

**Unequal Displacement:  
Gentrification, Racial Stratification, and Residential Destinations in Philadelphia\***

Jackelyn Hwang  
*Stanford University*

Lei Ding  
*Federal Reserve Bank of Philadelphia*

June 2020

Forthcoming in *American Journal of Sociology*

**Abstract**

Sociological theory and research on residential mobility and neighborhood stratification primarily explain urban decline and persistent segregation and do not account for the increasing spread of gentrification and its consequences. This study assesses how gentrification shapes whether and where disadvantaged residents move using a unique, large-scale consumer credit database of residents in Philadelphia from 2002–2014. We find that gentrification’s consequences on the residential mobility patterns of financially disadvantaged residents are unequally distributed by the racial contexts in which gentrification is taking place. Disadvantaged residents who move from nonblack gentrifying census tracts gain access to advantaged tracts, while those who move from black gentrifying tracts are more likely to move to a shrinking pool of disadvantaged urban tracts and to similar neighborhoods as disadvantaged residents moving from nongentrifying tracts. We argue that mechanisms of racial stratification that govern both the valuation of neighborhoods and neighborhood sorting patterns explain these differences. Our analysis demonstrates how gentrification in the twenty-first century is fundamentally structured by racial stratification and reconfiguring the urban landscape and residential sorting in ways that exacerbate neighborhood inequality by race and class.

**Keywords:** gentrification, displacement, residential mobility, racial stratification, credit scores, Philadelphia

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\* Direct correspondence to Jackelyn Hwang, Department of Sociology, 450 Jane Stanford Way, Bldg. 120, Stanford, CA 94305; e-mail: [jihwang@stanford.edu](mailto:jihwang@stanford.edu). The authors thank the anonymous reviewers, Jacob Faber, David Grusky, Robert M. Hunt, Tomás Jiménez, Douglas Massey, Ann Owens, Elizabeth Roberto, and audiences of various workshops, seminars, and conferences for their helpful feedback. This research was supported in part by the Eunice Kennedy Shriver National Institute of Child Health & Human Development of the National Institutes of Health (Grant No. T32HD007163). The views expressed in this paper are those of the authors and do not necessarily reflect the views of the Federal Reserve Bank of Philadelphia, the Federal Reserve System, or the National Institute of Health.

## **Unequal Displacement:**

### **Gentrification, Racial Stratification, and Residential Destinations in Philadelphia**

Large-scale economic and demographic transformations and the perpetuation of discriminatory housing policies and neighborhood preferences left many inner-city and predominantly black neighborhoods depopulated and in dire conditions during the latter half of the twentieth century (Wilson 1987; Massey and Denton 1993). But after decades of decline, some low-income central city neighborhoods have gentrified—they are undergoing a socioeconomic upgrading characterized by reinvestment and the in-migration of middle and upper-class residents (Smith 1998).<sup>1</sup> Although gentrification had been occurring in pockets throughout large cities for several decades, its rate and spread increased substantially since the late 1990s (Hackworth and Smith 2001; Hwang and Lin 2016), spurring increased public and scholarly debate about the redistribution of disadvantaged urban residents (Atkinson 2004).

Sociological theory and research on residential mobility and neighborhood stratification underscore how race-based neighborhood preferences and racially stratified residential sorting are central to explaining the decline of urban neighborhoods and cities, white flight and white residents' avoidance of central city, particularly minority, neighborhoods, and persistent segregation. These mechanisms may have served well for explaining much of the twentieth century, but the intensification and spread of gentrification, particularly to black urban neighborhoods, implies a fundamental shift in neighborhood preferences and racially stratified neighborhood sorting. Whether and how these processes apply to gentrification and its

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<sup>1</sup> Although there is no clear consensus in the literature over the definition of gentrification, we use this broad conceptualization, which generally aligns with most research and does not assume residential displacement or racial turnover for which evidence is mixed.

consequences requires further empirical analysis of who can stay, who moves out, who can move in, and where people can move in general as neighborhoods gentrify.

Numerous studies employing a range of methods have examined whether and how gentrification leads to residential displacement, producing a mixed set of results and overall conclusions (Brown-Saracino 2017). Qualitative accounts tend to document the unscrupulous ways low-income residents in gentrifying neighborhoods, particularly minority neighborhoods, are forced out of their homes and priced out of their gentrifying neighborhoods. In these accounts, middle- and upper-class newcomers arrive, businesses turnover, housing prices soar, neighborhoods whiten, all resulting in communities becoming “lost” and their cultural histories erased (e.g., Wellman 1979:1204; Zukin 2010; Hyra 2014). Yet quantitative inquiries consistently produce no evidence that disadvantaged or minority residents in gentrifying neighborhoods move more, in general or involuntarily, than they would have if they lived in lower-income neighborhoods that do not gentrify (e.g., Freeman 2005; McKinnish, Walsh, and White 2010; Ellen and O’Regan 2011; Ding, Hwang, and Divringi 2016; Martin and Beck 2018). Nor do quantitative studies find that gentrification disproportionately occurs in minority, especially predominantly black, neighborhoods (e.g., Owens 2012; Hwang and Sampson 2014). While gentrification is increasingly occurring in minority, including black, neighborhoods compared to the past (Owens 2012; Freeman and Cai 2015), gentrification is not the dominant trend in these neighborhoods. Some have even concluded that the portrayal of gentrification’s negative consequences for low-income and minority residents are “overstated” (Brown-Saracino 2017:526).

We argue that the existing research on gentrification has taken a limited view of residential displacement that focuses on *whether* residents move (for a review, see Carlson

2020). This focus obscures the complex reality of residential mobility, particularly among disadvantaged residents. Socioeconomically disadvantaged residents often experience forced moves regardless of gentrification resulting from exploitative landlords and financial instability (Desmond 2016), while those in gentrifying neighborhoods may try to stay in their neighborhoods as long as possible (Freeman 2006; Ellen and O'Regan 2011). Residents in both gentrifying and nongentrifying neighborhoods also make planned moves, which are often upward, when the opportunity arises (Rossi 1980; DeLuca et al. 2013). Such opportunities may be more likely in gentrifying neighborhoods where increasing values allow some to cash out. Thus, gentrification can serve as a mechanism that exacerbates financial disadvantage for some as costs rise, inducing an involuntary and constrained move. But, gentrification can also induce an upward move, providing financial advantage to others.

Perhaps more importantly, focusing exclusively on whether residents move ignores the context of racial stratification that imbues the housing market, from the valuation of neighborhoods to discriminatory practices by landlords and realtors, to informational differences that lead to stratified neighborhood destinations (Logan and Molotch 1987; Massey and Denton 1993; Charles 2003; Sampson and Sharkey 2008; Krysan and Crowder 2018). Despite gentrification's increasing prevalence in predominantly black neighborhoods relative to the past (Owens 2012; Freeman and Cai 2015), gentrification is slower and residents are more vulnerable to exploitative landlords in these neighborhoods (Pattillo 2007; Hwang and Sampson 2014; Desmond and Shollenberger 2015). Some residents may make voluntary or planned moves as a result of the dynamics of gentrification and others may make involuntary moves. But, the constraints of these moves likely differ across neighborhoods and their residents.

We expand the analytical purview of residential displacement to examine *where*

disadvantaged residents move when they move—both from within and outside of gentrifying neighborhoods. In doing so, our analysis offers a clearer view of the consequences of gentrification on residential displacement. Given the compounding evidence showing that living in disadvantaged neighborhoods can have detrimental effects on individuals' life chances (Sharkey and Faber 2014), the destination of movers from gentrifying neighborhoods bears out the material consequences of gentrification in full. Moreover, knowing *where* disadvantaged movers—including movers from beyond gentrifying neighborhoods—end up allows for an assessment of whether and how gentrification is restructuring the economic space of cities and surrounding areas as gentrifying neighborhoods become unaffordable and shift where disadvantaged movers end up (Davidson 2008; Newman and Wyly 2006; Sampson and Sharkey 2008).

The fact that the residential destinations of movers has been overlooked in the empirical research on gentrification is partly due to the lack of data with temporal and spatial detail for a large sample of residents. Drawing on a large-scale restricted consumer credit database of more than 50,000 randomly sampled adult residents with financial credit records in Philadelphia, Pennsylvania from 2002–2014, this study is the first to our knowledge to empirically examine how gentrification is associated with whether and where disadvantaged residents move; and whether this relationship varies across the neighborhood racial contexts in which gentrification is taking place.

We demonstrate that gentrification's consequences on the residential mobility patterns of financially disadvantaged residents in Philadelphia are unequally distributed by neighborhood racial composition. Financially disadvantaged residents in gentrifying census tracts—characterized by high influxes of higher-socioeconomic status (SES) residents and high increases

in housing prices—do not move more often than those in nongentrifying tracts across neighborhood racial compositions. However, financially disadvantaged movers from once predominantly black gentrifying tracts, which comprise half of the gentrifying tracts in Philadelphia, tend to end up in more disadvantaged tracts than where those moving from other gentrifying tracts end up, and they end up in similar neighborhoods to those moving from nongentrifying tracts. In other words, financially disadvantaged residents who move from tracts that were not predominantly black benefit from gentrification in terms of locational attainment, whereas those moving from once predominantly black tracts do not. We also show that financially disadvantaged individuals moving to and within the city are increasingly likely over time to end up in disadvantaged tracts that are not experiencing gentrification. This pattern of intracity residential mobility reflects how gentrification reduces the overall pool of neighborhoods accessible to financially disadvantaged residents within the city.

These findings bring the consequences of gentrification in the twenty-first century into fuller focus. Gentrification is reconfiguring the urban landscape by shrinking residential options within cities for disadvantaged residents and expanding them for more advantaged residents. Because mechanisms of racial stratification govern both the valuation of neighborhoods and residential sorting patterns, the benefit of gentrification as a mechanism of financial advantage disproportionately accrues to those in nonblack gentrifying neighborhoods, providing access to a broader set of neighborhoods, while those from black gentrifying tracts are relegated to less advantaged neighborhoods and face fewer options within the city—exhibiting similar mobility patterns as other disadvantaged residents from nongentrifying neighborhoods. Taken together, our findings show how the consequences of gentrification are fundamentally structured by racial stratification and help explain how gentrification is a mechanism that restructures residential

sorting in racialized ways that exacerbate neighborhood inequality by race and class in cities today.

### **Residential Mobility, Neighborhood Change, and Racial Stratification**

The neighborhood changes associated with the spread of gentrification has stimulated a growing body of research on its consequences, particularly surrounding residential displacement (Atkinson 2004).<sup>2</sup> Despite the rapid growth in scholarship on the topic, studies, particularly those using quantitative approaches, do not find consistent empirical evidence that gentrification is associated with higher rates of moving out of a neighborhood in general or involuntarily. However, insights from qualitative accounts and surveys of gentrification's consequences on residential mobility, research on the residential instability of the urban poor, and scholarship on residential mobility and racial stratification highlight the complexity of residential mobility. We draw on this research to guide our framework for improving our understanding of gentrification's consequences.

#### *Gentrification and Residential Mobility*

Qualitative accounts document the various ways by which residential displacement takes place in gentrifying neighborhoods: formal processes such as eviction or tax foreclosure; housing demolition or ownership conversion of rental units; landlord neglect or harassment; financial inducements offered by landlords or developers to entice existing residents to leave; or, through

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<sup>2</sup> Other important consequences associated with displacement examined by others include additional financial burdens for residents (Newman and Wyly 2006); social, cultural, and political displacement and exclusion (Anderson 1990; Martin 2007; Zukin 2010; Hyra 2014); and the displacement of businesses, amenities, and land use (Marcuse 1986; Davidson 2008).

household decisions in response to rising costs and financial hardship (Marcuse 1986; Newman and Wyly 2006; Brown-Saracino 2017). These different scenarios underscore the fact that the distinction between forced and voluntary moves resulting from gentrification can be unclear. Before a neighborhood begins gentrifying, residents may have purchased or inherited homes when values were cheap, while others may have been paying low rents to build wealth to eventually move elsewhere. As housing values increase with gentrification, some households may be able to take advantage of the increased neighborhood value to sell their homes for a large profit or by receiving payouts from developers or landlords, who may be incentivized to rehabilitate properties to take advantage of larger potential profits. Thus, for some households, gentrification can serve as a pathway to upward locational attainment. In this scenario, moves are both forced by gentrification yet voluntary, planned, and potentially beneficial. As with most existing data, including ours, capturing the circumstances of moves is limited (for an exception, see Desmond and Shollenberger [2015]). Earlier studies on gentrification and displacement use survey data asking whether moves were involuntary (e.g., Freeman 2005), but these data lack specific information to distinguish between the complexity of circumstances associated with gentrification described above.

Other studies suggest that poor residents in gentrifying neighborhoods may be more inclined to stay in their neighborhoods. Surveys and interviews reveal that lower-socioeconomic status (SES) and long-term households in gentrifying neighborhoods report higher levels of neighborhood satisfaction, which may explain why households try to stay if they can (Freeman 2006; Ellen and O'Regan 2011). Studies show how disadvantaged residents stay in gentrifying neighborhoods because many have housing subsidies; other residents increase the number of people living in a housing unit or employ other strategies to bear the increased costs (Freeman

2006; Newman and Wyly 2006; Ellen and O'Regan 2011). Finally, some long-term, low-SES residents are homeowners who purchased or inherited their homes when values were cheap, and thus have more protections from rising costs than renters (Ding et al. 2016; Martin and Beck 2018). Thus, most of the neighborhood-level demographic changes in gentrifying neighborhoods reflect the influx of higher-SES and predominantly white residents filling vacant units, including new construction, rather than the outmigration of lower-SES residents (Freeman 2005; McKinnish et al. 2010; Ellen and O'Regan 2011).

### *Residential Instability Among the Urban Poor*

Recent research documenting the residential instability of the urban poor show that disadvantaged residents in urban neighborhoods move relatively often regardless of gentrification (Desmond 2016). Desmond (2016) demonstrates how processes like eviction and landlord harassment and neglect occur often in poor urban neighborhoods. Thus, outmigration rates among disadvantaged residents in nongentrifying neighborhoods—the comparison group—may be exceptionally high because many of these neighborhoods are among the poorest, where disadvantaged residents frequently experience residential instability (Newman and Wyly 2006). Insights from recent works by Deluca and colleagues (2013) and Desmond and Shollenberger (2015) point to the importance of *where* residents move for understanding the constraints of residential mobility for disadvantaged residents. While some residents make voluntary and planned moves to better neighborhoods, minority and disadvantaged residents are more likely to move under forced circumstances resulting in moves to neighborhoods with similar or worse quality compared to their origin neighborhood.

### *Residential Mobility and Racial Stratification*

Even when making voluntary and planned moves, however, some residents, particularly racial minorities, may end up in similar or worse quality neighborhoods due to place stratification processes. Although race and ethnicity are central to the public discourse and debates on gentrification and displacement, surprisingly few studies on the subject systematically consider residential stratification by race. Place stratification perspectives argue that residential sorting patterns reflect racial inequalities that are not fully explained by socioeconomic indicators. Predominantly black neighborhoods are consistently preferred less and valued lower than neighborhoods with greater shares of white residents (Charles 2003). Further, black and white residents, net of socioeconomic differences, persistently tend to move to and from neighborhoods with starkly different social and economic conditions and racial and ethnic compositions from each other (Sampson and Sharkey 2008; Crowder, Pais, and South 2012). Crowder and South (2005) find that black residents are substantially more likely than white residents to move from nonpoor to poor census tracts and less likely to move from poor to nonpoor census tracts. Explanations for such differences include distinct preferences among the housing and neighborhood options available; the ability to realize such preferences because of discriminatory processes throughout various aspects of the housing market; and the information that residents have on these options through social networks or realtors (Charles 2003; Crowder et al. 2012; Krysan and Crowder 2018).

Historically, gentrification in predominantly minority neighborhoods, particularly African-American neighborhoods, was relatively rare and instead more likely to occur in racially and ethnically diverse neighborhoods or those with fewer shares of black residents (Freeman 2009; Hwang and Sampson 2014; Bader and Warkentien 2016). However, gentrification is more

likely to occur in predominantly black neighborhoods in recent decades compared with the past (Owens 2012; Freeman and Cai 2015), though gentrification in these neighborhoods may be slower or stagnant (Hwang and Sampson 2014). Nonetheless, gentrification's increasing occurrence in once predominantly black neighborhoods presents potentially distinct implications for disadvantaged residents in these neighborhoods, given the racialized structure of the housing market faced by minorities and in how black neighborhoods are valued. Indeed, ethnographic accounts of gentrification in minority neighborhoods show that low-income minority residents experience distinct challenges associated with their marginal positions in society. In Latino neighborhoods in Chicago, for example, Betancur (2011) highlights how gentrification destroyed place-based networks and institutions on which racial and ethnic minorities rely for social support and opportunities, causing many low-SES Latinos to disperse to other disadvantaged neighborhoods. Pattillo (2007) also portrays a similar vulnerability among disadvantaged, long-term black residents in a predominantly black Chicago neighborhood gentrified by middle-class black residents.

Our data do not contain information on individuals' race, but we can examine if the residential mobility patterns from gentrifying census tracts differ by their racial composition. Disadvantaged residents in gentrifying tracts with fewer shares of black residents may be better positioned than other financially disadvantaged movers either to stay in their tracts or to take advantage of increased housing values and wealth-building to move upward, despite moving in response to gentrification. On the other hand, disadvantaged residents who move from black gentrifying tracts may be subject to less favorable circumstances. For example, their neighborhoods may be valued less, thus providing them with lower cash offers to move; or, landlords and developers may engage in more exploitative practices in these neighborhoods to

drive disadvantaged residents out as they gentrify. Further, if the movers from predominantly black neighborhoods are indeed black, they may also experience discrimination in the housing market or have information on options that lead them to sort into disadvantaged tracts, regardless of whether their moves were voluntary or planned (Sampson and Sharkey 2008; Crowder, Pais, and South 2012; Desmond and Shollenberger 2015).

While we cannot distinguish whether and to what extent racialized mechanisms are occurring at the individual- or tract-level in this study, our analysis provides a necessary step to further our understanding of gentrification's consequences. To our knowledge, McKinnish et al.'s (2010) analysis of gentrification and displacement from 1990–2000 is the only quantitative study that examines differences between black and nonblack tracts. They do not find elevated rates of outmigration among low-SES or black residents in black gentrifying tracts, but their study did not examine residents' destinations and took place when gentrification in black neighborhoods was less prevalent.

Altogether, prior research on gentrification and displacement has focused primarily on two trajectories for disadvantaged residents in gentrifying neighborhoods—staying or moving, but moves can differ in important ways. Whether moving as a function of gentrification is forced or voluntary is not clear cut, but knowing where disadvantaged residents end up when they move provides a clearer view of the consequences of gentrification. Because few data sources have information on *where* residents move, only a few studies, to our knowledge, have examined where residents from gentrifying neighborhoods move (Freeman 2005; Newman and Wyly 2006; Ding et al. 2016). Freeman (2005) examined whether residents move within or outside of one's census tracts using data from the PSID but did not examine characteristics of residents' destinations. Newman and Wyly (2006) examined sub-borough destinations in New York City,

which have populations greater than 100,000, of residents who reported being displaced, but these geographies are too large to assess the implications of the destinations of residents. Finally, Ding et al. (2016) use similar data to our study to assess outmigration rates and whether financially disadvantaged movers are more likely to move to a tract in a lower quintile of median household income than their origin tract. While informative, because nongentrifying tracts are in low income quintiles, it is not surprising that they find that residents in these tracts are less likely than movers from gentrifying tracts to move to tracts with lower income quintiles than their origin. Thus, our understanding of how gentrification affects residential stratification remains limited from these analyses.

#### *Residential Sorting and Neighborhood Stratification*

Most research on residential mobility and gentrification has focused on individual processes, but the aggregate consequence of residential flows associated with gentrification has implications for broader patterns of residential stratification (Sampson and Sharkey 2008). Scholars have argued that gentrification can *indirectly* displace residents by reducing affordable neighborhood options for *all* disadvantaged residents (Newman and Wyly 2006; Davidson 2008; Slater 2009).

Gentrification implies a restructuring of the economic space of cities as financially disadvantaged residents who remain in the city are increasingly concentrated in a reduced set of affordable neighborhoods within the city. This can also increase the suburbanization of poverty (Kneebone and Berube 2013).

The increased concentration of disadvantaged residents in fewer neighborhoods within the city, coupled with increasing affluence in gentrifying neighborhoods, increases inequality between neighborhoods at the bottom of the hierarchy of neighborhoods and the rest of a city's

neighborhoods. Thus, even if disadvantaged individuals do not move more frequently from gentrifying neighborhoods relative to nongentrifying neighborhoods, as studies consistently find, residential sorting among disadvantaged movers associated with the spread of gentrification can result in emergent patterns of neighborhood inequality within a city and new dynamics of neighborhood inequality within the suburbs. To our knowledge, no studies on gentrification have examined this broader process of indirect displacement with information on where residents move as gentrification spreads.

### **The Present Study**

Our study aims to expand our understanding of the consequences of urban neighborhood change in cities today by proposing a broader framework for examining displacement in the context of gentrification. First, we argue that the implications of gentrification concern not only *whether* someone moves but also the characteristics of *where* they move. Given that gentrification can provide financial advantage to some but exacerbate financial disadvantage for others, for individual households, *where* they move sheds light on the material consequences of gentrification in full. Second, we theorize that gentrification and displacement are embedded in a racially stratified housing market. Third, we propose that the consequences of gentrification on residential stratification also concern residential mobility patterns of residents *beyond* those in gentrifying neighborhoods. Gentrification's effect on individuals' residential mobility patterns in turn affect broader patterns of neighborhood inequality. This framework guides our analysis.

Given prior research on gentrification, displacement, and residential mobility, we expect that financially disadvantaged residents are equally or more likely to stay in gentrifying tracts relative to disadvantaged residents from nongentrifying tracts. We also expect those from

gentrifying tracts to end up in similar neighborhoods as disadvantaged residents moving from nongentrifying tracts because the literature on residential instability among the urban poor suggests that financially disadvantaged residents from gentrifying tracts will tend to move downward, whereas residents from nongentrifying tracts will tend to churn among poor neighborhoods. It is also plausible that residents from gentrifying tracts will tend to move upward as they are more likely to cash in on the increased value of gentrifying neighborhoods and will therefore end up in more advantaged neighborhoods than those from nongentrifying tracts.

While disadvantaged residents from both gentrifying and nongentrifying tracts may often move under unfavorable circumstances and end up in disadvantaged neighborhoods, we expect to find heterogeneity in the residential mobility patterns depending on where residents move from based on prior research on residential stratification by race. Specifically, we expect that financially disadvantaged movers from gentrifying tracts that have lower shares of black residents will have lower likelihoods of moving and, among movers, they will move to better neighborhoods compared to those moving from tracts that were once predominantly black and to those moving from nongentrifying tracts. Lastly, we hypothesize that indirect displacement is occurring, such that financially disadvantaged residents in general who are moving to or within the city are increasingly less likely to move to gentrifying tracts and increasingly more likely to move to nongentrifying tracts compared to other tracts over time.

### *Credit Scores and Residential Stratification*

Our analysis focuses on residential mobility patterns among financially disadvantaged residents, as measured by credit scores. Credit scores are a measure of an individual's ability to pay debt

without defaulting and serve as an increasingly important and often overlooked dimension of stratification, particularly in the housing market (Poon 2007; Wherry et al. 2019). Although credit scores were originally used to screen loan applicants, banks now use them to stratify credit offerings, loan products, and interest rates. In addition, a variety of institutions beyond banks increasingly rely on credit scores for assessing the worthiness and responsibility of individuals: employers use credit scores to screen job applicants, landlords use them to screen tenants, and insurance companies use them to calculate prices (Mester 1997; Fellowes 2006; Poon 2009; Wherry et al. 2019). For understanding residential displacement in the context of gentrification, low credit scores, as well as the lack of a credit score, reflect financial disadvantage and serve as a good gauge of vulnerability to displacement. If the primary mechanism of gentrification-induced displacement is increased cost burdens, then those with low or missing credit scores are more likely to feel the consequences of these cost burdens and face further limitations in housing searches if they move.

Credit bureaus incorporate a variety of factors that relate to loan performance to compute credit scores, including previous payment history, outstanding debts, length of credit history, new accounts opened, and types of credit used (Federal Reserve Board 2007; Fair Isaac Corporation 2015). Events such as delinquency, large increases in one's debt, and events of public record (e.g., bankruptcy or foreclosure) often lead to low credit scores (Anderson 2007). Because the age of accounts is positively associated with credit scores, younger adults generally have lower scores than older ones, but the other factors have much greater influence in determining credit scores (Fair Isaac Corporation 2015). While credit bureaus do not factor race, gender, or income into the calculations, they correlate highly with race and income levels (Bostic, Calem, and Wachter 2005; Brevoort, Grimm, and Kambara 2016; Wherry et al. 2019).

Nonetheless, individuals with low credit scores may span the income or wealth distributions, and low scores better reflect individuals' ability to bear financial burdens. For example, Mester (1997) found that credit scores better predict foreclosure than income. Thus, credit scores represent a novel and distinct dimension of SES that can also limit or expand opportunities for individuals, particularly in the housing market.

Credit records, however, exclude individuals who do not have Social Security Numbers (SSNs) (e.g., noncitizens and unauthorized immigrants) or a credit history—approximately 26 million Americans, or one in 10 adults (Brevoort et al. 2016). While Wherry and colleagues (2019) estimate that 45 million U.S. adults do not have any credit score, nearly half of these adults are represented in our data. Credit records include anyone with past foreclosure or bankruptcy or individuals whose files only consist of closed or authorized user accounts. These individuals are often lower-income consumers and typically have missing scores, which indicates a “thin” file—a file containing very few accounts or new credit such that there is too little information to estimate a score (Brevoort et al. 2016:26). Despite the advantages of credit records for capturing financial disadvantage and residential histories, these data disproportionately exclude low-SES residents; thus, our analysis likely underestimates the extent to which gentrification affects low-SES residents' mobility patterns.

### *Research Setting*

Our study is a case study of Philadelphia. Given the heterogeneity across housing and labor markets and policies and the complexity of each one (Crowder et al. 2012), a case study of a single city allows us to carefully interpret and explain residential mobility patterns associated with gentrification. A national analysis that controls for unobserved heterogeneity across cities

can obfuscate important processes and inhibit our ability to understand what processes are at work. By focusing on a single city, we can also identify gentrification more reliably and check our measures against local knowledge and city-specific data. Operationalizing gentrification has been notoriously challenging in the gentrification literature, especially because gentrification has distinct characteristics across different cities and over time. Applying uniform criteria does not always capture areas undergoing similar changes or experiencing the socioeconomic transformations that are consistent with local understandings and qualitative depictions of gentrification (Wyly and Hammel 1999; Owens 2012; Barton 2016). Because our dataset contains more than 50,000 adult residents in the city of Philadelphia alone, a major advantage of our dataset over other longitudinal datasets with geographic information, such as the PSID, it provides us with the necessary statistical power to examine residential mobility patterns associated with gentrification within a single city and to stratify across various subpopulations within census tracts.

Philadelphia is well-suited for a study of gentrification and residential mobility patterns. Not only does much of the sociological literature on residential stratification and segregation examine Philadelphia itself (e.g., Dubois 1899; Anderson 1990; Hunter 2013), Philadelphia also shares many similarities with other cities featured prominently in this literature. Philadelphia experienced large-scale socioeconomic and population declines during the latter half of the twentieth century, leaving many inner-city neighborhoods with high vacancy and poverty rates and ripe for redevelopment (Smith 1996). Like other cities with similar histories of urban growth and decline, Philadelphia has a substantial share of black residents, comprising 44% of the population in 2016 and the largest racial group in the city, and very high levels of black-white segregation (Massey and Denton 1993). In recent decades, especially since 2000, gentrification

has expanded and accelerated in many Philadelphia neighborhoods abetted by property tax programs, a vibrant central business district, and strong anchor institutions (e.g., Drexel University, Temple University, University of Pennsylvania) (Gillen 2013). Despite housing price declines and slowed construction during the Great Recession, gentrification has continued to spread (Pew Charitable Trusts 2011).<sup>3</sup> Philadelphia is not experiencing the extreme housing demand and price increases of the handful of cities with more limited housing supply, like San Francisco or New York City, but gentrification has now spread well beyond the handful of “superstar cities” (Gyourko et al. 2013:167) over the last twenty years to Philadelphia and other cities with looser housing markets that have formed the basis for urban sociological theory and research (Hackworth and Smith 2001; Hwang and Lin 2016).

Philadelphia, nonetheless, has some unique characteristics that may lower the degree to which disadvantaged residents move compared to other cities. First, Philadelphia has a high vacancy rate relative to other large U.S. cities (Capperis, Ellen, and Karfunkel 2015), though a recent report found sharp declines in low-cost rental units in gentrifying neighborhoods in Philadelphia from 2000–2014 (Chizeck 2017). In addition, before 2014, the city had not assessed its properties, particularly older ones, for decades, which allowed long-term homeowners in gentrifying neighborhoods to avoid property tax increases.<sup>4</sup> Finally, Philadelphia has a historically high homeownership rate relative to other large cities (Capperis et al. 2015).

## **Data and Measures**

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<sup>3</sup> The Philadelphia metropolitan area experienced a relatively low foreclosure rate during the housing crisis compared with other large metropolitan areas (Pew Charitable Trusts 2011).

<sup>4</sup> Any effects from the City’s tax programs implemented in 2014 are beyond the period of our analysis.

Our data come from the Federal Reserve Bank of New York/Equifax Consumer Credit Panel (hereafter, CCP). These restricted data provide quarterly information on individuals' year of birth; credit characteristics; and the quantity, balance, and payment activity of mortgages and other credit accounts from June 2002<sup>5</sup> to June 2014 for an anonymized 5% random sample of adult consumers with SSNs and a credit history—having at least one public record (e.g., bankruptcy or foreclosure) or at least one credit account currently reported with Equifax (Lee and van der Klaauw 2010).<sup>6</sup> Most importantly for our study, the data provide individuals' census tracts (based on Census 2000 boundaries). The data, however, do not provide important demographic information, such as race, ethnicity, and income. While other longitudinal datasets, such as the PSID, contain richer demographic information, they have limited samples within cities and neighborhoods.

The CCP data is designed to provide a representative sample of individual consumers across the nation in any given quarter. Thus, younger individuals who develop credit histories and new immigrants are generally added, and older consumers who die, emigrate from the U.S., or have a prolonged period of inactivity are generally dropped. Approximately 1-3% of consumers are dropped from the panel, while a similar share of consumers is added each year. Because of this data structure and our focus on Philadelphia, we do not examine residential stability for the same individual over a longer period for this study. Instead, we construct our analytic dataset by considering each year of CCP data as a separate cohort for which we observe

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<sup>5</sup> The CCP data begin in 1999, but we begin our analysis in June 2002 because Wardrip and Hunt (2013) found that the geographic information prior to 2002 was less precise.

<sup>6</sup> Files of consumers with one of five numbers in the last two digits of their SSN are selected into the sample. The data that Equifax makes available to researchers do not include actual SSNs or any other identifying information, such as names, full addresses, or demographics (besides age category). About 5% of households have multiple adult householders in the CCP sample; results are similar when we exclude individuals in the same household.

mobility over an interval of one year. This strategy mitigates the potential bias introduced by the attrition and adjustment of the study sample. Our analytic sample consists of 517,429 person-years for residents living in the city of Philadelphia at any point in 2002–2013.<sup>7</sup>

Compared with estimates in Philadelphia from the American Community Survey (ACS), the population size and age distribution are similar, particularly for individuals between 25 and 65 years old. Because the sampling universe of these data excludes individuals with no credit history, the ACS population estimates for those younger than 25 years are larger than the CCP estimates, and the CCP estimates are slightly higher for individuals older than 65 years, which is likely because files for recently deceased individuals have not yet been removed. We exclude individuals younger than 25 years and older than 84 years in our analysis. This exclusion also ensures that we do not include college-age residents who are highly residentially mobile and often live in gentrifying areas associated with universities.<sup>8</sup> We present results including populations that are 65-84 years old because studies suggest that older individuals may experience displacement from gentrification (Henig 1981), but results are similar in separate analyses that exclude these individuals and that include 18-24-year-olds.

The CCP data report the Equifax Risk Score (hereafter, the Score)—a proprietary credit score estimating the likelihood that an individual will repay his or her debts without defaulting. The Score ranges from 280 to 850, with a low Score indicating lower financial health.<sup>9</sup> Our main

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<sup>7</sup> We excluded data from 2004 because the mobility rate in this year was abnormally high compared with other years and with estimates from the ACS, which is likely due to a change in the internal geocoding system made by the data vendor in 2004.

<sup>8</sup> Because we do not have information on individuals' school enrollment status, our analysis may include students who are 25 years and older.

<sup>9</sup> The three major credit bureaus—Equifax, Transunion, and Experian—collect consumer information independently and produce credit scores using various scoring models. While the scores are similar, they use slightly different scales.

subgroup of interest is residents with Scores below 580—a commonly used cutoff in credit underwriting<sup>10</sup> that captures financially unstable residents—and individuals who are in the data but do not have Scores. We group individuals without Scores with low-Score residents in the analysis since having no or few credit accounts generally indicates financial instability (Calem, Gillen, and Wachter 2004). Among our sample, 26.6% have Scores below 580 and 10.1% do not have Scores. The distribution of residents with low or missing Scores (we refer to this group as low-Score residents hereafter) in our sample across gentrifiable census tracts is higher in socioeconomically disadvantaged tracts and those with higher shares of black residents.

### *Measuring Gentrification*

For this study and consistent with characterizations in the literature, we conceptualize gentrification as a socioeconomic transformation comprised of both an influx of residents with relatively higher SES *and* an increase in housing prices in previously low-income central city neighborhoods.<sup>11</sup> We construct a measure of gentrification with 2000 decennial U.S. Census data and ACS 2009–2013 five-year estimates for census tracts located in the city of Philadelphia. We use census tracts as our unit of analysis for uniformity across our multiple datasets. We harmonized these data to the Census 2000 tract boundaries using the method employed by Brown University’s Longitudinal Tract Data Base, which uses both population and areal weighting. We exclude 16 census tracts with fewer than 50 residents or with no housing units

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<sup>10</sup> For example, the official minimum FICO score cutoff for low down-payment products for a Federal Housing Administration loan is 580 (see <http://archives.hud.gov/news/2010/pr10-016.cfm>).

<sup>11</sup> Although some scholars document gentrification in rural towns or suburbs or describe it as a citywide phenomenon, we adhere to the classic conception of it as a central city phenomenon occurring at the neighborhood-level.

during the period of the analysis, resulting in a sample of 365 census tracts.

The year 2000 is our baseline year, and we examine tract-level changes from 2000–2013.<sup>12</sup> Following existing approaches (e.g., Wyly and Hammel 1999; Freeman 2005; Ding et al. 2016), we consider tracts to be gentrifying if they were *gentrifiable*—if they were previously relatively low-income tracts such that they could undergo revitalization—and exhibited socioeconomic upgrading. We categorize tracts as gentrifiable if they had a median household income below the citywide median household income in 2000.<sup>13</sup> We use only income because other indicators—such as education levels, rent, or home values—as thresholds exclude downtown and university areas where gentrification is prevalent.

We consider a tract to be *gentrifying* if it experienced a percentage increase above the median increase across all of the city’s tracts in either its median gross rent or median home value *and* an increase above the median increase across the city’s tracts in its share of college-educated residents.<sup>14</sup> We consider gentrifiable tracts that do not meet these criteria as

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<sup>12</sup> We use 2013 hereafter, but most data are based on 2009–2013 ACS five-year estimates.

<sup>13</sup> This approach excludes neighborhoods undergoing “super-gentrification” (Lees 2000:398) that may have gentrified in earlier periods and had a median household income above the citywide median in 2000. This is consistent with the working definition of gentrification used in this paper as a phenomenon that occurs in previously low-income, central city neighborhoods. Nearly 80% of tracts that were gentrifying over the 10- or 20-year periods before 2000, according to our measure, were still gentrifiable in 2000. We also do not use metropolitanwide incomes as the threshold like some studies (e.g., Freeman 2005) because, in Philadelphia, over 80% of central city tracts, including those that are widely considered wealthy areas, fall below this threshold. We also separately examined tracts in the bottom quartile of the tract income distribution to examine if we are only capturing trends among tracts that begin the period with more advantage. About half of the gentrifying tracts begin in the bottom quartile, and our substantive results are generally similar. We note when there are differences, and results are available upon request.

<sup>14</sup> Alternative measures that use metropolitanwide median increases as thresholds or include tracts with percentage increases in income above the citywide median produce similar results. We also considered various stages and rates of gentrification. Our main results are qualitatively similar for tracts that are experiencing more rapid rates of gentrification or that have been gentrifying since before 2000, which both capture tracts in the more advanced stages of gentrification. These results are available upon request.

*nongentrifying*. We require shifts in both house prices and residents to avoid categorizing tracts as gentrifying with housing price spillovers but without demographic changes. We also include changes in either housing values or rents because both measures reflect shifts in various amenities and investment in a tract, but shifts in one dimension do not always occur in step with the other.<sup>15</sup> We include shifts in the educational status of the population over 25 years old because this better reflects the influx of young professionals often associated with gentrification compared with other measures such as household income, particularly for artists, nonprofit workers, and younger workers with lower paying jobs (Ley 1996). Education status also better captures the influx of new residents rather than incumbent upward mobility (Freeman 2005).

Figure 1 displays a map of Philadelphia and identifies tracts that were gentrifying, nongentrifying, and nongentrifiable during 2000–2013. Of the 365 census tracts in our analysis, 184 were gentrifiable in 2000, of which 56 were gentrifying. The map also distinguishes census tracts that were more than 50% black from those that were less than 50% black in 2000. We present results only distinguishing between black and nonblack tracts because, while the Latino and Asian populations have grown substantially since 2000 in Philadelphia, there are few predominantly Latino and Asian tracts. Of the 184 gentrifiable tracts, 109 of these tracts were more than 50% black in 2000 and 75 were not. Of the tracts that were over 50% black, 28 were gentrifying according to our measure; the other 28 gentrifying tracts were less than 50% black in 2000. Thus, 25.7% (28 of 109) of predominantly black low-income tracts gentrified, while 37.3% (28 of 75) of nonblack low-income tracts gentrified. This is consistent with quantitative scholarship that finds that gentrification is less likely in black neighborhoods compared to others.

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<sup>15</sup> Indeed, only about one-third of gentrifiable tracts experience both substantial increases in rents and home values over the period. In gentrifiable tracts in Philadelphia, median home values increased at faster rates than median rents.

Nonetheless, 50% of gentrifying tracts are predominantly black, and, given the historical persistence of neglect and disinvestment in predominantly black tracts, its substantial presence across gentrifying tracts make this phenomenon notable in the public sphere. Black and nonblack tracts in our sample are generally divided into the eastern and western sides of the city, with tracts in the downtown and university areas as exceptions.

[Figure 1 about here.]

To ground-truth our measures, we examined the demographic and housing characteristics from the US Census and 2013 ACS data for these tracts, facilitated focus groups with local researchers and practitioners, and compared our measures against two alternative indicators of gentrification used in past research: coffee shops (Papachristos et al. 2011), using data obtained from the Esri Business Locations Database from 2006–2012,<sup>16</sup> and filed building permits (Helms 2003), using data obtained from the Department of Licenses & Inspections in Philadelphia from 2009–2013. Table 1, which presents descriptive characteristics of tracts in each gentrification category, illustrates that our measure is consistent with characteristics often associated with gentrification: Compared with nongentrifying tracts, gentrifying tracts had greater increases in the shares of white residents, college-educated residents, median home values, and rents. In addition, gentrifying tracts had greater decreases in shares of black residents and poverty rates and greater increases in renters. While tracts that were gentrifying over the period began the period with similar levels of median household incomes, poverty, and median rents as those that did not gentrify, gentrifying tracts had higher shares of college-educated residents and higher home values at the beginning of the period. Tracts that we identified as gentrifying also had far greater numbers of building permits per 100 housing units, greater numbers of coffee shops per

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<sup>16</sup> Source: <https://doc.arcgis.com/en/esri-demographics/data/business.htm>

100 residents, and greater increases in the number of coffee shops.

[Table 1 about here.]

Comparisons between black gentrifying (B-G) and black nongentrifying (B-NG) tracts and between nonblack gentrifying (NB-G) and nonblack nongentrifying (NB-NG) tracts yield similar differences (see Table 1). Black and nonblack tracts, however, are notably different from each other and reflect the reality of racial stratification in Philadelphia. While B-G and B-NG tracts had similar racial compositions at the beginning of the period, NB-NG tracts were much more racially mixed compared to NB-G tracts. Most of the racial changes observed in the averages of gentrifying tracts occur among the B-G tracts, having average declines in the shares of black residents by 18.5% and average increases in shares of white residents by 13.6%. NB-G tracts also experienced declines in their black shares but only by 4.7%. Black tracts began the period with lower median rents and housing values on average compared to nonblack tracts. Although B-G tracts had greater average percent increases in home values and rents compared with NB-G tracts, home values and rents in B-G tracts were still substantially lower on average by the end of the period, reflecting a persistent racial hierarchy among gentrifying tracts.

### *Neighborhood Quality Indicators*

We assess four dimensions of the tracts to which residents move: 1) violent crime rates; 2) disadvantage; 3) median household income, and, 4) school test scores. We obtained tract-level violent crime rates using geocoded data from the Philadelphia Neighborhood Information System<sup>17</sup> for 2002–2005 data and the Philadelphia Police Department for data from 2006–

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<sup>17</sup> Source: [www.cml.upenn.edu/nis](http://www.cml.upenn.edu/nis).

2014.<sup>18</sup> These rates include non-negligent homicide, aggravated assault, and rape and are per 1,000 residents based on linearly interpolated tract populations from Census 2000 and the 2009–2013 ACS estimates.

For disadvantage and median household income, we use Census 2000 data and the 2009–2013 ACS five-year estimates, linearly interpolated for 2002–2014. We follow Wodtke and colleagues (2011) and employ principal component analysis—a statistical method that converts a set of variables that may be correlated into a set of linearly uncorrelated variables—to construct a composite measure of disadvantage. The disadvantage index is derived from the first principal component of the following indicators: percent unemployed, percent of residents living below the poverty level, percent of families headed by a female, percent of families on public assistance, percent of residents older than 25 years with less than a high school degree, percent of residents older than 25 years with at least a college degree, and percent of employed residents in professional or managerial occupations. In 2000, the resulting index ranged from –1.87 to 9.37, with higher values indicating more disadvantage. All variables included are correlated with the disadvantage index in their expected directions.

We obtained elementary school test scores on the Pennsylvania System of School Assessment, an annual standardized exam that measures student achievement in reading, mathematics, science, and writing, from the Pennsylvania Department of Education.<sup>19</sup> For each elementary school in Philadelphia, we calculated the sum of the proportion of students in the highest-grade level in the school (grades 4 or 5) scoring proficient or advanced—the standard

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<sup>18</sup> The data for 2002–2005 only include aggravated assault. To calculate violent crime rates for these years, we used linear predictions based on the relationship between aggravated assault and violent crime using the 2006–2014 data.

<sup>19</sup> Source: [www.education.pa.gov/Data-and-Statistics/PSSA](http://www.education.pa.gov/Data-and-Statistics/PSSA).

required by federal guidelines for student progress. Using elementary school catchment area boundary maps from 2003 and 2009–2014, we matched everyone’s census block in the sample to their appropriate school catchment area and test scores using the 2003 boundaries for 2003–2008 data and the boundaries for their corresponding years for the 2009–2014 data.

Table 1 shows that gentrifying tracts on average begin the period with slightly lower levels of crime and disadvantage and higher income and test scores than nongentrifying tracts, and they had greater improvements on all measures. Further, B-G tracts have higher levels of crime and disadvantage and lower income and test scores compared with NB-G tracts in 2000. The improvements in these measures between B-G and NB-G tracts are similar, except B-G tracts had much smaller increases in income.<sup>20</sup>

## **Methods**

Our analysis of residential mobility patterns in the context of gentrification and whether this varies by tract racial composition consists of three steps. We first examine the relationship between gentrification and outmigration rates among low-Score residents in our data to test if mobility rates in our data are consistent with prior findings and if they differ by tract racial composition. Then, we assess *where* low-Score residents move from gentrifying tracts relative to those in nongentrifying tracts, and we consider two different types of outcomes: (1) the destination type (outside the city, nongentrifiable, gentrifying, or nongentrifying tracts) and (2) the destination quality, measured by four separate indicators—crime rates, a disadvantage index, income, and school test scores. For all these analyses, we test if there are differences in residential mobility patterns from predominantly black tracts compared to nonblack tracts. It is

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<sup>20</sup> Unrestricted data and relevant code are available at <https://purl.stanford.edu/sn305sy2961>.

important to note our expectations given the counterfactual for these analyses. If gentrification does indeed have negative consequences for individuals' residential destinations, we expect that the types and quality of the residential destinations will *not* differ among low-Score residents between movers from gentrifying and nongentrifying tracts. In other words, we expect that financially disadvantaged residents from gentrifying tracts tend to move downward into nongentrifying tracts, whereas residents from nongentrifying tracts churn among nongentrifying tracts. Lastly, we examine where residents are moving over time to assess if low-Score movers are increasingly moving to nongentrifying tracts, reflecting indirect displacement as tracts gentrify throughout Philadelphia. Table 2 summarizes each analysis described below.

[Table 2 about here.]

### *Outmigration*

We estimate a linear probability model predicting whether a resident lives in a tract different from his or her origin tract one year before on whether one lives in a gentrifying tract and their Equifax Risk Score category. For the purposes of this study, we do not count moves within tracts because such a move would not reflect any change between the characteristics of the origin and destination tracts. While a resident may also move multiple times in a short period, we only count one's origin and destination over a one-year span in case of lagged address reporting. We use a linear model instead of a logistic or probit model primarily because our models rely on interaction terms, for which the interpretation of coefficients is problematic in logistic and probit models (Ai and Norton 2003; Mood 2010). Results are similar using these alternatives, and Appendix Table A1 presents results from a logistic regression model.

Our main independent variables are a set of dummy indicators for an individual's Risk

Score (no Score or Score below 580, 580–649, and 650–749, with above 750 as the reference category), a dichotomous variable for whether or not one’s origin tract is gentrifying, and a vector of interaction terms between the gentrification variable and each Risk Score category. The interaction terms allow us to test whether low-Score residents in gentrifying tracts experience differential mobility patterns than those in nongentrifying tracts. We also run these models and the next set of models replacing the gentrification dichotomous indicator and interaction terms with indicators of the racial composition and gentrification category of the tract (B-G, NB-G, B-NG, and NB-NG (reference category)) to test if residential mobility patterns of low-Score residents vary by the origin tract racial composition.

We control for observed individual and household characteristics that may also influence residential sorting patterns. Studies on residential mobility show that SES, life cycle factors (e.g., age, marital status, family status), tenure status, and unanticipated changes such as job loss or eviction influence moving decisions (Kendig 1984; Kan 1999; Crowder et al. 2012). Although the CCP has limited demographic information, we control for age as a proxy for one’s stage in the life cycle; the number of household members with credit records and SSNs, a proxy for overcrowding; whether an individual or any household member has at least one mortgage as a proxy for owners<sup>21</sup>; and whether the individual or a household member has at least one seriously delinquent (90+ days) account, which may reflect an unanticipated change that imposes a financial burden.<sup>22</sup> We also include fixed effects for each cohort to control for time trends.

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<sup>21</sup> ACS estimates, however, indicate that about 40% of households in owner-occupied units in Philadelphia do not have a mortgage, which is higher than the national average (35.7%). Because of this discrepancy, we do not present analysis separately for potential renters. When we examine residents with a mortgage versus those without one, we find similar but stronger trends among residents without a mortgage.

<sup>22</sup> Results are similar in models excluding the delinquency variable. The data do not provide direct information on length in residency. When we include a dummy variable for whether an

We include tract-level controls based on the origin tract that may influence one's probability of moving: proximity measures for the distance to City Hall, a proxy for Downtown; the nearest distance to major university areas (Temple University or University City), a proxy for other major employers in the city; the share of vacancies, obtained from U.S. Census and ACS data; subsidized housing units in each tract, determined from 2016 address-level data from the National Housing Preservation Database.<sup>23</sup> Descriptive statistics for these variables are in Table 1 and show that gentrifying tracts have more subsidized housing and are generally closer to Downtown and universities relative to nongentrifying tracts. Notably, B-G tracts had higher vacancy rates in 2000 and more subsidized housing compared with all other tracts.

#### *Residential Destination Type*

Next, we examine movers' destination type. Given that residential mobility is a two-stage process, we follow prior approaches and estimate a two-stage model where we first estimate whether one moves or stays in a census tract and then assess the destinations of the movers in the second stage of the model (Massey, Gross, and Shibuya 1994; Crowder et al. 2012). Single-stage models of only movers and without the correction produce substantively similar results for all models. Our intention in using this selection model is to adjust for observable differences between movers and stayers before comparing the residential outcomes of movers. Because there are likely differences between movers and stayers that our data do not capture and, relatedly, a

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individual lived in the census tract for more than 2 years and exclude early cohorts, the main results are similar.

<sup>23</sup> These data provide a listing of all active federally subsidized housing properties for nine separate funding streams, including Section 8 Project-Based Rental Assistance, Public Housing, and Low-Income Housing Tax Credit. See [www.preservationdatabase.org/datanotes.php](http://www.preservationdatabase.org/datanotes.php) for details.

relationship between moving or staying and where residents move, we caution an interpretation of these estimates as the direct and unbiased causal effect of gentrification.

The first-stage model predicts if an individual lives in a census tract different from his or her origin tract over a one-year period using a probit model. We include the same set of variables as the model described above, except we exclude the interaction terms between the gentrification indicators and Equifax Risk Scores. For the second stage, we predict the types of tracts to which residents move over the one-year period using a multinomial logistic regression model, with moves outside of the city as the reference category. The second stage only considers movers and includes a Heckman correction (the inverse Mills ratio) to adjust for bias in our estimates that occurs because only movers are included. This model includes the individual- and household-level control variables used above, proximity to downtown and university areas of the origin tract, and cohort fixed effects. In contrast to the first stage of the model, the second stage of the model excludes the tract-level shares of vacancies and subsidized housing, which predict the likelihood of moving but not where residents move and serve as the exclusion restrictions in our two-stage model. The second-stage model also includes the gentrification indicators and interaction terms between the gentrification variables and the Risk Score categories.

### *Residential Destination Quality*

To analyze destination characteristics, we restrict the analysis to within-city movers because, despite trends of increasing poverty in the suburbs across the U.S. (Kneebone and Berube 2013), the vast majority of suburbs in Philadelphia are much more advantaged than its central city tracts on our measures, and tract-level measures for crime and school test scores are not available outside of the city. The first-stage model predicts whether an individual moved to a tract within

the city over a one-year period using the probit model described above. The second stage model uses the same exclusion restrictions as above and estimates an ordinary least squares regression model predicting the percentile of movers' destination tracts for each indicator (crime, disadvantage, income, and test scores) in separate models. In addition to the variables included in the analysis above and the Heckman correction, we include a lagged variable of the percentile rank of movers' origin tract quality indicator.<sup>24</sup>

### *Residential Destinations across the City*

Last, we estimate a multinomial logistic regression model predicting whether residents moving into and around Philadelphia move into nongentrifiable, gentrifying, or nongentrifying (reference category) tracts. We include variables for Risk Score categories, and control variables include the type of tract from which the resident is moving (outside the city, gentrifying, nongentrifying, or nongentrifiable tracts), cohort fixed effects, and identical individual- and household-level control variables as above. We separately consider cohorts who moved during the housing boom (2002–2007), the housing bust (2008–2011), and the recovery (2012–2014) and test if the likelihood of moving into nongentrifying tracts changes over time for low-Score residents. We present results from three separate models for these periods for interpretation, but models including all cohorts and interaction terms between cohorts and Risk Scores yield similar results.

## **Results**

### *Outmigration*

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<sup>24</sup> Following Allison (1990), we use a lagged regression model rather than a change model because it is likely that one's initial origin tract characteristics, whether the tract gentrifies, and one's destination characteristics are correlated.

Table 3 presents descriptive statistics of the individual residents in our pooled sample who lived in the City of Philadelphia at any point from 2002–2013. The table also separates the sample by tract type based on residents’ origin tracts. About 10% of the sample moves each year, and gentrifying tracts had outmigration rates 3.0 percentage points higher than nongentrifying tracts. As expected, nongentrifying tracts had more residents with missing or low Scores, while nongentrifiable tracts had more residents with high Scores and mortgages. Relative to nongentrifying and nongentrifiable tracts, gentrifying tracts had more residents between the ages 25–34 years and a greater share of households with one adult.

When we compare tracts by racial composition, nonblack tracts had higher outmigration rates compared to black tracts among both gentrifying and nongentrifying tracts. B-G tracts had more residents with low and missing Scores and delinquent accounts and fewer residents with mortgages relative to NB-G tracts. Further, the Risk Score distribution is substantially higher in NB-G tracts compared to other gentrifiable tracts, which suggests that the gentrification in these tracts is farther along than in B-G tracts.

[Table 3 about here.]

Table 4 presents mobility patterns for the low-Score residents in the sample who lived in a gentrifiable tract at any point from 2002–2013. The second and third columns of the table display the share of residents in the pooled sample who are stayers and movers by their origin tract type. The remaining columns, which we discuss later, are a residential change matrix indicating the type of tract to which residents move, with the percentages only including residents who moved. Like the trends presented in Table 3, gentrifying tracts have higher outmigration rates (8.5%) than nongentrifying tracts (7.9%), even among low-Score residents, but this difference is much smaller compared to the 3.0 percentage point difference for all

residents. This indicates that higher-Score residents comprise a greater share of the outmigration in gentrifying tracts. While the outmigration rate was higher in nonblack tracts compared to black tracts for all residents, these rates were similar among low-Score residents.

[Table 4 about here.]

Once we control for individual, household, and tract characteristics in linear probability models predicting outmigration, we find that low-Score residents in gentrifying tracts are *less* likely to move than low-Score residents in nongentrifying tracts. The first bar in Figure 2 displays the difference in the predicted probability of moving from a gentrifying compared with a nongentrifying tract for the average low-Score resident.<sup>25</sup> Appendix Table A2 displays the regression results for the main variables and a summary of coefficients and results from F-tests comparing movers from different tracts by gentrification category. The difference in the probabilities is .008, which is over a 10% difference (The mobility rate among low-Score movers in the sample is 7.8 percent.). Additional individual- and household-variables positively associated with outmigration include single households and households without mortgages.

[Figure 2 about here.]

When we examine outmigration rates by the racial composition of tracts, we find that the difference between low-Score residents in gentrifying and nongentrifying tracts is driven by relatively high outmigration rates in B-NG tracts, which the last three bars in Figure 2 illustrate. There is no difference between NB-G and NB-NG tracts, but low-Score residents in B-G tracts are significantly less likely to move than similar residents in B-NG tracts, which suggest that residential instability among disadvantaged residents is particularly high in B-NG tracts. There is

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<sup>25</sup> The average low-Score mover is 33–44 years old in the 2007 cohort with an adult household size of two, no mortgage or delinquent accounts, and average levels of all other controls.

no significant difference in the probability of moving from B-G and NB-G tracts for low-Score residents, shown by the fourth bar in the figure.

Overall, the results contrast popular narratives of gentrification and displacement but support our first hypothesis that low-Score residents in gentrifying tracts are not more likely to move compared with low-Score residents in nongentrifying tracts. The findings are generally consistent with recent quantitative studies on displacement focusing on *whether* people move and findings demonstrating the high levels of residential instability that disadvantaged residents in disadvantaged, specifically black, neighborhoods face.

### *Residential Destination Type*

Now, we turn to *where* low-Score residents move if they move. The latter set of columns of Table 4 show that the largest proportions of low-Score movers from all gentrifying tracts moved to nongentrifying tracts (33.0%) or outside of the city (30.3%). But, if we compare movers by the racial composition of their origin tracts, over 40% of low-Score movers from B-G tracts move to low-income, nongentrifying tracts, reflecting downward moves. By contrast, low-Score movers from NB-G tracts make far more upward moves: only 20.5% of movers move to nongentrifying tracts, while 19.3% move to other gentrifying tracts, 25.0% to nongentrifiable tracts, and 35.2% to outside of Philadelphia—areas with significantly higher SES levels than Philadelphia tracts. The odds ratios of moving to each destination type relative to nongentrifying tracts reflect the relative differences in locational attainment for those moving from gentrifying relative to nongentrifying tracts. In other words, the locational gains by moving laterally to another gentrifying neighborhood or moving upward to a nongentrifiable tract or out of the city are 2.6 times ( $2.75/1.07 = 2.58$ ) greater for low-Score movers from NB-G tracts compared to B-G tracts.

While the odds ratio for residents from black tracts (1.07) indicates that gentrification provides some gains for these residents, this is small and substantially lower than for nonblack tracts.

The results are similar after we account for individual, household, and tract characteristics and selective differences between movers and stayers with two-stage models. Table A3 in the Appendix presents coefficients and standard errors from the models for the main variables. Low-Score movers from gentrifying tracts are less likely to move to nongentrifying tracts compared with similar movers from nongentrifying tracts, which counters our second hypothesis that residents from gentrifying tracts are just as likely to move to nongentrifying tracts compared with financially disadvantaged residents moving from nongentrifying tracts and better supports the alternative hypothesis that gentrification increases the likelihood of cashing in on the increased value of the neighborhood. However, distinguishing tracts by racial composition reveals significant differences among gentrifying tracts. Figure 3 presents comparisons of the predicted probabilities of moving to each tract type for the average low-Score mover by their origin tract's gentrification status and racial composition. Each panel represents the destination type. The first set of bars in each panel compares NB-G and NB-NG tracts, and the second set of bars compares B-G and B-NG tracts to examine differences within tract compositions. The third set of bars compares NB-G and B-G tracts to examine differential trajectories of residents by tract racial composition in gentrifying tracts.

[Figure 3 about here.]

Overall, low-Score residents moving from NB-G tracts exhibit distinct residential trajectories compared to other low-Score movers. They have a significantly lower probability than movers from B-G and nongentrifying tracts—black or nonblack—to move to nongentrifying tracts and a significantly higher probability than all other low-Score movers to

move out of the city. Given that 35% of the city's census tracts are nongentrifying, low-Score residents moving from B-G and NG tracts are disproportionately more likely to move to nongentrifying tracts. Compared to movers from B-G tracts, low-Score movers from NB-G tracts also have a higher predicted probability of moving to high-income nongentrifiable tracts.<sup>26</sup> The predicted probabilities of moving to other gentrifying tracts, however, are not substantially different across tract origins. When we compare odds ratios of moving to gentrifying or nongentrifiable tracts or moving out of the city relative to moving to a nongentrifying tract based on the predicted probabilities, those moving from B-G tracts have an odds ratio of .58, indicating that gentrification results in losses rather than gains for these residents. The locational gains for movers from NB-G tracts, who have an odds ratio of 1.70, are 2.93 times larger ( $1.70/.58 = 2.93$ ) compared with those from B-G tracts.

Altogether, the results are consistent with our third hypothesis that residential destinations may be disproportionately worse for disadvantaged residents moving from B-G tracts compared to those moving from NB-G tracts. Whereas those from NB-G tracts disproportionately make upward moves, moving to the suburbs and nongentrifiable tracts; other low-Score residents are disproportionately moving to nongentrifying tracts. Those from B-G tracts are disproportionately making downward moves compared with those from NB-G tracts.

### *Residential Destination Quality*

Next, we examine the percentile rank of movers' destinations for tract quality indicators among Philadelphia movers. We first present the average characteristics of the tracts to which low-Score

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<sup>26</sup> This difference is not statistically significant in analyses examining only movers in tracts that begin the period in the bottom quartile of median household incomes in the city.

residents move in Table 5. The table presents the average percentiles for all Philadelphia census tracts of the tract quality indicators of destinations of low-Score movers who move within the city of Philadelphia.<sup>27</sup> The values are from linear interpolations of the percentiles based on the year of the move. The table illustrates the stark differences in the types of tracts to which residents from NB-G tracts move relative to movers from B-G tracts and movers from nongentrifying tracts. In particular, low-Score movers from NB-G tracts move to tracts with significantly lower crime and disadvantage and higher income and test scores compared with all other movers, while movers from B-G tracts end up in similar destinations to those from both B-NG and NB-NG tracts. The direction of changes in percentiles from origin to destination (not shown) reflect substantial improvements for movers from nongentrifying tracts, highlighting the circumstantial differences on average for movers from nongentrifying tracts. Further, changes for movers from gentrifying tracts are varied because B-G tracts begin the period with lower percentiles on all indicators and appear to gentrify slowly—in terms of socioeconomic gains (see Table 1), while NB-G tracts begin more advantaged and change rapidly, consistent with prior research (Hwang and Sampson 2014). Thus, what appear to be upward and downward moves based on tract characteristic percentiles are conflated with changes in the origin tract itself.

[Table 5 about here.]

Next, we account for individual, household, and tract characteristics, one's origin tract percentile, and selection into moving within Philadelphia using two-stage regression models to

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<sup>27</sup> Income and disadvantage levels for all destinations outside of the city significantly exceed the distribution within the city. Nonetheless, we find that low-Score movers from NB-G tracts who move to the suburbs end up in tracts with percentile rankings 8.8 points higher and 6.6 points lower than movers from B-G tracts for income and disadvantage, respectively. Compared to low-Score movers from B-G tracts, low-Score movers from NB-NG tracts move to higher-SES tracts, and low-Score movers from B-NG tracts move to slightly lower-SES tracts.

adjust for the selective differences into moving and the distinct circumstances in which residents move. Table A4 presents coefficients and standard errors for the main variables from the models including gentrification by racial composition tract categories and testing differences by the gentrification status and racial composition of the origin tract. Figure 4 illustrates the findings from these models comparing the predicted percentiles of the tract quality indicators of movers by their origin tracts.

[Figure 4 about here.]

For brevity, we do not present results comparing movers from gentrifying and nongentrifying tracts. Low-Score movers from gentrifying tracts have predicted probabilities of ending up in relatively higher quality tracts in terms of income, schools, and crime compared with movers from nongentrifying tracts. Differences for disadvantage are not statistically significant. Distinguishing tracts by their racial composition, however, reveals results consistent with findings on tract destination types. Low-Score movers from NB-G tracts move to tracts with better quality on all indicators compared to low-Score residents moving from other tracts.<sup>28</sup> For example, those from NB-G tracts have predicted percentiles of destinations with crime and disadvantage that are 7.2 and 3.2 points, respectively, lower than those from NB-NG tracts and 7.1 and 4.1 points lower than those from B-G tracts. They also end up in tracts with income and school test score percentiles that are 7.7 and 6.6 points, respectively, higher than in NB-NG tracts, and 5.8 and 9.6 points higher compared to B-G tracts. Among black tracts, however, those moving from B-G tracts have higher predicted percentiles of disadvantage compared to low-

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<sup>28</sup> The differences between NB-G versus NB-NG are in the same direction but not statistically significant for disadvantage and test scores and are in the same direction but not statistically different for B-G versus NB-G for disadvantage when we only consider tracts that begin the period in the bottom quartile of median household incomes.

Score movers from B-NG tracts, but we do not find significant differences for other indicators. While low-Score movers from NB-G tracts move to significantly higher-quality tracts compared to others, those from B-G tracts move to similar or worse destinations as the low-Score movers from nongentrifying tracts.

In sum, although we do not find that gentrification is associated with elevated rates of moving out of a tract, we find substantial differences in movers' destinations that suggest unequal patterns of displacement by tract racial composition. While low-Score residents moving from NB-G tracts end up in relatively high-quality tracts, low-Score residents from B-G tracts and nongentrifying tracts move among relatively low quality tracts within Philadelphia. The results suggest that low-Score movers in NB-G tracts are more likely to move to opportunity, benefiting from gentrification, at least in locational attainment, by moving to tracts with more advantage compared to other low-Score movers. Low-Score residents that move from B-G tracts do not experience similar advantages, moving to relatively low quality and nongentrifying tracts. At the same time, low-Score residents in nongentrifying tracts, both black and nonblack, churn among similar low quality and nongentrifying tracts, consistent with past findings that depict residential churning of the poor among poor neighborhoods (Sampson and Sharkey 2008).

#### *Residential Destinations across the City*

Last, we assess if indirect displacement is occurring by examining where residents, stratified by Risk Score, are moving more broadly when they move into or around the City of Philadelphia from 2002-2014 as tracts gentrify and become less affordable to disadvantaged residents. We observe 52,092 moves in our data. Of these moves, 32% are moves by low-Score residents, and 62% of these moves by low-Score residents originate within the city. Figure 5 presents predicted

probabilities of moving to a nongentrifying, gentrifying, or nongentrifiable census tract for the average low-Score (no Score or less than 580) resident during the housing boom (2002–2007), the housing bust (2008–2011), and the recovery (2012–2014) based on results from multinomial logistic regression models for each period. We also include the predicted probabilities for high-Score (750 or greater) residents for illustrative purposes of comparison. Movers with Scores between these categories have predicted probabilities between the probabilities illustrated. Regression results are available upon request.

[Figure 5 about here.]

Even though about one-third of the tracts are nongentrifying, low-Score residents' predicted probabilities of moving to nongentrifying tracts increased from .37 to over .44 across the period, while high-Score movers have predicted probabilities below .18 during the entire period. The differences over time among low-Score movers is statistically significant at the  $p < .05$  level. Further, while half of the tracts are nongentrifiable, low-Score residents' predicted probabilities of moving to nongentrifiable tracts decreased from .49 to .43 over the period ( $p < .05$ ), while high-Score residents' probabilities were over .62 across the periods. In gentrifying tracts, high-Score residents are consistently more likely to move into them relative to low-Score residents, and this difference increased over time ( $p < .05$ ) as high-Score residents became increasingly more likely and low-Score residents became increasingly less likely to move into them—consistent with what we would expect in tracts undergoing gentrification. Whereas high-Score residents' probability of moving to a gentrifying tract (.18) was 1.2 times the average low-Score residents' probability (.14) during the housing boom, it was 1.5 times during the housing recovery (.20 vs. .13). A similar inverse pattern emerges in nongentrifying tracts: whereas low-Score residents' probability of moving to a nongentrifying tract (.37) was 2.2 times the average

high-Score residents' probability (.16) during the boom, it was 2.5 times larger during the recovery (.44 vs. .17).

Together, these two trends are indicative of indirect displacement, supporting our final hypothesis that indirect displacement is occurring. Low-Score residents are increasingly more likely to move to low-income tracts that do not experience socioeconomic upgrading and increasingly less likely to move to gentrifying tracts. This pattern is consistent with recent findings that show a significant decline in affordable housing options across Philadelphia, especially in gentrifying neighborhoods (Chizeck 2017), and suggests that low-Score residents are becoming increasingly concentrated in disadvantaged neighborhoods within the city.

## **Discussion**

The spread of gentrification in recent decades, particularly to predominantly black neighborhoods, defies the durable hierarchy that characterized central city neighborhoods throughout the latter half of the twentieth century. Our framework for studying the relationship between gentrification and residential displacement expands our attention beyond *whether* disadvantaged residents move out of gentrifying neighborhoods to *where* they move and to where they cannot move in a racially stratified housing market. While gentrification counters past trends of white flight from central city neighborhoods and decreasingly reflects whites' avoidance of minority neighborhoods, our study refines theory and research on residential stratification by showing how racial stratification continues to play a fundamental role in how gentrification unfolds. We show that neighborhood racial composition confers a distinct set of advantages and disadvantages to financially disadvantaged residents in gentrifying neighborhoods, resulting in racially stratified outcomes for locational attainment. In the era of

white flight, metropolitan areas had unlimited space to which white residents could move and develop, but, in the era of gentrification, this is not the case for all residents moving out of gentrifying neighborhoods. Such moves are embedded in a racially stratified housing market with increasingly limited options as the spread of gentrification decreases affordable neighborhood options within the city and minority residents face barriers to accessing options both within the city and beyond. Although sociologists studying residential mobility have long considered where poor residents move and racial differences in these outcomes, theory and research stemming from this body of work do not fully explain how these processes play out under dynamics of neighborhood and metropolitan change. And, while there have been a growing number of studies on gentrification's consequences on displacement, the complexity of residential mobility, particularly among the urban poor, and the financial advantages and disadvantages that gentrification can offer demands this more nuanced approach for improving our understanding of gentrification's consequences for residential displacement.

Drawing on a novel dataset, our study demonstrates that the consequences of gentrification are structured by racial stratification, exacerbating neighborhood inequality by race and class in the contemporary American city. Like prior quantitative studies on displacement and consistent with our first hypothesis, we find that low-Score residents in Philadelphia's gentrifying tracts are no more likely than residents in nongentrifying tracts to move out of their tracts. Low-Score residents in B-NG tracts, rather, have relatively high rates of outmigration, suggesting high levels of residential instability in poor, black neighborhoods. Low-Score residents who move, however, have divergent trajectories depending on where they move from, and these differences are only revealed when we consider heterogeneity across neighborhood racial composition. When we examine the residential destinations of those who move and

account for observed selective differences into moving, those from NB-G tracts have high probabilities of moving out of the city to the suburbs or to high-income nongentrifiable tracts, landing in significantly higher-quality tracts compared with the destinations of other movers. On the other hand, those from B-G tracts, which both begin with lower quality and improve along these indicators slower than NB-G tracts, have disproportionately high probabilities of moving to nongentrifying tracts within the city, ending up in tracts with similar characteristics and even higher levels of disadvantage to those moving from nongentrifying tracts and much lower quality than the destinations of movers from NB-G tracts. The findings suggest that financially disadvantaged residents from NB-G tracts move in more favorable circumstances or disproportionately benefit from gentrification compared with those moving from B-G tracts.

We also show that gentrification is fundamentally restructuring patterns of neighborhood sorting among disadvantaged residents that further exacerbate neighborhood inequality. We find that gentrification is indirectly displacing low-Score residents in Philadelphia by shrinking residential options for them within the city as disadvantaged residents moving either to Philadelphia or within the city are increasingly moving to nongentrifying tracts over time compared to other tracts, supporting our last hypothesis. We also find that movers from B-G tracts and from both B-NG and NB-NG tracts are disproportionately more likely to move to nongentrifying tracts compared to those from NB-G tracts. Although a significant portion of residents from all groups also move out of the city, significantly more residents from NB-G tracts do so. And even for those who move out of the city, residents moving from B-G tracts move to tracts that have lower household incomes and more disadvantage compared to low-Score residents moving from NB-G tracts, albeit improvements from their origin neighborhoods. Taken together, the results suggest growing neighborhood inequality within cities and new

implications for the suburbs. While we have framed these moves as upward in this study, these moves may certainly lead to longer commutes, greater expenses that come with having to own a vehicle, and difficulty accessing services and resources (Murphy and Wallace 2010).

Our findings highlight the racialized nature of gentrification and its consequences and are thus consistent with the emphasis in many qualitative accounts and public discourse on gentrification's negative effects on minorities and minority neighborhoods (Brown-Saracino 2017). Although we do not know for certain if low-Score residents in B-G tracts are black or if low-Score residents in NB-G tracts are not black,<sup>29</sup> we argue that racialized mechanisms governing both neighborhood valuation and sorting processes at the individual- and neighborhood-levels explain our results. While the socioeconomic upgrading and rising home values in gentrifying neighborhoods can benefit preexisting disadvantaged residents, our study suggests that this benefit may be limited to residents in gentrifying neighborhoods with fewer black residents. Disadvantaged residents in NB-G tracts may be able to cash in on the higher values placed on NB-G relative to B-G tracts, or they may have greater access to credit and wealth and face fewer limitations on the housing market that can facilitate their upward mobility. Disadvantaged residents moving from B-G tracts, however, may receive lower cash offers by landlords or developers, move more often in forced circumstances, or face greater obstacles in the housing market that limit their ability to make an upward move. Because the period of our study spans the foreclosure crisis, which disproportionately affected minority neighborhoods in highly segregated cities like Philadelphia (Hwang, Hankinson, and Brown 2015), low-Score

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<sup>29</sup> There are very few moves in our data by individuals that we could infer have a high probability of being nonblack in black tracts to assess differential outcomes. Within B-G and B-NG tracts, fewer than 1.5% of blocks are over 80% non-Hispanic white and over 80% of blocks were over 80% black based on the 2000 US Census.

movers in B-G tracts may also disproportionately face greater financial disadvantages related to loan terms or wealth-building, prohibiting their ability to convert the increased value of their neighborhood into a path toward upward mobility. Further comparative research on the experiences of disadvantaged residents in gentrifying neighborhoods of different racial compositions or by individuals' race or ethnicity can shed light on these differences.

Our study also highlights how a novel large-scale data source—consumer credit data—can shed light on residential stratification and mobility. Credit scores reflect an important aspect of financial (dis)advantage that other traditional measures, like income, do not capture. In a time when economic insecurity has increased and wealth has declined for many (Carr and Mulcahy 2010), financial stability provides a key indicator of how individuals fare in the housing market. Unlike longitudinal data used in prior mobility analyses, credit score data allow us to track residential mobility, including locations of both origins and destinations of movers, at frequent intervals and in a recent period for a large sample of the adult population.

Despite the temporal and spatial richness and scale of the data, such data also have its limits. Credit record data face some of the limitations that other datasets used for studying mobility also experience, such as the disproportionate exclusion of individuals vulnerable to displacement and the lack of information on the circumstances of the moves. In addition, locational information is inaccurate for those who become homeless, including those who resort to temporary living situations. Therefore, we view our estimates of outmigration rates and the degree to which financially disadvantaged residents are moving to specific kinds of neighborhoods as an underestimate of growing neighborhood inequality and the constraints of the changing housing market for disadvantaged residents. Without information on the circumstances of the move, we are unable to distinguish between whether movers from B-G

neighborhoods are more likely to face forced moves than movers from NB-G neighborhoods or whether the differences reflect mechanisms of place stratification. The data also highlight a more general shortcoming of big data for sociological research. Although there are increasingly new data sources that contain detailed data on large numbers of people, the preservation of anonymity and privacy are crucial for the availability and use of these data. This necessity, however, inherently limits information on individuals. In this study, the lack of information on individuals in the data, such as race and ethnicity, homeownership status, and university enrollment, limits the extent to which we can identify the various mechanisms affecting residents.

Although our results suggest that gentrification affects residential sorting patterns among low-Score residents from 2002–2014 in Philadelphia in distinct ways by tract racial composition, as with all efforts with causal inference, we are limited in our ability to make strong causal claims. While we adjust for observable differences between movers and stayers and for observable characteristics among movers, there are still factors that we do not observe in our data but likely affect residential sorting patterns, such as having children, and the selection model does not fully remove all bias associated with moving rather than staying. Moreover, because gentrification is an ongoing, evolving process that occurs unevenly across neighborhoods over time, a direct assessment of the relationship between gentrification and displacement in a pre- and post-treatment causal framework is inappropriate. The infrequency of the Census and ACS data further preclude identification of when gentrification begins in a place or its stage when residents move. As new sources of data on neighborhood characteristics at more frequent intervals—such as Google street-level imagery and Craigslist rent prices—become available, future studies linked with these data can address these issues. Moreover, a longer period of analysis may be necessary to capture a full picture of residential displacement, especially in a

relatively loose housing market like Philadelphia.

While our study is based on the case of Philadelphia, we believe that our findings on racialized differences in residential mobility patterns associated with gentrification would bear out in other cities with similar histories of large-scale decline and high levels of racial segregation—cities that shape much of the theory and research in urban sociology. In “superstar cities” (Gyourko et al. 2016:167) with stronger housing markets and where the housing supply is lacking, differences in outmigration rates may be significant across gentrifying neighborhoods, and we may also see greater moves to outside of the city but to areas with more disadvantage or to declining areas. Recent studies have documented the decline of the inner-ring suburbs as cities have become increasingly unaffordable (Kneebone and Berube 2013). While there is evidence of this decline in some of Philadelphia’s surrounding suburbs, the suburbs of Philadelphia are still much more socioeconomically advantaged on average than even the neighborhoods at the upper end of the city’s socioeconomic distribution. In cities with lower levels of racial segregation, we may also expect distinct outcomes, as long-term integration may be more feasible, racialized processes in the housing market may be more muted, and neighborhood differences may be less severe. Further research on other cities with tighter housing markets and distinct contexts of segregation is necessary to expand our understanding of gentrification’s effects. Our findings, nonetheless, rely on the best available data at this time on where residents move to offer a crucial starting point for future efforts to better understand how gentrification affects residential mobility and stratification.

## **Conclusions**

Our study sheds new light on the consequences of gentrification and contributes to theories of

neighborhood change, residential mobility, and racial and ethnic stratification by demonstrating how gentrification is reconfiguring the twenty-first century American city in racialized ways. By considering where residents move and their origin tracts' racial composition, we show how gentrification unfolds in ways that are governed by racial stratification, affecting residents living within gentrifying neighborhoods, as well as the context in which residents are moving, to exacerbate neighborhood inequality.

Whether gentrification will continue at its current pace and perpetuate this process is uncertain. But, the patterns we observe suggest the need for policies to ensure that gentrification does not continue to increase socioeconomic and racial segregation. Given that our findings suggest that the benefits of gentrification disproportionately accrue to financially disadvantaged residents in NB-G neighborhoods relative to B-G neighborhoods, targeted efforts to both prevent existing disadvantaged residents from moving downward and to preserve an affordable housing supply in B-G neighborhoods are necessary. While Philadelphia's recently implemented property tax relief program, which prohibits increases in property taxes for long-time low- and middle-income homeowners, is an important step in mitigating outmigration, policies and programs that ensure residential stability for renters and access to quality neighborhoods for disadvantaged residents who move are necessary to maintain diverse neighborhoods and help facilitate the long-term well-being of these residents. Additional efforts that help address racial discrimination in the housing market and racial wealth disparities are also needed. Finally, sustained investment in resources and opportunities in nongentrifying neighborhoods is necessary to ensure that disadvantaged movers are not limited to neighborhoods with high levels of disadvantage, high crime, and low-quality schools. Place-based investment that can attract racial and socioeconomic diversity while implementing policies that allow disadvantaged residents to stay, connect them to

resources and opportunities, and include them in the development process are needed. Without the right policy levers and the continued commodification of housing and neighborhoods, neighborhood inequality will continue to persist as cities transform.

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## **Figures**

(See separate files for figures)

**Figure 1.** Gentrifying and Nongentrifying Black (> 50% Black) and Nonblack (< 50% Black) Census Tracts in the City of Philadelphia.

Notes: Authors' definition based on data from Census 2000, the 2009–2013 American Community Survey, and U.S. Census TIGER/Line Shapefiles.

**Figure 2.** Differences in Predicted Probabilities of Moving for the Average Low-Score Resident in Gentrifiable Tracts

Notes: N = 237,686. Based on results from linear probability models predicting moves for all residents living in gentrifiable tracts in the City of Philadelphia from 2002-2013 (excluding 2004). Estimation is based on data from the FRBNY/Equifax Consumer Credit Panel, Census 2000, and 2009-2013 ACS. Regression results for main variables are displayed in Appendix Table A2.

\*\*\*p < .001, \*\*p < .01, \*p < .05, †p < .10 (two-tailed tests).

**Figure 3.** Predicted Probabilities of Moving to Each Tract Type for the Average Low-Score Resident in Gentrifiable Tracts

Notes: First-stage N = 237,686; Second-stage N = 21,504. Based on results from two-stage models in which first stage predicts moves for all residents living in gentrifiable tracts in the City of Philadelphia from 2002-2013 (excluding 2004) using a probit model and second stage predicts the destination type of movers using a multinomial logistic regression model with correction for moving.

Estimation is based on data from the FRBNY/Equifax Consumer Credit Panel, Census 2000, and 2009-2013 ACS. Regression results for main variables are displayed in Appendix Table A3.

\*\*\*p < .001, \*\*p < .01, \*p < .05, †p < .10 (two-tailed tests).

**Figure 4.** Predicted Percentiles of Destination Characteristics for the Average Low-Score Resident in Gentrifiable Tracts

Notes: First-stage N = 237,686; Second-stage N = 13,426. Based on results from two-stage models in which first stage predicts moves for all residents living in gentrifiable tracts in the City of Philadelphia from 2002-2013 (excluding 2004) using a probit model and second stage predicts the destination characteristics of movers using an ordinary least squares model with correction for moving. Estimation is based on data from the FRBNY/Equifax Consumer Credit Panel, Census 2000, 2009-2013 ACS, the Philadelphia Police Department, and the Pennsylvania Department of Education. Regression results for main variables are displayed in Table A4. \*\*\*p < .001, \*\*p < .01, \*p < .05, †p < .10 (two-tailed tests).

**Figure 5.** Predicted Probabilities of Moving to Nongentrifying, Gentrifying, and Nongentrifiable Tracts for the Average Low-Score and High-Score Movers over Time

Notes: N = 16,263 (Boom), 16,058 (Bust), 11,631 (Recovery). Results from multinomial logistic regression models for each period predicting residential destinations for all movers to the City of Philadelphia. The 2004 cohort is excluded in the models. Estimation is based on data from the FRBNY/Equifax Consumer Credit Panel, Census 2000, and 2009-2013 ACS. Statistical differences over time are discussed in text and do not compare low- and high-Score residents. Full regression results are available upon request.

## Tables

**Table 1.** Descriptive Statistics of Census Tracts by Gentrification Category

	Gentrifying			Nongentrifying			Nongentri- fiable
	All	Black	Nonblack	All	Black	Nonblack	
Mean Initial Tract Characteristics, 2002							
Population	3,753	3,569	3,937	4,330	4,335	4,321	4,143
% of population non-Hispanic white	35.2	12.0	58.4	17.4	7.0	35.2	62.6
% of population non-Hispanic black	48.2	80.9	15.5	64.6	87.6	24.9	27.1
% renters	57.1	60.7	53.5	45.9	47.1	43.9	35.4
% vacancies	16.4	20.3	12.5	15.4	17.2	12.4	7.0
% college-educated	19.0	15.8	22.3	8.7	8.0	9.7	28.8
% below poverty	34.5	36.0	33.0	35.3	34.0	37.5	11.9
Median home value (in 2013 \$)	\$99,567	\$87,499	\$111,635	\$61,438	\$57,628	\$68,006	\$157,321
Median rent (in 2013 \$)	\$609	\$537	\$681	\$564	\$543	\$600	\$823
Crime rate	9.8	11.1	8.5	10.5	10.7	10.1	3.0
Disadvantage index	2.9	3.8	2.0	4.3	4.3	4.5	-0.3
Median household income (in 2013 \$)	\$30,460	\$28,711	\$32,209	\$29,745	\$29,783	\$29,680	\$60,066
Public school test scores	55.3	36.3	70.3	37.0	32.0	47.3	75.4
Number of subsidized housing units (2016)	179.2	264.1	94.3	160.0	213.7	67.4	28.6
Distance to City Hall (miles)	2.0	2.1	2.0	4.2	3.8	4.8	6.9
Distance to universities (miles)	1.7	1.3	2.0	2.5	2.2	3.1	5.5
Mean Change in Tract Characteristics, 2002–2013							
Population	72.4	-30.9	157.7	-68.1	-218.9	192.0	122.0
% non-Hispanic white	6.3	13.6	-1.0	-4.5	-0.5	-11.4	-7.1
% non-Hispanic black	-11.6	-18.5	-4.7	-0.3	-2.3	3.1	1.5
% renters	2.9	2.6	3.2	8.4	8.0	9.0	2.6
% vacancies	0.9	-1.2	2.9	2.1	2.5	1.3	1.8
% college-educated	13.9	14.4	13.4	1.4	1.2	1.3	5.3
% below poverty	-3.6	-0.4	-6.8	4.1	3.6	4.8	3.2
Median home value (% change)	105.5	110.0	101.0	45.8	49.7	39.2	45.9
Median rent (% change)	28.2	31.5	24.9	4.3	3.1	6.4	10.1
Crime rate	-2.9	-3.5	-2.3	1.1	1.1	1.0	0.4
Disadvantage index	-1.6	-1.7	-1.6	-0.1	-0.3	0.3	0.0
Median household income (% change)	23.1	5.5	40.6	-16.2	-16.4	-16.0	-6.9
Public school test scores	20.7	20.1	21.2	16.5	15.4	18.6	16.3
Number of Tracts	56	28	28	128	81	47	181

Notes: Authors' calculations using linearly interpolated data from Census 2000, 2009–2013 ACS, the Philadelphia Police Department, the Pennsylvania Department of Education, and the National Housing Preservation Database.

**Table 2.** Summary of Analyses

Analysis	Outcome	Model(s)	Sample	Quantities of Interest	Results
Outmigration	Moved from origin tract	Linear probability	Residents in gentrifiable tracts	Probability of outmigration for low-Score residents in gentrifying vs. nongentrifying tracts	Figure 2, Table A2
Residential Destination Type	Destination type (outside of city [reference], nongentrifiable, gentrifying, nongentrifying)	First stage: probit; Second stage: multinomial logistic regression	First stage: Residents in gentrifiable tracts; Second stage: Movers from gentrifiable tracts	Probability of moving to tract types for low-Score residents from gentrifying vs. nongentrifying tracts	Figure 3, Table A3
Residential Destination Quality	Destination percentile: crime, disadvantage index, median household income, school test scores	First stage: probit; Second stage: ordinary least squares regression	First stage: Residents in gentrifiable tracts; Second stage: Within-city movers from gentrifiable tracts	Predicted tract quality for low-Score residents from gentrifying vs. nongentrifying tracts	Figure 4, Table A4
Residential Destinations across the City	Destination type (nongentrifiable, gentrifying, nongentrifying [reference])	Multinomial logistic regression by cohort periods (boom, bust, recovery)	Residents moving to or within Philadelphia	Probability of moving to nongentrifying tracts over time for low-Score residents	Figure 5

**Table 3.** Descriptive Statistics of Sample of Philadelphia Residents from 2002–2013

Variable	All	Gentrifying			Nongentrifying			Nongenti-
	Residents	All	Black	Nonblack	All	Black	Nonblack	fiable
Person years (2002–2013, excluding 2004)	517,429	68,069	31,663	36,406	169,617	111,415	58,202	279,743
Percent of sample	100.0%	13.2%	6.1%	7.0%	32.8%	21.5%	11.2%	54.1%
Moved	9.4%	11.0%	10.3%	11.6%	8.3%	7.8%	9.1%	9.8%
Equifax Risk Score								
No Score	10.4%	12.7%	15.2%	10.4%	15.2%	15.6%	14.3%	6.9%
290–579	25.6%	25.8%	32.7%	19.8%	36.7%	38.2%	33.9%	18.9%
580–649	17.3%	17.4%	18.7%	16.2%	20.6%	20.6%	20.5%	15.3%
650–749	22.1%	22.7%	19.0%	25.9%	17.1%	16.2%	18.9%	25.1%
750+	24.6%	21.6%	14.5%	27.7%	10.4%	9.4%	12.4%	33.9%
Mean Risk Score	656.1773	650.9	624.7	672.5	609.5	604.2	619.6	683.2
Std. Dev. Risk Score	112.3	109.816	108.1	106.5	102.4	101.1	103.9	109.4
Age								
25–34	22.7%	26.7%	26.1%	27.2%	22.1%	20.2%	25.8%	22.1%
35–44	20.1%	20.6%	20.6%	20.6%	20.8%	19.6%	23.2%	19.5%
45–54	20.0%	18.3%	19.1%	17.7%	20.8%	21.2%	20.0%	19.9%
55–64	15.8%	14.1%	13.7%	14.5%	15.4%	16.4%	13.6%	16.4%
≥65	21.5%	20.2%	20.5%	20.0%	20.9%	22.7%	17.4%	22.1%
Adult household size (incl. only those with credit)								
1	19.5%	24.9%	24.4%	25.2%	20.1%	20.5%	19.4%	17.8%
2	28.8%	28.2%	27.8%	28.6%	25.7%	25.5%	26.0%	30.7%
3+	51.8%	46.9%	47.8%	46.1%	54.3%	54.0%	54.6%	51.5%
1+ mortgages in household	32.1%	23.0%	19.2%	26.4%	19.2%	17.1%	23.1%	42.2%
1+ delinquent (90+ days) accounts in household	20.1%	19.3%	22.9%	16.1%	26.2%	27.8%	23.3%	16.5%

Notes: Authors' calculations using data from the FRBNY/Equifax Consumer Credit Panel. These figures are for the full set of pooled person-years and, therefore, can include the same individual more than once.

**Table 4.** Neighborhood Change Matrix for Low-Score Residents in Analytic Sample

<u>Origin Tract</u>	<u>Total</u>	<u>Stayers</u>	<u>Movers</u>	<u>Destination Tract (Movers Only) and Odds of Moving to each Destination Type (vs. Nongentrifying Tracts)</u>								
				<u>Out of City</u> %      Odds	<u>Nongentrifiable</u> %      Odds	<u>Gentrifying</u> %      Odds	<u>All Types</u> %      Odds	<u>Nongentrifying</u> %				
<b>Gentrifying</b>												
All Tracts	26,165	91.8%	8.2%	30.3%	0.92	20.0%	0.60	16.7%	0.50	67.0%	2.03	33.0%
Black	15,166	91.8%	8.2%	26.8%	0.64	16.3%	0.39	14.7%	0.35	57.8%	1.37	42.2%
Nonblack	10,999	91.8%	8.2%	35.2%	1.71	25.0%	1.22	19.3%	0.94	79.5%	3.88	20.5%
<b>Nongentrifying</b>												
All Tracts	88,025	92.3%	7.7%	26.5%	0.62	21.9%	0.51	8.5%	0.20	56.9%	1.32	43.1%
Black	59,970	92.3%	7.7%	26.7%	0.61	20.1%	0.46	9.4%	0.22	56.2%	1.28	43.9%
Nonblack	28,055	92.3%	7.7%	26.2%	0.63	26.0%	0.63	6.4%	0.15	58.5%	1.41	41.5%

Notes: Authors' calculations using data from Census 2000 and 2009–2013 ACS and the FRBNY/Equifax Consumer Credit Panel. Percentages are row percentages. Percentages for destination tracts are out of the total number of movers in each Risk Score category. These figures are for the full set of pooled person-years and, therefore, can include the same individual more than once.

**Table 5.** Average Tract Quality Percentile of Destination for Low-Score City Movers in Sample

<u>Origin Tract Type</u>	<u>N</u>	(1)	(2)	(3)	(4)
		<u>Violent Crime</u> <u>Rate</u>	<u>Disadvantage</u> <u>Index</u>	<u>Median</u> <u>Income</u>	<u>School Test</u> <u>Scores</u>
All Gentrifiable Tracts	6,272	61.2	65.3	35.9	38.1
<b>Gentrifying</b>					
All Tracts	1,466	58.0	59.0	40.4	40.5
Black	898	62.8	63.3	36.1	35.3
Nonblack	568	50.5	52.1	47.2	48.6
<b>Nongentrifying</b>					
All Tracts	4,806	62.1	67.2	34.5	37.4
Black	3,309	63.0	65.9	34.8	35.6
Nonblack	1,497	60.3	70.0	33.9	41.3

Notes: Values are based on data from the FRBNY/Equifax Consumer Credit Panel, 2000 Census, 2009–2013 ACS, the Philadelphia Police Department, and the Pennsylvania Department of Education.

## Appendix

**Table A1.** Results Predicting Outmigration for Philadelphia Residents in Gentrifiable Tracts

	(1)		(2)	
	Gentrification		Gentrification by Race	
	Coef.	Std. Error	Coef.	Std. Error
Equifax Risk Score (ref: 750+)				
No Score or < 580	-0.31***	(0.04)	-0.47***	(0.05)
580–649	0.02	(0.04)	-0.04	(0.05)
650–749	0.11**	(0.04)	0.11*	(0.05)
Gentrification Dummy	-0.05	(0.05)	--	
Gentrification by Race (Ref: Nonblack nongentrifying)				
Nonblack gentrifying	--		-0.13*	(0.06)
Black nongentrifying	--		-0.19**	(0.07)
Black gentrifying	--		-0.15*	(0.07)
Gentrification * Equifax Risk Score				
Gentrifying × no Score or < 580	-0.01	(0.04)	--	
Gentrifying × 580–649	0.11†	(0.05)	--	
Gentrifying × 650–749	0.24***	(0.05)	--	
Nonblack gentrifying × no Score or < 580	--		0.14†	(0.07)
Nonblack gentrifying × 580–649	--		0.17*	(0.07)
Nonblack gentrifying × 650–749	--		0.23**	(0.07)
Black nongentrifying × no Score or < 580	--		0.27***	(0.07)
Black nongentrifying × 580–649	--		0.13†	(0.07)
Black nongentrifying × 650–749	--		0.01	(0.07)
Black gentrifying × no Score or < 580	--		0.14†	(0.08)
Black gentrifying × 580–649	--		0.16†	(0.08)
Black gentrifying × 650–749	--		0.24**	(0.08)

### Summary of Coefficients and F-Tests

1. Gentrifying vs. Nongentrifying: Gentrifying + (Gentrifying × no Score or < 580)	-0.07**	--
2. Nonblack gentrifying vs. Nonblack nongentrifying: Nonblack gentrifying + (Nonblack gentrifying × no Score or < 580)	--	0.01
3. Black gentrifying vs. Black nongentrifying: (Black gentrifying + Black gentrifying × no Score or < 580) - (Black nongentrifying + Black nongentrifying × no Score or < 580)	--	-0.10***
4. Black gentrifying vs. Nonblack gentrifying: (Black gentrifying + Black gentrifying × no Score or < 580) - (Nonblack gentrifying + Nonblack gentrifying × no Score or < 580)	--	-0.02

Notes: N = 237,686. Logistic regression models include cohort fixed effects and the following control variables: age, household size, mortgage status, delinquency status, proximity to City Hall, proximity to university areas, vacancy rate, and subsidized housing units. Estimation is based on data from the FRBNY/Equifax Consumer Credit Panel, Census 2000, and 2009–2013 ACS. \*\*\*p < .001, \*\*p < .01, \*p < .05, †p < .10 (two-tailed tests).

**Table A2.** Results Predicting Outmigration for Philadelphia Residents in Gentrifiable Tracts

	(1)		(2)	
	<u>Gentrification</u>		<u>Gentrification by Race</u>	
	Coef.	Std. Error	Coef.	Std. Error
Equifax Risk Score (ref: 750+)				
No Score or < 580	-0.02***	(0.00)	-0.04***	(0.00)
580–649	0.00	(0.00)	0.00	(0.00)
650–749	0.01***	(0.00)	0.02***	(0.00)
Gentrification Dummy	-0.01	(0.00)	--	
Gentrification by Race (Ref: Nonblack nongentrifying)				
Nonblack gentrifying	--		-0.01	(0.00)
Black nongentrifying	--		-0.01*	(0.01)
Black gentrifying	--		-0.01*	(0.01)
Gentrification * Equifax Risk Score				
Gentrifying × no Score or < 580	0.00	(0.00)	--	
Gentrifying × 580–649	0.01**	(0.00)	--	
Gentrifying × 650–749	0.03***	(0.00)	--	
Nonblack gentrifying × no Score or < 580	--		0.01	(0.01)
Nonblack gentrifying × 580–649	--		0.02*	(0.01)
Nonblack gentrifying × 650–749	--		0.03***	(0.01)
Black nongentrifying × no Score or < 580	--		0.02***	(0.00)
Black nongentrifying × 580–649	--		0.01	(0.01)
Black nongentrifying × 650–749	--		-0.01	(0.01)
Black gentrifying × no Score or < 580	--		0.01	(0.01)
Black gentrifying × 580–649	--		0.01†	(0.01)
Black gentrifying × 650–749	--		0.02***	(0.01)

Summary of Coefficients and F-Tests

1. Gentrifying vs. Nongentrifying: Gentrifying + (Gentrifying × no Score or < 580)	-0.01**	--
2. Nonblack gentrifying vs. Nonblack nongentrifying: Nonblack gentrifying + (Nonblack gentrifying × no Score or < 580)	--	0.00
3. Black gentrifying vs. Black nongentrifying: (Black gentrifying + Black gentrifying × no Score or < 580) - (Black nongentrifying + Black nongentrifying × no Score or < 580)	--	-0.01***
4. Black gentrifying vs. Nonblack gentrifying: (Black gentrifying + Black gentrifying × no Score or < 580) - (Nonblack gentrifying + Nonblack gentrifying × no Score or < 580)	--	0.00

Notes: N = 237,686. Linear probability models include cohort fixed effects and the following control variables: age, household size, mortgage status, delinquency status, proximity to City Hall, proximity to university areas, vacancy rate, and subsidized housing units. Estimation is based on data from the FRBNY/Equifax Consumer Credit Panel, Census 2000, and 2009–2013 ACS.

\*\*\*p < .001, \*\*p < .01, \*p < .05, †p < .10 (two-tailed tests).

**Table A3.** Results Predicting Destination Type for Movers from Gentrifiable Tracts

	(1) Gentrification		(2) Gentrification by Race									
<i>First-Stage Predicting Move</i>												
<i>(N = 237,686)</i>												
	<u>Coef.</u>	<u>SE</u>					<u>Coef.</u>	<u>SE</u>				
Equifax Risk Score (ref: 750+)												
No Score or < 580	-0.18***	(0.01)					-0.18***	(0.01)				
580–649	0.01	(0.01)					0.01	(0.01)				
650–749	0.10***	(0.01)					0.10***	(0.01)				
Control variables included		yes						yes				
Year fixed effects		yes						yes				
 <i>Second-Stage Predicting Destination</i>												
<i>(N = 21,504)</i>												
<i>(Ref: Out of City)</i>												
	<u>Coef.</u>	<u>SE</u>	<u>Coef.</u>	<u>SE</u>	<u>Coef.</u>	<u>SE</u>	<u>Coef.</u>	<u>SE</u>	<u>Coef.</u>	<u>SE</u>	<u>Coef.</u>	<u>SE</u>
Equifax Risk Score (ref: 750+)												
No Score or < 580	0.89***	(0.15)	0.45*	(0.21)	0.81***	(0.15)	1.13***	(0.19)	0.36	(0.25)	0.71***	(0.17)
580–649	1.41***	(0.10)	0.62***	(0.14)	0.48***	(0.09)	1.49***	(0.15)	0.37†	(0.21)	0.47***	(0.12)
650–749	1.18***	(0.12)	0.62***	(0.17)	0.17	(0.11)	1.20***	(0.17)	0.57**	(0.22)	0.27†	(0.14)
Gentrification Dummy	-0.75***	(0.15)	0.00	(0.15)	0.10	(0.11)	--	--	--	--	--	--
Gentrification by Race												
<i>(Ref: Nonblack nongentrifying)</i>												
Nonblack gentrifying	--	--	--	--	--	--	-0.99***	(0.22)	-0.16	(0.20)	0.07	(0.13)
Black nongentrifying	--	--	--	--	--	--	0.16	(0.18)	-0.06	(0.24)	-0.20	(0.14)
Black gentrifying	--	--	--	--	--	--	-0.40†	(0.22)	0.14	(0.22)	-0.07	(0.16)
Gentrification * Equifax Risk Score												
Gentrifying × no Score or < 580	0.607***	(0.16)	0.01	(0.17)	-0.08	(0.12)	--	--	--	--	--	--
Gentrifying × 580–649	0.317†	(0.17)	0.06	(0.18)	-0.09	(0.13)	--	--	--	--	--	--
Gentrifying × 650–749	0.03	(0.17)	0.03	(0.17)	-0.05	(0.12)	--	--	--	--	--	--
Nonblack gentrifying × no Score or < 580	--	--	--	--	--	--	0.30	(0.24)	0.20	(0.24)	-0.08	(0.16)
Nonblack gentrifying × 580–649	--	--	--	--	--	--	0.24	(0.25)	0.38	(0.25)	0.00	(0.17)
Nonblack gentrifying × 650–749	--	--	--	--	--	--	-0.12	(0.25)	0.00	(0.23)	-0.09	(0.15)
Black nongentrifying × no Score or < 580	--	--	--	--	--	--	-0.26	(0.19)	0.28	(0.26)	0.02	(0.16)
Black nongentrifying × 580–649	--	--	--	--	--	--	-0.14	(0.20)	0.39	(0.28)	0.06	(0.17)
Black nongentrifying × 650–749	--	--	--	--	--	--	-0.11	(0.20)	0.01	(0.28)	-0.04	(0.17)
Black gentrifying × no Score or < 580	--	--	--	--	--	--	0.35	(0.24)	0.09	(0.25)	-0.10	(0.19)
Black gentrifying × 580–649	--	--	--	--	--	--	0.10	(0.25)	0.15	(0.28)	-0.15	(0.20)
Black gentrifying × 650–749	--	--	--	--	--	--	0.02	(0.25)	0.06	(0.26)	-0.07	(0.19)
Control variables included	yes		yes		yes		yes		yes		yes	
Year fixed effects	yes		yes		yes		yes		yes		yes	

**Table A3.** Results Predicting Destination Type for Movers from Gentrifiable Tracts (continued)

	(1) Gentrification			(2) Gentrification by Race		
<u>Summary of Coefficients and F-Tests</u>						
1. Gentrifying vs. Nongentrifying: Gentrifying + (Gentrifying $\times$ no Score or $<$ 580)	-0.14*	0.00	0.02	--	--	--
2. Nonblack gentrifying vs. Nonblack nongentrifying: Nonblack gentrifying + (Nonblack gentrifying $\times$ no Score or $<$ 580)	--	--	--	-0.70***	0.04	-0.01
3. Black gentrifying vs. Black nongentrifying: (Black gentrifying + Black gentrifying $\times$ no Score or $<$ 580) - (Black nongentrifying + Black nongentrifying $\times$ no Score or $<$ 580)	--	--	--	0.04	0.01	0.19
4. Black gentrifying vs. Nonblack gentrifying: (Black gentrifying + Black gentrifying $\times$ no Score or $<$ 580) - (Nonblack gentrifying + Nonblack gentrifying $\times$ no Score or $<$ 580)	--	--	--	0.64***	0.19	-0.16**

Notes: Results are from two-stage regression models in which first stage predicts moves for all residents living in gentrifiable tracts in the City of Philadelphia from 2002-2013 (excluding 2004) using a probit model and second stage predicts the destination type of movers using a multinomial logistic regression model with correction for moving. Estimation is based on data from the FRBNY/Equifax Consumer Credit Panel, Census 2000, and 2009–2013 ACS.

\*\*\*p  $<$  .001, \*\*p  $<$  .01, \*p  $<$  .05, †p  $<$  .10 (two-tailed tests).

**Table A4.** Results Predicting Destination Quality for City Movers from Gentrifiable Tracts

	(1)		(2)		(3)		(4)	
	<u>Crime</u>		<u>Disadvantage</u>		<u>Income</u>		<u>Schools</u>	
	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE
<i>First-Stage Predicting City Move</i>								
<i>(N = 237,686)</i>								
Equifax Risk Score (ref: 750+)								
No Score or < 580	0.04*	(0.02)	0.04*	(0.02)	0.04*	(0.02)	0.04*	(0.02)
580–649	0.18***	(0.02)	0.18***	(0.02)	0.18***	(0.02)	0.18***	(0.02)
650–749	0.20***	(0.02)	0.20***	(0.02)	0.20***	(0.02)	0.20***	(0.02)
Control variables included	yes		yes		yes		yes	
Year fixed effects	yes		yes		yes		yes	
<i>Second-Stage Predicting Destination Quality</i>								
<i>(N = 13,426)</i>								
Origin tract percentile	0.17***	(0.01)	0.33***	(0.01)	0.16***	(0.01)	0.07***	(0.01)
Equifax Risk Score (ref: 750+)								
No Score or < 580	18.51***	(1.66)	19.95***	(1.63)	-20.17***	(1.61)	-19.72***	(1.84)
580–649	16.44***	(2.67)	22.33***	(2.62)	-24.58***	(2.60)	-23.23***	(2.97)
650–749	9.46***	(2.82)	17.66***	(2.77)	-20.06***	(2.75)	-18.30***	(3.13)
Gentrification by Race (Ref: Nonblack nongentrifying)								
Nonblack gentrifying	-1.46	(1.97)	-4.48*	(1.96)	8.14***	(1.92)	-0.47	(2.18)
Black nongentrifying	4.61*	(2.04)	1.36	(2.01)	-3.02	(1.98)	-14.01***	(2.27)
Black gentrifying	-1.15	(2.25)	-4.21†	(2.24)	4.90*	(2.22)	-5.89*	(2.50)
Gentrification * Equifax Risk Score								
Nonblack gentrifying × no Score or < 580	-5.70**	(2.16)	1.30	(2.14)	-0.44	(2.11)	7.11**	(2.41)
Nonblack gentrifying × 580–649	-4.48*	(2.28)	0.87	(2.25)	-0.75	(2.22)	6.18*	(2.54)
Nonblack gentrifying × 650–749	-3.05	(2.19)	-1.77	(2.16)	0.96	(2.14)	6.96**	(2.44)
Black nongentrifying × no Score or < 580	-4.27*	(2.16)	-3.09	(2.13)	4.27*	(2.10)	10.31***	(2.40)
Black nongentrifying × 580–649	-2.32	(2.27)	-1.04	(2.24)	2.79	(2.22)	6.99**	(2.53)
Black nongentrifying × 650–749	1.25	(2.36)	-0.08	(2.32)	0.95	(2.30)	5.17*	(2.63)
Black gentrifying × no Score or < 580	1.07	(2.41)	5.14*	(2.38)	-3.04	(2.36)	2.96	(2.68)
Black gentrifying × 580–649	1.22	(2.59)	4.44†	(2.56)	-3.05	(2.53)	1.44	(2.89)
Black gentrifying × 650–749	-1.18	(2.58)	-0.99	(2.55)	0.64	(2.52)	2.20	(2.88)
Control variables included	yes		yes		yes		yes	
Year fixed effects	yes		yes		yes		yes	

**Table A4.** Results Predicting Destination Quality for City Movers from Gentrifiable Tracts (continued)

	(1) <u>Crime</u>	(2) <u>Disadvantage</u>	(3) <u>Income</u>	(4) <u>Schools</u>
<u>Summary of Coefficients and F-Tests</u>				
1. Nonblack gentrifying vs. Nonblack nongentrifying: Nonblack gentrifying + (Nonblack gentrifying × no Score or < 580)	-7.16***	-3.18*	7.70***	6.65***
2. Black gentrifying vs. Black nongentrifying: (Black gentrifying + Black gentrifying × no Score or < 580) - (Black nongentrifying + Black nongentrifying × no Score or < 580)	-0.43	2.66**	0.61	0.77
3. Black gentrifying vs. Nonblack gentrifying: (Black gentrifying + Black gentrifying × no Score or < 580) - (Nonblack gentrifying + Nonblack gentrifying × no Score or < 580)	7.07***	4.12**	-5.84***	-9.57***

Notes: Results are from two-stage regression models in which first stage predicts moves for all residents living in gentrifiable tracts in the City of Philadelphia from 2002-2013 (excluding 2004) using a probit model and second stage predicts the destination type of movers using a multinomial logistic regression model with correction for moving. Estimation is based on data from the FRBNY/Equifax Consumer Credit Panel, Census 2000, 2009–2013 ACS, the Philadelphia Police Department, and the Pennsylvania Department of Education.

\*\*\*p < .001, \*\*p < .01, \*p < .05, †p < .10 (two-tailed tests).