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Can community land trusts slow gentrification?

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ABSTRACT

Gentrification has become one of the most widely discussed phenomena in urban affairs due to its prevalence around the world. However, most discussions remain at the theoretical level or are limited to case studies of a few metropolitan cities. Furthermore, there is little research on the relationship between gentrification and community land trusts (CLTs)—to our knowledge, no studies have examined their connection.

Our investigation seeks to address this research gap by evaluating *whether* and *how* CLTs affect gentrification. Can CLTs counteract the negative effects of gentrification? Using a data set detailing the locations of CLT units at the national level, we employed a binomial logistic regression to examine whether CLTs influence gentrification, as well as a paired *t*-test with 9 relevant indicators to understand how CLTs affect gentrification. The findings suggest that CLTs may function as appropriate tools for stabilizing neighborhoods at risk of gentrification.

Despite increasing concerns about gentrification in many of our nation's metropolitan areas, relatively few strategies have been identified that can mitigate its negative effects. Such strategies are typically developed through valuable research. However, though gentrification has been widely discussed, most conversations remain at the theoretical level or are limited to case studies of typical American metropolitan cities. More specifically, studies examining the relationship between gentrification and housing programs are rare—to our knowledge, no studies have empirically assessed the relationship between gentrification and community land trusts (CLTs).

CLTs are perceived to offer benefits for neighborhoods, but few researchers have examined the practical impact of CLTs on their communities. Even fewer studies have evaluated the ability of CLTs to influence changes in neighborhood conditions such as gentrification. For this reason, our research addresses this lack of empirical research by evaluating the effects of CLTs on gentrification. More specifically, it poses the following research question: Do CLTs counteract the known negative effects of gentrification on neighborhoods?

Gentrification and CLTs

Gentrification first gained attention within the planning field in the 1980s when discussions on its causes resulted in fierce debates between supply-side and demand-side theorists (Bailey & Robertson, 1997).¹ Proponents of supply-side theories argued that gentrification, as an outcome of capitalism, stemmed from flows of capital that favored developers, landlords, and investors (Smith, 1979; Smith & LeFaivre, 1984). However, demand-side theorists claimed that such arguments failed to adequately explain the causes of gentrification despite numerous empirical assessments and case studies published between the 1970s and early 1980s (Beauregard, 1986; Ley, 1996). Clay (1979) argued

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from a demand-side perspective that gentrification resulted from the resettlement of professional and upper-middle-class homeowners into city neighborhoods. This class of gentrifiers included diverse groups of professionals, artists, and people wealthier than previous residents (Redfern, 2003). These demographics typically included nontraditional households, couples with later marriages, families with fewer children, gay couples, childless marriages, nonmarried couples, and single people (Lang, Hughes, & Danielsen, 1997). Thus, proponents of demand-side theories emphasized demographic factors as more compelling causes of gentrification than flows of capital.

In the early 1990s, however, demand-side and supply-side theories transitioned from a conflicting to a complementary relationship (Hamnett, 1991; Lees, Slater, & Wyly, 2000; Ley, 1996). Wyly and Hammel (1999) observed the resurgence of gentrification after a mid-1990s economic recession and attributed it not only to class turnover (demand-side perspective) but also to capital reinvestment (supply-side perspective). Indeed, early supply-side and demand-side explanations still offer meaningful contributions to the understanding of gentrification during this decade (Lees et al., 2008).

Perhaps because of these broad and shifting debates, gentrification has become perceived as a chaotic and complex phenomenon. Because there is no unified theory of the gentrification process, the term itself resists a singular definition (Beauregard, 1986; Davidson, 2011; Rose, 1984). Some scholars regard gentrification as a positive process that encourages renovation, upgraded dwellings (Rose, 1984), and reversals from decline or disinvestment in inner-city neighborhoods (Freeman, 2005). Others interpret gentrification as a negative phenomenon—indeed, the majority of scholars write that the negative aspects outweigh the positives. For example, the definition of gentrification as displacement of the working class by the upper-middle class emphasizes such relocation as the primary negative consequence of this process (Kennedy & Leonard, 2001; Sumka, 1979; Wyly & Hammel, 1999).

Considering its diverse dynamics worldwide and its multiple controversial definitions, gentrification should be studied in terms of its actual phases and effects, rather than its definitions (Lees et al., 2008). Gentrification includes not only physical or spatial restructuring but also dimensions of social, cultural, political, economic, and institutional significance (Bourne, 1993; Lees et al., 2008; Smith & LeFaivre, 1984; Smith & Williams, 1986; Zukin, 1987). For the purposes of this research, we acknowledged that gentrification depends partly on capital reinvestment toward an urban core, but we also examined factors that indicated resident class shifts in a neighborhood from working class to upper-middle class, along with involuntary displacement of the existing working class.

The negative neighborhood effects associated with gentrification have caused major concerns. Among them, three are central to the debate. The first is the displacement of incumbent residents. Though some argue that displacement does not occur or is unrelated to gentrification (Freeman, 2005; Freeman & Braconi, 2004), the majority of researchers assert that gentrification leads directly to displacement (Angotti, 2012; Clay, 1979; Smith, 1996).

Displacement as a corollary to gentrification forces longtime residents and businesses to relocate due to skyrocketing land prices and rents (Angotti, 2012; Lees et al., 2008). The influx of investment, ostensibly improving the environment, also brings with it the potential for destruction of the community (Abu-Lughod, 1994; Betancur, 2002). According to Betancur (2011), the real tragedy of gentrification includes not only displacement but also community disintegration. Angotti (2012) claimed, "Gentrification is not place-making but place-taking" (p. 103). Other criticisms cite the disappearance of small businesses, changes in established neighborhood identities (Brown-Saracino, 2004), and disruption of social dynamics. Critics have concluded that such drawbacks characterize gentrification efforts as poor strategies for urban revitalization (Angotti, 2012; Betancur, 2002).

Second, gentrification often leads to the removal of affordable housing from urban building stock (Zukin, 1987). Along with displacement, the decrease in affordable units diminishes housing opportunities for low-income households in gentrified neighborhoods. Such housing units are crucial for many low-income, immigrant, and minority communities who experience a shortage of options concerning where to live (Betancur, 2002).

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Unsustainable speculative property price increases comprise the third negative effect of gentrification. Poor people have fewer resources and less power to enact institutional resistance in neighborhoods with a speculative boom. Consequently, all neighborhoods are subject to the potential threat of the rent increase process (Logan & Molotch, 1987). Even advocates of gentrification point to the inflation of housing prices as a chief drawback associated with gentrification (Freeman, 2005).

Many policy tools and programs implemented by governments, communities, and/or combined efforts have mitigated gentrification and its effects. These initiatives are categorized into two strategies: improvement of housing affordability and the building of community assets (Levy, Comey, & Padilla, 2007; Wyly & Hammel, 1999). However, these strategies—providing one-time affordable housing units and not separating land from the speculative market—remain insufficient. New mechanisms such as CLTs are emerging to compensate for this lack of policies. The CLT is a relatively new housing model in the United States, mitigating the negative effects of gentrification by offering long-term owner-occupied affordable housing and building community assets for low-income households (Davis, 2010; Defilippis, 2004; Lees, 2008). Since the emergence of the first CLT (New Communities Inc., founded in 1969), their numbers have increased to over 240 in 45 states. Though most CLTs are nonprofit organizations, state and city governments have increasingly implemented CLTs as components of broader housing programs. In addition, other countries have adopted the CLT model and concept (Davis, 2010).

CLTs assume that land is a public asset and not a private good. Under this principle, a community —often a nonprofit organization—owns and leases land to individual residents who buy structures on the land from CLTs. Typically, CLTs acquire land through donation or purchase, offering it through long-term ground lease to residents who own their homes. CLTs impose restrictions on the resale prices of their units to preserve affordability, and they serve as long-term stewards of the land (Curtin & Bocarsly, 2008; Davis, 2007; Gray, 2008). Their membership follows an open, place-based system, with the board of directors including residents of CLT units, other community residents, and public representatives, to allow for a self-governing community.

The primary purpose and benefit of CLTs is to preserve long-term affordable housing in neighborhoods by removing houses, buildings, and lands from the market (Curtin & Bocarsly, 2008; Gray, 2008; Paterson & Dunn, 2009). Secondly, CLTs enhance neighborhood stability by increasing length of residency, preventing displacement of low-income households, and main-taining optimal unit conditions by ensuring security of tenure. Moreover, CLTs can prevent excessive speculative investment from gentrifying areas by preserving housing affordability (Davis, 1991; Saegert & Benitez, 2005). Thirdly, CLTs contribute to the building of community assets, because owner-occupants interact regularly on the basis of shared residential interests. In addition, CLTs promote increases in economic and racial diversity by creating and preserving affordable housing units in neighborhoods where low-income families would not otherwise be able to live (Davis, 2006).

These three benefits of CLTs can mitigate the major negative effects of gentrification. By building community assets, producing and preserving affordable housing, and stabilizing neighborhoods, CLTs might prevent the displacement of low-income households, in addition to counteracting low affordability and rising property values in neighborhoods.

Research framework

The central question of this study addresses whether and how CLTs counteract the negative effects of gentrification. Our analytical approach involves a quasi-experimental, pretest-posttest, nonequivalent groups design. Four neighborhood groups were established in order to assess their changes from 2000 to 2010. The impact of CLTs (the treatment) on gentrifying and nongentrifying neighborhoods was tested, while control groups (both gentrifying and nongentrifying neighborhoods without CLTs) were maintained, as seen in Figure 1.

	2000	CLTs	2010
Nongentrifying (nG/C)	nG	Х	nG
Nongentrifying (nG/nC)	nG		nG
Gentrifying (G/C)	G	Х	G
Gentrifying (G/nC)	G		G

Figure 1. Research design.

Figure 1 describes how the four groups of neighborhoods were categorized and named throughout the remainder of the article: nongentrifying neighborhoods with CLTs (nG/C), nongentrifying neighborhoods without CLTs (nG/nC), gentrifying neighborhoods with CLTs (G/C), and gentrifying neighborhoods without CLTs (nG/nC).

Based on our literature review, we hypothesize that CLTs have the potential to offset gentrification in three ways: (a) counteracting displacement, (b) preserving affordability, and (c) stabilizing the speculative increase of property values when neighborhoods are gentrified. Nine indicators (described in Table 1) were selected based on these three categories to measure whether and how CLTs affect gentrification. We employed binomial logistic regression to assess whether CLTs have an independent impact on gentrification, after which we measured how CLTs affect gentrification through paired *t*-tests. Comparisons across groups allowed us to examine the impacts of CLTs on neighborhoods that were gentrifying and those that were not.

Unit of analysis

The census tract is the most commonly used proxy for neighborhoods in the literature on neighborhood effects and/or gentrification (Freeman, 2005; Galster & Booza, 2007; Hammel & Wyly, 1996), though the literature acknowledges the ambiguity of neighborhood boundaries (Chaskin, 1997; Park & Rogers,

Indicator	Description
Racial composition	Proportion of White population
Lower-middle class	Proportion of households with 80–100% of AMI
Income level	Proportion of median income compared to citywide area
Education level	Proportion of residents who graduated high school or more
Length of residence	Proportion of residents who live in the same house compared to citywide area
Age fluctuation ^a	Change in age distribution between 2000 and 2010 (index)
Affordability	Proportion of median housing value compared to citywide area
Homeownership	Proportion of owner-occupied housing units compared to all occupied housing units
Housing value	Proportion of median housing value compared to national median housing value

Table 1. Neighborhood indicators for measurement (data from the 2000 and 2010 decennial censuses).

Note. ^aWe composed the age fluctuation index, which indicates the amount of change in age distribution between 2000 and 2010. There are four age brackets in the census data set. Each bracket has its own percentage in a neighborhood, so the age fluctuation index is calculated by the sum of the percentage change in each bracket between 2000 and 2010 according to the following table and formula:

Description of the age fluctuation index formula	Description	of the age	fluctuation	index	formula
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Age bracket	2000	2010	Change
Under 18 years	A0	A1	$(A1 - A0)^2$
18 to 34 years	BO	B1	$(B1 - B0)^2$
35 to 64 years	C0	C1	$(C1 - C0)^2$
65 and over	D0	D1	$(D1 - D0)^2$

Age Fluctuation Index Formula = $\sqrt{(A1 - A0)^2 + (B1 - B0)^2 + (C1 - C0)^2 + (D1 - D0)^2}$.

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2015). On the other hand, neighborhoods are generally considered to be smaller than cities but larger than a small collection of blocks (Sawicki & Flynn, 1996). According to the U.S. Census Bureau, census tracts generally contain 4,000 people, never cross any state or county boundaries, and include relatively homogeneous units grouped according to population characteristics, economic status, and living conditions. In this sense, census tracts roughly approximate the typical concept of neighborhoods. Therefore, consistent with the existing literature, this research employs census tracts as units of analysis, though it uses the term *neighborhood* in lieu of census tract.

Sample selection and measurement approach

Data collection

To assess the impact of CLTs on neighborhoods, we first must establish the number, location, and establishment dates of CLT units. To collect the location and number of units, each CLT organization listed in the directory of the National Community Land Trust network was contacted during the summer of 2014. Of the 131 baseline CLTs that were contacted, a total of 68 responded, reflecting a response rate of 52%. However, only 46 provided the requested information, including the locations of 3,709 CLT units in 22 states. The remaining 22 CLTs revealed that they had not yet established any CLT units on the ground.

Although we expected units from the same CLT organizations to be clustered, this was not always the case. To ensure that we examined a "critical mass" of units, we excluded neighborhoods that had only one or two CLT units. In this study, only neighborhoods with three or more units were considered neighborhoods with a CLT.² To accurately assess the impact of CLTs, we used only CLT units that were put into service between 2000 and 2009, allowing us to include nearly 80% (79.5%) of all CLT units currently in service. Upon implementing these criteria, we were left with 124 neighborhoods with three or more CLT units.

Measurement of gentrification

Given our comparison of neighborhoods categorized based on whether they were gentrifying, the identification of gentrifying neighborhoods was critical. We relied on previous literature to identify indicators appropriate for determining whether a neighborhood was gentrifying (Atkinson, 2000; Freeman, 2005; Freeman & Braconi, 2004; Galster & Peacock, 1986; Hammel & Wyly, 1996; Sullivan, 2007). Using data from the U.S. Census and the American Community Survey, changes in the following five characteristics were used to identify gentrifying neighborhoods: racial composition, education level, neighborhood average income, property values, and homeownership types.³ To minimize unexpected effects from diverse time spans and to reflect recent conditions, the years 2000 and 2010 were selected to exhibit the rate of change in these five characteristics within each neighborhood. To be identified as a gentrifying area, neighborhoods were required to simultaneously meet all of the following quantitative criteria:

- (1) The rate of change of **percentage White population** is higher than that of the corresponding citywide median.⁴
- (2) The rate of change of **percentage college-educated** is higher than that of the corresponding citywide median.
- (3) The rate of change of **median income** is higher than 120%⁵ of the corresponding citywide median.
- (4) The rate of change of **median value of single-family homes** is higher than that of the corresponding citywide median.
- (5) The rate of change of **percentage owner-occupied units** is higher than that of the corresponding citywide median.

In summary, the changes over time and relative values compared to each neighborhood's corresponding citywide area were investigated as the primary criteria by which to identify gentrifying neighborhoods.

Selection of each neighborhood type

Out of the 124 neighborhoods with CLTs, 14 neighborhoods in nine cities and five states were deemed to be gentrifying between 2000 and 2010 (G/C); the remaining 110 neighborhoods in 15 states were regarded as nongentrifying neighborhoods with CLTs (nG/C).

To identify the comparison groups without CLTs (G/nC and nG/nC), we chose neighborhoods located adjacent to or near the neighborhoods with CLTs in order to control for larger socioeconomic differences. To select G/nC neighborhoods, every neighborhood in the nine cities with G/ C neighborhoods was investigated for evidence of gentrification. Of the 388 neighborhoods, 38 were deemed to be gentrifying and comprised our comparison group (G/nC). We added six more G/nC neighborhoods by considering tracts adjacent to CLT tracts in cities without G/C neighborhoods, for a total of 44 G/nC neighborhoods.

To select the remaining nongentrifying non-CLT neighborhoods (nG/nC) from the process identified above, we selected 52 nongentrifying neighborhoods adjacent to neighborhoods with CLTs. Afterward, we randomly selected 52 neighborhoods from the remaining pool of 469 tracts in our CLT cities that did not have CLTs and were not gentrifying, resulting in a total of 104 tracts as shown in Table 2. Altogether, our four comparison groups included 272 neighborhoods.

There remained a few limitations in the selection of neighborhoods. First, the limited number of cities in the sample selection process renders difficult the generalization of the results. Second, a few major CLT organizations in megacity regions were excluded from the analysis due to nonresponse.

Measurement of neighborhood impact

Several neighborhood indicators related to the drawbacks of gentrification and the benefits of CLTs were selected based on literature review. First, in response to the threat of displacement, CLTs build community assets in their neighborhoods, thereby increasing racial diversity, maintaining lower-middle-class households and income levels, and stabilizing education levels. They also stabilize their neighborhoods by increasing the length of residence and reducing age fluctuation.⁶ Second, CLTs counteract decreasing affordability in neighborhoods by instead prioritizing affordability and decreasing owner-occupied housing rates. Third, they mitigate skyrocketing housing prices in their neighborhoods by slowing the rise of housing prices compared to those of surrounding areas. Table 1 describes how each indicator was measured.

Displacement transforms the demographic composition of neighborhoods. The research hypothesis predicts that CLTs help maintain racial diversity in gentrifying neighborhoods. The proportion of White residents to the total population often measures racial diversity in neighborhoods.

The low-income household ratio in a community indicates the level of a community's assets, and the building of community assets relates to the mixed-income residents in that community. Because CLTs attract higher numbers of lower-middle-class households into their units, the research hypothesis argues that CLTs maintain a middle-class ratio in neighborhoods that are gentrifying. The definition of middle-class may vary, but this study focuses on the lower-middle class—the primary target of CLTs. Generally, the lower-middle class accounts for 80 to 100% of the area median income

Table 2. Humber of heighborhoods by type.						
	With CLT	Without CLT				
Gentrifying	14 (G/C)	44 (G/nC)				
Nongentrifying	110 (nG/C)	104 (nG/nC)				

Table 2. Number of neighborhoods by type.

(AMI). Therefore, the lower-middle-class ratio corresponds to the percentage of households with incomes of 80 to 100% of the AMI.

In general, resident incomes indicate the assets available to a community (Kretzmann & McKnight, 1993). However, when displacement occurs due to the influx of wealthier people into areas that are gentrifying, the stabilization of income level may maintain existing community assets by preventing displacement of low-income residents from such areas. In this sense, we assume that CLTs stabilize neighborhood income levels in neighborhoods that are gentrifying. The proportion of median income to citywide area can be used to estimate neighborhood income level.

CLTs may stabilize neighborhoods located in rapidly changing areas. We hypothesize that less change in stability indicators for neighborhoods (education level, length of residence, and age fluctuation) than for citywide areas corresponds to lower levels of displacement for incumbent residents.

CLTs strive primarily to maintain affordability by providing affordable housing units to middleand low-income households and expanding the number of permanently affordable dwelling units within neighborhoods. Therefore, understanding how CLTs affect their neighborhoods in terms of affordability proves critical to evaluate their effectiveness. We hypothesize that CLTs work to counteract decreasing affordability in gentrifying neighborhoods. Although the housing affordability may be defined a variety of ways, we defined the housing value of a neighborhood in comparison to that of its surrounding area. Generally, housing values in gentrifying areas closely follow increases in median income. This periodical mismatch between median income and housing value explains why we refrain from using income–housing value ratios as an affordability index. Thus, the affordability index is defined as the proportion of a neighborhood's median housing value to that of a citywide area.⁷

CLTs aim to increase homeownership as a means of building community assets by leasing land and selling houses to residents. In their neighborhoods, CLTs provide more housing options for residents and, in turn, promote increases in the number of available rental units. Generally, rental units are crucial for low-income residents and thus it is important to ensure affordable rental units as land prices rise (Levy et al., 2007). The research hypothesis predicts that, especially in gentrifying neighborhoods, CLTs help stabilize increasing owner-occupied housing rates, which are defined as the percentage of owner-occupied housing units out of the total number of occupied housing units.

Skyrocketing property prices in gentrifying neighborhoods serve as major negative effects of gentrification that have been explored by researchers who focus on rent gap theory (Lees et al., 2008; Smith, 1996). When gentrification occurs, wealthier people move in and raise rents for both residential and commercial use, displacing low-income people. Because rents and property values are closely related, we hypothesize that CLTs can help alleviate abrupt property value increases in neighborhoods that are gentrifying. In this sense, housing price acts as one of the most common indicators of overall property values in neighborhoods. In addition, the stabilization of housing price relates to the ability of CLTs to stabilize neighborhoods. We used the housing price index—that is, the relative housing price compared to the national median housing price—to compare changes between 2000 and 2010 without inflation effects. National median housing prices were \$111,800 in 2000 and \$188,400 in 2010. Thus, the housing price index indicates the proportion of a neighborhood's median housing price to the national median housing price.

Findings

This study explored whether and how CLTs affect gentrification. A binomial logistic regression model was employed to examine whether CLTs yielded an impact on the phenomenon, and a paired *t*-test was used to analyze how this impact was made.

Logistic regression analysis

The logistic regression model explored the relationship between gentrification and a variety of neighborhood indicators such as the existence of CLT units, while simultaneously controlling for other indicators. The dependent variable measured whether the gentrifying process occurred in a neighborhood between 2000 and 2010, and the independent variables included nine indicators from the group comparison in 2010 as well as the existence of a CLT (dummy variable). The housing value was not included as an independent variable due to high collinearity.

Multicollinearity

The possibility of multicollinearity persists as a common problem in most regression models. None of the independent variables may be strongly correlated with another independent variable or with a linear combination of another independent variable. To test for multicollinearity, we calculated variance inflation factors (VIFs) and tolerance scores in Table 3.

All tolerance scores were greater than 0.2 and all VIFs were less than 4, confirming that there was no issue with multicollinearity in our model. Generally, tolerance scores less than 0.2 or 0.1 and/or VIFs greater than 5 or 10 indicate the presence of strong multicollinearity (Kutner, Nachtsheim, & Neter, 2004; O'Brien, 2007).

Propensity score matching

Because our data were selected in nonexperimental settings, this study employed propensity score matching to assign appropriate comparison groups. Propensity score matching is a tool used to address confounding due to selection bias, reducing bias by accounting for selection effects (Grinstein-Weiss et al., 2011). Propensity scores are the conditional probability that any neighborhood in our studied area has CLT units, given a set of observed characteristics for the neighborhood (Austin, 2011). The nearest neighbor matching without replacement was employed to select non-CLT neighborhoods whose propensity scores were close to that of a CLT neighborhood. After matching, the number of observations in our model decreased from 272 to 197 (Table 4).

Results

We developed three logistic regression models sequentially to disentangle the effects of CLTs and other indicators. Model 1 includes demographic indicators, model 2 adds housing and class indicators, and model 3 contributes the CLT indicator. Additionally, by including methodological issues such as selection bias, we explored the relationship between gentrification and CLTs through propensity score matching to reduce bias in model 3. We also presented the results of the logistic regression analysis using matched samples.

Table 4 describes the results of the logistic regression from these three full sample models, as well as from the matched sample model. The total number of neighborhoods was 272 for three full sample models and 197 for the matched sample model.

		SQRT		
Variables	VIF	VIF	Tolerance	R ²
White population (%)	1.84	1.36	0.5425	0.4575
Graduate high school or more (%)	1.73	1.31	0.5786	0.4214
Age fluctuation between 2000 and 2010	1.06	1.03	0.9423	0.0577
Owner-occupied unit (%)	2.81	1.68	0.3559	0.6441
Length of residence compared to citywide area	1.99	1.41	0.5028	0.4972
Affordability index	2.38	1.54	0.4205	0.5795
Income level compared to citywide area	3.79	1.95	0.2638	0.7362
Lower-middle-class household (%)	1.13	1.06	0.8866	0.1134
CLT = 1	1.07	1.04	0.9307	0.0693
Mean VIF	1.98			

Table 3. Multicollinearity diagnostics.

Table 4. Odds ratios of the I	likelihood of	gentrification.
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			Model	3: CLTs
Variables	Model 1: Demographic	Model 2: Housing and class	Full sample	Matched sample
White population (%)	0.98	0.98	0.97*	0.98
Graduate high school or more (%)	1.06*	1.04	1.05	1.02
Age fluctuation between 2000 and 2010	1.15**	1.16**	1.15**	1.14**
Owner-occupied unit (%)		0.96	1.00	0.99
Length of residence compared to citywide area		1.90	1.17	1.89
Affordability index		1.04	0.95	0.72
Income level compared to citywide area		2.09	1.66	6.15
Lower-middle-class household (%)		0.94	0.95	0.98
CLT = 1			0.30***	0.26***
Constant	0.00***	0.00*	0.01	0.02
Log likelihood	-132.07	-129.23	-123.27	-82.61
Number of neighborhoods	272	272	272	197

Note. **p* < .05. ***p* < .01. ****p* < .001.

As seen in Table 4, the presence of CLT units had a significant effect on the probability of gentrification. We distinguished the effects of CLTs from those of other indicators by comparing models.

Considering model 1, which was restricted to demographic characteristics, the findings conformed closely to the literature on gentrification. All other indicators were equal: for every 1% increase in the age change index, the odds of gentrification increased by 15%. Moreover, for every 1% increase in the proportion of residents who graduated high school or achieved a higher level of education, the odds of gentrification increased by 6%.

Model 2 included housing and class indicators and showed no significant findings with the exception of age fluctuation, demonstrating that housing and class indicators do not substantially affect gentrification.

Most important, model 3 illuminated the effects of CLTs on gentrification, adding to the analysis with propensity score matched samples. The results of both models, as well as a CLT indicator, provided strong support for our main hypothesis that predicted that CLTs might slow the gentrification process. In the full sample model, when all other factors were equal, the odds of gentrification were 0.30 times as likely for neighborhoods with CLTs than for neighborhoods without a CLT. In other words, the presence of CLTs decreased the odds of gentrification were 0.26 times as likely for neighborhoods without a CLT. In other words, when all other factors were equal, the odds of gentrification were 0.26 times as likely for neighborhoods with out a CLT. In other words, the presence of CLTs than for neighborhoods without a CLT. In other words, the presence of CLTs decreased the odds of gentrification were 0.26 times as likely for neighborhoods with CLTs than for neighborhoods without a CLT. In other words, the presence of CLTs decreased the odds of gentrification were 0.26 times as likely for neighborhoods with CLTs than for neighborhoods without a CLT. In other words, the presence of CLTs decreased the odds of gentrification by 74%, remaining significant beyond the 0.1% level. The only difference between the full and matched sample models was the change in statistical significance for the White population ratio. Unlike in the full sample, no significant relationship existed between the White population and gentrification in the matched sample.

Although some differences existed, after propensity score matching was implemented, CLTs still maintained a significant counteractive relationship with gentrification. Throughout the models, age fluctuation consistently displayed a significant negative relationship with gentrification, as expected.

Goodness of fit

Assessing the fit between the estimated logistic regression model and the actual data set is crucial, because it shows whether the model includes every important variable with the correct functional form (Hosmer, Lemeshow, & Sturdivant, 2013). Though there is no simple goodness-of-fit measure for a logistic regression model (Browne & Tootell, 1995), the Hosmer-Lemeshow test has been commonly adopted, grouping cases based on the values of estimated probabilities. It groups data by ordering the estimated probabilities and identifying 10 equally sized subgroups. Afterward, it

		Gentrific	Gentrification = 1		ation = 0	
Decile	Cut point	Obs	Exp	Obs	Exp	Total
1	0.0514	0	0.8	20	19.2	20
2	0.0662	0	1.2	20	18.8	20
3	0.0841	3	1.5	17	18.5	20
4	0.1153	4	1.8	15	17.2	19
5	0.1511	3	2.7	17	17.3	20
6	0.1761	2	3.3	18	16.7	20
7	0.2329	2	4.0	17	15.0	19
8	0.2882	6	5.2	14	14.8	20
9	0.3836	6	6.6	14	13.4	20
10	0.7085	11	10.0	8	9.0	19

Table 5. Goodness-of-fit (matched sample)—Observed and estimated expected frequencies within each decile.

Note. Number of observations = 197. Number of groups = 10. Hosmer-Lemeshow $chi^{2}(8) = 8.97$. Prob > $chi^{2} = 0.3449$.

calculates the observed and expected frequencies of gentrification and nongentrification for each group. We estimated the goodness-of-fit test for the matched sample below.

The Hosmer-Lemeshow goodness-of-fit statistic calculated from the frequencies in Table 5 was 8.97, and the corresponding p-value calculated from the chi-square distribution with 8 degrees of freedom was .3449. This suggests that we cannot reject our model, because it fits with high agreement between the observed and expected cell frequencies.

The paired t-test

To explore *how* CLTs affect gentrification, we used a paired *t*-test to examine differences among each of our control and treatment groups, both pre-CLT and post-CLT. The results are shown in Tables 6–9. Nine indicators were tested based on the four neighborhood types in 2000 and 2010. The differences between group means that were statistically significant at a level of p < .05 were considered to be valid, and Table 6 shows the results of each comparison.

	Racial composition		Low	Lower-middle-class ratio			Income level		
	2000	2010	Change	2000	2010	Change	2000	2010	Change
G/C	64.21	69.54	+5.33*	12.05	9.94	-2.11	0.98	1.10	+0.12*
nG/C	77.88	75.60	-2.28*	13.14	10.58	-2.56*	0.99	1.00	+0.01
G/nC	69.92	77.48	+7.56*	13.06	8.65	-4.41*	0.96	1.16	+0.20*
nG/nC	77.23	76.74	-0.49	12.44	9.68	-2.76*	1.09	1.08	-0.01
	Education level			Le	ngth of resid	ence		Age fluctuat	ion
	2000	2010	Change	2000	2010	Change		Index	
G/C	79.11	86.44	+7.33*	1.10	1.06	-0.04		6.59	
nG/C	84.30	86.67	+2.37*	0.96	1.00	+0.04*		5.79	
G/nC	81.55	91.49	+9.95*	0.90	1.01	+0.11*		7.73	
nG/nC	83.34	86.79	+3.45*	1.02	1.01	-0.01		5.91	
		Affordability			Homeownership			Housing val	ue
	2000	2010	Change	2000	2010	Change	2000	2010	Change
G/C	-0.91	-1.00	-0.09*	67.89	67.88	-0.01	0.90	1.12	+0.22*
nG/C	-1.00	-1.00	0	62.92	60.70	-2.22*	1.31	1.43	+0.12*
G/nC	-1.03	-1.20	-0.17*	56.88	58.46	+1.58*	1.33	1.53	+0.20*
nG/nC	-1.10	-1.10	0	60.05	57.66	-2.39*	1.35	1.38	+0.03

Table 6. Comparison of CLT/non-CLT and gentrifying/nongentrifying neighborhoods over time by selected indicators.

Note. *p < .05.

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Table 7.	Comparisons	between c	gentrifying	and non	gentrifying	neighborł	noods by	<pre>selected</pre>	indicators.

	Le	Length of residence			Affordability		Age fluctuation
	2000	2010	t-Value	2000	2010	t-Value	2000-2010
Gentrifying	0.95	1.02	-2.04*	-1.00	-1.16	-8.58*	7.45
Nongentrifying	0.99	1.01	-1.11	-1.05	-1.05	-0.17	5.85
t-Value	0.93	-0.74		0.95	-1.83		-3.48*

Note. *p < .05.

Table 8. Comparisons between neighborhoods with CLT and no CLT by selected indicators.

	Racial composition			Income level				Affordability		
	2000	2010	t-Value	2000	2010	t-Value	2000	2010	t-Value	
CLT	76.30	74.90	2.38*	0.99	1.01	-1.37	-1.00	-1.00	-0.92	
No CLT	75.10	76.96	-2.84*	1.05	1.10	-3.19*	-1.08	-1.13	-3.15*	
t-Value	-0.44	0.88		1.39	1.99*		2.05*	2.73*		

Note. *p < .05.

Table 9. Cross-comparisons between each neighborhood type by year.

	Edu	Education level (2010)			Affordability (2010)			Housing value (2000)		
	CLT	No	t-Value	CLT	No	t-Value	CLT	No	t-Value	
Gentrifying	86.44	91.49	-2.03*	-1.00	-1.20	-3.00*	0.90	1.33	-3.93*	
Nongentrifying	86.67	86.79	-0.06	-1.00	-1.10	-1.72	1.31	1.35	-0.36	
t-Value	-0.05	2.48*		0.02	1.43		-2.29*	-0.14		

Note. *p < .05.

Table 6 shows the overall results of the comparisons and the statistically significant differences over time in each type of neighborhood. Both significant and insignificant differences were crucial in the interpretation of differences among each test group. In Table 7, for example, significant *t*-values in the rows indicate a significant change over time, whereas significant *t*-values in the columns indicate differences between gentrifying and nongentrifying neighborhoods. Detailed interpretations are provided by each indicator in the following tables.

To supplement the findings in Table 6, Table 7 compares gentrifying and nongentrifying neighborhoods based on the three indicators that were not used for identifying gentrifying neighborhoods: length of residence, affordability, and age fluctuation. Length of residence significantly increased and affordability significantly decreased in gentrifying neighborhoods between 2000 and 2010, while showing no change in nongentrifying neighborhoods. Age fluctuation between 2000 and 2010 was significantly higher in gentrifying neighborhoods.

Table 8 shows the results of comparisons between neighborhoods with and without CLTs to show the impact of CLTs on average neighborhoods (regardless of gentrification). Only three comparisons (racial composition, affordability, and income level) showed statistically significant differences: The proportion of the White population decreased in neighborhoods with CLTs and increased in those without a CLT, meaning that racial diversity increased in neighborhoods with a CLT. However, the affordability index and income level significantly decreased in neighborhoods without a CLT, whereas no such change was evident in neighborhoods with CLTs.

The cross-comparison tables complement the findings in Table 6 and fully compare the means of each neighborhood type. Even though comparisons were conducted for every indicator, only the comparisons with statistically significant differences by year among the nine indicators are shown.

Racial composition

According to Table 6, significant increases in the White population are shown in both gentrifying neighborhoods. By contrast, significant decreases in the White population of nongentrifying

neighborhoods with CLTs (with no corresponding change in nongentrifying neighborhoods without CLTs) indicate that CLTs yield positive effects on racial diversity in nongentrifying neighborhoods. The fact that the White population ratio has remained unchanged in nongentrifying neighborhoods without CLTs between 2000 and 2010 further supports this assertion.

According to Table 8, the White population ratio significantly decreased in neighborhoods with CLTs while significantly increasing in neighborhoods without CLTs. This shows that CLTs generally have positive effects on the racial diversity of their neighborhoods, regardless of gentrification.

Lower-middle-class ratio

According to Table 6, the lower-middle-class ratios of gentrifying neighborhoods with CLTs did not significantly change between 2000 and 2010. However, there were significant decreases in the neighborhoods without CLTs that were gentrifying, as well as in both nongentrifying neighborhoods. In neighborhoods that are gentrifying, therefore, CLTs might have significant impact on maintaining lower-middle-class ratios, suggesting a contribution to stabilization.

In summary, CLTs counteract the decrease of lower-middle-class residents in gentrifying neighborhoods, possibly reducing the displacement of such residents due to gentrification. However, CLTs do not affect the maintenance of lower-middle-class ratios in nongentrifying neighborhoods.

Income level

In Table 6, as we expected, gentrification increased the median income of neighborhoods compared to citywide areas. Table 8 shows that whereas income level increased in neighborhoods without CLTs, no such changes occurred in neighborhoods with CLTs. Therefore, despite a lukewarm impact on the trends of gentrifying neighborhoods, CLTs help stabilize income level in neighborhoods, perhaps leading to lower levels of displacement for low-income households.

In summary, although gentrification raises the income levels of neighborhoods by displacing lowincome households, CLTs mitigate this effect in neighborhoods that are gentrifying.

Education level

Though Table 6 shows no difference between neighborhood types, Table 9 shows that, among gentrifying neighborhoods, those without CLTs had higher increases of high school-educated residents than did those with CLTs between 2000 and 2010. Therefore, CLTs may dampen the increase in number of households with higher levels of education during the gentrification process.

In summary, CLTs may help prevent the displacement of less-educated people and lower-income households. Though CLTs may have negative effects toward building community assets such as higher education levels, they may positively maintain a sense of belonging by preventing the displacement of incumbent residents. However, CLTs do not appear to significantly affect the maintenance of education level in nongentrifying neighborhoods.

Length of residence

According to Table 6, length of residence does not change in gentrifying neighborhoods with CLTs or in nongentrifying neighborhoods without CLTs, but it increases in gentrifying neighborhoods without CLTs and nongentrifying neighborhoods with CLTs. Table 7 shows that, when considering neighborhoods regardless of whether they have CLTs, length of residence increases in gentrifying neighborhoods while remaining unchanged in nongentrifying neighborhoods.

Considering together the above findings, CLTs might increase length of residence in nongentrifying neighborhoods while having no such effect in gentrifying neighborhoods. This result is inconsistent with our expectation. In addition, contrary to the general assumption, gentrification increases length of residence in a neighborhood.

Age fluctuation

Table 7 shows that age distribution changed more within gentrifying neighborhoods than in nongentrifying neighborhoods. Typically, age fluctuation would be expected among gentrifying neighborhoods because people move or become displaced in such neighborhoods. However, we found no significant change based on the existence of CLTs in neighborhoods.

Affordability

Table 6 shows that affordability decreases in gentrifying neighborhoods, whereas no such change is reported in nongentrifying neighborhoods. Tables 7 and 8 show that gentrification has negative effects on affordability, whereas CLTs stabilize these decreases in affordability. Moreover, affordability significantly decreased in neighborhoods without a CLT.

Table 9 shows that, among gentrifying neighborhoods, affordability decreased more in neighborhoods without a CLT between 2000 and 2010, indicating that CLTs stabilize the decreases in affordability within gentrifying neighborhoods.

The results coincide with what was expected. In gentrifying neighborhoods, though neighborhoods with a CLT showed slight decrease in affordability, neighborhoods without CLTs experienced a more drastic decrease. Thus, CLTs mediate the decrease of affordability in gentrifying neighborhoods, suggesting that CLTs can counteract the trend of lower affordability in gentrifying neighborhoods.

Homeownership

According to Table 6, in gentrifying neighborhoods, whereas neighborhoods with CLTs show no change in owner-occupied housing rates, neighborhoods without CLTs experience increases in these rates. This suggests that rental housing units, which are typically more affordable residential options, either increased in proportion or did not decrease in gentrifying neighborhoods. By contrast, both nongentrifying neighborhoods experienced reductions in owner-occupied housing rates.

In summary, CLTs may help retain rental units in gentrifying neighborhoods, thus preventing the loss of rental housing units by providing additional residential options.

Housing value

Tables 6 and 9 show significant increases in housing price index in both gentrifying neighborhoods. The housing price index of gentrifying neighborhoods with CLTs was lower than that of nongentrifying neighborhoods with CLTs in 2000. The results suggest that CLT units were introduced into neighborhoods with lower housing values than those of surrounding areas, although housing prices in gentrifying neighborhoods significantly increased throughout the last decade.

In nongentrifying neighborhoods, housing price index increased in neighborhoods with CLTs, whereas no such change occurred in neighborhoods without a CLT. Therefore, CLTs may contribute to increases in housing price within nongentrifying neighborhoods.

In summary, though gentrification appears to facilitate an increase in housing price, CLTs do not produce significant effects on housing price during the gentrification process. However, CLTs stabilize the excessive increase in housing prices in gentrifying neighborhoods by initially entering areas with lower housing prices. In addition, among nongentrifying neighborhoods, CLTs help increase housing prices, though not to the degree that they do in gentrifying neighborhoods.

Discussion: CLTs can moderate the negative effects of gentrification

Although a few researchers and practitioners have studied CLTs based on literature and experience (Davis, 2010; Gray, 2008; Paterson & Dunn, 2009), their studies did not focus on the impact of CLTs on neighborhoods. Moreover, few quantitative studies on CLTs have been published. This study therefore seeks to address the missing quantitative evaluation of CLTs and their effects on neighborhoods, with special attention paid to the process of gentrification.

Negative effects of gentrification	CLTs' counteracting effects on gentrification	Gentrifying neighborhood	Average neighborhood
Displacement	Increase racial diversity	+, Mixed	+, Consistent
	Maintain middle-class ratio	+, Consistent	+, Mixed
	Stabilize income level	+, Mixed	+, Consistent
	Maintain education level	+, Consistent	+, Mixed
	Increase length of residence	– (Negative)	None
	Decrease age fluctuation	None	None
Lower affordability	Increase affordability	+, Consistent	+, Consistent
	Decrease owner-occupied housing rate	+, Consistent	+, Mixed
	Stabilize housing price	+ Mixed	– (Negative)
skyrocket or property price	Stabilize housing price	1, 111/20	(regulive)

Table 10. Direction and magnitude of CLTs' effects on neighborhoods.

This study explored whether CLTs produce an impact on gentrification and how such a mechanism might work. To respond to the "whether" question, a binomial logistic regression analysis was employed, the results of which showed a clear inverse relationship between CLTs and gentrification, suggesting that CLTs may slow or dampen the negative impacts of gentrification.

We used paired *t*-tests to examine differences among nine relevant indicators over time between gentrifying and nongentrifying neighborhoods, with and without CLTs. The findings were synthetically interpreted by each indicator based on whether they mitigated the negative effects of gentrification. The direction of CLT effects on their neighborhoods was illustrated as positive (+) or negative (-), even though CLTs produced positive effects in most indicators. The magnitude of the effects was labeled "consistent" when the research hypotheses were consistently supported by the paired *t*-test. When there was either no support or mixed findings based on the paired *t*-test, the magnitude was labeled "mixed," because no evidence was reported on which to reject the CLT effects. Each interpretation was compiled into Table 10 to summarize the effects of CLTs on gentrification.

Table 10 demonstrates that the effects of CLTs in slowing gentrification were significant in most indicators and that such effects appeared more prominently in gentrifying neighborhoods than in average neighborhoods. Taken together, we found strong support for the ability of CLTs to help maintain middle-class ratios, education levels, and owner-occupied housing rates, as well as increasing affordability in neighborhoods that were gentrifying. Moreover, CLTs increased racial diversity and stabilized income levels and housing prices. However, contrary to the predictions of the research hypothesis, CLTs yielded negative effects on length of residence in gentrifying neighborhoods, likely caused by the additional residential options provided by CLT units. In addition, negative effects on the stabilization of housing price in average neighborhoods might have been positive; considering CLTs' positive effects on restricting excessive increases in housing price within gentrifying neighborhoods, a moderate increase in housing price in an average neighborhood would have corresponded to an increase in residents' assets.

Analysis of the results according to the negative effects of gentrification shows strong support for the effectiveness of CLTs in counteracting lower affordability in gentrifying neighborhoods. Such counteraction of displacement in gentrifying neighborhoods was supported by most indicators, and CLTs produced positive effects on stabilizing housing prices in gentrifying neighborhoods.

However, CLTs' general effects on their neighborhoods were significant except for three indicators: increasing the length of residence, decreasing age fluctuation, and stabilizing housing prices. Furthermore, the high impact of CLTs on increasing affordability relates closely to their main purpose—thus, this result supports the practical effectiveness of the CLT model.

Implications

This research provides a comprehensive perspective on the impact of CLTs on their surrounding neighborhoods. Our population included the full set of CLTs in service in the United States, and our response rate suggested that our results were representative of the population. A research design with

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a pretest and posttest, as well as treatment and control groups, indicated the robustness of our results, allowing for causal attribution to CLTs as catalysts for change (or stability) within their neighborhoods. Previous research has revealed a range of disadvantages associated with gentrification, but until now the role of CLTs in these circumstances has only been assumed or suggested. Furthermore, past studies have not evaluated the actual effects of CLTs on the gentrifying process. Therefore, this research contributes to planning theory by providing practical evidence to bolster the assumptions of previous research.

The findings highlight the importance of using CLTs as a means to alleviate the negative impacts of gentrification in neighborhoods. Previous literature has suggested the production and preservation of affordable housing, the building of community assets, and the intervention of government (Henig, 1980; Kennedy & Leonard, 2001; Levy et al., 2007) as primary tools for addressing the gentrification of areas. Our results indicate that CLTs may be one of the best ways to stabilize neighborhoods, preserve affordability, and build community assets in neighborhoods. It warrants much wider use than is currently seen across the United States.

Another lesson to draw from this research relates to the subcategories of CLT benefits. That is, CLTs build community assets in neighborhoods by strengthening their stability. Neighborhood stability, in turn, yields benefits to residents and to local jurisdictions themselves, whether they are gentrifying or not (Rohe & Stewart, 1996). Any local government that intends to improve its community may consider using the CLT model. CLTs are effective in increasing racial diversity and affordability, as well as stabilizing the average household income in their neighborhoods. Additionally, CLTs maintain middle-class ratios, education levels, and owner-occupied housing rates. Thus, policymakers and/or community representatives should strongly consider using the CLT model as a development tool in their neighborhoods.

Notes

- 1. According to Lees (2000), the terms *supply-side* and *demand-side*, *economic-side* and *cultural-side*, and/or *production-side* and *consumption-side* are synonymous.
- 2. We are confident that there were no unknown CLT units in our neighborhoods, because even the locations of CLTs that did not participate in the survey were verified.
- 3. Based on the definition of gentrification in this study, these five characteristics relate to demographic change (1, 2, 3, 5) and capital reinvestment (3, 4, 5).
- 4. The corresponding citywide area includes the original neighborhood and for this reason likely shares similar socioeconomic characteristics. Two selection criteria were employed to identify these corresponding citywide areas. First, they must encompass the original neighborhood. Second, the specific census places in the census data set must have been used as corresponding citywide areas when the neighborhoods with CLTs were located inside. If this was not the case, county data were used instead.
- 5. One hundred twenty percent of the AMI is commonly considered to be a threshold that determines a highincome group. The U.S. Department of Housing and Urban Development has suggested that moderate income groups have 80–120% of AMI in their income guidelines (Galster & Booza, 2007).
- 6. Migration of residents may change age distribution beyond what is ordinarily caused by demographic change (aging, births, and deaths).
- 7. The affordability index is converted to help explain neighborhood affordability. A higher affordability index indicates higher affordability.

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