portland during the 1990's was negatively associated with assault and robbery. Papachritos et al. (2011) reported a negative association with robbery and homicide in Chicago during the 1990's. A study by Smith (2014) also of Chicago for a slightly larger time period, including the early 2000's, identified a negative effect on gang homicide. It is true that Smith (2014) found both a positive and negative association between gentrification and crime. The difference in outcome was due to diverging operationalizations of gentrification. Lastly, Barton (2016) reported a negative association between three types of violent crime, homicide, assault and robbery.

There are several similarities in the methodologies of these studies. All of the studies above examined a similar time frame, namely the 1990's and early 2000's. Moreover, all four studies used official crime data to examine disaggregated types of violent crime. Barton (2016) and O'Sullivan (2005) converted the reported crime into rates per 1000 inhabitants whereas Smith (2014) and Papachristos et al. (2011) chose to use the crime counts. Furthermore, Smith (2014), Papachristos et al. (2011) and Barton (2016) all base their hypotheses, that gentrification will lead to a decrease in crime, on ecological theories that propose that crime rates will fall as a result of a deconcentration of disadvantage. Only O'Sullivan (2005) based his assumptions on economic theory that proposed that location decision of high-income agents drive down crime rates.

Operationalization of the measure for gentrification also displays minor similarities. Smith (2014) and Papachristos et al. (20110 both used coffee shops as an indicator for gentrification. On the other hand, Barton (2016) and O'Sullivan (2005) both did not use such a single indicator but rather a complex measure for gentrification. O'Sullivan (20050 qualitatively selected gentrifying neighborhoods, he ten plotted changes in several census level measure such as, housing value, income, and educational attainment, against the changes in crime rates. Barton's (2016) measure of gentrification was the percentage of neighborhoods that gentrified within a sub-borough. As such, Barton is the first study in which the unit of analysis is not neighborhoods.

The last empirical study in this overview is the only research to report an association that varied over time. Kreager et all. (2011) hypothesized a curvilinear association based on the assumption that gentrification only decreases crime when the process is consolidated. Results supported their hypothesis. The association between gentrification, total crime, and property crime was positive during the first decade but negative for the second decade. The association between gentrification and violent crime was not significant. Kreager et al. (2011) came to this conclusion by incorporating an intricate measure for time.

Like others, their measure of gentrification, mortgage investment, reflects increasing housing values. On the other hand, Kreager et all. (2011) is the only research in this overview to not examine disaggregated types of crime. Rather, Kreager et all. (2011) calculated change score measure, based on crime indexes calculated by the Seattle police department, for aggregated total, property, and violent crime.

In conclusion, despite some similarities, there is at least some degree of difference in the methodology of the empirical research, as well in the outcomes. Smith especially highlighted the concern that operationalization can manipulate results by using two different types of operationalization and also finding two different associations. Methodological choices must be well thought through. One of the main methodological considerations, as a result of this empirical overview, is to create a methodology that could easily be employed in different contexts, increasing the ability to properly compare results. The next chapter will explain which methodology was thus chosen for this thesis.

3. Methodology

Unit of analysis.

This thesis analyses variation in 42 gentrifying neighbourhoods of Amsterdam from 2010-2018. In total Amsterdam is home to approximately 800.000 people, divided over seven districts. The seven districts are divided into 22 sub-boroughs, which are divided into 99 neighborhoods.

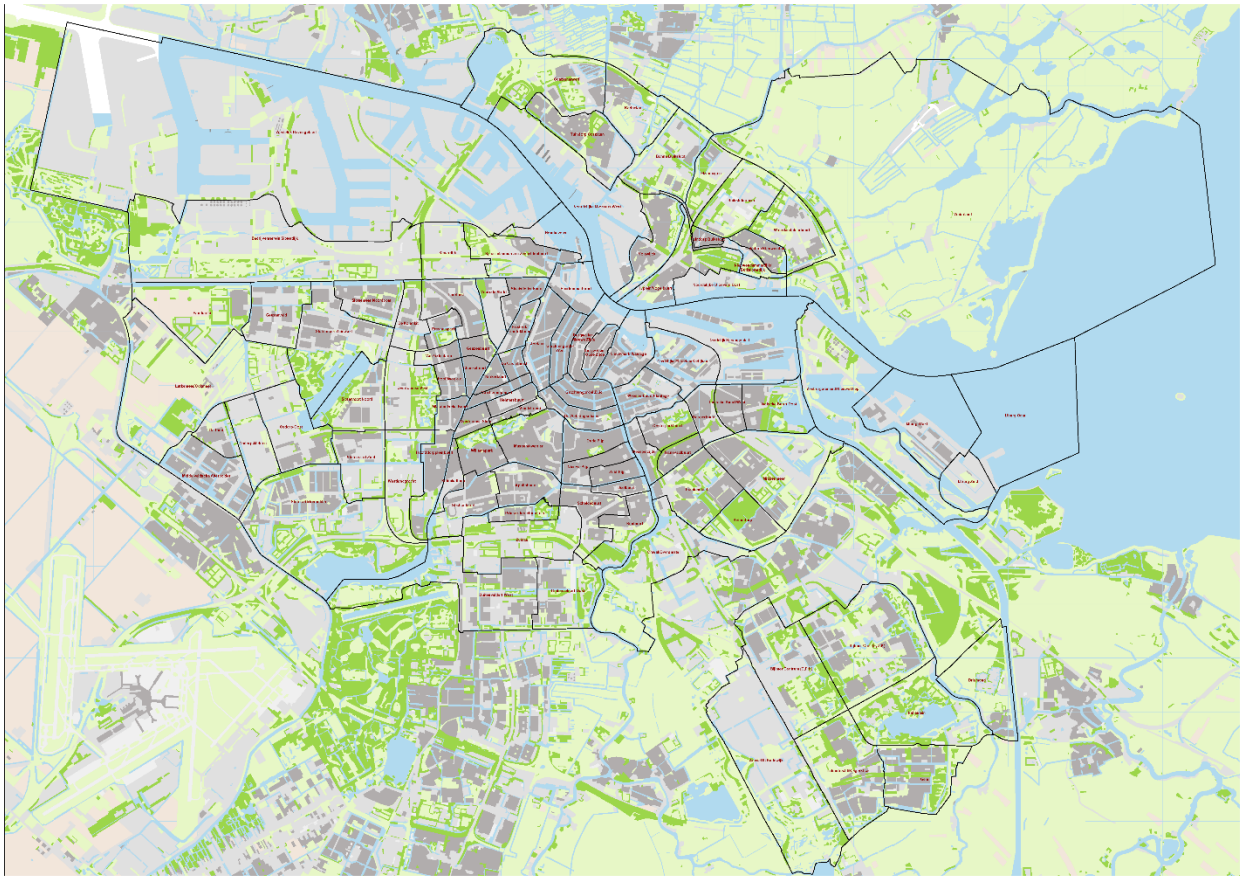

Figure 3:Neighborhoods Amsterdam

Neighbourhoods were chosen as the unit of analysis because they are the unit of analysis used in much of the gentrification/crime literature (Convington and Taylor, 1989; Kreager et al., 2011; Papachristos et al., 2011; Smith, 2014). By employing similar unit sizes for the analysis as previous research, the results can be compared more accurately. Furthermore, the size of the unit allows for accurate classification. When using bigger units, such as the sub-boroughs, variation between areas within the unit is more likely. Some areas in a sub-borough might show signs of gentrification, while other are not. Classifying a sub-borough as gentrifying could therefore be a misrepresentation of what is actually happening within the

sub-borough. Smaller units, such as tracts, are not applicable for this thesis due to practical reasons. Both the municipality of Amsterdam and the central bureau of statistics, collect information on the neighborhood-level. There is thus a plethora of measures to choose from when operationalizing both gentrification and crime on the neighborhood-level. For this reason, neighborhood-level analysis is the more logical choice.

Gentrification: independent variable

As discussed in the empirical chapter, in the past researchers operationalized gentrification through changes in neighborhood-level and individual-level measures, such as changes in housing value, income, and educational background (Lipton, 1977; Nelson, 1988; McDonald, 1986). Several gentrification studies use an economic census measure that reflect changes in housing value (Covington & Taylor 1989; Lee, 2010; Kreager et al, 2011). Considering that one of the aims of this study is to create a methodology that is easily replicated while also using a methodology that resembles previous study, the single measure 'housing value' is chosen. Moreover, studies on gentrification have identified rising housing prices as a leading indicator of gentrification (Galster & Peacock, 1986; Nesbitt, 2005; Zuk et al., 2015). There is no theory to indicate what the most accurate operationalization of gentrification would be. Therefore, following those that have studied the process of gentrification intensively should suffice for this thesis. Moreover, using a single indicator eliminates the chances for multicollinearity or other unknown qualities of the resulting construct.

To overcome the single measure critique in this study, several variables are added into the model that are also often proposed to be associated with gentrification. The control variables will be addressed shortly.

The next step in the operationalization of gentrification is to establish which neighborhoods will be included in this study. Following Barton (2016), we include those neighborhoods in the analysis that are considered to be gentrifying at the start of the decade. Neighborhoods were classified as gentrifying if they featured an average household income that was less than the median for the city and featured a proportion of owner-occupied dwellings lower that the average proportion city-wide at the start of the decade. The average household income in 2010 was 29.600 euros and the average proportion of owner-occupied dwellings was 26.5 percent.

Data on housing prices, household income, and owner-occupied dwellings is collected from the online publications *Amsterdam in cijfers,* (translation: Amsterdam in numbers), for the years 2010-2018. These can be found on the public data collecting website of the municipality of Amsterdam.

Dependent variable: Crime

For this thesis, official crime statistics data, collected by the Central Bureau for Statistics, was chosen to measure the dependent variable. The Central Bureau for Statistics collects registered crime data from the police data portal in the Netherlands on a neighborhood level. The type of crimes that are registered by the police on a neighborhood level are property crime, vandalism, and violent and sexual crime not including homicide, which are subsequently divided into categories.[1] Operationalization of the dependent variable is thus limited to these types of crimes. From this moment forward, when speaking of 'crime rates' what is implicitly meant is 'reported crime rates'. For the sake of avoiding repetitiveness, I will use the term crime rates when referencing crimes reported by official police data.

In this study measures of both property and violent crime are included. Only including one type of crime would limit the scope of this study. Property crime is represented by burglary. After bicycle theft, burglary is the most common type of property crime in Amsterdam. Burglary is preferred as a measure over bicycle theft because burglary is used in previous research whereas bicycle theft is not (Kreager et al., 2011). Additionally, burglary is more likely to be influenced by the process of gentrification as gentrifiers have more valuable property which could influence the propensity for burglary (Barton & Gruner, 2016). On the other hand, gentrifiers have more means to install security systems (Barton & Gruner, 2016). The outcome of this measure of property crime can thus be more directly linked to the gentrification process. Violent crime is represented by assault and robbery. Assault is the most common type of violent crime in Amsterdam and therefore chosen as a measure to represent violent crime (Huijzer & Boers, 2019). Moreover, the issue of underreporting is much smaller for assault than it is for sexual violent crimes (Akkermans, 2016). Robbery is included as a measure of violent crime because it tends to function as a strong indicator of the overall level of violent crime in a neighborhood (Papachristos et al., 2011). Using

[1] Categories are: Property crime: total theft, bicycle theft, theft other vehicles, theft from vehicles, robbery, burglary residential property, burglary from non-residential property, other burglary. Vandalism: total vandalism, vandalism motorvehicles, other vandalism. Violent crime: total violent crime, assault, intimidation and stalking, other violent and sexual crime.

disaggregated crime data is consistent with the criminological tradition and allows for more accurate identification of trends driving development in subgroups (Smith, 2014).

The dependent variable is calculated as follows. The counts of assaults, robbery, and burglary per year, per neighborhood, is transformed into a rate per 1000 neighbourhood residents for each year.

Using official crime statistics provided by the police has a number of limitations (Altbeker, 2005). The most well-known limitation is the underreporting of crimes. The official statistics often are an underestimation of actual crime since many people believe crime are either too trivial to report or faith in police capacity is low (Akkermans, 2016).

A brief assessment of the problem of underreporting in using official crime data for the Netherlands leads to the following conclusion. Between 2005 and 2015 there was an upwards trend in the willingness to report a crime from 31 percent in 2005 to 34 percent in 2015. Especially in cases of robbery and burglary, the willingness to report a crime is high. Simultaneously, the willingness to press charges dropped from 29 percent in 2005 to 26 percent in 2015 (Bernasco & Weijer, 2016). Since the CBS defines registered crime as including reported crimes regardless of whether criminal charges were pressed, the drop in willingness to press charges does not influence the crime data used in this study.

An additional issue is the discrepancy between crime reported to and by the police. An investigation into the reliability of police data in 2012 found that not all reported crime is actually recorded. While some officers choose to record every report that is made, others interpret some reports as ineligible for recording ("Inspectie Justitie en Veiligheid", 2013). Therefor there is a small discrepancy between crime that is reported *to* the police and crime that is reported *by* the police. Overall, the issue of underreporting is a consistent problem for studies that use official crime data. These are limitations that the current study is aware of. The conclusions of this study capture at least part of the trend. Additional research using different data, such as victimization or perception data, could later add to a deeper understanding of the development of crime rates in gentrifying neighborhood. The recommendations for future research will be more adequately discussed in the final part of this thesis.

An argument for the use of official crime data is uniformity with previous research. The purpose of this study is to produce results that could be compared to results from previous studies and thus add to the existing literature. As stated previously, a big shortcoming in gentrification and crime research has been the lack of uniform operationalization leading to mixed results. By using a similar operationalization of the dependent variable, comparison of results to previous studies could lead to new insights.

Controlled variables

To address spuriousness several extraneous variables are added to the model. Data for these variables also come from the online datasets of the municipality of Amsterdam.[2] One of the functions of adding extraneous variables to the model is to establish whether other variables, that are not the independent variable, could account for the changes in the dependent variable. Including extraneous variables in this study, aids in determining whether the relationship between gentrification and crime is not explained better by another variable. The choice for control variables in this study is based on the literature review provided previously. Social disorganization theory identifies racial heterogeneity, residential instability, and concentrated disadvantage as major indicators for neighborhood crime (Barton, 2016). Studies that also include such control variables are Kreager et al., (2011) Barton (2014), Papachristos et al. (2011), and Covington and Taylor (1989).

Racial heterogeneity is operationalized as the percentage of non-western residents within a neighborhood. The municipality of Amsterdam categorized non-western residents as migrants born in Afrika, South- and Central America, and Asia, with the exception of Indonesia and Japan. Residential instability is operationalized as the change in population who has live in the same home for at least five years. Concentrated disadvantage is operationalized as the proportion of registered unemployment in a neighborhood.

Before embarking on the statistical analysis of some preliminary tests were run to establish whether these control variables would indeed be a useful addition to the model. To check correlations a Pearson R test was done. All three of the control variables, racial heterogeneity, residential instability, and concentrated disadvantage had at least one significant correlation with the dependent variables robbery, burglary and assault.[3] Although correlations are not a automatic predictions of significant association in a regression model, the positive correlations do confirm the theoretical considerations that these control variables should be added to the model.

[3] See appendix 1 for pearsons r table

Another major consideration in constructing the statistical model is incorporating a notion of time. The model must reflect the awareness that the passing of time alone could have an effect on the outcome.

To add a measure of time to our fixed effects model, a dummy variable is created for every 3-year time period between 2010-2018. Observations for the years 2010-2012 are the reference category. Observations for the years 2013-2015 are recoded into time_1, and observations for the years 2016-2018 are recoded into time_2. The addition of a control variable for time to our model allows us to establish whether the relationship between gentrification and crime is robust. Three-year time periods were chosen as a result of considerations mentioned by Papachristos et all. (2011) that assessment of crime rates is often done in three-year time periods in criminological research.

Statistical strategy

The main consideration in choosing a statistical method is that the model should deal with omitted variable bias in a meaningful way.

In this study, a fixed effect regression model is used to address this concern. Fixed effects models observe the same relationship of the same cases over two or more time points in time. This differs from standard regression models because the relationship in fixed effects models in observed within cases instead of between cases. In our case, a standard regression model would tell us the change in crime rates based on the change in the measure of gentrification that is chosen. The problem here is that we do not take into account all the measures that could also affect crime rates but are not in our model. Essentially, a standard regression would assume that all cases within our analyses are the same, and that individual specific effects are uncorrelated with the independent variable. Fixed effects models on the other hand, presume that all cases have some characteristics that vary that could also affect their outcome. The fixed effects assumption is that the individual specific effects are correlated with the independent variable. The variation in each case is assessed individually. In order to express that in the model, each case gets its own intercept.

The fixed effect model controls for omitted variable bias by recognizing that each case has individual characteristics that affect the outcome and only focussing on that effect. The heterogeneity between all cases is controlled for by focussing on within case effects. Although it is not specified which characteristics account for the differences, it at least recognizes that differences exist. Traditional linear regressions only rely on the establishment of some control variables. However, controlling for all confounding variables in

the case of gentrification and crime is highly unlikely, while control variables could be imagined and added to the model, this list will not be exhaustive. Using a statistical method that inherently addresses the issue of is difference is thus preferred.

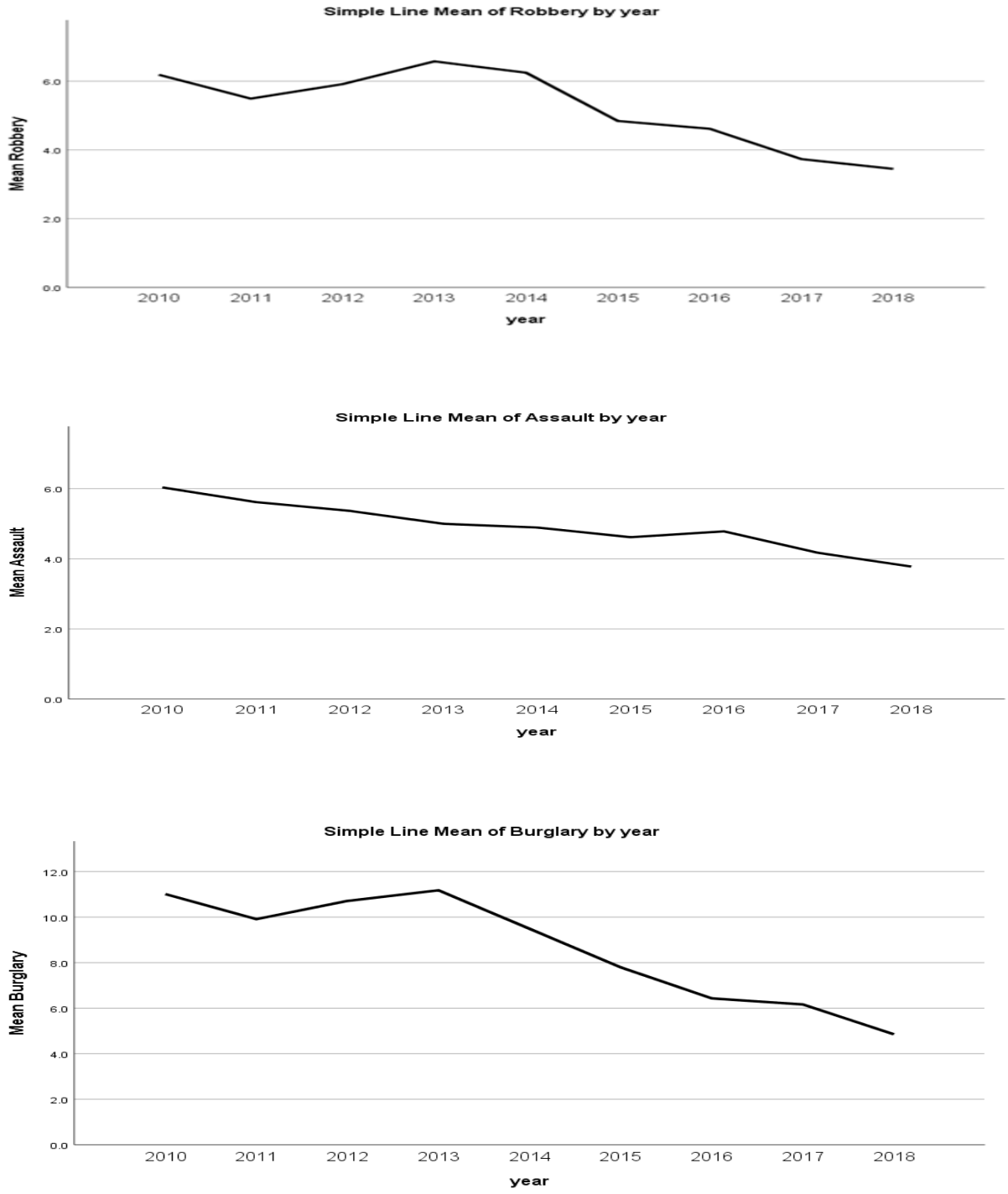

Figure 4 Mean line graphs of robbery, burglary and assault rates per 1000 residents in the all gentrifying neighborhoods of Amstedam for the years 2010-2018.

4. Results

Descriptive analysis. Figure 5 represents the line graphs of the mean robbery, burglary and assault rates per 1000 inhabitants for all of the gentrifying neighborhoods of Amsterdam included in this study per year in the time period 2010-2018. Figure 5 shows and overall decline in mean robbery, burglary and assault rates in Amsterdam. However, the trends do show some variation. The assault line is rather moderate, consistent, and downward trend, with a small increase in 2015. Overall, the mean assault rate decreased from 6 in 2010 to 3.8 in 2018. Both the mean robbery and burglary rate display a spike in 2013 after which the burglary line displays a steep decrease and the robbery line a more sporadic decrease. The mean robbery rate declined from 6.2 in 2010 to 3.4 and the mean burglary rate from 11 in 2010 to 4.9 in 2018.

	Housing Value (x€1000)		Robbery		Burglary		Assault	
	Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*
2010	195	35	6.2	6.5	11	4.8	6	6.5
2011	191	26	5.5	4.6	9.9	4.7	5.6	2.1
2012	195	27	5.9	5	10.7	4.6	5.4	2.3
2013	188	27	6.6	7.6	11.2	3.4	5	2.2
2014	182	29	6.2	8.3	9.5	4.3	4.9	1.7
2015	184	32	4.8	6.2	7.8	2.6	4.6	1.8
2016	194	38	4.6	4.8	6.4	1.8	4.8	2.5
2017	224	49	3.7	3.9	6.2	2.2	4.2	1.5
2018	268	60	3.4	4.1	4.9	1.9	3.8	1.4

Figure 5: Descriptive statistics for the independent and dependent variables in all gentrifying neighborhoods in Amsterdam in the time period 2010-2018. Robbery, Burglary and Assault mean and standard deviation reflect rates per 1000 residents.

Figure 6 lists the yearly mean and standard deviations for housing value and the three types of crime rates. Looking at housing value, there is a downward trend from 2013-2015 and a strong upward trend from 2015 to 2018. What these descriptive statistics also show is that for robbery, as opposed to burglary and assault, the standard deviation is often larger than the mean. Whereas the mean is a description of the location of the data, the standard deviation is a description of the spread of the data. In other words, robbery rates are less clustered than burglary and assault rates and show greater variation. Indeed, the highest robbery rate per 1000 resident in a single neighborhood between 2010 and 2018 was 53 for robbery as opposed to 34.1 and 24.8 for burglary and assault respectively. The lowest rate for robbery was 0.3 as opposed to 1.6 and 1.4 for burglary and assault respectively. Seeing

that housing value does seem to be normally distributed, it can be deduced that the association between robbery rates and our measure of gentrification is likely not statistically significantly.

Statistical analysis

Table 2 presents the results for the fixed effects regression analyses of the variation in all gentrifying neighborhoods between 2010-2018. The descriptive analyses confirmed that, overall, crime rates declined during these years. Based on the concern that time has to be incorporated into the statistical analysis in a meaningful way, the first three model regress the independent variables, robbery, burglary and assault on the dummy variable of time. In the first three models time is used as a predictor variable to determine whether the decline in crime rates is in part due simply to the passing of time. The question was whether time can explain the decline in crime rates. The results indicate that time is a significant factor in explaining the drop in robbery and assault rates that gentrifying neighborhoods have experienced between 2010-2018. For robbery rates there is a statistically significant negative relationship in the latter time frame, 2016-2018, but not in the first. This result indicates that the changes in robbery rates are not simply a result of the temporal nature of the progression in crime rates.

Now that the significance of the temporal element has been established, the remaining models incorporate time not as a predictor variable but rather as a control variable. Models 4 through 6 regressed the variables residential instability, racial heterogeneity, and concentrated disadvantage on robbery, burglary and assault rates respectively. In this model, residential instability, racial heterogeneity, and concentrated disadvantage are treated as predictor variables based on the theoretical considerations mentioned both in the theoretical review and the methodology. No statistically significant relationship was found between residential stability and any of the crime rates for robbery, burglary and assault. The measure of racial heterogeneity was significantly associated with robbery, burglary and assault but the direction of the association differed. The positive association with robbery indicates that neighborhoods experiencing greater disparities between the proportion of western and non-western residents are more likely to report higher robbery rates. The negative association between racial heterogeneity and burglary and assault, indicate that neighborhoods will report less counts of burglary and assault is the disparity between western and non-western residents grows. No statistically significant association was found between the measure for concentrated disadvantaged and robbery, burglary, and assault rates.

The last set of models focus on the main association of interest, between the measure of gentrification and rates of robbery, burglary and assault. First the measure of gentrification regressed on the types of

crime only with the time dummy variable as control. In the last models, the dummy variables for time as well as the variables residential instability, racial heterogeneity, and concentrated disadvantage act as control variables to test whether the relationship is robust. Results indicate that as neighborhoods experience more gentrification, the rates for burglary and assault will go down. The negative coefficient is larger for burglary rates than for assault rates. The relationship between robbery and the measure for gentrification is also negative albeit not statistically significant indicating that changes in robbery rates are not well explained by the process of gentrification.

Table 1 Fixed effects analysis of Robbery, Burglary and Assault rates in gentrifying neighborhoods in Amsterdam, 2010-2018

	Robbery				Burglary				Assault			
	1	2	3	4	1	2	3	4	1	2	3	4
Time 2013-2015	.024 (.302)	-.004 (.306)	-.126 (.356)	.120 (.356)	-1.058** (.368)	-1.278*** (.363)	-.937* (.435)	-.961* (.424)	-.838*** (.152)	-.958*** (.147)	-.744*** (.180)	-.758*** (.172)
Time 2016-2018	-1.932*** (.302)	-1.814*** (.345)	-1.793*** (.300)	-1.547*** (.404)	-4.728*** (.368)	-3.811*** (.420)	-4.690*** (.412)	-3.589*** (.481)	-1.429*** (.152)	-.925*** (.170)	-1.372*** (.171)	-743*** (.195)
Residential stabiltity	-	. -	005 (.031)	.005 (.031)	-	-	.013 (.038)	.011 (.037)	-	-	.004 (.016)	.004 (.015)
Racial hetereogeneity	-	-	.043* (.015)	.044** (.015)	-	-	-.048* (.019)	-040* (.018)	-	-	-.015* (.008)	-.011 (.007)
Concentrated disadvantage	-	-	-.079 (104)	-.104 (.107)	-	-	-.049 (.127)	-.161 (.127)	-	-	-.046 (.053)	-.110* (.051)
Housing Value	-	-.003 (.005)	-	-.006 (.005)	-	-.026*** (.006)	-	-.026*** (.006)	-	-.014*** (.002)	-	-.015*** (.003)
Constant	5.292*** (.809)	5.783*** (1.114)	3.895 (1.892)	5.046* (2.305)	10.785*** (.985)	14.608*** (1.322)	14.374*** (5.723)	19.535*** (2.744)	6.311*** (.408)	8.410*** (.535)	7.931*** (1.042)	10.880*** (.1.111)

Note N=369 (42 neighborhoods with 9 observations each). Standard error in parentheses

* p < .05 ** p < .01 *** p < .00

5. Discussion

The findings of this thesis contribute to research on associations between gentrification and crime rates by examining a European city that has no such research to date (Covington & Taylor, 1988; Taylor & Covington; 1989; O'Sullivan, 2005; Lee, 2010; Kreager et al., 2011; Papachristos et al., 2011; Smith, 2014; Barton, 2016). Omitted variable bias and time were controlled for by the selection of a fixed effects regression analysis. Results indicate that gentrifying neighborhoods experienced lower rates of all three types of crime at the end of the decade than at the beginning but only burglary and assault did so as a result of the gentrification process.

Traditional predictors of crime as established by social disorganization theory, namely residential stability, racial heterogeneity and concentrated disadvantage, were added to the model as potential extraneous variables assumed to influence the dependent variables (Barton & Gruner, 2016). The addition of these variables aid in combatting omitted variable bias. Similarly, to Barton (2016) residential instability had no statistically significant association with robbery, burglary or assault rates. Contrary to Barton (2016) concentrated disadvantage also had no significant association with robbery, burglary and assault. This result is surprising since there seems to be a consensus among researchers that the deconcentration of disadvantage is generally associated with a reduction in crime (Kubrin & Weitzer, 2003; Wang & Arnold, 2008; Chamberlain& Hipp, 2015; Barton, 2016). A possible explanation for this is that the process of gentrification is not yet fully consolidated in the neighborhood included in this study. As discussed by Kreager et al. (2011) the process of gentrification happens over time, not all at once. Considering this study has only included nine years in the analysis it could be that the process of deconcentrating of disadvantage in neighborhoods experiencing gentrification is not adequately captured by such a time frame.

The ethnic and racial composition does seem to have an effect on the changes in crime rates. Robbery rates are expected to be higher in neighborhoods that see an increase in racial and ethnic disparities. This supports the idea portrayed in social disorganization and the civic communities theory that the disruption of cohesion within neighborhoods will lead to an increase in violent crime (Tolbert et al., 2002; Lee, 2008). However, only for robbery. Racial heterogeneity is negatively associated with both burglary and assault. What this result could mean is that, as proposed by the defended communities theory, the process of gentrification causes displacement that motives offenders to commit crimes as a means to either scare

off the newcomers of as a way to alleviate grievances (Suttles, 1972). In order to get more insight into this process, victimization data could be compared to the reported crime data. If the victimization data shows an increase in the number of Caucasian victims, as one of the main characteristics of a 'gentrifier' is being of Caucasian accent, the defended communities perspective would have more empirical support (Nesbitt, 2015).

Rational choice theory or crime opportunity theory do not seem to explain the association between gentrification and crime in Amsterdam as that would have resulted in an increase of crime. To quickly recap, these theories propose that the new residents, or 'gentrifier', possess characteristics that make them suitable targets for crime (Akers, 1990; Hayward, 2007). Gentrifiers are often more affluent and as such own more valuable items, which would increase the gain from committing a crime against them (Nesbitt, 2015). Considering the associations found in this thesis are all negative, it does not follow that gentrifiers are suitable targets for crime.

The current study is not capable of determining what the exact mechanisms are that drive down crime rates in the neighborhoods in the process of gentrifying. For instance, it could be that burglary rates go down because gentrifiers have better home security systems that deter crime but it could also be the case that offenders of crime are being displaced and as a result so are the crimes. This thesis did however fulfil its primary goal of gaining a basic insight into the relationship between gentrification and crime in Amsterdam. How future studies can build on this current study to uncover the underlying mechanism, will be discussed shortly.

Before that discussion, the outcome of this study is compared to the outcomes of previous research. The current study is consistent with research by Papachristos et al. (2011), Barton (2016) insofar the association between gentrification and assault is negative. However, contrary to the current research, the association between gentrification and robbery was significant in all these studies. A possible explanation for this is that robbery rates are better explained by a measure of gentrification that reflects changes in local culture. Census based measure relation to housing value or investment, such as the one used in the present study, do capture the economic changes that occur when neighborhoods change but do not adequately represent the accompanying cultural changes (Kreager et al., 2011). Papachristos et al. (2011) used the number of coffee shops as the measure for gentrification as an expression of the cultural changes a neighborhood goes through. The conclusion brough forward by Smith (2014) support the idea that different operationalization can produce different results. In his study, gentrification operationalized as public housing demolition was positively associated with violent crime, but gentrification operationalized

as the amount of coffee shops was negatively associated. Results from Papachristos et al. (2011) do indicate that changes in robbery rates are associated with changes in local culture. In would be worthwhile to investigate whether robbery rates in neighborhoods in Amsterdam are associated with the type and breadth of amenities in those neighborhoods.

Kreager et al. (2011) did not report a significant association between gentrification and violent crime. However, their results are difficult to compare to the present study, which did report a significant association between the violent crime 'assault'. The operationalization of violent crime in Kreager et al.'s (2011) study was distinctly different from all other studies on gentrification and crime. Kreager et al. (2011) did not separate violent crime into categories during their operationalization but rather used an aggregated measure of violent crime, including all types of violent crime as reported by the Seattle police department. It could therefore be that the difference in outcome is due to the use of this aggregated measure of violent crime.

On the other hand, similarly to this study, Kreager et al. (2011) did find a negative association between property crime and gentrification but it varied over time. The current study does not support the curvilinear association between gentrification and property crime found by Kreager et al. (2011) since the negative association was consistent across time. Again, it must be mentioned that their measure of property crime was an aggregated measure whereas the measure of property crime in this study consisted of the single measure burglary.

The contradictory results of the negative association between gentrification and assault found in this study and the positive association between gentrification and assault found by Covington and Taylor (1989) is likely due the largely gap between the time period under review. The nature of gentrification processes was distinctly different for this time period as it was not yet a wide spread urban strategy, making the process more precarious (Kreager et al. 2011; Van Gent, 2012). The process of gentrification was not yet support by changing housing policies but also policing policies. In Amsterdam, the neighborhoods the municipality is actively trying to revitalize through housing policies, are also subjected to increased policing ("Veiligheidsplan Amsterdam 2012-2014", 2011; "Veiligheidsplan 2015-2018", 2014). The convergence of the process of gentrification from a spontaneous occurrence to a wide spread urban planning strategy, likely influence the changes in crime rates in gentrifying neighborhoods. For that reason, it is difficult to compare results from such different time periods.

6. Limitations

This study has several limitations that must be noted. First, the measure for gentrification used is simple and directly associated with property value and, as a result, more likely to be related to changes in property crime (Barton, 2016). As addressed above, using a measure of gentrification that reflects changes in local culture, such as the amount of coffee shops or restaurants in a neighborhood, would be more likely to be associated with changes in neighborhood culture such as the use of violence. It could thus be that changes in violent crime are not well measured by an economic measure such as the one used in this study. By incorporating different operationalization of the measure of gentrification we would be able to gain deeper understanding into the mechanism that regulates changes in different types of crime rates. Now we only know that gentrification as a whole affects assault and burglary rates in Amsterdam. By testing different measures for different types of crime we would know exactly what type of characteristics a neighborhood needs to possess to see a decrease in crime rates.

Secondly, the current study only examined the relationship between gentrification and crime for gentrifying neighborhoods. What is not yet known is how the development of crime rates in gentrifying neighborhoods compares to non-gentrifying neighborhood. Consequently, the findings of this study only allow for a tentative recommendation for policy entrepreneurs or city planners. Only when the development of crime rates can be compared to both non-gentryfing poor neighborhoods and non-gentrification affluent neighborhoods, can we know whether or not gentrification should be pursued as a policy instrument due to its distinctively positive effects for neighborhoods in Amsterdam. For instance, if crime increases again after a neighborhood has gentrified and is considered affluent, if gentrification truly the answer to the policy makers dilemma on how to make neighborhoods more liveable?

A third limitations is that the time period under review, stretching over nine years, is somewhat shorter than in previous gentrification research. As a result, it is unlikely that the entire process of gentrification was captured in this study. It is possible that some neighborhoods included in this study where not done gentrifying in the last year of observations. Additionally, some neighborhoods might have been further along in the gentrification process than others. For example, one neighborhood might have been close to the average housing value in 2010 while others were still two standard deviations away but both have been included in this study. The results thus do not capture the progression of crime rates for the entire process of gentrification, rather just for these nine years. If neighborhood level data would have been available for a longer time period, the process of gentrification could have been more accurately captured.

Similarly, to Kreager et al. (2011), whose data spans two decades, the curvilinear hypotheses could have been aptly tested.

A related limitation is that the selection of gentrifying neighborhoods has solely been done on the basis of quantitative data. There is no field survey data available for the city of Amsterdam that would allow verification of the chosen neighborhoods. It could be the case that, based on census data, a neighborhood seems to be gentrifying but that the urban renewal processes associated with gentrification such as better landscaping, repainting, or other home renovations, are absent. The lack of such qualitative data increases the risk that neighborhoods are included in the study that should not have been even if the selection criteria were well founded and strict. Field studies conducted throughout Amsterdam by for instance the Department of Urban planning could produce such qualitative data. The availability of that qualitative data would allow future researchers to verify whether the cultural changes that belong to the gentrification process are present in the neighborhoods chosen based on quantitative data. If the quantitative data and qualitative data match, researchers can be sure no neighborhoods in the research skew the data because they do not actually belong in the sample.

The last limitation of this study is that the chosen measure of crime limits the conclusions that can be made about actual crime. No research on gentrification and crime specifically state that the conclusions actually only pertain to *reported* crime. There seems to be an overall lack of consideration for the limitations that result from using police data of registered crime. The underreporting of crime is a whole field of expertise on its own and each type of crime suffers from its own amount of underreporting (Myers, 1980). It could be the case that for Amsterdam registered burglary rates closely resemble actual burglary rates, in that case it is justified to say that gentrification is negatively associated with burglary rates. However, is there is a large discrepancy maybe what we are actually measuring is the association between the willingness to report burglary and gentrification rather than the actual crime. What gentrification and crime literature must be wary of is making the inaccurate assumption that conclusion of research on reported crime rates are automatically generalizable to actual crime rates. Van Wilsem & De Graaf (2006) are the first to tackle this issue by using victimization data in their study on the association between displacement and crime rates. But victimization if not the only type of data that could be included in gentrification and crime research, perception data of crime rates could also further our understanding. Future research could regress gentrification and crime measure separated by the type of data used. Differences in the associations could elucidate whether the relationship between gentrification and crime rates is similar across different types of crime data.

7. Recommendations

Apart from the recommendations that derived from the discussion on the limitations of this studies, some additional recommendations can be made. Future research should include a proximity measure. Displacement of poverty is a prominent negative effect of gentrification (Palen & London, 1984). In the current study, the spatial dimension of gentrification was not incorporated. It is not known whether crime went up or down in neighborhoods that were adjacent to gentrifying neighborhoods. Again, this would be crucial information for policy makers. If policy makers operate under the assumption that crime disappears when neighborhoods revitalize, but in reality, crime is merely displaced, then their urban strategies run the risk of being ineffective or inefficient. Future research should be focused on more comparative research in order to gain understanding on the impact that gentrification has on the city of as a whole. Panel data regression could be performed to compare gentrifying neighborhoods adjacent to either affluent or disadvantaged neighborhoods

In similar vein, crime development in gentrifying neighborhoods should be examined in conjunction with crime trends in non-gentrifying neighborhoods. Only if we can state that crime rates change differently in gentrifying neighborhoods, do we know the value of gentrification for a city. Kreager et al. (2011) called this approach 'gentrification as an outcome'. More statistical analysis that allows for the differentiation between crime rates in gentrifying and non-gentrifying neighborhoods is needed. Without such comparisons, we cannot know how if the negative effect gentrification seems to have on crime is worth the time and effort to pursue through municipal policies.

Overall, the results shown in this study support the logic of the municipality of Amsterdam to promote the process of gentrification as a means to revitalize deprived neighborhoods in order to create 'liveable neighborhoods' (Van Gent, 2013). Nevertheless, the municipality of Amsterdam should be wary of treating gentrification as a panacea. Gentrification has its own distinct set of negative consequences, such as the suburbanization of poverty, that must be dealt with appropriately as to ensure that gentrification does not disproportional negative effects for minorities (Hochstenbach & Musterd, 2018).

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9. Appendix 1

Figure 1 Table of Correlations between variabels racial heterogneity, residential instability, concentrated disadvantage, robbery, burglary, and assualt.

	1	2	3	4	5	6
1. Racial heterogeneity	-					
2. Residential instability	-.102	-				
3. Concentrated disadvantage	.363**	.113*	-			
4. Robbery	.059	-.199*	-.228*	-		
5. Burglary	.262**	-.040	-0.79	-.199*	-	
6. Assault	.188**	-.124*	-.001	.673*	.492**	-

*Note: *p<0.05 , **p<0.01, two tailed, N=369*