Housing, Neighborhood Stability, and Demographic Change:

Assessing the Relationship Between Housing Dynamics, Neighborhood Change and Stability over time, Los Angeles County, 2007 – 2013 [EXTENDED ABSTRACT]

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Introduction

The present study assesses the degree to which various housing characteristics contribute to neighborhood stability and neighborhood change. The stability or degree of turnover in a neighborhood constitutes an important outcome in its own right, as it is linked with both individual and community well-being. For example, research in the field of community criminology finds that residential instability is a robust predictor of heightened levels of crime (Boggess and Hipp 2010; Bellair 2000; Heitgerd and Bursik 1987; McNulty and Holloway 2000; Warner and Pierce 1993; Warner and Rountree 1999). Related work finds that instability disrupts the formation of social ties between neighbors (Kasarda and Janowitz 1974; Bursik and Grasmick 1993; Sampson 1991; Coleman 1990), compromises the development of collective efficacy (Sampson et al. 1997; Wickes et al. 2013) and reduces the frequency or prevalence of neighboring behaviors (Guest et al. 2006; Greif 2009). Neighborhood instability is also predictive of individual mental health and well-being (Matheson et al 2006; Silver, Mulvey and Swanson 2002; Aneshensel et al 2007). As such, it is important to understand the more macro-level processes which contribute to instability.

Further, housing dynamics contribute to neighborhood change. For example, a key component of gentrification is the alteration of the built environment coupled with demographic changes (Glass 1964; Davidson and Lees 2005; Badcock 2001; Cameron 2003; Hackworth 2001; 2002; Rose 2002; Germain and Rose 2000) and the potential or eventual displacement of former residents, particularly renters. Other housing processes, such as foreclosure leading to long-term vacancy spells, are implicated in processes of neighborhood decline, which is associated with the concentration of poverty (e.g. Lauria and Baxter 1999), racial-ethnic segregation (Rugh and Massey 2010; Hall, Crowder, and Spring 2015), and a deteriorating housing stock which in turn has consequences for the health and well-being of residents in these contexts (e.g. Jones, Squires and Ronzio 2015). While much attention has been paid to how the decisions of individual actors contribute to processes such as gentrification and decline, we argue that a focus on housing dynamics potentially offers a more fruitful line of inquiry. First, though we recognize that while individual choices regarding mobility shape neighborhood outcomes, these choices are made within a set of constraints. While the sources of these constraints vary, we argue that housing dynamics are a considerable force in shaping these decisions and shaping neighborhoods more directly. In a society where housing is a commodity rather than a social right, the exchange value of neighborhood properties figures prominently into the processes of neighborhood turnover and neighborhood change (Logan and Molotch 1987). Second, focusing on housing dynamics rather than individual mobility decisions offers a more direct avenue for policy to influence these processes. Among the research questions posed in the present study, we examine the implications of housing change on residential segregation and urban inequality.

A substantial body of research focuses on the individual characteristics and decisions which affect neighborhood attainment and mobility, which ultimately bear on neighborhood demographic compositions. These studies tend to focus on how individuals convert their stock of human capital into desired neighborhood contexts. Thus, individual mobility and neighborhood demographics are in part a function of individual resources and choice. However, this line of research also recognizes that these choices are made and resources expended within a set of constraints shaped not by the individual but by broader forms of social stratification (Massey and Denton 1993; Charles 2003; Logan and Molotch 1987; Alba and Logan 1991; Logan and Alba 1993). We argue, and hope to demonstrate, that housing dynamics are at the very heart of these constraints and forms of stratification. Rather than centering our study on the factors which influence individuals' selection into one neighborhood or another, we focus on the more macro-dynamics of urban housing markets which shape the constraints and opportunities underlying mobility decisions, with implications for neighborhood stability and change.

Thus, in the present study we examine several dimensions of housing which should bear on neighborhood stability and neighborhood change. These include new development, home sales, foreclosures, evictions, and the construction of affordable rental units under the Low-Income Housing Tax Credit (LIHTC) program. Recognizing that cities are characterized by multiple, complex housing markets, we stratify neighborhoods according to socioeconomic status and examine the degree to which each of these housing characteristics contributes to neighborhood (in)stability across neighborhood socioeconomic status. For example, it is unlikely that evictions play a major role in the stability of affluent neighborhoods that are predominantly owner-occupied, but are more likely to shape outcomes in low-income neighborhoods. Likewise, though mass foreclosures associated with the housing crisis around 2008 were widespread, they were not felt evenly across neighborhoods but rather concentrated in certain areas according to patterns of new single-family unit development and subprime mortgage lending. This variation across urban space suggests the importance of understanding what contributions various housing dynamics make to neighborhood stability in different kinds of neighborhoods.

Background

Foreclosure: The foreclosure crisis which occurred between 2006 and 2013 had severe consequences for neighborhoods. Due in part to the prevalence of subprime lending preceding, and the subsequent rise in unemployment and job loss during the Great Recession, mortgage delinquency peaked at about 10.06% in the first quarter of 2010, and was still above pre-recession levels in the second quarter of 2013 at 6.96% (Schwartz 2014; Cho 2013; McBride 2013). The foreclosure rate for subprime loans is 2.5 to 3 times higher than that of traditional loans. Foreclosures affected an average of just 0.5% of mortgages from 2000 to 2006, but rose to a high of 1.42% in the third quarter of 2009 (Schwartz 2014; Cho 2013; McBride 2013). The frequency of these mass foreclosures was not constant across space, with neighborhoods in the

Rust Belt and the Sun Belt hit the hardest. Relevant to the present study, California was the second highest in foreclosures among all states in 2012 and 2013 (Schwartz 2014).

Just as the rate of foreclosure varied across US states, their impact was not felt evenly across neighborhoods, according to neighborhood socioeconomic status. Past research finds that foreclosed homes in more affluent neighborhoods are maintained by the banks that repossess them, as they expect to get a return on the defaulted mortgage and the cost of upkeep in an eventual sale or auction. As such, foreclosed homes in affluent neighborhoods have little effect on the value of nearby homes (Kingsley, Smith and Price 2009; Mallach 2009). However, in less affluent or less stable neighborhoods, banks are less likely to see a return on their investment and as such, are less likely to invest in the upkeep and maintenance of vacant, foreclosed properties. As a result, these properties are more susceptible to deterioration and a loss in value (Kingsley, Smith and Price 2009; Mallach 2009). Prior work finds that this effect is compounded in neighborhoods with high foreclosure rates, leading to more disinvestment and more rapid deterioration, which has a significant effect on the value of nearby properties (Schuetz 2008; Immergluck and Smith 2006).

Foreclosures are of interest to the present study for two reasons. First, they represent the forced displacement of residents. This should have an effect on the stability of the neighborhood overall. Neighborhoods with high rates of foreclosure will experience a period of substantial population loss. Even if properties are sold to new homeowners following an eviction, the process contributes to overall neighborhood instability and population churning. Second, if we consider the longer-term effects of foreclosure, neighborhood foreclosures can contribute to several forms of neighborhood change. First, foreclosed properties are generally sold at auction for a lower price which may attract investors. While many investors may choose to “flip” such properties and sell them at a profit (which would contribute to instability for a period) they may also choose to rent the properties which would alter the normal level of stability in a neighborhood as it alters the proportion of renters, who are more mobile than homeowners. Further, particularly in lower-income neighborhoods characterized by mass foreclosures, high rates of foreclosure can initiate a period of neighborhood decline as nearby housing values drop and the housing stock deteriorates as it sits vacant. Filtering theory from the housing economics literature suggests that housing deterioration (generally from aging) will reduce home values and will transfer to lower-income residents over time (Hoyt 1933; Coulson and Bond 1990; Rosenthal 2014). This would not only affect neighborhood SES, but given broader patterns of economic stratification, may result in demographic change as well. Li and Morrow-Jones (2010) argue that mass foreclosures speed up the filtering process, and find that they are associated with changes in the black population, median household income and unemployment in an older sample (1980s) of neighborhoods in Cuyahoga County, Ohio. Further, research in the field of criminology finds an association between foreclosure and crime, at least in the short term (e.g. Ellen 2012; Immergluck and Smith 2006b; Katz, Wallace and Hedberg 2011; Hipp and Chamberlain 2015). Increases in crime can in turn result in neighborhood instability as residents with the ability to move seek safer contexts.

A few key studies suggest significant implications of foreclosure for various forms of neighborhood change. In a study of nearly all block groups in the United States over the 2005 to 2009 period, Hall, Crowder and Spring (2015) conducted simulations which suggest that foreclosures during this period increased racial segregation between black and white residents by 1.1 dissimilarity points and between Latinos and whites by 2.2 dissimilarity points. The authors find that foreclosure concentrations were linked to declining shares of whites and increasing shares of black and Latino residents, where white population loss and minority population growth tended to occur in previously mixed neighborhoods with high rates of foreclosure (Hall, Crowder and Spring 2015). Other research using the Panel Study of Income Dynamics finds that experiencing foreclosure was associated with migrating to less white and more disadvantaged contexts, with worse outcomes among Latino households (Hall, Crowder, Spring and Gabriel 2018).

The present study contributes to this literature by assessing the role of foreclosure in neighborhood (in)stability, changing neighborhood demographic composition, and neighborhood inequality. Further, our focus on the period of 2007 to 2013 captures the latter years of the crisis where foreclosure rates were still quite high in states like California, whereas most studies tend to focus on the 2006 to 2009 period. Further, while the focus of past research has been on single-family foreclosures, we also include the rate of multi-family foreclosures. In the state of California, where the present study is situated, tenants residing in properties which undergo a foreclosure have the right to a 60 day notice to vacate before the lender (who repossesses the property) can remove the tenant. A buyer of a foreclosed property is legally required to honor the tenant's lease until its expiration unless the buyer chooses to move into the home, in which case a 90 day notice to vacate is required. Thus, while a foreclosure of a rental property does not result in the immediate displacement of tenants, it usually results in their eventual displacement.

New Development: New housing development fundamentally contributes to neighborhood stability as it is associated with an influx of new residents. We distinguish between single-family and multi-family construction. Single-family construction is more likely to become owner-occupied, which should contribute to greater stability in the long term, while multi-family units which house renters might contribute to lower stability in the long term as renters tend to be more mobile than homeowners. Thus, new development allows for the in-migration of new residents in the short-term, and may alter the long term stability of neighborhoods according to the type of housing built.

Research in the gentrification literature suggests additional pathways whereby new development can affect neighborhood change over the long term. Davidson and Lees (2005) propose and provide empirical evidence for the phenomenon of "new build gentrification," which is the gentrification of either brownfield sites, vacant land, or recently razed neighborhoods through new housing construction, typically in the luxury market. Research on new build gentrification finds that such development can lead to what Marcuse (1984) terms 'exclusionary displacement' through 'price shadowing', whereby less affluent groups are unable to access property, thus shaping and constraining the demographics of neighborhoods where such development occurs (Lambert and Boddy 2002; Liu 2017; Atkinson, 2002; Hall and Ogden

1992; Vicario and Monje 2003). Additionally, displacement can occur in nearby properties as rents and home values rise in response to new development (Davidson and Lees 2005; Davidson 2008; Hamnett 2003). Thus, the present study considers the role of both single-family and multi-family housing development in altering neighborhood stability and contributing to neighborhood change over time.

Sales: Home sales are perhaps the most straightforward component of housing examined in the present study. A sale represents the transfer of property from one resident to another, contributing to residential turnover. The sale of a rental property also results in displacement, though in the state of California the new buyers are required to honor the tenant's lease until its expiration. Thus, we consider the extent to which the sale of single- and multi-family properties contribute to both neighborhood stability and change over time.

Eviction: Eviction is a surprisingly understudied phenomena in the social sciences. Much of the work most relevant to the present study has been done by Matthew Desmond and colleagues, in his examination of evictions in Milwaukee, Wisconsin in 2003 to 2008. Using data from court eviction records and ethnographic fieldwork in several communities, Desmond (2012) finds that eviction is not a rare event, with about 16,000 adults and children evicted from about 6,000 homes on average each year in the city over the four year study period. Other research by Desmond (2013; 2015) finds that eviction compels renters to accept substandard housing, which drives them to soon move again. There are several potential effects of evictions on neighborhood stability and change. First, consider a poor neighborhood with high rates of evictions but rather stable characteristics in terms of racial-ethnic and economic composition over time. In these cases, eviction should contribute to instability, but have little effect on change as the population is churning rather than shifting. In contrast, displacement through eviction has been a topic of longstanding interest to gentrification scholars. According to Neil Smith's rent gap theory, gentrification occurs when the gap between the rents currently garnered for a property and what could be garnered if its use changed becomes sufficiently large to warrant investment (Smith 1987). In the case of gentrifying neighborhoods, evictions would not only impact the level of stability in a neighborhood, but may lead the way to neighborhood demographic change. Further, evictions in these contexts could lead to neighborhood change in the form of housing tenure as former rental units are converted to owner-occupied units.

Changing Rents: While foreclosures and evictions represent formal measures of displacement events, we also consider change in rents as a "push" factor which may displace residents. Put simply, as rents increase when neighborhoods gentrify (due to a variety of factors) tenants unable to pay for increases and thus unable to renew their leases are displaced to more affordable units elsewhere. Thus, we consider changing rents as a factor that may induce both residential instability as some residents are priced out and others move in, and neighborhood change as more affluent residents replace lower-income residents.

LIHTC Construction: As part of the Tax Reform Act of 1986, the Low Income Housing Tax Credit (LIHTC) program represents the single largest subsidy for the production of low-income housing in the United States. Indeed, 30% of all multi-family housing constructed from 1987 to 2006 were built as part of the LIHTC program (Khadduri, Climaco and Burnett 2012).

The program allows investors to reduce their own federal income taxes by $1 for every dollar of tax credit received for a duration of 10 years, while the properties have to offer low-income housing for a minimum of 15 years. Fully 62% of LIHTC projects are new construction, with the remainder being rehabilitation projects (Schwartz 2014). These developments are more likely than non-LIHTC rental units to be in tracts where 30% or more of residents live under the poverty threshold, 50% or more are minority households, 20% or more are female-headed households, and 50% or more are renter-occupied households (Schwartz 2014). As such, the LIHTC program has been critiqued as contributing to the persistence of racial-ethnic segregation and economic segregation (e.g. Freeman 2004; Neuwirth 2004; Van Zandt and Mhatre 2009). Relevant to the timeline of the present study (2007 – 2013), the allure of the LIHTC program to investors and banks declined during the financial crisis, beginning in 2006. In response to this, the Housing Economic Recovery Act of 2008 increased the amount of tax credits available, and the American Recovery and Reinvestment Act of 2009 included two provisions which provided actual funding to LIHTC projects.

Given that the LIHTC program has provided much needed housing for low-income renter households, it is of particular interest to the present study. Our review of eviction and foreclosure outlines the degree to which low-income households are especially vulnerable to high rates of residential mobility (and thus, low-income neighborhoods are susceptible to high rates of turnover). As such, the presence and prevalence of low-income units supplied by the LIHTC program should increase stability in the low-income neighborhoods where they tend to be built. However, echoing the concerns of other scholars (Freeman 2004; Neuwirth 2004; Van Zandt and Mhatre 2009) we also examine the degree to which LIHTC housing contributes to neighborhood change – whether by increasing segregation through altering the shares of certain racial-ethnic groups, or by increasing spatial inequality by concentrating poverty in particular contexts.

Neighborhood Differences: The present study seeks to examine how the housing dynamics examined vary in their relationship to neighborhood stability and change across neighborhood SES. In the most fundamental sense, higher-income neighborhoods tend to have greater rates of homeownership, and resident affluence provides some protection against the threat of eviction or foreclosure. As such, the degree to which these factors contribute to stability and change in affluent versus poor neighborhoods should vary, with eviction in particular expected to explain more of the variance in stability/change in poor neighborhoods compared to more affluent ones. Further, we recognize that metropolitan areas are characterized by a diversity of housing markets, which in the most basic sense vary according to neighborhood socioeconomic status. Our analyses attempt to distinguish the role of each housing factor in explaining stability and change in neighborhoods of varying economic standing.

The Present Study

We analyze the role of foreclosure, new single-family and multi-family construction, single-family and multi-family unit sales, LIHTC construction, and evictions on neighborhood stability and change for neighborhoods (defined here as Census tracts; N = 2,339) in Los Angeles County during and following the financial/housing crisis from 2007 to 2013. We assess the role of each housing factor in shaping neighborhood stability overall, and for owners and renters separately. Further, we examine the degree to which these dynamics contribute to neighborhood change over time. We measure change as *racial-ethnic change*, changes in housing tenure (e.g. *proportion owner vs. renter*), changes in *neighborhood inequality*, and changes in neighborhood SES as captured by *average home sales values*. In addition to the broader goal of understanding the social phenomenon of neighborhood stability and change through a more macro-sociological and demographic lens, we also argue that our approach here offers insight into possibly policy interventions. That is, given the well-documented effect of neighborhood (in)stability on both community and individual outcomes, our analyses should point to sites of intervention in local housing markets to increase stability. At the very least, governmental policy and local organization strategies can utilize such findings to help buffer residents against the potential negative effects of local housing dynamics on community and individual outcomes. We will also consider the theoretical import of our findings to the scholarly understanding of urban neighborhood dynamics in the full paper to follow.

Data and Methods

Data: Our study setting is comprised of all neighborhoods in Los Angeles county, which we define as the Census tract based on 2010 boundaries (N= 2,339). Using data from the American Community Survey 5-year estimates for 2007 (2005-2009) we stratify neighborhoods into three quantiles based on average household income. Data for the present study come from several sources. First, data on foreclosures, home sales, and new construction come from Zillow. Data were provided at the point level, and aggregated up to the tract level. Data on LIHTC construction come from the Department of Housing and Urban Development. Data on evictions come from the Eviction Lab (evictionlab.org)[1]. Data on sociodemographics come from the American Community 5-year Estimates for 2007 (2005-2009) and 2013 (2011-2015), and each year in between.

Independent variables: Foreclosures are cases where a resident receives a notice of default, and the home is subsequently sold at auction or through a Trustee's Deed. We compute the singe-family unit (SFU) foreclosure rate as the count of SFU foreclosures divided by the count of single-family units in a tract, and the multi-family foreclosure rate as the count of MFU foreclosures divided by the count of multi-family units in a tract. This is done for each of the years between 2007 and 2013. We then take the average of these yearly rates to construct the *Average SFU Foreclosure Rate* and the *Average MFU Foreclosure Rate.* These averaged measures are created for the initial models we present here; in the final models we will include measures at each year and capture the average and change based on latent trajectory models (described below in the Methods section). Similar computations are used to compute the *Average SFU Sales Rate* and the *Average MFU Sales Rate,* based on the count of each type of sale per tract and year. To account for new housing development, we compute the *Sum of New Single-Family Units* and the *Sum of New Multi-Family Units* as the count of each type of unit built between 2007 and 2013. Two variables capture the share of rental units associated with the Low-Income Housing Tax Credit (LIHTC), where developers are offered a tax credit for including a certain number of low-income units in new housing construction. As such, the

[1] This research uses data from The Eviction Lab at Princeton University, a project directed by Matthew Desmond and designed by Ashley Gromis, Lavar Edmonds, James Hendrickson, Katie Krywokulski, Lillian Leung, and Adam Porton. The Eviction Lab is funded by the JPB, Gates, and Ford Foundations as well as the Chan Zuckerberg Initiative. More information is found at evictionlab.org.

majority of LIHTC developments include both low-income and market-rate units. First, we take the *Total Proportion of LIHTC Low-Income Units* as the count of active LIHTC units designated as low-income for the study period over the total number of housing units. Next, we compute the *Total Proportion of LIHTC Market Rate Units* as the count of active market-rate LIHTC units for the study period over the total number of housing units. The eviction rate is calculated by the Eviction Lab, where the numerator is the count of completed evictions filed with local courts and completed (i.e. this does not include informal evictions), and the denominator is the number of occupied renting households in the tract, derived from the US Census and the ESRI Business Analyst demographic estimates. We then take the rate for each year and compute the *Average Eviction Rate* for 2007 to 2013. *Change in Average Rent* is calculated as the difference in tract average rent between 2007 and 2013.

Dependent Variables: We use data from the ACS 5-year estimates to construct a number of dependent variables. First, we include several measures of neighborhood stability. As a general measure, we include the *% in same house as 1 year ago.* We also include measures specific to housing tenure type, the *% owners in same house as 5 years ago* and the *% renters in same house as 5 years ago.* We also include the *Average Length of Residence* for all residents in the tract, measured in years. Given that neighborhood rates of homeownership are predictive of neighborhood stability, we estimate the effect of the aforementioned housing dynamics on the change in the share of percent homeowner between 2007 and 2013, denoted as *Δ % homeowner.* Recognizing that neighborhoods have different "normal" levels of turnover, we also examine the change in these variables over the study period by computing the difference between the 2007 and 2013 values.

In addition to assessing the role of housing dynamics in producing varying levels of neighborhood (in)stability, we examine their relationship with neighborhood change over time, which we conceptualize as racial-ethnic change, change in inequality and change in home values. To capture racial-ethnic change at the tract level, we subtract the percent of each group in 2007 from their 2013 value to get the *Δ % black, Δ % Asian, Δ % Latino,* and *Δ % white.* While the change in the share of each major racial-ethnic group is of interest, we also examine the degree to which our independent variables are associated with changes in racial-ethnic heterogeneity, which we compute using the Herfendahl Index, and take the difference of between 2007 and 2013, denoted as *Δ Racial-Ethnic Heterogeneity.* We capture *change in inequality* by taking the difference in measures using the Gini index of inequality based on household income. Finally, we compute the change in the adjusted natural log of sales prices. For this measure, we first compute the three year logged average around the end points of our study period (2006-2008 and 2012-2014) and take the difference between those values.

Methods: Our models focus on determining the components of change in neighborhood residential stability. We will accomplish this by estimating multi-group latent trajectory models, as described in Bollen and Curran (2006). The groups will be determined by the various strata described earlier. For a particular outcome measure, the latent trajectory model implies the following set of equations:

(1) $$y_{ti} = \alpha + (t)\beta_L + (t^2)\beta_Q + \varepsilon_t$$

where y_{ti} is the variable of interest (e.g., residential stability) at each time point (t) in tract i, α is a latent intercept that captures the estimated value of the measure in the tract in the first time point, β_L is a latent variable capturing the linear trajectory over the time period (positive values indicate the measure generally increases over the time period, whereas negative values indicate it generally decreases), t is coded to capture the change in time by showing the number of years since the first time point); β_Q is a latent variable capturing the quadratic trajectory over the time period (positive values indicate the measure generally increases more rapidly later in the time period, whereas negative values indicate greater decreases) and time is coded as quadratic values, and ε_t is an error term for the tract at that time point.

In each model for a particular outcome variable, we will estimate an analogous trajectory model for the outcome variable, as well as our set of "independent" variables (only the latent variables of their trajectories are independent, not the observed measures at each time point). Thus, a trajectory equation for a typical "independent" variable is:

(2) $$x_{ti} = \alpha_x + (t)\beta_{Lx1} + (t^2)\beta_{Qx1} + \varepsilon_t$$

where the variables are similar to equation 1 except that the latent variables include the x-subscript to denote that these are independent latent trajectories in the full structural model (x1 for the first independent variable, x2 for the second one, etc).

The typical model then will look something like:

(3) $$\beta_L = \Gamma_{\alpha x1}\,\alpha_{x1} + \Gamma_{\beta Lx1}\,\beta_{Lx1} + \Gamma_{\alpha x2}\,\alpha_{x2} + \Gamma_{\beta Lx2}\,\beta_{Lx2} + \zeta$$

where β_L is the latent trajectory of the variable of interest (e.g., change in residential instability), α_{x1} is the random intercept of the first independent latent trajectory (e.g., SFU foreclosure rate) which captures the SFU foreclosure rate at the first time point (2007) and has a $\Gamma_{\alpha x1}$ effect on the change in residential instability, β_{Lx1} is the random slope of the SFU foreclosure rate, which captures the change in foreclosures over this time period and has a $\Gamma_{\beta Lx1}$ effect on the change in residential instability, and α_{x2} and β_{Lx2} are the random intercept and random slope for the second independent latent trajectory (e.g., MFU foreclosure rate), with analogous coefficients. The model generalizes to our complete set of independent variables, and ζ is a random disturbance assumed to have a normal distribution.

Preliminary Results

Descriptive Statistics: Table 1 shows the mean, standard deviation, and minimum and maximum values for average household income for the three neighborhood strata (split based on equal number of observations in each group). Our *Low-Income* strata (N=780) has a mean 2007 average household income of $43,636. The *Middle-Income* strata (N=780) has a mean 2007 average household income of $66,684. Finally, the *High-Income* strata (N=779) has a mean 2007 average household income of $121,575.

Table 2 shows the means for our key study variables across neighborhood strata. These are provided to contextualize the study variables for the reader, and to draw attention to the finding that the housing dynamics examined here do indeed vary across neighborhoods stratified by household income.

Table 1. Neighborhood Strata Summary Statistics					
Neighborhood Strata	N	2007 Average Household Income			
		Mean	Std. Dev	Min.	Max.
Low-Income	780	43,636	7,514	10,196	55,582
Middle-Income	780	66,684	6,948	55,612	80,381
High-Income	779	121,575	49,190	80,383	412,445

Table 2. Summary Statistics for Key Study Variables			
	Neighborhood Strata		
	Low Income	Middle Income	High Income
Variable	Mean	Mean	Mean
Avg. SFU Foreclosure Rate	1.501	1.341	1.149
Avg. MFU Foreclosure Rate	0.007	0.003	0.001
Sum of New Single-Family Units	3.333	9.196	17.112
Sum of New Multi-Family Units	145.950	0.094	0.176
Average SFU Sales Rate	1.503	1.588	1.833
Average MFU Sales Rate	0.006	0.003	0.001
Total Proportion LIHTC Low-Income Units	0.322	0.117	0.018
Total Proportion LIHTC Market Rate Units	0.028	0.003	0.001
Average Eviction Rate	1.857	2.033	1.963
Change in Average Rent	126.55	136.51	178.56
% owners in same house as 5 years ago	84.242	85.561	85.355
% renters in same house as 5 years ago	54.687	51.177	44.138
% in same house as 1 year ago	81.800	83.209	83.472
avg. length of residence	13.857	16.042	17.316
Δ % homeowner	-1.781	-3.125	-4.029
Δ % black	-0.889	-0.555	-0.384
Δ % Asian	0.723	0.707	1.740
Δ % Latino	-0.299	2.101	2.993
Δ % white	0.206	-2.555	-5.143
Δ Racial-Ethnic Heterogeneity	0.060	-0.207	3.721
Δ % owners in same house as 5 years ago	22.371	22.777	24.234
Δ % renters in same house as 5 years ago	24.783	24.086	20.025
Δ % in same house as 1 year ago	1.472	1.185	0.295
Δ avg. length of residence	4.601	4.498	4.808
Δ Gini index of HH Income Inequality	0.011	0.020	0.002
Δ in Adjusted ln of Sales Prices	-0.091	-0.051	0.044

N	780	780	779

Note: Variables computed as rate, sum, or difference for 2007 to 2013 period.

Neighborhood strata are computed as quantiles of average household income in 2007

Initial structural equation models: Preliminary models presented in Table 3 include four outcome variables which capture various measures of neighborhood stability for 2013. The measures are *average length of residence, % in same house 1 year ago, % owners in same house 5 years ago,* and *% renters in same house 5 years ago.* Our final models will include full multiple dual latent group models (as described in the Methods section), but these initial models are estimated to give a sense of the final results we expect to detect. We estimated multiple group SEM's that are stratified by the three income groups. The results are presented in Table 3. We note that over this time period, the correlation within strata between sales and foreclosures (for each SFU and MFU) was too high to include both sets of measures in the model, so we excluded the sales measures. The final models will parse out normal sales from those resulting from a foreclosure event.

The first panel shows the results for the model with *average length of residence* as the outcome variable. In the low income strata, three variables are significant and the model explains 9.5% of the variance in the equation. Single-family foreclosures and the proportion of units designated as low income in the LIHTC program are associated with lower average length of residence. Higher multi-family foreclosure rates are associated with a greater average length of residence in low income neighborhoods. In the mid income strata, five variables are significant and 44.2% of the variance in the equation is explained. Again we observe that the rates of single-family foreclosures and the proportion of units designated as low income in the LIHTC program are associated with lower average length of residence. However, in contrast to the model for the low income strata, we also observe that the proportion of LIHTC units offered at market rate, average eviction rate and increasing rents are associated with greater average length of residence. For the high income strata, 86.8% of the variance in the equation is explained and four variables are statistically significant. As in the models for the other two strata, increasing rates of single-family foreclosures are associated with lower average length of residence, as is the average multi-family foreclosure rate. Similar to our findings for the mid income strata, increasing rates of eviction are associated with greater average length of residence in high income neighborhoods. In contrast to the results for other strata, the count of new single-family units developed over the study period is associated with lower average length of residents.

The second panel shows the results with overall residential stability (% in same house 1 year ago) as the outcome variable. 7.7% of the variance in the equation is explained for the low income strata, where four variables of interest have emerged as statistically significant predictors. The average single-family foreclosure rate, the average eviction rate, and increasing rents are associated with lower stability, while the average multi-family foreclosure rate is associated with greater stability. In the model for the mid income strata, 19.3% of the variance in the equation is explained and three variables are statistically significant. The average single-family foreclosure rate is again associated with lower stability, as are increasing rents ($p<.10$), while the average eviction rate is associated with higher stability. In contrast to the results of the other strata, only the coefficient for the average single-family foreclosure rate is statistically significant, and is associated with lower stability in high income neighborhoods.

The third panel shows the results with owner residential stability (% owners in same house as five years ago) as the outcome. Just 2.6% of the variance in the equation for the low income strata is explained. We find that the average multi-family foreclosure rate is associated with greater owner stability, while the average eviction rate is associated with lower owner stability. Though marginally significant ($p<.10$) the proportion of LIHTC units offered at market rate are also associated with lower owner stability. In the model for the mid income strata, 18.1% of the variance is explained, and five of the housing variables are statistically significant. Increasing rates of average single-family foreclosures are associated with lower owner stability, as is the share of LIHTC low income units, the number of new single-family units developed, and increasing rents. The average eviction rate is associated with greater owner stability. In the model for the high income strata, 51.1% of the variance in the equation is explained and three variables are statistically significant. As in the model for the mid income strata, the average single-family foreclosure rate and the number of new single-family units developed are associated with lower owner stability, as the average eviction rate is associated with greater owner stability.

The fourth panel shows the results for the model using rental residential stability (% renters in the same house as 5 years ago) as the outcome. 13.9% of the variance in the equation for the low income strata is explained. Five variables of interest are statistically significant in the model. The average eviction rate is associated with lower renter stability, as is increasing rents and the average single-family foreclosure rate, though the effect is just marginally significant ($p<.10$). The average multi-family foreclosure rate is associated with greater renter stability, as is the number of new multi-family units developed. In the model for the mid income strata, 12.1% of the variance in the equation is explained and five variables are statistically significant. The average multi-family foreclosure rate, the count of new multi-family units developed, and the proportion of units designated as market rate in LIHTC developments are associated with greater renter stability. The average single-family foreclosure rate and increasing rents are associated with lower renter stability in mid income neighborhoods. In the model for the high income strata, 4.2% of the variance in the equation is explained and five of the variables are statistically significant. The average single-family foreclosure rate, increasing rents, and the average eviction rate are associated with lower renter stability, while the average multi-family foreclosure rate and the number of new multi-family units developed are associated with greater renter stability.

We also estimated initial models that used the *change* in four of our variables of interest between the last time point (2013) and the initial time point (2007), presented in Table 4. The four outcome variables which capture change in general neighborhood stability are *change in average length of residence*, *change in % in same house 1 year ago*, *change in % owners in same house 5 years ago*, and *change in % renters in same house as 5 years ago*. Conceptually, these models assess the deviation in residential stability compared to the beginning of the study period, distinguished from the previous models which assessed the degree to which each of our housing variables explain levels of stability or turnover.

The first panel in Table 4 shows the results for the model with the change in average length of residence as the outcome variable. In the low income strata, increasing average rents are associated with decreased average length of residence, and the model only explains 3% of the variance. In the mid income strata two measures are significant and 9.7% of the variance in the equation is explained. Neighborhoods with a higher MFU foreclosure rate experience a larger decrease in average length of residence. A higher eviction rate increases length of residence, controlling for the other measures in the model. Finally, in the high income strata, a high eviction rate has a modest positive relationship with the change in average length of residence ($p < .10$) and increasing average rents are associated with increased average length of residence, with the model explaining about 18.5% of the variance in the equation.

The second panel shows the results for the change in general residential stability (same residents in the last year). Our model explains just 2.3% of the variance in the equation for the low income strata, where increasing average rents are associated with decreased stability. There are differences between the mid- and high-income strata. In mid-income neighborhoods, a higher multi-family foreclosure rate is associated with reduced stability, whereas a higher eviction rate is moderately associated with increased stability ($p < .10$). In the high income strata, the most important explanators of increased stability are a high number of new SFUs, and a reduced eviction rate. In mid income neighborhoods, increasing average rents are associated with decreased stability, whereas there is a marginally significant positive effect for this variable in the high income strata.

In the third and fourth models, we distinguish between residential stability specific to owners or renters. In panel 3 we see notable differences across income strata for which measures best explain stability for owners specifically. In low income neighborhoods, a high number of low income housing units is associated with increased owner residential stability, whereas a high number of market rate low income housing has a negative relationship, controlling for the other measures in the model. Furthermore, an increase in new MFU is associated with increased owner stability. In contrast, it is foreclosures that appear to drive owner stability in mid income neighborhoods: a higher SFU foreclosure rate has a positive relationship, whereas a higher MFU foreclosure rate is negatively associated with owner stability. Finally, owner stability in high income neighborhoods appears to be positively driven by the SFU foreclosure rate and the number of new SFU units.

The fourth panel shows the results explaining the change in renter residential stability. In low income neighborhoods, this appears to be entirely driven in part by the MFU foreclosure rate, which has a positive relationship with renter residential stability. Increasing average rents are associated with decreased stability, and the model explains about 14.5% of the variance in the equation. In mid income neighborhoods, the eviction rate has a strong positive relationship with renter stability, as does the number of new SFUs. Again, increasing average rents are associated with decreased stability. However, a higher MFU foreclosure rate is negatively associated with renter stability, which is opposite of the results for low income neighborhoods. For the mid income strata, the model explains about 19.2% of the variance in the equation. Finally, increasing average rent is also associated with instability in high income neighborhoods.

Conclusion

In conclusion, these preliminary models provide some initial support for the underlying assertions of the present study – that the housing dynamics which explain various forms of neighborhood stability, and the extent of variance they explain differ across neighborhood strata. The full models will also include changes in racial-ethnic composition and inequality as outcomes. Further, the final models will include a set of control variables to account for other neighborhood factors that may be associated with our outcomes.

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Table 3. Results of SEM multiple group models based on 3 income strata

Strata	Average single-family foreclosure rate	Average multi-family foreclosure rate	Proportion low income housing units	Proportion market rate low income housing	Average eviction rate	Number of new single-family units	Number of new multi-family units	Change in Average Rent	R- squared
Outcome variable: average length of residence									
Low income	-0.032 *	89.683 ***	-0.422 ***	-0.534	-0.149	-0.002	0.000	0.000	0.095
	-(2.05)	(6.52)	-(3.91)	-(1.55)	-(1.58)	-(0.18)	-(0.02)	-(0.47)	
Mid income	-0.267 ***	-15.096	-0.595 **	7.141 *	0.768 ***	-0.004	0.069	0.002 *	0.442
	-(6.25)	-(1.55)	-(3.06)	(2.08)	(8.05)	-(1.28)	(1.01)	(2.57)	
High income	-0.230 ***	-148.290 *	-1.116	0.682	0.923 ***	-0.010 ***	-0.048	0.000	0.868
	-(7.17)	-(2.57)	-(1.25)	(0.04)	(8.50)	-(4.28)	-(0.94)	(1.10)	
Outcome variable: residential stability (residents in same house last year)									
Low income	-0.091 *	106.123 ***	-0.396	-0.775	-1.115 ***	-0.003	0.000	-0.006 **	0.077
	-(2.45)	(3.29)	-(1.56)	-(0.96)	-(5.03)	-(0.17)	(0.90)	-(3.24)	
Mid income	-0.500 ***	4.169	-0.366	7.093	0.849 ***	0.008	0.128	-0.003 †	0.193
	-(5.33)	(0.19)	-(0.86)	(0.94)	(3.98)	(1.11)	(0.86)	-(1.65)	
High income	-0.483 ***	-112.127	-0.626	-9.783	-0.096	-0.002	-0.148	0.000	0.077
	-(6.74)	-(0.87)	-(0.33)	-(0.27)	-(1.14)	-(0.42)	-(1.34)	(0.37)	
Outcome variable: owner residential stability (owners in same house last 5 years)									
Low income	-0.065	202.618 **	0.327	-2.970 †	-1.040 *	-0.046	0.000	0.001	0.026
	-(0.85)	(3.08)	(0.61)	-(1.82)	-(2.20)	-(1.16)	(0.27)	(0.22)	
Mid income	-0.553 ***	-4.481	-1.599 **	10.626	0.783 **	-0.038 ***	0.101	-0.003 †	0.181
	-(5.24)	-(0.19)	-(2.80)	(1.25)	(3.24)	-(4.50)	(0.60)	-(1.94)	
High income	-0.323 ***	-24.276	-1.910	13.289	0.608 ***	-0.027 ***	-0.095	0.000	0.511
	(0.00)	-(0.24)	-(1.23)	(0.46)	(3.31)	-(6.31)	-(1.07)	(0.28)	
Outcome variable: renter residential stability (renters in same house last 5 years)									
Low income	-0.109 †	311.635 ***	-0.153	-1.485	-0.113 ***	0.000	56.761 ***	-0.016 ***	0.139
	-(1.88)	(6.18)	-(0.39)	-(1.18)	-(3.67)	(0.50)	(68.15)	-(5.42)	
Mid income	-0.733 ***	84.225 *	0.131	23.057 †	-0.021	-0.393	50.367 ***	-0.008 ***'	0.121
	-(4.62)	(2.32)	(0.18)	(1.80)	-(1.61)	-(1.55)	(58.61)	-(3.42)	
High income	-0.270 *	887.640 ***	1.296	-44.883	-0.028 **	-0.166	44.150 ***	-0.004 *	0.042
	-(2.01)	(3.66)	(0.35)	-(0.65)	-(2.70)	-(0.78)	(43.47)	-(2.22)	

**** p<.001 (two-tail test), ** p < .01(two-tail test), * p < .05 (two-tail test), † p < .10 (two-tail test). T-values in parentheses.*

Table 4. Results of SEM multiple group models based on 3 income strata - Change outcomes

Strata	Average single-family foreclosure rate	Average multi-family foreclosure rate	Proportion low income housing units	Proportion market rate low income housing	Average eviction rate	Number of new single-family units	Number of new multi-family units	Change in Average Rent	R- square
Outcome variable: change in average length of residence									
Low income	-0.005	7.392	-0.082	-0.367	-0.094	-0.002	0.000	-0.002 ***	0.030
	-(0.48)	(0.79)	-(1.13)	-(1.57)	-(1.46)	-(0.36)	-(0.29)	-(3.86)	
Mid income	0.014	-39.926 **	0.019	-0.657	0.161 *	-0.001	-0.010	0.000	0.097
	(0.48)	-(5.80)	(0.14)	-(0.27)	(2.40)	-(0.46)	-(0.20)	(0.79)	
High income	-0.025	0.012	-0.444	-16.569	0.133 †	0.000	-0.027	0.001 *	0.185
	-(1.07)	(1.18)	-(0.69)	-(1.39)	(1.72)	-(0.23)	-(0.72)	(2.06)	
Outcome variable: change in residential stability (residents in same house last year)									
Low income	0.035	17.555	0.200	-0.360	-0.327	0.009	0.000	-0.007 ***	0.023
	(0.94)	(0.55)	(0.79)	-(0.45)	-(1.48)	(0.46)	(0.31)	-(3.57)	
Mid income	-0.024	-57.776 **	0.337	-2.097	0.368 †	0.009	-0.051	-0.006 ***	0.070
	-(0.26)	-(2.79)	(0.82)	-(0.29)	(1.82)	(1.25)	-(0.35)	-(4.40)	
High income	-0.016	-0.023	-0.782	-39.529	-0.177 **	0.010 *	-0.049	0.001 †	0.068
	-(0.25)	-(0.82)	-(0.44)	-(1.21)	-(2.98)	(2.00)	-(0.49)	(1.65)	
Outcome variable: change in owner residential stability (owners in same house last 5 years)									
Low income	0.031	-74.635	2.390 **	-6.209 *	0.894	0.035	0.001 **	0.001	0.035
	(0.27)	-(0.76)	(2.95)	-(2.56)	(1.27)	(0.59)	(2.61)	(0.21)	
Mid income	0.588 **	-167.616 **	1.347	-17.390	-0.035	-0.007	-0.163	-0.006 *	0.057
	(3.64)	-(4.53)	(1.54)	-(1.33)	-(0.09)	-(0.51)	-(0.63)	-(2.38)	
High income	0.534 **	0.007	-2.067	-48.957	-0.418	0.038 **	-0.230	-0.001	0.217
	(5.80)	(0.18)	-(0.81)	-(1.03)	-(1.31)	(5.38)	-(1.57)	-(0.88)	
Outcome variable: change in renter residential stability (renters in same house last 5 years)									
Low income	-0.060	280.952 **	-0.320	-1.636	-0.033	0.009	0.000	-0.029 ***	0.145
	-(0.97)	(5.23)	-(0.76)	-(1.22)	-(0.09)	(0.27)	-(0.57)	-(9.51)	
Mid income	-0.145	-85.714 *	1.128	2.571	1.562 **	0.036 *	-0.088	-0.017 ***	0.192
	-(0.81)	-(2.10)	(1.39)	(0.18)	(3.92)	(2.52)	-(0.31)	-(6.30)	
High income	-0.142	0.016	4.325	-85.914	-0.487	-0.015	-0.201	-0.009 ***	0.074
	-(0.83)	(0.21)	(0.91)	-(0.97)	-(0.85)	-(1.18)	-(0.73)	-(4.15)	

*** p < .01(two-tail test), * p < .05 (two-tail test), † p < .10 (two-tail test). T-values in parentheses.*