Neighborhood Inequality Spillover Effects of Gentrification

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Abstract

Numerous articles have studied the impact of gentrification on the gentrifying neighborhood, but less research has been devoted to the spillover effects of gentrification onto neighboring areas. In particular, a spillover effect on the income inequality of neighboring areas may arise from lower-income households being priced out of gentrifying neighborhoods and being forced to relocate to nearby places. We consider this possibility by estimating the impact on the income inequality of census tracts of having neighboring census tracts gentrify between 2000 and 2010. Our findings indicate that the gentrification of a neighboring neighborhood results in an increase in income inequality that is greater for census tracts that are poorer and located in smaller MSAs.

Introduction

Gentrification is often portrayed as a double-edged sword (Svaldo, 2016). It updates older, generally run-down housing in urban areas with modern, attractive infrastructure but may result in worse outcomes for low-income households who are priced out of the improved housing market. Gentrification through revitalization improves the existing housing stock and is generally associated with improved local amenities. These improvements increase house prices and may displace lower-income households who are unable to afford the higher rents that can be commanded of these improved spaces.

Several studies consider the impact of gentrification on changing racial composition, income composition and income segregation within the gentrified area (Freeman, 2009), but gentrification is also likely to generate spillover effects to neighboring communities. These spillover effects have received scant attention in the literature, but may play a substantial role in the economic development of a region or neighborhood (Ellen and O'Regan, 2010). Gentrification is thought to be both a cause and a consequence of rising income inequality in many large cities (Krugman, 2015), but this concern is often levied at cities as a whole or the neighborhood that is being gentrified in particular. Analysis at the neighborhood level, rather than a broader region, can provide insight into some of the consequences of gentrification that would be obscured at the city or metropolitan level.

If gentrification does influence location decisions of low-income households, by low-income households being displaced after gentrification or incoming low-income households choosing to migrate to more affordable areas, these location decisions will influence the surrounding communities. If a poor neighborhood is "dismantled" through gentrification and low-income households choose to reside in neighboring communities which are relatively higher income than their previous neighborhood (but still affordable), income inequality in these surrounding neighborhoods will increase.[1]

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[1]We consider several definitions of gentrification and all require that a neighborhood be in the lowest quintile income group to qualify for potential gentrification. As a result, it is not possible for a surrounding neighborhood to be in a lower quintile of the income distribution than the recently gentrified neighborhood

Higher income inequality has been found to negatively influence growth (Alesina and Rodrik, 1994), health outcomes (Torre and Myrsyla, 2011), and happiness (Oishi et al., 2011). However, the negative influence of inequality on economic outcomes has largely been found when the effect is considered at the aggregated state or national level. Analysis at the neighborhood level find potential benefits of within-neighborhood inequality for low-income households. Chetty et al. (2016) found that young children in low-income households who were moved to relatively richer low-income neighborhoods (increasing the income inequality in these neighborhoods) earned more as adults, had higher college completion rates and were less likely to become single parents.

Low-income households who reside in low-income neighborhoods, on the other hand, have been found to experience worse health outcomes (Bilger and Carrieri, 2013), labor market outcomes and education outcomes (Sampson et al., 2002), even though the income inequality is lower than neighborhoods with a mix of low- and relatively higher-income households. If true, and if gentrification is associated with an increase in income inequality in surrounding neighborhoods, this may be beneficial to low-income families in these neighborhoods.

We consider the influence of gentrification on within-neighborhood income inequality of areas surrounding newly gentrified regions in the 30 largest metropolitan statistical areas in the US during 2000-2010. More specifically, we examine the influence of being a contiguous neighbor to a census tract(s) experiencing gentrification in the previous decade on the change in the income inequality over the same decade, while controlling for education levels, demographics, income, housing characteristics and the size of the metropolitan population and employing robust clustered standard errors.

We use various definitions of gentrification and generally find that an increase in income inequality *is* positively associated with a tract being located near a gentrified tract. When we classify a census tract as gentrified when it experiences an increase in average income such that it moves out of the bottom quintile of the metropolitan statistical area (MSA)

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and, in most cases, surrounding neighborhoods are relatively richer.

income into at least the 3rd income quintile, we find that bordering a newly gentrified tract is associated with an statistically significant increase in the gini coefficient. This associated positive influence is larger than when we define gentrification as occurring when a tract moves out of the bottom quintile to any other quintile (although this still exhibits a positive and significant associated influence).

It is possible that the influence of gentrification on surrounding areas is not uniform for all MSAs. If low-income households are more constrained in their location decisions, the spillover effects may be larger than if low-income households have many options. To consider this we interact the population size of the MSA whether a tract borders a newly gentrified census tract. We find that neighboring tracts in the smaller MSAs do indeed have a larger positive influence of neighboring gentrification on increasing inequality than larger MSAs, which experience either a statistically insignificant relationship or even a slight *decrease* of within-census tract inequality. Census tracts which experienced gentrification saw a reduction in within-tract inequality for all specifications, whether located in a large or small MSA.

Taken together, we find that gentrification significantly influences inequality in surrounding neighborhoods. The influence is large and positive in smaller MSAs while it is either insignificant or slightly negative for larger MSAs. This may be due to smaller MSAs having less geographic mobility for low-income households, both in terms of residential location and employment so low-income households spill into neighboring areas, increasing inequality. In larger MSAs, where low-income households may have more residential and employment options across the larger region, it may be that gentrification is resulting in a flight of low-income households from the gentrified area *and* the surrounding communities. Essentially, neighborhoods in larger areas surrounding gentrified areas become an extension of the gentrified area with respect to inequality trends whereas in smaller MSAs the effect is constrained to the gentrified area.

It also is likely that the influence of the spillover effect differs in surrounding neighbor-

hoods that are relatively poor compared to neighborhoods that are relatively rich. If the effect of gentrification is to drive low-income households into surrounding neighborhoods, we expect this effect to be larger for surrounding neighborhoods that are relatively low-income (with relatively cheaper housing). It is unlikely that low-income households would choose to locate in surrounding relatively rich neighborhoods if the decision to relocate is based on supply of affordable housing. Consequently, we should not observe a spillover influence of a change in residential choice of lower income households in richer neighborhoods.

To determine whether the spillover is concentrated in lower-income areas, we interact the influence of a neighboring census tract gentrifying with the average household income of the census tract (as a percentile of the larger MSA income). We find that a gentrified census tract *positively* influences neighboring census tract inequality for census tracts in the bottom 2 income quintiles but does not yield any statistical influence on the level of inequality for surrounding census tracts in the top 3 quintiles.

This is consistent with the hypothesis that the influence on surrounding census tract inequality is driven by low-income households. This finding also highlights the potential that the observed negative influence of gentrification on surrounding census tract inequality for MSAs may be obfuscating a similar trend. This persistent influence of gentrification on inequality in surrounding neighborhoods ought to be considered when regions consider policies to promote or dissuade gentrification. Unlike the strong negative effect of rising inequality at the larger regional level, an increase in inequality at the neighborhood level may have a very different, and potentially positive, influence on the well-being of low-income households who are potentially displaced due to gentrification.

Taken together, neighborhoods bordering gentrified neighborhoods experienced an increase in inequality and a reduction in the percent of low-income and black households relative to similar neighborhoods which did not border gentrified neighborhoods. These spillover effects largely mirrored the influence of gentrification on the demographics in the gentrified neighborhood, suggesting that gentrification has consequences for low-income households

beyond the reach of the affected area. Analysis of gentrification at the city-wide level may not capture these localized effects while analysis of *only* gentrified neighborhoods may not capture the spillover influence we observe.

Literature Review

Gentrification

The determinants of gentrification have recently been given theoretical consideration by Brueckner and Rosenthal (2009). They extend a model of gentrification in which higher income households initially reside in newer houses in the suburbs and accept a longer commute as a tradeoff to consuming newer construction, originally proposed by Alonso (1960); Muth (1969). Brueckner and Rosenthal (2009) incorporate the consideration of remodeling an aging housing stock. Once the city center housing is old enough to make remodeling a financially sound investment, the higher income households will begin bidding for this remodeled or soon-to-be remodeled older housing stock closer to the city centers. In this model the relative age of housing stock is the primary motivation for gentrification and predicts an increase in gentrification as the city center housing stock becomes older.

Kolko (2007) considers several determinants of gentrification and finds evidence that, similar to Brueckner and Rosenthal (2009), the age of housing stock is indeed positively related to gentrification, consistent with model predictions. He also finds that proximity to richer neighborhoods increases the likelihood of gentrification occurring. This "inter-neighborhood spillover" effect captures the influence of surrounding neighborhood characteristics on the propensity of a neighborhood to gentrify.

Guerrieri et al. (2013) incorporates a theoretical motivation to explain the propensity for areas surrounded by richer areas to have an increased probability of gentrifying. They argue that low-income areas that are near higher-income areas benefit from positive spillovers. These spillover effects of lower crime and better amenities make low-income areas more

attractive for gentrification. As part of an endogenous gentrification model, they use zip code level housing prices from 1988-2008 to examine the influence of a housing demand shock. They find evidence that, consistent with their model predictions, bordering a higher-income area does increase the likelihood that an area will gentrify.

We extend this consideration of spillovers to capture the inter-neighborhood spillover *after* gentrification rather than as a precursor. The post-gentrification influences are typically constrained to the newly gentrified region. Freeman (2009) analyzes census data from 1970 to 2000 to determine how gentrification influences regional income and racial diversity. He finds mixed results, with gentrified neighborhoods not experiencing decreased diversity at the neighborhood level but some (weak) evidence of an increase in diversity at the metropolitan area level.

We follow Freeman (2009) in focusing on the influence of gentrification at the neighborhood, rather than the metropolitan, level. Gentrification can dramatically influence a neighborhood and surrounding community but does not constitute a large portion of any region and, consequently, will likely not have a significant effect on the development of the larger region. Similarly, Ellen and O'Regan (2010) argue that analysis at the neighborhood level can yield important insight into factors which influence the economic activity of the broader region. Many household decisions are made at the very local level and can shape the growth of the region and lives of its residents. Many individuals live and work in their local community and issues which influence this local community can have a dramatic influence on its neighborhood and surrounding neighborhoods. Ellen and O'Regan (2010) point out that regional scientists have largely been remiss of these important spatial interactions.

Inequality

Although there are several important potential spillover influences of gentrification, our paper aims to account for changes of within-neighborhood inequality. We use the Gini coefficient at the neighborhood level to measure the level of income inequality, following the literature.

The Gini coefficient is useful when considering changes in the distribution of richer and poorer households and has the benefit of not being influenced by population size (Glaeser et al., 2008). Glaeser et al. (2008) analyze changes in income inequality at the MSA level and point out that inequality has increased in the majority of areas in the last few decades.

Dangers of growing levels of inequality and the impact of inequality for the middle class has been afforded considerable attention in the media. Considerations of the causes and consequences of inequality have typically been analyzed across large regions (countries or states or MSAs) but Wheeler and Jeunesse (2006) find that the majority of MSA level inequality occurs within neighborhoods rather than between neighborhoods. Consequently, analysis of factors which influence within-neighborhood inequality may have important implications for MSA level inequality. However, as previously noted, our focus on areas surrounding gentrified neighborhoods only (rather than all neighborhoods) decreases the likelihood of observed influences of within-neighborhood inequality factoring into changes in overall MSA level inequality.

Within-neighborhood inequality has grown in recent decades while the concentration of poverty within neighborhoods has changed from decade to decade. Kasarda (1993) and Abramson et al. (1995) find that the percent of households in poverty living in low-income neighborhoods had increased from 1970 to 1990. During the 1990s, the concentration of households living in high poverty areas decreased then surged to new highs in the 2000s (Bishaw, 2014). Although the influence of an increasing concentration of low-income households in designated low-income census tracts does not provide enough information to determine whether within-tract inequality increased or decreased during these time periods, there is a vast literature detailing the implications for low-income households of living in a neighborhood with largely low-income households.

Chetty et al. (2016) analyzes the effect of moving to a neighborhood with less poverty on children in low-income households. They consider the findings of an experiement "Moving to Opportunity" in which some low-income households were given the opportunity to move

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to neighborhoods with a lower percent of low-income households. They find that children in families that moved to neighborhoods with less poverty fare better in the long run across a wide range of economic and social outcomes, from increased earnings to lower probability of being a single parent. Recent findings, summarized by (Chetty et al., 2016), suggest that higher rates of high school completion are associated with less time spent living in low-income neighborhoods during childhood (Crowder and South, 2011; Wodtke et al., 2011; Chetty et al., 2014).

That living in areas with *higher* levels of inequality would benefit children in low-income households is in direct contrast to the findings of the effect of inequality at an aggregated regional level. Higher levels of larger level regional inequality have been associated with poor health outcomes in numerous studies, summarized in Subramanian and Kawachi (2004). These poor health outcome include higher levels of morbidity (Soobader and LeClere, 1999), mortality (Lochner et al., 2001) and lower levels of self-rated health (Blakely et al., 2002).

Higher levels of inequality at the state and/or national level have also been found to be positively related to a number of undesirable social outcomes, summarized in Wilkinson and Pickett (2009). These include homicide rates (Hsieh and Pugh, 1993; Kaplan et al., 1996), violent crime (Franzini et al., 2001; Hsieh and Pugh, 1993; Kaplan et al., 1996; Krohn, 1976), obesity (Pickett et al., 2005; Wilkinson and Pickett, 2006), imprisonment rates (Kaplan et al., 1996; Wilkinson and Pickett, 2006), social capital (Kawachi et al., 1997) and trust (Kawachi et al., 1997; Uslaner, 2002). Additionally, inequality at the state level is negatively associated with high school completion rates and scores in math and reading (Kaplan et al., 1996; Wilkinson and Pickett, 2006). However, when MSA level inequality remains constant, a lower level of inequality at the neighborhood level implies that the region is *more* segregated than neighborhoods with higher levels of inequality (Glaeser et al., 2008).

These findings imply that low-income households may benefit from residing in neighborhoods that have higher levels of inequality (relative to residing in neighborhoods with primarily other low-income households) even though this may not be true for low-income

households residing in MSAs or states with high levels of inequality. Gentrification may influence income inequality in surrounding neighborhoods if current and potential low-income residents are priced out of the gentrified area and must seek housing in neighboring locals. Simultaneously, the housing location decisions of relatively high-income residents may be affected if these households are attracted to areas near newly-gentrified neighborhoods.

In either (or both) cases, it is possible that low-income families will benefit from living in neighborhoods with more relatively rich neighbors, whether it is primarily driven by richer households moving to lower income neighborhoods or poorer houses moving to richer neighborhoods. Our aim in this paper is to determine if gentrification induces spillover effects related to income inequality. Identifying these potentially influential effects may shed light on the evolving perception of how gentrification affects local communities and low-income households.

Data and Methodology

We employ census tract level data for the central cities in the 30 largest MSAs in the US for 2000 and 2010. A census tract is designed to include around 4,000 individuals (1500 households) but can include as many as 8,000 individuals or as few as 2,000 households, depending on local geography and population density. Although these designations cannot precisely identify neighborhoods in the same way that its inhabitants would identify the neighborhood, researchers generally rely on this designation to study influences at the neighborhood level.

There are 12,638 census tracts included in our sample and we identify the census tracts that are eligible for gentrification between 2000 and 2010. There is no consensus on the specific classification requirements to designate an area as having been gentrified (Barton, 2016). Some researchers designate an area as gentrified if the average income increases from the bottom 50% to the top 50% (Guerrieri et al., 2013).

However, McKinnish et al. (2010) note that this definition may obscure significant differences between the experience of a census tract with a slightly below median income to a census tract that is very (relatively) poor. McKinnish et al. (2010) adopt the stricter definition of designating an area as having gentrified if the average income is initially in the bottom quintile and increases enough that the average is out of the bottom quintile. It has been found that the influence of gentrification is quite sensitive to the criteria used to classify gentrification, and there are several designations employed in the literature (Freeman, 2005). Hammel and Wyly (1996) note that classifying gentrified neighborhoods on the basis of changes in average income rather than demographic or other economic variables is most consistent with field study classification. Consequently, our primary measure is a function of changes in the relative standing of average income.

We adopt a variation of the classification proposed by McKinnish et al. (2010) and designate a census tract as eligible for gentrification if the average income of the households in the census tract are in the bottom quintile of the income distribution (of that city). We consider two definitions of gentrification according to house price or income. The first simply requires that a census tract which is in the bottom quintile with respect to income or house price in 2000, is no longer in the bottom quintile in 2010. A second definition requires that the tract move from the bottom to at least the third quintile for gentrification to be classified as occurring.

The stricter requirement of requiring that a census tract move from the bottom quintile of average income to at least the third quintile is useful for several reasons. It ensures that our results are not driven by census tracts on the border of the first and second quintile of average income where minor fluctuations in income may influence the results. It is also a useful measure to observe whether the spillovers are stronger when we only classify areas that have experience a significantly larger increase in average income. It is expected that the "more gentrified" an area is, the larger the potential spillovers. We provide results for both designations.

Table 1 contains summary statistics on the number of gentrified, neighboring and unaffected census tracts and the average change in the Gini coefficient and other demographic variables. There were 5,143 census tracts that were eligible for gentrification, of which 887 were gentrified by 2010 (102 for the stricter definition). With respect to potential spillovers, over 3,000 census tracts had at least one contiguous neighbor tract gentrify (530 for the stricter definition).

[*Insert Table 1 here.*]

The summary statistics for the change in various neighborhood demographics from 2000-2010 is then segmented by whether a tract is a newly gentrified tract, whether it is neighboring a gentrified tract (but did not experience gentrification) or whether a tract is neither newly gentrified or neighboring a gentrified area. On average, inequality within-tract increased over this period but increased less for neighborhoods next to gentrified tracts (more when the stricter definition is employed) and actually *decreased* for gentrified neighborhoods. The percent of households in poverty increased followed a similar pattern, as well as the change in the number of poor households.

[*Insert Table 2 here.*]

Consistent with Jackson (2015), we observe that the percent of black households decreased more in areas that experienced gentrification and this influence appears to spill over into neighboring areas. While the MSAs in general experienced an overall average decline in percent of black households by 1.05%, census tracts which gentrified (according to the less stringent classification) experienced an average decline of 3.5%, their neighbors experienced an average decline of almost 1.8% and tracts which neither gentrified or were near gentrified tracts saw a decline of only .55%. For the stricter classification of a gentrified tract, requiring the average income move from the bottom quintile to at least the third, the changes are even more pronounced. Gentrified tracts experienced a reduction of almost 8% in the percent of black households while their neighbors experienced a reduction of over 3%. Our full model

takes the following form:[2]

$$Gini_{2010} = \alpha + B_1 Gini_{2000} + B_2 \%Educ_{2000} + B_3 \%Immig_{2000} + B_4 \%Black_{2000} +$$

$$B_5 RacialHetero._{2000} + B_6 \%Poverty_{2000} + B_7 AvgHHInc(\%)_{2000} +$$

$$B_8 CBSAPopulation_{2000} + B_9 Gent.Tract_{2010} + B_{10} NeighborGent.Tract_{2010} + \epsilon$$

We include controls that have been shown to influence inequality and employ robust standard errors. All demographic variables represent 2000 values. Average household income is the average household income (where household income is expressed as a percentile of all households in the CBSA). We also include the degree of racial fractionalization to capture . This index measures the probability that two census tract residents drawn randomly will be of a different race and captures the degree of racial segregation at the census tract level. This is calculated as $1 - \sum race_i^2$, where race is the share of the population with race 'i'.

Since we are interested in the change in income inequality, rather than the level, we include the initial gini coefficient by census tract. Similar to Glaeser et al. (2008), we find that the correlation between the Gini coefficient in 2000 and 2010 is .59, suggesting some movement but not extreme shifts over time. Our primary specification includes a dummy variable for whether a census tract is a contiguous neighbor to a census tract which gentrified from 2000 to 2010 and a dummy variable indicating the census tract experienced gentrification. [3]

It is likely that the influence of a gentrified tract depends on the size of the MSA. If gentrification results in lower income households (current and future residents) seeking residence elsewhere in the city, it is expected that larger cities offer more options and the spillover influence may be less concentrated. Similarly, the influence of gentrification on surrounding neighborhoods may be larger in areas where there are fewer options. The average CBSA population size is approximately 8,100,000 so we classify CBSAs with a population

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[2]Some specifications do not include all variables while other specifications include additional interaction terms.

[3]We also consider the spillover influence of gentrification by including the number of gentrified neighboring tracts rather than a simple dummy variable in a separate specification. We do not report the results from this specification, but they are consistent with our primary specification and are available upon request.

below this cutoff to be relatively small and above this cutoff to be relatively large. A cursory look at the changes in the relevant demographics in areas which bordered gentrified areas in large cities relative to small CBSAs are provided in Table 3.

[*Table 3 here.*]

The overall average change in inequality is positive for both relatively small and large MSAs while newly gentrified tracts experience an average reduction in inequality in both (although the decrease in inequality is much greater in larger MSAs). Census tracts which did not experience gentrification or were neighboring to tracts which did, experienced an increase in overall inequality for large and small MSAs. However, while census tracts which bordered gentrified tracts in smaller MSAs experienced an average increase in inequality, neighboring tracts in larger areas experienced an average decrease.

Trends in the percent of households below the poverty line, as well as the raw number of poor households, tell a similar story. In the larger MSAs, census tracts that bordered a newly gentrified tract experienced an average reduction of .61% in the percent of households below the poverty line while in smaller MSAs, the neighboring tracts experienced an average *increase* of 3.1%. Small and large MSAs both experienced a large reduction in the percent of households below the poverty line (2.1% and 5.9%, respectively) for newly gentrified tracts and, similarly, both types of MSAs experienced an increase in the average percent poverty for tracts that were neither gentrified nor neighboring to a newly gentrified tract (2.7% and .62%). The divergence in overall trend is concentrated for areas bordering a newly gentrified census tract.

Overall, neighboring tracts in smaller MSAs experienced an increase in inequality (likely through an increase in the number/percent of poorer households), while neighboring tracts in larger MSAs experienced the opposite. We incorporate this trend in our analysis by including an interaction term for population of the MSAs in our sample with whether a census tract borders a gentrified tract.

It is also likely that spillovers will differ for neighboring richer areas from neighboring

poorer areas. If a gentrification spillover influences the location choice of lower-income households, this should be evident in a stronger influence for neighboring poorer areas. To that end, we include an interaction term between the census tract percentile of income (within the MSA) in 2000 with whether that tract is a contiguous neighbor with a tract that gentrified between 2000 and 2010. If lower-income households are disproportionately influenced by gentrification, it is expected that the spillovers for the poorer neighboring areas will be greater than for richer neighboring areas.

Results

Our initial specifications include all control variables and interaction terms. These estimations, provided in Table 4, include cases where gentrification is classified by the weaker definition (moving out of the bottom quintile of income distribution) and the stronger definition (moving out of the bottom to at least the third quintile of the income distribution). Columns 1 and 3 consider the influence of the direct gentrification only (without inclusion of the influence of being near a gentrified area). Columns 2 and 4 include designation of census tracts which are neighbors to recently gentrified areas.

[*Insert Table 4 here.*]

For all estimations, gentrification results in significantly lower levels of within census tract inequality in 2010. We observe that a census tract which gentrified between 2000 and 2010 is estimated to experience a reduction in the Gini coefficient of approximately 2 points (from a mean of approximately 42). Although reductions in income inequality are typically viewed favorably at the aggregated levels, a reduction in neighborhood level Gini coefficients implies that there is an increase in segregation by income (Glaeser et al., 2008), which may harm low-income households (Chetty et al., 2016). Coupled with evidence of a reduction in low-income households and minority households in newly gentrified tracts, our findings are consistent with the sentiment that gentrification may displace/discourage low-income

households from residing in these regions.

Although the magnitude of influence changes slightly depending on the classification of gentrification employed, our control variables behave as expected. Similar to Glaeser et al. (2008), we find that an increase in percent of households with a college degree is positively associated with higher levels of inequality. On the other hand, an increase in racial heterogeneity and percent of immigrants is associated with a decline in inequality while the percent of households under the poverty line yields a positive and significant influence.

With respect to neighboring tracts, we find strong evidence that the influence of gentrification does generate spillover effects. Bordering a newly gentrified area is associated with a statistically significant increase in the Gini coefficient and, similar to the influence of gentrification directly, there is an increased magnitude of influence for the stricter definitions of gentrification. The interaction of population and the average income by percentile of the distribution (with whether a tract is neighbor to a newly gentrified tract) are negative and significant. This suggests that the influence of gentrification extends beyond the borders of the gentrified area while the direction and magnitude of influence is conditional on initial income and the size of the larger region.

To further consider the influence along MSA population and, separately, for different average incomes of the neighboring tract, we split the sample into Low and High Population areas and High and Low Income areas. These results, provided in Tables 5 and 6, respectively, are consistent with our hypotheses. In smaller MSAs, tracts which border gentrified areas experience a statistically significant increase in inequality, while an insignificant influence is found in larger MSAs.[4] This suggests that gentrification influences neighboring areas to a greater extent in smaller metropolitan areas.

[*Insert Table 5 here.*]

With respect to the income of the neighboring tracts, we detail our findings of the influ-

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[4]We also split the sample into 3 classifications by population. Medium-sized MSAs also exhibited an insignificant influence. These results are available upon request.

ence of gentrification on low and high income neighbors in Table 6. Low-income tracts which neighbor newly-gentrified areas experience a statistically significant increase in inequality, while higher-income tracts are not influenced by newly gentrified neighbors. The significant influence for low-income neighboring tracts is higher when the stricter definition of gentrification is employed (columns 3 and 4), but remains insignificant for higher-income neighboring tracts. This is consistent with our hypothesis since low-income households priced out of gentrified areas will seek housing in low-income neighboring areas, rather than higher-income areas.

[*Table 6 here.*]

Conclusion

The gentrification of a low-income neighborhood is thought to make the most vulnerable populations worse off. Gentrified areas experience an increase in the cost of living and many low-income households relocate to more affordable regions. As a result, these newly gentrified areas have higher levels of racial and socioeconomic segregation. At the neighborhood level, an increase in segregation by income results in a decrease in the within-neighborhood inequality. Although lower levels of inequality are often desired at the aggregate level, at the local level the corresponding segregation may be especially harmful to low-income households.

To our knowledge, we are the first to consider whether these effects of gentrification spill into the surrounding neighborhoods. Previous analysis considers how neighboring areas influence whether a tract will gentrify but do not consider the how a gentrified area will influence the neighboring areas. If low-income households are migrating to neighboring regions, we would expect an increase in within-neighborhood inequality. At the neighborhood level, this reduction in inequality occurs from decreased segregation by income and may potentially benefit low-income households residing in the area. If low-income households

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migrate out of the general region, the neighborhoods next to newly gentrified tracts may experience a reduction in inequality, similar to the gentrified region.

We use data on over 12,000 census tracts from the 30 largest MSAs to examine this potential spillover influence. In doing so, we also confirm previous findings that income inequality is negatively influenced by the neighborhood experiencing gentrification. We find that, in the smaller MSAs, within neighborhood income inequality is positively influenced by a neighboring tract experiencing gentrification in the previous period.

Larger MSAs experience the opposite influence, perhaps because low-income households in these regions have more relocation options. For these neighboring areas, the spillover of gentrification acts to expand the reach of the, potentially harmful, reduction in income inequality.This spillover influence is only evident in surrounding neighborhoods which are also low-income, as expected. It is unlikely that a relatively rich neighboring area would attract displaced low-income households.

Our analysis suggests that the effects of gentrification extend well beyond the directly impacted areas. While our focus is on how gentrification shapes within neighborhood income inequality immediately after gentrification, the effects are likely to continue. These legacy effects may play an important role in considering the benefits and drawbacks of gentrification on low-income households. Future research may, for example, consider whether this increase of within neighborhood inequality increases economic outcomes for low-income households in the neighborhood.

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Table 1: Summary Statistics

Variable	Description	Mean	Standard Deviation
Census tract Gini (2000)	The census tract gini coefficient in 2000	41.879	6.189
Census tract Gini (2010)	The census tract gini coefficient in 2000	42.744	6.966
Percent Educated	Percent of individuals in the census tract with a college degree in 2000	26.808	20.339
Percent Black	Percent of black individuals in the census tract in 2000	23.266	31.312
Racial Fractionalization	Degree of racial fractionalization within the census tract in 2000	0.409	0.196
Percent Poverty	Percent of individuals within the census tract who are below the poverty line in 2000	17.144	12.735
Percent Immigrant	Percent of immigrants within the census tract in 2000	22.352	17.457
Population	Population of the Core-Based Statistical Area (CBSA) in 2000	8,123,466	5,844,265
Household Income Percentile	The average household income within the census tract as a percentile of the population within the CBSA	0.379	0.284

Percent of Tracts which experienced moderate gentrification	7.167%
Percent of Tracts which neighbored moderately gentrified tracts	28.676%
Percent of Tracts which experienced extreme gentrification	0.824%
Percent of Tracts which neighbored extremely gentrified tracts	4.282%

Average Change in Gini 2000-2010 (All tracts)	0.865
Average Change in Pct. College Educated 2000-2010 (All tracts)	4.397
Average Change in Pct. Black 2000-2010 (All tracts)	-1.059
Average Change in Pct. Poverty 2000-2010 (All tracts)	1.140
Average Change in Immigrant 2000-2010 (All tracts)	1.281
Average Change in Number of Poor Households 2000-2010 (All tracts)	42.852

Table 2: Average Changes in Gentrified, Neighboring and Non-Gentrified/Non-Neighboring Tracts

Avg. Tract Chg. (2000-2010)	Moderately Gentrified			Extremely Gentrified		
	Gentrified	Neighbor to Gentrified	Non-Neighbor Non-Gent	Gentrified	Neighbor to Non-Gent	Non-Neighbor Non-Gent
Gini	-2.329	0.296	1.404	-2.782	1.177	0.883
Pct. Educated	9.859	4.961	3.621	18.895	9.439	4.055
Pct. Black	-3.518	-1.749	-0.553	-7.722	-3.101	-0.913
Pct. Immig.	-0.559	0.701	1.682	-2.268	0.352	1.352
Pct. Poverty	-4.050	1.226	1.654	-7.935	-0.668	1.296
# Poor HH	-101.324	35.317	60.687	-105.68	-3.663	46.135

Averages for neighboring tracts do not include neighboring tracts which also gentrified.

Table 3: Average Changes in Census Tracts Within Small and Large CBSAs (Moderately Gentrified)

Small MSAs					Large MSAs			
Change (2000-2010)	All	Gentrified	Neighbor to Gentrified	Non-Neighbor Non-Gent	All	Gentrified	Neighbor to Gentrified	Non-Neighbor Non-Gent
Gini	1.411	-1.589	1.191	1.798	0.329	-3.037	-0.561	1.013
Pct. Educated	4.200	9.954	4.508	3.498	4.589	9.768	5.397	3.742
Pct. Black	-0.629	-3.544	-1.182	-0.133	-1.480	-3.494	-2.292	-0.968
Pct. Immig.	1.632	0.335	1.376	1.857	0.937	-1.418	0.054	1.510
Pct. Poverty	2.465	-2.093	3.148	2.695	-0.158	-5.925	-0.616	0.624
# Poor HH	84.061	-20.342	92.969	91.686	2.460	-178.909	-19.954	29.986

A tract is classified as gentrified if 'moderately' gentrified.

Table 4: Income-Based Definition of Gentrification (Full Sample)

Dependent Variable: 2010 Census Tract Gini

	Moderate Gentrification				Extreme Gentrification			
	Gent. Only		Full Model		Gent. Only		Full Model	
Gini(2000)	0.629	***	0.629	***	0.629	***	0.629	***
	(0.0153)		(0.0153)		(0.0154)		(0.0153)	
Education	0.120	***	0.120	***	0.119	***	0.118	***
	(0.0045)		(0.00458)		(0.00459)		(0.00460)	
Poverty	0.0635	***	0.0621	***	0.0682	***	0.0684	***
	(0.00953)		(0.00956)		(0.00958)		(0.00955)	
Pct Immigrant	-0.030	***	-0.0309	***	-0.0335	***	-0.0309	***
	(0.00506)		(0.00507)		(0.00506)		(0.00507)	
Pct Black	0.0015		0.0019		0.00218		0.0225	
	(0.0026)		(0.00262)		(0.00254)		(0.00263)	
Racial Frac	-0.797	***	-0.801	***	-0.812	***	-0.833	***
	(0.289)		(0.288)		(0.289)		(0.289)	
Population	1.66e-08		4.97e-08	**	1.57e-08		2.22e-08	
	(1.92e-08)		(2.09e-08)		(1.92e-08)		(1.95e-08)	
HH Income %	-2.014	***	-1.786	***	-1.427	***	-1.121	***
	(0.408)		(0.419)		(0.404)		(0.406)	
HHinc*NeighGent(Mod.)			-1.285	**				
			(0.555)					
Pop*NeighGent(Mod.)			-1.36e-07	***				
			(3.21e-08)					
Mod. Gent	-2.146	***	-2.195	***				
	(0.218)		(0.221)					
Neighbor Mod. Gent			1.317	***				
			(0.286)					
HHinc*NeighGent(Ext.)							-4.031	***
							(1.154)	
Pop*NeighGent(Ext.)							-2.19e-07	**
							(9.21e-08)	
Ext. Gent					-2.679	***	-2.780	***
					(0.644)		(0.642)	
Neighbor Ext. Gent							2.973	***
							(0.704)	
Constant	13.91	***	13.55	***	13.50	***	13.39	***
	(0.612)		(0.618)		(0.612)		(0.628)	
Observations	8,979		8,979		8,979		8,979	
R-squared	0.458		0.459		0.454		0.455	

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 5: Differing Influence in Low and High Population Areas

Dependent Variable: 2010 Census Tract Gini

	Moderate Gentrification				Extreme Gentrification			
	Small MSA		Large MSA		Small MSA		Large MSA	
Gini(2000)	0.6647	***	0.4758	***	0.6640	***	0.4771	***
	(0.018)		(0.031)		(0.018)		(0.031)	
Education (2000)	0.1047	***	0.1775	***	0.1012	***	0.1773	***
	(0.005)		(0.009)		(0.005)		(0.009)	
Poverty (2000)	0.0636	***	0.0686	***	0.0709	***	0.0733	***
	(0.011)		(0.017)		(0.011)		(0.018)	
Pct Immigrant (2000)	-0.0239	***	-0.0156	*	-0.0237	***	-0.0190	**
	(0.006)		(0.009)		(0.006)		(0.010)	
Pct Black	-0.0031		0.0224	***	-0.0026		0.0213	***
	(0.003)		(0.006)		(0.003)		(0.006)	
Racial Frac	-0.7674	**	-0.3156		-0.7884	**	-0.3516	
	(0.345)		(0.520)		(0.346)		(0.519)	
HH Income %	-1.7261	***	-2.6216	***	-0.9525	**	-2.4439	***
	(0.469)		(0.895)		(0.451)		(0.875)	
HHinc*NeighGent	-1.1117	*	-1.6799		-5.3255	***	-2.1285	
	(0.635)		(1.083)		(1.372)		(1.902)	
Gentrified	-2.6052	***	-1.1441	***	-3.1405	***	-1.7513	
	(0.264)		(0.395)		(0.700)		(1.439)	
Neighbor Gentrified	0.5630	**	0.2804		2.4783	***	0.0471	
	(0.242)		(0.416)		(0.496)		(0.785)	
Constant	12.7755	***	18.2198	***	12.3534	***	18.0790	***
	(0.724)		(1.354)		(0.718)		(1.359)	

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 6: Differing Influence in Low and High Income Areas

Dependent Variable: 2010 Census Tract Gini

	Moderate Gentrification				Extreme Gentrification			
	Low-Income		High-Income		Low-Income		High-Income	
Gini(2000)	0.4747	***	0.8044	***	0.4685	***	0.8018	***
	(0.021)		(0.020)		(0.021)		(0.020)	
Education (2000)	0.1384	***	0.0969	***	0.1347	***	0.0974	***
	(0.006)		(0.005)		(0.007)		(0.005)	
Poverty (2000)	0.1154	***	-0.0369		0.1180	***	-0.0395	
	(0.011)		(0.025)		(0.011)		(0.025)	
Pct Immigrant (2000)	-0.0225	***	-0.0280	***	-0.0230	***	-0.0294	***
	(0.006)		(0.009)		(0.006)		(0.009)	
Pct Black	0.0100	***	-0.0069		0.0105	***	-0.0074	
	(0.003)		(0.006)		(0.003)		(0.006)	
Racial Frac	-0.7910	**	-0.6900		-0.8465	**	-0.7083	*
	(0.378)		(0.427)		(0.379)		(0.428)	
Population	0.0000	***	0.0000	***	0.0000	***	0.0000	***
	(0.000)		(0.000)		(0.000)		(0.000)	
Population∗NeighGent	0.0000		0.0000	***	0.0000	**	0.0000	
	(0.000)		(0.000)		(0.000)		(0.000)	
Gentrified	-2.1791	***			-2.4998	***		
	(0.222)				(0.652)			
Neighbor Gentrified	0.5224	*	0.6193		2.5188	***	0.0309	
	(0.290)		(0.431)		(0.727)		(1.110)	
Constant	18.9335	***	6.6558	***	19.0739	***	6.8358	***
	(0.756)		(0.657)		(0.750)		(0.658)	

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1