

Measuring displacement: Assessing proxies for involuntary residential mobility

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Abstract

Research has repeatedly found that displacement is not more likely in gentrifying neighborhoods. Since the dependent variable – displacement – is difficult to measure, researchers resort to a variety of proxy measures for it. I classify three types of proxies: a population approach that measures compositional changes in neighborhoods over time, an individual approach that measures individual housing mobility, and a motivational approach which traces both individual mobility as well as the reasons why a household moved to determine whether that move was involuntary. I examine the prevalence of these approaches across a sample of the literature. I then test the commensurability of the proxy measures with data from New York City by comparing the rank-orderings of neighborhoods with the most and least displacement. I find widely different results across the approaches. I explain these results by examining the underlying mechanisms of displacement that are masked by the other approaches.

Residential displacement and housing insecurity are pernicious sources of inequality and poverty (Desmond 2018; Desmond, Gershenson, and Kiviat 2015). The causes and consequences of displacement are a growing area of research. One area of investigation is around the relationship between gentrification and displacement. As a neighborhood gentrifies and more affluent residents move into it, there is a concern that this leads to the displacement of preexisting residents – where they are pressured or forced to move involuntarily from their homes. While some scholars argue that gentrification leads to increased displacement (Newman and Wyly 2006), others claim that displacement is not more prevalent in gentrifying neighborhoods (Ellen and O'Regan 2011; Freeman 2005; Freeman and Braconi 2004; McKinnish, Walsh, and White 2010; Vigdor 2002). These studies examine the relative likelihood of displacement between gentrifying and non-gentrifying neighborhoods.

Yet studying displacement is made empirically elusive due to the difficulty in measuring it. It has been described as “measuring the invisible,” since by definition, displaced people are not where they were when the displacement occurred, making it difficult to know the conditions of their mobility (Atkinson 2000; Wyly et al. 2010). Often we do not know if a household moved at all, or the specific reason why they moved. This makes disentangling displacement from

other types of benign household mobility difficult. These challenges in empirically measuring displacement leads to varying operationalizations of the concept. Many researchers thus rely on a variety of proxy measures of displacement based on available data. Proxy measures are common in social science research and necessary to understand complex social phenomena in a world of data limitations. The question is how well a given measure approximates the real-world social object it seeks to emulate.

This paper examines the use and efficacy of different quantitative measures of displacement in neighborhoods. First, starting from the baseline definition of displacement as “involuntary residential mobility,” I describe three common types of proxy measures of displacement: a population approach that measures compositional changes in neighborhoods over time, an individual approach that measures individual housing mobility, and a motivational approach which traces both individual mobility as well as the reasons why a household moved in order to determine if that move was involuntary. Through a systematic review of gentrification and displacement studies, I show the relative prevalence of these three measures of displacement in the literature, using a sample of all available articles collected through a set of academic journal databases. I find that the approach that most closely approximates the underlying concept of displacement, the motivational approach, is the least commonly used methodology. Then, I use data from New York City to look at the three approaches in their ability to present comparable rank-orders of the amount of displacement across neighborhoods. I show that the different approaches do not consistently identify where displacement is most and least likely. Next, I show that part of the reason why these other measures misidentify concentrations of displacement is that they cannot account underlying processes of displacement, or they make untenable assumptions about mobility. In particular, the population approach masks people who stay in their neighborhood after leaving their housing unit, and do not account for the in-flow of displaced people from other neighborhoods. On the other hand, the individual approach does not account for the fundamentally different mobility patterns between those who move involuntarily and those who move willingly. Lastly, to further explore some of the possible implications of our measurement choices, I examine the relationship between gentrification and displacement, compared across the three measurement approaches. I find suggestive evidence that gentrification correlates with increased displacement for some measurement approaches, but not others. These findings suggest that in considering the relationship between gentrification and displacement, accurate measures of the dependent variable – displacement – should account for both individual mobility and the specific motivations for why people move.

Gentrification and Displacement

Gentrification has been referred to as a “chaotic concept,” since it describes multiple phenomena (Warde 1991: 223), and scholars employ a variety of definitions for it (Brown-Saracino 2017). The choices authors make in operationalizing

gentrification can lead to different empirical results (Barton 2016). For a general working definition, gentrification describes, “the process by which central urban neighborhoods that have undergone disinvestments and economic decline experience a reversal, reinvestment, and the in-migration of a relatively well-off middle- and upper middle-class population” (Smith 1998: 198).

Displacement refers to the variety of ways that people involuntarily lose their ties to a particular place. The research on displacement generally addresses it in two broad ways, through *physical displacement* of people from their residences, and through *social displacement*, meaning the various ways that people lose their social connections in – and to – a place. In a common definition of physical displacement, “Displacement occurs when any household is forced to move from its residence by conditions which affect the dwelling or immediate surroundings, and which: 1) are beyond the household’s reasonable ability to control or prevent; 2) occur despite the household’s having met all previously-imposed conditions of occupancy; and 3) make continued occupancy by that household impossible, hazardous or unaffordable” (Grier and Grier 1978: 8). Displacement thus implies that a person moved when they otherwise would have preferred to stay, and thus their mobility is to some degree involuntary. This contrasts with other types of residential mobility, where someone may move from a prior residence to take a job or buy a home. On the other hand, social displacement examines how people lose their sense of place and belonging in their community – an experience of “displacement” (Davidson and Lees 2010: 403). This can be cultural displacement or political displacement, (Brown-Saracino 2009; Hyra 2015), or the rupturing of social networks that people depend on in a community (2011). The remainder of this article will refer only to physical displacement.

Many have suggested that displacement is a result of gentrification. Ding et al. (2016) use credit score data and find a small effect of gentrification on the likelihood of people moving, and that people with lower credit scores – used as a proxy for low-income status – living in gentrifying neighborhoods were more likely to subsequently move to low-income neighborhoods. Martin and Beck (2018) found that while homeowners were not more likely to be displaced in gentrifying neighborhoods, renters were. Newman and Wyly (2006) argue that displacement is more prevalent in gentrifying areas, and that one reason we may see lower displacement levels in a gentrified neighborhood is that all the people at risk of displacement have already left.

While some imply that gentrification and displacement are two sides of the same coin – that gentrification requires displacement – others have suggested that displacement is not a necessary condition for gentrification. Freeman (2005) ascribes the compositional changes in gentrifying neighborhoods to “succession.” In succession, new groups *replace* rather than *displace* preexisting groups, as households leave a neighborhood voluntarily, and more affluent, whiter residents take their place. This is why Freeman argues that you do not see substantially greater displacement in “gentrifying” neighborhoods. Others say that incumbent residents might be more willing to absorb the increased housing costs in favor

of greater amenities and neighborhood quality (Ellen and O'Regan 2011; Guerrieri, Hartley, and Hurst 2013; Vigdor 2002). Thus, changes in neighborhood composition might not indicate displacement per se.

The competing explanations for gentrification – displacement or succession – necessitates that the concepts be analytically distinct. Some make displacement a necessary condition in their definitions of gentrification, which would technically preclude any analysis that separates them.¹ Thus, I treat gentrification as a *neighborhood-level* phenomenon and displacement as a *housing-unit-level* process. Therefore under this framework, a single home cannot “gentrify,” but rather it is once the aggregation of housing and investment patterns within a particular neighborhood passes a certain threshold do we say that a neighborhood has “gentrified.” Similarly, a neighborhood in its entirety is not “displaced” at once, even though the process of its transformation over time may consist of many individual instances of displacement from housing units. Thus by analytically distinguishing the two concepts, we can elaborate how neighborhood-level processes relate to individual-level outcomes.

Measuring Displacement

At its core, displacement is generally referred to as an involuntary residential move by a household (Grier and Grier 1978; Vigdor 2002). This means that displacement has two components, 1) somebody moves, and 2) that move was involuntary, meaning that a household otherwise would have preferred to stay. Capturing individual level mobility and the reasons for moving is difficult with most data, since both of these questions are not often directly asked on surveys. Researchers rely on a variety of proxy measures, which may or may not include these attributes. There are three broad approaches to measuring displacement quantitatively: what I call the *population approach*, the *individual level approach*, and the *motivational approach*. The population approach measures aggregate changes in the composition of a neighborhood, the individual approach uses individual-level data to identify any increase in mobility, and the motivational approach adds to the individual approach the specific reason why someone moved to determine whether that move was involuntary. These approaches are used to measure the breadth and scale of displacement – to answer the question of “how much” displacement is occurring.

One of the most readily available proxies for displacement is the *population approach*, which looks at compositional changes in a neighborhood through cross-sectional data. In this method, a given area is measured at time, t_1 , for its demographic composition (usually by income or race) and again at time,

¹Examples include: “Gentrification as a process whereby lower-class residents of degraded residential neighborhoods are displaced by higher income, white inhabitants, who invest in local infrastructure rehabilitation” (Essoka 2010: 299), and “...gentrification — that is, neighborhoods changed because higher income, usually white, households moved into low-income, minority neighborhoods and displaced the original (lower income) residents, spurring racial transition in the process” (Ellen and O'Regan 2011: 89).

t_2 . The loss in population for a particular subgroup over the time period is then attributed to “displacement” (see Zuk et al. 2015 for a review of many of these studies). This is often based on changes in the counts of the low-income households in a neighborhood (Ong et al. 2017: 65).² This is a method that is commonly used by governments and policy researchers to track and predict where gentrification and displacement is likely to occur (Chapple and Zuk 2016). This is a useful approach in seeing how populations compositionally change over time in a particular area, but does not trace actual mobility. Thus, we do not know if households actually left a given neighborhood, or instead the incomes of incumbents increased (Hochstenbach and van Gent 2015), or people moved within a neighborhood.

The *individual approach* thus seeks to improve on the population approach by relying on individual-level data to see whether a household actually moves – for any reason. This often requires either longitudinal data, or other data that otherwise documents mobility. The New York City Housing and Vacancy Survey (NYCHVS) and the American Housing Survey (AHS) both have been used to trace individual mobility (Ellen and O’Regan 2011; Freeman and Braconi 2004; Vigdor 2002). These data sources are longitudinal by housing units, allowing researchers to see who replaces a previous resident in a given housing unit. Others have used longitudinal data, such as the Panel Study of Income Dynamics, to follow individuals as the move households (Freeman 2005; Martin and Beck 2018).³ New research has used credit score data to track individual mobility patterns for low-income people (Ding et al. 2016). However, these studies do not distinguish between moves classified as displacement versus other types of residential moves that households make.

Both the population approach and the individual-level mobility approach do not identify the specific reasons that households move. The *motivational approach* is a proxy that adds to the individual approach the reasons for someone moving, in order to distinguish people who may move to take a better job or choose to move to a better home, from those who move for reasons that are not entirely of their own volition. Some surveys do ask respondents for the reason why they moved from their previous residence. Researchers have used this when analyzing the Panel Study of Income Dynamics (PSID) (Freeman 2005; Martin and Beck 2018) and the New York City Housing and Vacancy Survey (Freeman and Braconi 2004; Newman and Wily 2006; Wily et al. 2010). The specific reasons that are documented in a survey may not perfectly estimate every real-world reason for moving that would be considered “displacement,” but they help separate out those who moved for jobs or other positive reasons. Its limitation is that the data is less available than Census data, and not all individual mobility studies ask for the motivations why someone moved.

All three of these approaches should be considered as proxy measures to the “true”

²This would be formally represented as $DISPLACEMENT = LOWINC_{t_2} - LOWINC_{t_1}$.

³Both Freeman (2005) and Martin and Beck (2018) use both the individual and motivational approaches.

process of displacement. Mobility behaviors are complex, as are the reasons behind them. Nonetheless, I argue that the motivational approach should be considered the proxy that most closely operationalizes of the underlying phenomenon of displacement, since it captures both that a household did indeed move, and that that move was involuntary. However, there are limitations with this approach. Relying on self-reporting makes a number of assumptions about people and their reasons for moving: that they honestly report their reasons, that they have a single reason, and that they are fully aware of their reasons. What counts as “involuntary mobility” is also heavily conditioned on people’s alternative choice sets, which in turn are shaped by their access to resources, social networks, and other factors. In spite of these limitations, I will use the motivational approach as an approximate benchmark against which I can compare the other approaches.

Systematic review of proxies for displacement

In the next section, I conduct a systematic review (Petticrew and Roberts 2006) to show how prevalent each of these three approaches are in the literature. Indeed, the three approaches are used frequently to measure residential displacement. To determine this, I collected a sample of scholarly articles from a variety of methodologies that employed some quantitative measure of displacement somewhere in their study. Then I coded them for the specific approach(es) they used, and used their frequencies to create rates of their usage. In deriving usage rates for the three approaches, given that the specific set of research questions focus on whether displacement is *more likely* in gentrifying neighborhoods, the target population is the *quantifiable* measurements of displacement – that authors not only identify that displacement may be occurring, but specifically *how much* displacement there is. I elaborate the methodology below.

First, I created a sample of relevant articles using the “SocINDEX”, “EconLit”, and “Urban Studies Abstracts” databases through EBSCOhost. I used the search terms “gentrification AND displacement” to select the articles. I restricted the search to “academic journals”, which after removing duplicates resulted in a sample of 207 articles.⁴ Next, I restricted the data to papers – quantitative, qualitative, or mixed-methods – which include quantitative measures of displacement. A quantitative measure of displacement is something that captures a magnitude of something that the author explicitly calls “displacement.” This would still include primarily qualitative papers, which for example might include as background information descriptions of levels of “displacement” occurring near their field sites. Papers which only described instances of displacement, or neighborhoods where they asserted that displacement was occurring would not be included. After removing articles which did not have any discernible quantitative measure of displacement, I had a sample of 45 papers. It is notable that only 22% of the studies in my sample employed a quantitative measure of

⁴This excludes the following document types: Journals, Conference Materials, Books, Reviews, Magazines, Working papers, Trade publications, Dissertations.

displacement.

I then searched for how the authors operationalized what they referred to as “displacement”. I documented both the “conceptual” definitions and the “operational” definitions of displacement. A conceptual definition is how the author broadly defines displacement as a social phenomenon, while the operational definition is the specific way that they make it into a researchable object. The text of the definition was copied into a database and coded according to the typology. A displacement measure was coded as the “population approach” if it measured displacement as compositional changes in a neighborhood, often through Census data. If the measure used individual level data to track actual mobility, it was coded as the “individual approach”. If an author’s measure both tracked individual data, and included the reason why someone moved, then it was coded as the “motivational approach”. There was a residual “Other” category that had a variety of approaches. The most common was when a public housing facility would be shut down, and the people would be removed from the building. While somewhat in line with the motivational approach, since it captures both mobility and whether moving was involuntary, I categorized it as a residual category, since it was restricted to specific housing projects and thus difficult for making cross-neighborhood comparisons about the likelihood of multiple forms of displacement.

I find that the population approach was the most common, with 51% of studies using this method.⁵ Table 1 shows that the individual approach was the next common, with 26% of studies using it. The least common was the motivational approach, with 12% of studies employing this method. With a sense of the relative prevalence of these three approaches, I will next apply them to New York City.

Table 1: Prevalence of displacement approaches in literature

Approach	Share in sample
Population Approach	0.51
Individual Approach	0.26
Motivational Approach	0.12
Other	0.14

Data

The New York City Housing and Vacancy Survey (NYCHVS) is a survey administered every three years by the US Census Bureau, under contract from the City of New York. The sample is based on the most recent decennial Census and is longitudinal between Census takings. The unit of analysis is the household

⁵Proportions do not add up to 1, due to rounding and because some studies used multiple approaches.

within a specific housing unit. If a family moves out of that unit between waves of the survey, then the new household is surveyed, but the housing unit remains constant. The survey is administered by an in-home interviewer. The main focus for this paper is on the three sample years 2005, 2008, and 2011, for which the total pooled sample size is $n = 49,873$.⁶

The two main aims of the survey relate to the demographic and economic characteristics of the respondent, as well as the physical condition and traits of the housing unit itself. The survey records the amount that the respondent pays in rent, utilities, mortgage, and other housing expense information. It includes their income, differentiated by a variety of sources, including wages, SSI, TANF, unemployment, financial receipts, and others. It also includes a number of physical descriptors of the building, such as peeling paint and leaky pipes, recorded by the interviewer. The history of maintenance issues is included, as well rent regulation status.

The geographical unit of analysis provided by the NYCHVS is the “sub-borough,” which is nested within a “borough.” The boroughs of New York City are five large subdivisions, which are equivalent to counties. The sub-boroughs are 55 Public Use Microdata Areas, as designated by the Census Bureau, which are geographically bigger than census tracts and zip codes, but smaller than boroughs. In New York City, sub-boroughs roughly correspond to “community districts,” which are administrative subdivisions that each have their own Community Boards of appointed residents to make community-level decisions. Thus, while not the most granular geography, they are nonetheless intelligible as a kind of neighborhood in the city. Community districts vary widely in population, ranging from about 52,000 to about 247,000 people, with an average size of about 139,000, according to 2010 New York City Department of City Planning data. In this article, the words “sub-borough” and “neighborhood” will be used interchangeably.

To measure displacement, the NYCHVS is able to both answer the question of whether a person moved as well as their reason for moving. To determine mobility, the survey asks whether the respondent moved in the past three years. Then it asks for which neighborhood they lived in for six months or more, as long as it was within New York City.⁷ When paired with the respondent’s current reported neighborhood, this allows me to create origin-destination patterns for household mobility.

Next, to determine the whether a move was involuntary, the survey asks for the reason why the household moved from their previous residence. The survey provides thirty-three possible options for the respondent, such as “job transfer,” “needed larger house or apartment,” “to attend school,” and others. To help isolate people who moved due to displacement, the responses I am concerned with are:

⁶The 2014 and 2017 waves of the survey are not used for this article, since they are missing a question I require to make the methodology consistent across years.

⁷This question about previous residence was not asked in 2002, 2014, or 2017, and thus these years are not included in this analysis.

“Wanted less expensive residence/difficulty paying rent or mortgage,” “Evicted,” “Poor building condition/services,” “Harassment by landlord,” “Displaced by urban renewal, highway construction or other public activity,” and “Displaced by private action (other than eviction)” (see Table 2 for a summary of reasons for moving, among displaced movers). Any of these responses were coded as “displaced,” as they indicate an involuntary move. This is the same definition used by other researchers who used the NYCHVS to measure displacement (Freeman and Braconi 2004, Newman and Wyly 2006, Wyly et al. 2010). A similar definition of displacement is also used with the PSID (Freeman 2005, Martin and Beck 2018).

Table 2: Reasons for moving, among the displaced

Reasons	Share of displaced movers
Wanted less expensive residence/difficulty paying rent or mortgage	0.59
Poor building condition/services	0.14
Displaced by private action (other than eviction)	0.13
Evicted	0.08
Harassment by landlord	0.05

The advantage of the NYCHVS is that it solves some of the limitations of other datasets, which make it amenable to evaluating displacement methodologies. While Census data is available for every neighborhood at a variety of scales, it does not trace individual mobility or record the reason why someone moved. On the other hand, nationally representative data such as the AHS or the PSID, trace individual mobility, but typically do not have sample respondents in large enough numbers to say anything about how displacement concentrates in a particular neighborhood in a given city. The NYCHVS thus both captures individual mobility and the reasons why someone moved, and it has a large enough sample size to speak to how displacement concentrates in a neighborhood. I will use these advantages to test how well the varying displacement approaches consistently report the relative levels of displacement across neighborhoods.

Testing the methods of displacement

To test the comparability of the three different proxy approaches for measuring displacement, I examine whether they achieve similar rank-orders of neighborhoods for their magnitudes of displacement. If the three approaches achieve approximately similar relative results, then they should produce similar rank-orders of amount of displacement occurring across neighborhoods – the neighborhoods experiencing the most displacement and those experiencing the least displacement should be comparably ranked across the different approaches.

While the motivational approach is the most closely aligned with the underlying concept of displacement, the other methods might be satisfactory if they perform comparably well, and the data is more readily available. To test whether this is the case, I compare the three approaches to measuring displacement with the NYCHVS and the Census during the same years for which I have data, 2005-2011.

Measures

For the population approach, I follow the work of the Urban Displacement Project (Ong et al. 2017: 65) as well as the threshold commonly used by the City of New York, which measures displacement as the loss in the number of low-income households in a neighborhood, defined as those who make less than 80% of the city’s median income.⁸ To do this, I use 1-year American Community Survey (ACS) estimates of household income from at the PUMA geography from 2005 and 2011.⁹ The median income for New York City for each year is taken, to determine the 80% threshold. Since Census estimates for household income are binned into \$5,000 intervals, to determine which estimates should be included in the low-income category, I round to the nearest \$5,000. I then take the resulting count estimates of low-income households and subtract the 2011 estimates from the 2008 estimates to determine how many low-income households were “displaced” over the time period in a given neighborhood. I then rank the neighborhoods based on how many people were displaced according to the measure.

Under the individual approach, I use the NYCHVS to measure the number of household moves out of a housing unit between 2005-2011 for each neighborhood in the city, irrespective of their stated motivation for moving or their income. This follows work by (Ding et al. 2016; Ellen and O’Regan 2011; Freeman and Braconi 2004; Vigdor 2002). To do this, I count the number of heads of household who reported that they moved in the past three years, as well as units that were reported vacant, but were not new constructions.¹⁰ I repeat this for each of the three waves of the survey. I then pool the counts of “displacement” by neighborhood and rank the neighborhoods by how many households moved over the time period.

The motivational approach also uses the NYCHVS to measure how many households moved between 2005-2011, who also stated that their reason for moving was involuntary. To do this, I include those heads of household who stated that

⁸While I use the Census estimates for the city’s median income, some use the HUD-designated Area Median Income, which I discuss below.

⁹I use 1-year estimates to align with the years of the NYCHVS survey. 5-year estimates taken at the midpoint are not possible for 2005, since that was the year that the ACS. As a robustness check described later in the paper, I do attempt to make estimates from the 5-year data.

¹⁰These units could be vacant due to a temporary gap between occupants, renovations, conversion to non-residential purposes, legal disputes, the unit is used for recreational purposes, and other reasons.

they moved in the past three years and provided a reason why they moved. I then count the number of respondents who said they were “displaced” from their previous residence (according to the definition described in Table 2). I then aggregate those respondents by their reported *previous* residence, to determine where they were displaced from. Those neighborhoods are then ranked by the number of people displaced from that neighborhood over each of the three waves of the survey.

Neighborhood rankings of displacement

To see whether the three approaches identify similar neighborhood concentrations of displacement, I compare the rank orders of the 55 neighborhoods according to each displacement approach over the years 2005-2011. To illustrate, in Table 3 I show a sample of the top five and bottom five neighborhoods with the most and least displacement according to the motivational approach. Also, in that table are the rankings for those neighborhoods according to the other approaches. (A full table of the rankings for all the 55 neighborhoods can be found in the Appendix). A neighborhood with rank “1” indicates the neighborhood with the most displacement and “55” is the neighborhood with the least, according to each approach.

Table 3: Rank order of relative neighborhood displacement, across approaches

Neighborhood	Rank Motiv.	Rank Indiv.	Rank Pop.
Bedford Stuyvesant	1	23	36
Lower East Side/Chinatown	2	8	19
Bushwick	3	26	17
Upper West Side	4	2	28
...
South Shore	52	38	45
Bayside/Little Neck	53	52	47
Hillcrest/Fresh Meadows	54	37	50
Bellerose/Rosedale	55	34	21

Figure 1 graphically presents the results of the comparison of the three approaches. The histogram shows how much the ranking of a particular neighborhood under one approach differs from the ranking for that same neighborhood under the reference approach: the motivational approach. In general, a tall, narrow histogram around zero would indicate that the different approaches achieve similar rankings, while a wide histogram would suggest that the rankings differ greatly. Positive values in the histogram indicate that the particular approach under-ranks the amount of displacement in a neighborhood when compared with the motivational approach. Negative numbers indicate that it over-ranks the amount of displacement. There are 55 neighborhoods in New York City.

The top histogram, labeled “Motiv-Indiv,” shows how different the ranks of the individual approach are from the reference group, the motivational approach. The second histogram, “Motiv-Pop” similarly compares the population approach to the motivational approach.¹¹ The figure shows wide variation in how neighborhoods are ranked in the amount of “displacement” they experience. The difference in rankings across the 55 neighborhoods can be by as much as 49.

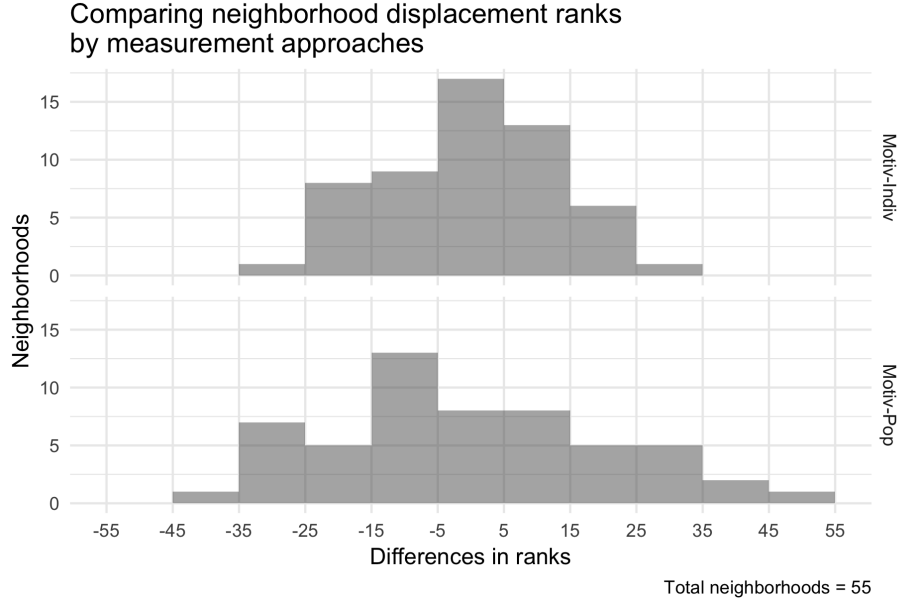


Figure 1: Differences in rankings across approaches

I then calculate Spearman’s ρ which measures the correlation between two rankings. Like other correlation coefficients, it ranges between -1 to 1. For the motivational and individual approaches, $\rho = 0.67$, and is statistically significant. The coefficients comparing the motivational and population approaches is $\rho = 0.06$, and is not significant.¹² The population approach is thus a poor proxy when compared to the motivational approach. While the correlation between the motivational and individual approaches is positive, it stretches the bounds of what might be considered a good proxy variable, which should serve as a substitute for the unmeasurable variable.

I conduct a number of robustness checks. To test whether the population approach masks variation within sub-boroughs, I use the same methodology for census tracts, ranking them on a city-wide scale. I then average the rankings

¹¹A similar comparison between the population and the individual approaches can be found in the Appendix.

¹²Comparing the individual and the population approaches yields $\rho = 0.12$, and is also not significant.

within a sub-borough, and then re-rank the sub-boroughs based on those averages. This adds more variation in the comparison rankings between the population and motivational approaches. I additionally use 5-year American Community Survey data and the Area Median Income (AMI) levels designated by the Department of Housing and Urban Development. Both of these increase the variation between the rankings of the population and the motivational approaches. I also attempt to estimate the number of low-income households with a linear approximation estimate, instead of rounding to the nearest income bin provided by the Census, which also leads to increased variation in the rankings. Thus the above findings should be taken as a conservative estimate of how far the population approach diverges from the motivational approach in identifying neighborhood concentrations of displacement.

Why the approaches miscount displacement

Now that we have established that the other measures are inconsistent proxies for displacement, why is that the case? What processes do they mask? I document three ways that these approaches mis-measure displacement: some displaced people stay in their neighborhood, neighborhoods both send and receive displaced people, and displacement is not consistently proportional to other types of mobility.

Staying while displaced

Some are displaced from their home, but not their neighborhood. There has been some prior qualitative research indicating some people find ways to stay in gentrifying neighborhoods (Hyra 2015). I find in New York City that 37% of displaced people stay within their original neighborhood, while an additional 29% move to an adjacent neighborhood (see Table 4). Adjacent neighborhoods have borders that touch, identified using the *rgeos* package in *R*. Displaced households seem to have a similar propensity to stay in their neighborhood or move to an adjacent neighborhood as those who move for other reasons. This suggests that most households seek to stay near their original community. While the specific reasons how and why people stay require further investigation, it could be to maintain connections to social and family networks, access to school and work, and the amenities they were used to in their community.

Table 4: Mobility rates by destination, for displaced and non-displaced movers

	Non-displaced movers	Displaced
Stayed in neighborhood	0.36	0.37
Moved to adjacent neighborhood	0.29	0.29
Moved to non-adjacent neighborhood	0.35	0.34

This is a non-trivial share of displaced people who remain in their neighborhood.

A majority of the displaced try to stay in or near their community. Not accounting for displaced people who stay in their neighborhood would cause the population approach to undercount the amount of displacement in a neighborhood. This is because the population approach can only account for losses and gains in the absolute number of people residing in a neighborhood between two points in time. A displaced household that remains in their neighborhood would thus not appear as having been “lost” from the neighborhood according to the population approach.

In-displacement

Another limitation of the population approach is that it cannot account for the simultaneous in-migration of people displaced from other neighborhoods. By tracking the origin and destination patterns of displaced households, we can see both where they were displaced from, and where they were displaced to. While there is variation across neighborhoods in how much displacement is occurring, there is also variation in how much neighborhoods are receiving displaced people. To measure the in-displacement for a neighborhood, I aggregate displaced households by their *current* neighborhood, while out-displacement is calculated by aggregating households by their *previous* neighborhood.

Figure 2 shows the net displacement across neighborhoods using the motivational approach. This is measured by subtracting a neighborhood’s magnitude of in-displacement from its level of out-displacement. Purple indicates a net displacing neighborhood, while orange represents a neighborhood that is a net receiver of displaced households. Bold outlines around neighborhoods indicate displacement “hot-spots,” which have the highest levels of both in- and out-displacement. This is measured by calculating the total displacement flow by adding each neighborhood’s in- and out-displacement and taking the highest 25% of total displacement flows.

Without accounting for the in-displacement into neighborhoods, the population approach undercounts the amount of displacement. This is because it cannot capture if, for example, a low-income person who had left a neighborhood would be replaced by another low-income person who arrives from another neighborhood. This would lead to a net zero change, according to the population approach.

Proportionality of mobility

The individual approach assumes that the rates of displacement are proportional to rates of mobility for those who move for any reason. The validity of this assumption is testable by comparing the displacement rates to the all-mobility rates for a given neighborhood. Across New York City, I find that on average, every three years 22% of people move residences. Of those movers, about 9.5% are “displaced.” For mobility to be a suitable proxy for displacement, we would need to see similar proportions across neighborhoods.

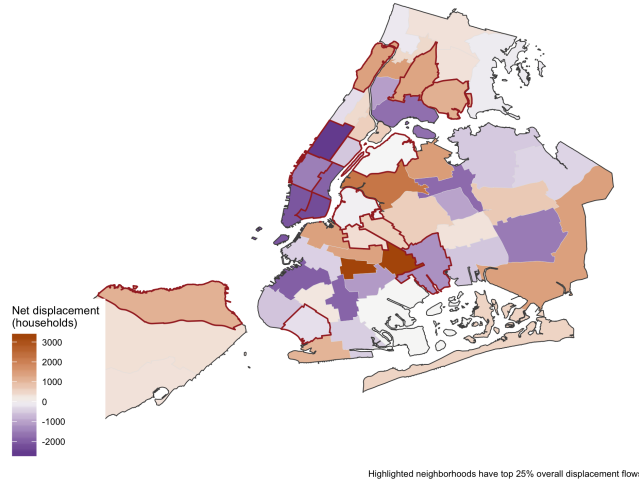


Figure 2: Net Displacement

Figure 3 shows a map of displacement as a share of all mobility across neighborhoods. If displacement was consistently proportional to mobility, we would see little differentiation across neighborhoods, and would be close to 0.09 as the proportion of moves that are due to displacement. Instead we see a range from 0.06 to 0.29. Darker colors mean that displacement is a greater share of all mobility. Moreover, we can see that this disproportionally clusters in certain parts of the city. Given that much of the research on displacement examines the *relative* likelihood of displacement across neighborhoods, this suggests that using the individual approach as a proxy would lead to inconsistent estimates of the amount of displacement across neighborhoods.

Effects of measurement choices: relating gentrification to displacement

As an exploration of the possible consequences of our measurement choices, I return to the question of the relationship between gentrification and displacement. If the measures are interchangeable, then we should see comparable correlations with between gentrification and displacement across the three measures. Through a series of simple OLS models, I show that one's chosen approach to measure displacement can potentially affect their results. I find that gentrification is positively and significantly associated with higher magnitudes of displacement according to the motivational approach, but not the others. However, given a number of limitations I will discuss below, this analysis should be considered illustrative.

I use a modified version of Freeman's (2005) measurement of gentrification, which has been used elsewhere in the literature (Barton 2016; Martin and Beck 2018).

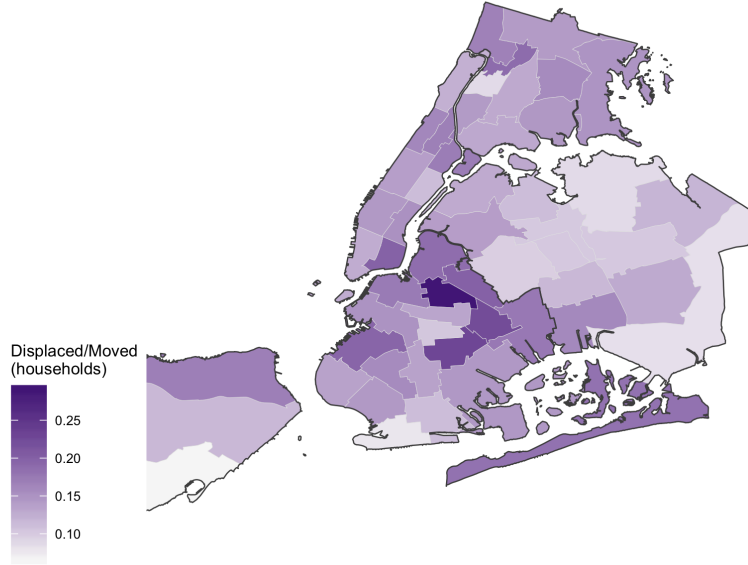


Figure 3: Displacement as share of all mobility

Freeman’s measure first identifies “potentially gentrifying” neighborhoods at a initial decennial census which are 1) are within a central city, 2) are below the median income for the metropolitan area, and 3) have a share of housing built within the past 20 years below that of the median for the metropolitan region. Neighborhoods are then considered to have “gentrified” if at the subsequent decennial census they have 1) had an increase in the share of residents with a college degree greater than the median increase for the metropolitan area, and 2) had an increase in real housing prices. I use Freeman’s measure to identify gentrifying neighborhoods in New York City, modifying it in two ways. First, since the NYCHVS data is restricted only to New York City, I instead used city-level comparisons, rather than metropolitan area. Second, I remove the criterion for housing built within the past 20 years. In many places, including New York City, a great deal of gentrification happens through older housing stock. While gentrification often includes new construction, early concepts of gentrification specifically focused on changes through existing housing stock, such as brownstones, lofts, or larger apartment buildings (Davidson and Lees 2010; Smith 1996). Thus I exclude the new building criterion.¹³

The dependent variables are the magnitudes of displacement according to each of the three approaches, as described in the above sections. I use Census data to

¹³The new building criterion would have excluded the following neighborhoods, which by many accounts should be included in the pool of gentrifying neighborhoods: Central Harlem, East Harlem, Bushwick, Bedford Stuyvesant.

determine sub-borough areas that gentrified between 2000 and 2010, of which there are 13 neighborhoods. Table 1 in the Appendix lists these neighborhoods in bold. This three-level categorical variable (0 = potentially gentrifying, 1 = gentrified, 2 = other neighborhood) is my primary independent variable. I additionally include control variables for the number of low-income households in a neighborhood and the total population, both in the year 2000. This is to account for the possibility that displacement is more prevalent in neighborhoods where there are more people or more at-risk low-income people. I then standardize the variables to facilitate comparisons between the approaches, and use OLS regression to estimate parameters.

I find that whether gentrification is a significant predictor of neighborhood displacement levels depends on the choice of measurement. Table 5 shows that according to the motivational approach, displacement is approximately 0.84 standard deviations higher in gentrifying neighborhoods than non-gentrifying neighborhoods, while the individual and population approaches do not report a significant relationship between gentrification and displacement. The individual approach – which does not account for whether moving was involuntary – does not report a significant association with gentrification, but does with total population and low-income population. This suggests that mobility in general is more prominent in more populous neighborhoods and neighborhoods with fewer low-income households, but *involuntary* mobility is mostly prevalent in gentrifying neighborhoods. The population approach does not report any significant relationship.

Table 5: Relationship between gentrification and displacement, by measurement approach

	Motivational	Individual	Population
Gentrified neighborhood	0.841*	0.420	-0.421
Other neighborhood	0.159	-0.188	0.125
Low-income population	0.115	-0.562*	-0.043
Total population	0.153	0.665***	0.034
Constant	-0.271	-0.014	0.043
N	55	55	55
R^2	0.177	0.326	0.061
Adjusted R^2	0.111	0.273	-0.014
Residual Std. Error (df = 51)	0.943	0.853	1.007
F Statistic (df = 3; 51)	2.687*	6.044***	0.811
p < .05; **p < .01; ***p < .001			

This analysis suggests that our measurement choices can be consequential for our findings – but this is subject to a number of important limitations. First, the number of neighborhoods (n = 55) restricts how many variables can be included

in the analysis, thus limiting the ability to control for potential confounding variables. Additionally, the challenges in measuring gentrification mirror those for measuring displacement, as numerous approaches are used to identify gentrifying neighborhoods (??). A full accounting of those challenges is beyond the scope of this paper. However as a robustness check, I attempted the analysis with two other prominent measures of gentrification by Ellen and O'Regan (2008) and McKinnish et al. (2010).¹⁴ While I find differences between the measures in terms of the size and direction of the coefficients, the gentrification measures produce large standard errors. This is because the Ellen and O'Regan and McKinnish et al. measures identify significantly fewer neighborhoods as “gentrified” – two and five neighborhoods, respectively (See Table 1 in the Appendix for a comparison of these neighborhoods). Moreover, the neighborhoods identified by these other methods do not correspond as well as the modified Freeman method to neighborhoods that were gentrifying during the time period, according to firsthand knowledge of the city. As a result, these findings should be taken as suggestive evidence of the implications of measurement choices, but robust conclusions of the relationship between gentrification and displacement require further analysis.

Conclusion

This paper has shown that common proxy measures of displacement lead to different estimates of neighborhood concentrations of displacement. This lack of consistent proportionality across the approaches might lead to biased estimates when examining the comparative likelihood of displacement across neighborhoods. The population approach – the most common method of approximating displacement – is a particularly volatile measure. This is partly because some households remain in their neighborhood after they are displaced from their home, and neighborhoods both displace and receive displaced people. Displacees also have fundamentally different mobility patterns than those who move for other reasons, leading to divergences between the individual and motivational approach. These findings point the importance of accounting for the motivations behind someone moving when examining mobility patterns, particularly in the context of gentrification.

However, this is not to suggest that measuring the compositional changes of neighborhoods or individual mobility patterns are unimportant or invalid, especially for understanding the various processes associated with gentrification. Indeed, depending on one's research questions, these can be important calculations. My

¹⁴Ellen and O'Regan (2008) define a gentrifying neighborhood as those neighborhoods which start with an average household income that is 70% of the metro area average (in this case, I use the city average to maintain consistency with the other measures.), and subsequently sees at least a ten percentage point increase in the ratio between the average household income of the neighborhood and the MSA (city). McKinnish et al. (2010) identify as gentrifying those neighborhoods that begin in the 20th percentile of average household incomes, and then experience an increase in the average household income by at least \$10,000. As in the above measure, I calculate these at these measures at the sub-borough level.

argument is simply that these approaches are fundamentally measuring different things, and we should be careful when assuming they are equivalent. These findings suggest that if our goal is to measure displacement – understood as involuntary household mobility – then the population and individual approaches do not consistently measure that.

In addition to suggesting more precise ways of measuring displacement, this study also points to future avenues of research. As shown above, by tracing the actual mobility pathways of individuals, we see that some might be displaced from their home, but not their community. Despite being involuntarily pushed from one’s home, people are resilient and may find ways to stay in their neighborhood. This opens up future research possibilities for the conditions under which households might stay, as well as the consequences of staying. In New York City, 43% of people who stay in their neighborhood after being displaced are still rent-burdened, signaling a risk of future displacement.¹⁵ The extent to which preserving local social networks, ties to schools, and other community assets by staying in one’s neighborhood might help prevent future displacement, or are simply delaying the inevitable, is a possible future research question.

These findings also suggest that displacement does not only harm the poor. Many studies explicitly or implicitly restrict displacement to something that only affects poor households (Ding et al. 2016; Freeman 2005). Displacement does not just affect low-income or gentrifying communities – it occurs in every neighborhood in New York City and across the income distribution. A landlord can raise your rent to the point where you have to move whether you make \$30,000 or \$90,000 a year. In the context of gentrification, this could be indicative of a cyclical model, where early waves of “gentrifiers” are subsequently displaced by increasingly affluent in-movers. Future research could look at the interactions between the mobility patterns of movers from the mobility patterns of the displaced.

There are some limitations with this data, which also point to further avenues of research to improve methodologies of studying displacement. The survey only allows for one reason why someone moved. People make mobility decisions for a variety of reasons, of which displacement pressures may or may not be primary (Newman and Wily 2006). For example, someone who primarily moved to begin cohabiting with a romantic partner, but also was facing a steep rent increase, would not be captured as having been “displaced” by this data. This suggests that allowing for multiple responses as in the Milwaukee Area Renters Study (Desmond 2016) or rank-ordering of reasons for moving would be beneficial to capture the complexity in reasons for moving. Moreover, when someone reports moving due to “high housing costs”, we don’t know if that was because: 1) their housing costs increased, 2) other expenses increased, 3) their income decreased, or 4) they wanted to downsize. The displacement data here is also restricted to households who currently live in New York City. Therefore, if someone is displaced outside of the city, they are lost to the analysis. The data also does

¹⁵“Rent-burdened” is a standard definition indicating a household that spends more than 30% of its income on rent.

not capture someone who enters the shelter system or other institutional housing (Newman and Wyly 2006). The survey also does not have data available at a smaller geography than the sub-borough area, which may mask heterogeneity of displacement patterns within neighborhoods. Data availability also limits the ability to consistently examine this over a longer continuous time period, which could also potentially reveal different patterns.

These results suggest that the reasons why people move are important for explaining their mobility patterns. People who move involuntarily have different movement pathways than those who move of their own volition. When these patterns aggregate to neighborhoods, they identify different hot-spots of mobility, depending on the reason why people move. It suggests that we need to actually measure mobility when we examine displacement. Future research will need to improve data collection or find ways to adjust for these differences. By more accurately measuring displacement, we can more closely understand the various processes and mechanisms that affect the housing security of families in rapidly changing cities and communities.

Appendix

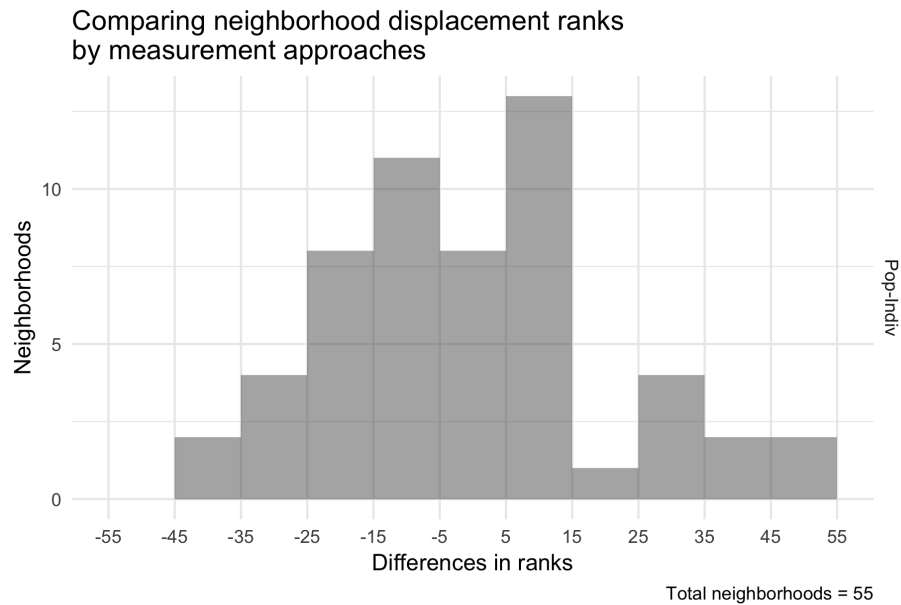


Figure 4: Differences in rankings, individual and population approaches

Table 6: Rank order of relative neighborhood displacement, across approaches

Neighborhood	Rank Motiv.	Rank Indiv.	Rank Pop.
Bedford Stuyvesant ?	1	23	36
Lower East Side/Chinatown	2	8	19
Bushwick ?	3	26	17
Upper West Side	4	2	28
Chelsea/Clinton/Midtown	5	4	53
Astoria	6	7	2
Williamsburg/Greenpoint & ?	7	15	16
East New York/Starrett City	8	41	52
Upper East Side	9	1	12
Jamaica	10	19	49
North Shore	11	14	26
Flatbush	12	30	43
Greenwich Village/Financial District	13	5	34
Bensonhurst	14	11	4
Sunset Park	15	29	37
Park Slope/Carroll Gardens	16	16	7
Stuyvesant Town/Turtle Bay	17	3	46
Elmhurst/Corona	18	36	13
Bay Ridge	19	27	31
Morrisania/East Tremont	20	20	48
Flushing/Whitestone	21	6	55
Soundview/Parkchester	22	18	30
Highbridge/S. Concourse	23	39	41
Washington Heights/Inwood	24	17	1
Flatlands/Canarsie	25	33	39
Brooklyn Heights/Fort Greene	26	9	14
Morningside Heights/Hamilton Heights	27	25	8
Rockaways	28	40	32
East Flatbush	29	42	29
Forest Hills/Rego Park	30	32	5
Williamsbridge/Baychester	31	24	44
Jackson Heights	32	22	27
Sunnyside/Woodside	33	21	9
North Crown Heights/Prospect Heights	34	10	6
Mott Haven/Hunts Point	35	50	11
East Harlem	36	43	24
Central Harlem & ?	37	13	23
Borough Park	38	44	25
Howard Beach/S. Ozone Park	39	55	42

Neighborhood	Rank Motiv.	Rank Indiv.	Rank Pop.
Pelham Parkway	40	49	40
Middle Village/Ridgewood	41	12	51
Mid-Island	42	47	3
Sheepshead Bay/Gravesend	43	35	33
Kingsbridge Heights/Mosholu	44	28	10
Brownsville/Ocean Hill ?	45	46	22
Kew Gardens/Woodhaven	46	31	38
University Heights/Fordham	47	45	20
Throgs Neck/Co-op City	48	54	35
Riverdale/Kingsbridge	49	48	15
South Crown Heights	50	53	54
Coney Island ?	51	51	18
South Shore	52	38	45
Bayside/Little Neck	53	52	47
Hillcrest/Fresh Meadows	54	37	50
Bellerose/Rosedale	55	34	21

Bold = Freeman (2005); ? = McKinnish et al. (2010); & = Ellen & O'Regan (2008)

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