Public Housing Redevelopment, Neighborhood Change, and the Restructuring of Urban Inequality[1]

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Housing policy plays a central role in the reproduction of urban inequalities. This study asks whether one such policy—public housing redevelopment via the federal HOPE VI program—altered the trajectories of high-poverty, racially segregated neighborhoods and reduced urban neighborhood inequality. Using a novel spatially integrated data set that combines administrative data with census data for 168 U.S. cities, the authors find that public housing redevelopment had significant direct and indirect spillover effects on neighborhood racial and economic composition between 1990 and 2010. The change induced by public housing redevelopment was ecologically significant, altering durable racial and economic hierarchies among urban neighborhoods. Changes in poor, minority neighborhoods were driven largely by displacement, however, from a net reduction in the number of poor and nonwhite residents. The authors evaluate the significance of these results for theories of neighborhood effects, gentrification, and durable urban inequality and discuss implications for urban policy.

Concentrated neighborhood disadvantage is a central dimension of social stratification, one produced by the confluence of deindustrialization, racial segregation, and discriminatory urban policy (Wilson 1987; Massey and Denton 1993; Quillian 1999, 2012; Squires 2011). Generations of scholars have

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examined the consequences of neighborhood disadvantage for people and for places. Researchers examining disadvantaged places have highlighted the importance of neighborhoods as ecological units of stratification, documenting the extreme persistence of spatial patterns of segregation and concentrated poverty over time (Jargowsky 1997, 2015; Sampson and Morenoff 2006; Sampson 2012; Sharkey 2013) and the racially and spatially structured ways that neighborhoods change (Wyly and Hammel 1999; Owens 2012; Hwang and Sampson 2014). Researchers studying the people within disadvantaged places have used increasingly sophisticated methods to estimate the causal effects of neighborhood context on individual well-being, as well as the interpersonal and institutional mechanisms that produce such effects (see Sampson, Morenoff, and Gannon-Rowley [2002] and Sharkey and Faber [2014] for reviews).

Housing policy plays a central role in the reproduction of urban inequalities among people and places (Desmond 2012, 2016). Enduring inequalities among neighborhoods were produced by generations of unequal access to public and private investment (Massey and Denton 1993; Hillier 2003; Squires 2011); entire minority neighborhoods were razed in the name of urban renewal and revitalization (Gans 1962; Mollenkopf 1983; Hyra 2008; Fullilove 2009; Vale 2002, 2013); and suburban growth was enabled via public investments in infrastructure and discriminatory lending practices (Wilson 1987; Massey and Denton 1993). Housing policy is also a key driver of economic inequality: housing that is unaffordable, low in quality, and insecure undermines the well-being of the poor (Coley et al. 2013; Newman and Holupka 2015; Desmond and Gershenson 2016), while the affluent compound economic advantages via wealth generation and tax benefits from homeownership (Keister and Moller 2000; Shlay 2006). The spatially targeted nature of government intervention in housing markets, combined with stark racial and economic segregation among neighborhoods, has translated into population-level inequalities by race and class—including extreme wealth inequality, gaps in life expectancy, and differential economic mobility—that persist across generations (Williams and Collins 2001; Oliver and Shaprio 2006; Sharkey and Elwert 2011; Chetty, Hendren, and Katz 2015).

Because housing policy shapes both housing choices and neighborhood context, it offers a window into questions of long-standing theoretical importance regarding neighborhood effects, neighborhood change, and the reproduction of urban inequality. In this article, we ask whether one such policy—public housing redevelopment via the federal HOPE VI program—has altered the trajectories of high-poverty, racially segregated neighborhoods or reduced urban neighborhood inequality. Using a novel spatially integrated data set that combines administrative data on public housing and HOPE VI redevelopment grants with census data on the racial and economic composition of neighborhoods, we use difference-in-differences methods to identify whether public housing redevelopment changed the economic and racial composition

of neighborhoods between 1990 and 2010, distinguishing between direct effects and indirect spillover effects. We then evaluate the population processes that generate neighborhood change by detailing patterns of net migration by race and poverty status. Finally, we assess the ecological significance of public housing redevelopment for systems of place stratification by examining whether redevelopment altered durable economic and racial hierarchies among urban neighborhoods.

Urban scholars and policymakers have long debated the relative merits of people- versus place-based solutions to urban inequality (Davidson 2009), and our findings reveal the fundamental tensions inherent in these two approaches: we find substantial changes within poor, minority places that were generated by the net displacement of poor, minority people. Public housing redevelopment via the federal HOPE VI program significantly altered neighborhood economic and racial contexts, had spillover effects on surrounding neighborhoods, and disrupted durable racial and economic hierarchies among urban neighborhoods. Unlike other forms of gentrification and against the hopes of urban policymakers, however, the vast majority of neighborhood change induced by public housing redevelopment was produced by a reduction in poor and minority residents rather than by the net influx of more advantaged residents.

SPATIAL INEQUALITY AND HOUSING POLICY

The spatial organization of poverty has changed dramatically over the past half century, and public housing has played a central role in the concentration, and later the deconcentration, of poverty in urban America. In the mid-20th century, urban renewal legislation was used to enact "slum clearance" within minority neighborhoods positioned in desirable central city locations, and the public housing program was expanded to relocate residents displaced during urban renewal (Hyra 2012; Goetz 2013). Although public housing constitutes a small share of the total housing units in any given city (McClure 2008; Desmond 2012; Owens 2015), it has a disproportionate presence in neighborhoods of concentrated poverty. In our sample of 168 U.S. cities, for example, fully 38% of all high-poverty neighborhoods (defined as census tracts where 40% or more of residents are poor) contained a public housing development in 1990. The distinct urban form and stigma associated with public housing exert a disproportionate influence on surrounding areas, shaping neighborhood reputations, property values, and residential decisions far beyond the footprint of the development itself (Venkatesh 2000; Vale 2002; Hunt 2009). Below, we describe trends in the spatial reorganization of poverty since the 1970s, and we focus on the persistence of neighborhood inequality, the processes of neighborhood change and gentrification, and the role of housing policy. In doing so, we theorize how public housing redevelopment contrib-

utes to—and is potentially distinct from—these broader processes of neighborhood stability and change.

The Concentration of Poverty

Between 1970 and 1990, the number of people living in high-poverty neighborhoods—where more than 40% of residents are poor—doubled (Jargowsky 1997). This trend was racially structured: by the 1990s, one in three poor African-Americans lived in a high-poverty neighborhood, compared to just one out of 20 whites (Jargowsky 1997). High-poverty neighborhoods also expanded spatially during this period, taking up more physical space within urban centers, particularly in the urban industrial hubs of the Northeast and Midwest (Wilson 1987; Jargowsky 1997). The growth of concentrated poverty was produced not by declining incomes—the national poverty rate held steady during this time period—but by the spatial reorganization of poverty: poor people increasingly lived in poor places (Jargowsky 1997). Growing poverty concentrations were accompanied by other forms of economic and social distress including joblessness, welfare receipt, and school dropout (Wilson 1987, 1996; Kasarda 1993).

Even as concentrated poverty became more pronounced, the relative economic and racial standing of neighborhoods in the broader urban ecological system remained quite persistent. Sampson and Morenoff (2006), for example, found that neighborhood poverty rates in Chicago were correlated 0.87 between 1970 and 1990, indicating great stability in the relative rank order of neighborhoods while poverty rates grew overall (see also Sampson 2009). Similarly, Sharkey (2008, 2013) found little change over time in the extent to which black neighborhoods or black individuals were surrounded by contextual disadvantage. Neighborhood disadvantage is thus a durable form of inequality, one reproduced over time and across generations by race- and class-specific patterns of residential mobility (Tilly 1998; Sampson and Sharkey 2008; Sharkey 2013). Once a neighborhood has become disadvantaged, it is exceedingly rare that it alters its position in the ecological hierarchy of a city.

Public housing played a central role in the growth of concentrated neighborhood poverty in the latter half of the 20th century (Hyra 2012; Goetz 2013). The developments constructed to house residents displaced by urban renewal were located overwhelmingly in poor, African-American neighborhoods (Bauman 1987; Bickford and Massey 1991; Rohe and Freeman 2001; Polikoff 2007; Hirsch 2009; Hunt 2009; Hyra 2012; Vale 2013). For example, Massey and Kanaiaupuni (1993) estimated that a low-income African-American tract in Chicago had a 69% chance of having a public housing development built within it between 1950 and 1970, while a middle-income white tract in Chicago had only a 3% chance of this event. The location of public

housing has a mechanical effect on the poverty rate of a neighborhood because public housing units are income restricted. Mid-century high-rise housing developments were typically large and could contain thousands of units in some cities, so their construction made large contributions to the number of poor residents in the neighborhood. This concentration of economically vulnerable residents meant that the adverse economic and social effects of deindustrialization were particularly acute in public housing developments.

Several policy decisions exacerbated this trend, increasing poverty concentrations even more over time than would be expected from macroeconomic changes alone (Von Hoffman 1996; Schwartz 2014). The federal government started requiring that housing authorities prioritize very low-income tenants and charge a smaller share of tenant income for rent, with the goal of increasing access to affordable housing for the poorest. These changes, combined with dwindling federal budget allocations, often left local housing authorities with less money to pay operating and maintenance costs, which in combination with lax management precipitated the physical decline of the projects (Venkatesh 2000; Hunt 2009; Vale 2002, 2013).

Public housing developments also influence the neighborhoods around them, with crime and disorder spilling over into the surrounding streets (Lens 2013). The distinct urban form of public housing is often readily visible in a neighborhood streetscape, and these locations became stigmatized places as quality of life in the projects declined, adversely shaping neighborhood reputations (Wacquant 2008; Keene and Padilla 2010). The physical and social blight of public housing depressed property values, raised vacancy rates, and shaped residential decisions (Lee et al. 1999; Nguyen 2005), with poverty rates growing much more sharply in neighborhoods located closer to public housing as a result (Massey and Kanaiaupuni 1993; Carter, Schill, and Wachter 1998). Thus, the decline of public housing was intertwined with the growth of concentrated poverty both directly via the physical design and income restrictions of developments and indirectly via the broader spillover effects on surrounding neighborhoods.

Poverty Deconcentration and Gentrification

In a departure from previous decades, concentrated neighborhood poverty declined substantially during the 1990s. The number of people living in high-poverty neighborhoods declined by 25%, and the number of African-Americans living in high-poverty neighborhoods declined even more, by over a third (Jargowsky 2003). These changes, fueled primarily by a strong economy that raised incomes, were also accompanied by a period of urban renaissance marked by renewed federal and local investments and a return to the city of capital and people (Smith 1996; Wyly and Hammel 1999; Hyra 2008, 2012). Amid broader economic forces of globalization and the deregulation of financial

markets (Sassen 2000; Wyly, Atia, and Hammel 2004), federal urban policy was a key enabling force of poverty deconcentration during the 1990s. The Department of Housing and Urban Development (HUD) issued more than $80 billion for inner-city revitalization via placed-based economic, housing, and community development initiatives, which were designed to mitigate the blight and distress of concentrated poverty neighborhoods and to attract private business capital and middle-class residents (Goetz 2011*b*; Hyra 2008, 2012).

These urban transformations have prompted a renewed scholarly focus on the causes and consequences of gentrification, which we define here as "the process by which central urban neighborhoods that have undergone disinvestments and economic decline experience a reversal, reinvestment, and the in-migration of a relatively well-off middle and upper-middle class population" (Smith 1998, p. 198). As this influential definition suggests, gentrification is one particular form of neighborhood socioeconomic upgrading that typically involves the influx of capital and socioeconomically advantaged residents into previously disinvested neighborhoods (Owens 2012).[2] Concern over the potential displacement of poor residents has loomed large in gentrification debates (Brown-Saracino 2010).

Rates of class-selective in- and out-migration are one metric for assessing residential displacement. Although most quantitative research has found that lower-income residents do not move out of gentrifying neighborhoods at higher rates than they move out of other neighborhoods, gentrifying neighborhoods tend to exhibit race- and class-selective patterns of *in*-migration: vacant units in gentrifying neighborhoods are more likely to be filled by higher-income residents than vacant units in other poor areas (Vigdor 2002; Freeman 2005; Ellen and O'Reagan 2011; Ding, Hwang, and Divringi 2016; but see Newman and Wyly 2006). Some have called this process of class-selective in-migration neighborhood succession (e.g., Freeman 2005), while others have labeled it exclusionary displacement (e.g., Marcuse 1986) or indirect displacement (e.g., Davidson and Lees 2005).

The rate of residential in- and out-migration is only one metric for assessing displacement in gentrifying neighborhoods, however. The circumstances leading to out-migration—including evictions, rent affordability, and coercive actions by landlords or neighbors—provide another important metric for assessing the exclusionary processes by which populations change in gentrifying neighborhoods (Marcuse 1986; Freeman 2005; Pattillo 2007; Brenner, Marcuse, Mayer 2012). The outcomes for those who leave are another important consideration. The limited evidence available on destinations of

[2] Some definitions of gentrification also include rising property values, changes to the built environment, racial change, or changes in the cultural and institutional fabric of the community (Davidson and Lees 2005; Brown-Saracino 2010).

low-income residents suggests those who leave gentrifying neighborhoods relocate to significantly less favorable neighborhoods than their counterparts leaving other types of neighborhoods (Ding et al. 2016). Finally, displacement need not refer exclusively to residential moves—it also can take the form of cultural, institutional, and political exclusion for the residents who remain within gentrifying neighborhoods (Perez 2004; Lloyd 2005; Pattillo 2007; Hyra 2008; Zukin et al. 2009; but see also Freeman 2006; Brown-Saracino 2009).

Public Housing Redevelopment

Perhaps nowhere are the tensions inherent in the gentrification debate more evident than in the case of public housing redevelopment, which began in earnest during the 1990s (Goetz 2011*b*, 2013; Hyra 2012). The redevelopment of public housing involves significant public investments to demolish or substantially renovate existing public housing stock and construct new buildings that are integrated into the surrounding neighborhood. Public housing redevelopment has also typically incorporated mixed-income housing, with specific shares of units reserved for residents of different income brackets ranging from those with very low incomes to those who can afford market-rate rents. Since 1993, the federal government has allocated over $6 billion dollars to the redevelopment of distressed public housing developments and the construction of mixed-income developments in their place.[3]

Most public housing redevelopment has occurred via the federal HOPE VI program, which targeted the portion of the public housing stock deemed severely distressed. These developments met standards of extreme physical disrepair, economic distress, and social disorganization. The first goal of the HOPE VI program was to physically revitalize distressed public housing by demolishing or renovating the existing housing stock, replacing it with high-quality, new-urbanist construction integrated into the surrounding neighborhood. Its second stated goal was to deconcentrate poverty via the construction of mixed-income housing rather than building housing exclusively for poor residents. The third aim of the program was to "revitalize sites on which such projects were located and contribute to the improvement of the surrounding neighborhood."[4] Public housing authorities (PHAs) with distressed housing submitted applications that were evaluated based on PHA technical capacity; the development's level of need; feasibility of demolition, relocation, and redevelopment plans; resident involvement in the planning process; leveraging ad-

[3] http://portal.hud.gov/hudportal/HUD?src=/program_offices/public_indian_housing/programs/ph/hope6.

[4] Section 24 of the United States Housing Act of 1937 as amended by sec. 535 of the Quality Housing and Work Responsibility Act of 1998, P.L. 105–276.

ditional funding; and coordination with community partners.[5] Between 1993 and 2010, HUD awarded 549 federal grants to local PHAs for these purposes, which resulted in the demolition of over 100,000 public housing units in over 150 cities (Holin et al. 2010).[6]

In the 1990s, the dominant narrative in academic and policy circles was that concentrations of poor residents led to fewer opportunities to exchange information and resources, fewer positive role models, less formal and informal social control, and a dearth of economic and political power to leverage external resources for the neighborhood (Wilson 1987; Joseph, Chaskin, and Webber 2007). In addition to improving the physical quality of the housing stock, public housing redevelopment initiatives like HOPE VI were championed as a means to address the economic and social ills of concentrated poverty by creating a deliberate mix of incomes. The assumption that income mixing would build social capital, enhance social control, and boost residents' economic status soon came under scrutiny as qualitative researchers identified little cross-class contact within the mixed-income communities, along with new forms of social exclusion taking hold (Graves 2010; Fraser et al. 2013; Chaskin and Joseph 2015).

Since its inception, some scholars and fair housing advocates have criticized public housing redevelopment via HOPE VI as part of a thinly veiled neoliberal agenda to displace the poor and to gentrify communities, much as urban renewal had done just a half century before (Crump 2002; Vale 2002, 2013; Imbroscio 2008; Fullilove 2009; Hyra 2012; Fraser et al. 2013). Indeed, if gentrification involves the influx of capital and more-advantaged residents into previously disinvested neighborhoods, public housing redevelopment via HOPE VI may constitute a special—and extreme—case of gentrification. The program targeted neighborhoods that had received little public investment for decades, and HOPE VI grants were often used to leverage additional sources of public and private capital for redevelopment activities. The program also created a deliberate mix of incomes in place of exclusively low-income housing, which required the in-migration of moderate-income and market-rate tenants into areas once restricted to low-income tenants. Finally, the program aimed to spur reinvestment in the neighborhoods surrounding the public housing development, suggesting the potential for attracting capital and more advantaged residents into those areas as well.

[5] https://portal.hud.gov/hudportal/HUD?src=/program_offices/public_indian_housing/programs/ph/hope6/grants/history.

[6] Our focus on public housing redevelopment via the HOPE VI program covers most public housing redevelopment that has occurred in the United States since the 1990s. Given the scope and cost of demolition, renovation, and construction, most PHAs could not redevelop public housing without a significant investment of federal dollars. That said, some demolition, redevelopment, and renovation initiatives have been undertaken at the local level without federal involvement.

At the same time, public housing redevelopment via HOPE VI may involve more extreme forms of displacement than what typically occurs within gentrifying neighborhoods. Without a "build-first" approach, public housing residents often had to leave for many years while their buildings were demolished and then slowly rebuilt. The lack of one-for-one replacement of subsidized units meant that only a minority of public housing residents could return to the new mixed-income developments, and the rates at which they returned varied greatly across sites (Buron 2004; Popkin et al. 2004; Holin et al. 2010). In some cities, the original public housing stock consisted of high-rise buildings, and redevelopment resulted in a significant reduction in housing density, further limiting the number of original public housing residents who could return.

Although there are growing literatures that document the experiences of residents who are relocated by public housing redevelopment and the emerging social dynamics within new mixed-income developments, it is unclear whether public housing redevelopment fundamentally alters the racial and economic composition of neighborhoods, has spillover effects on surrounding neighborhoods, or disrupts the durable systems of racial and economic stratification among urban neighborhoods. It is also unclear whether the process of neighborhood change induced by public housing redevelopment mirrors more general processes of gentrification via an influx of higher-SES residents, or whether public housing redevelopment represents a distinct form of neighborhood socioeconomic upgrading driven mainly by population loss and the dispersal of public housing residents.

Answering these questions presents a number of methodological and conceptual challenges. The 1990s were a period of declining concentrated poverty and racial segregation for many U.S. cities, and public housing neighborhoods likely would have experienced some change in poverty and racial composition even in the absence of redevelopment (Goering, Kamely, and Richardson 1997). This concern is magnified by the fact that some neighborhoods targeted for revitalization by city elites may have been selected because they were poised to gentrify and thus were attractive investment opportunities (Fraser et al. 2013; Goetz 2011*b*; Hyra 2012). Even if redevelopment did have a causal effect on neighborhoods, it is unclear whether these changes were large enough to alter the durable hierarchies among neighborhoods (Sampson and Morenoff 2006; Sampson 2009; Hwang and Sampson 2014).

A second challenge involves geographic variation and geographic scale. Public housing developments clearly experience major compositional changes when buildings are demolished and rebuilt. In many cases, new developments were rebuilt with fewer public housing units than the original developments (Holin et al. 2010). We might therefore expect some decline in the poverty rate of the development as a direct, mechanical result of demolition and redevelopment. However, most of what we know about relocation and return in the HOPE VI program comes from case studies of a few large cities

and a handful of high-profile public housing developments (Popkin et al. 2004; Popkin, Levy and Buron 2009). It is unclear whether these findings hold for redevelopment that occurred in the rest of the United States, where the public housing stock was less distressed, buildings were smaller, and gentrification pressures were perhaps less intense. Additionally, local officials and housing advocates argued that redevelopment was intended to spur revitalization in surrounding neighborhoods via public and private investments in infrastructure, housing stock, amenities, and services (Hyra 2008), so there may be indirect spillover effects on surrounding neighborhoods. In case studies of a handful of cities, researchers have identified rising property values in areas surrounding redeveloped projects (Zielenbach 2002; Zielenbach and Voith 2010), suggesting that some spillovers may have indeed occurred, though it is unclear if this changed the income or racial profile of neighborhoods.

A small body of work has taken a first step toward answering these questions. In a study of 15 "early-adopter" HOPE VI sites, HUD researchers found heterogeneous short-term trends in neighborhoods (defined as census tracts) containing demolished projects, relative to citywide changes. Some neighborhoods experienced substantial demographic change and rising incomes relative to the city as a whole, while others experienced smaller scale changes, and some experienced virtually no change (Holin et al. 2010). Because the census tract was the unit of analysis, these trends combine both the direct effect on residents living in the developments as well as the indirect, or spillover, effects on those living in the surrounding neighborhoods. In an analysis of a similar set of HOPE VI redevelopments that occurred during the 1990s, Goetz (2011*a*) examined the decline in poor and black populations in HOPE VI neighborhoods, defined as census block groups with centers within a half mile of a HOPE VI development, relative to changes in the population citywide. He found large average declines in poverty rates in HOPE VI neighborhoods, with smaller and more heterogeneous effects on neighborhood racial composition. Both of these studies offer important first steps toward assessing the effects of redevelopment; we build on these analyses by analyzing the universe of HOPE VI redevelopment projects over a longer time span and with stringent methods to account for endogeneity.

The Present Study

In this article, we situate public housing redevelopment within the broader literatures on neighborhood inequality and neighborhood change. We ask (1) whether public housing redevelopment through federal HOPE VI grants changed the economic and racial composition of neighborhoods enough to disrupt durable systems of racial and economic inequality among neighborhoods and (2) whether these changes resulted from the net displacement of poor and minority residents or the influx of more advantaged residents.

Our findings have implications for theories of neighborhood effects and neighborhood change. At the individual level, this work reveals whether housing policy can disrupt multigenerational exposure to poor, segregated neighborhoods; alter neighborhood environments enough to influence the well-being of residents; or induce residential mobility and displacement. At the neighborhood level, this work informs debates in the neighborhood change literature about the varieties of gentrification, the stability of neighborhood composition, and the ecological spillovers of public investments (Vigdor 2002; Freeman and Braconi 2004; Freeman 2005; Ellen and O'Regan 2011; Owens 2012; Hwang and Sampson 2014). Finally, this work informs our understanding of how durable systems of spatial inequality within cities are perpetuated—and potentially disrupted—over time (Tilly 1998; Sampson and Morenoff 2006; Sampson and Sharkey 2008; Sampson 2009).

We also aim to make several substantive and methodological contributions to prior research on the effects of public housing redevelopment. First, we build on existing work by examining the full set of HOPE VI sites, not just certain cities or early-adopter sites, which allows us to assess the effects of redevelopment more comprehensively than has been done before. Case studies of high-profile developments and cities tend to receive disproportionate attention in academic and policy circles, which might bias our assessments of redevelopment given the wide variability in neighborhood conditions and implementation plans across cities. Second, we build on the methodologies of prior studies, which either make no comparison or compare changes in redeveloped neighborhoods to changes in citywide averages, by using a set of plausible counterfactual control groups and a variety of robustness and falsification tests to identify effects of redevelopment and to distinguish between direct compositional effects and indirect spillover effects of redevelopment. Finally, we contextualize our findings within broader spatial systems of inequality, looking beyond individual neighborhoods to determine whether the effects of public housing redevelopment were large enough to alter durable racial and economic hierarchies among neighborhoods.

DATA AND METHOD

Data

We created a spatially integrated data set that combines administrative records with census data to analyze the effects of public housing redevelopment, operationalized as HOPE VI grants. Our administrative records on public housing prior to redevelopment were obtained from HUD's 1993 Family Data on Public and Indian Housing.[7] This database contains summary data on

[7] http://www.huduser.org/portal/datasets/famdat.html.

the characteristics of housing units and families in each public housing development, as reported by the local housing authorities to HUD. We used HUD's Picture of Subsidized Households databases to obtain the latitude and longitude location for each housing development. We also compiled information from administrative records about HOPE VI grants received by each housing development, along with the calendar years in which grants were applied for and awarded.[8] Some housing developments received multiple HOPE VI grants between 1993 and 2010, and some grants were awarded to multiple housing developments. After merging the grant information with the public housing administrative records, we identified 547 grants for 483 distinct housing developments.

To obtain our analytic sample of public housing developments for this analysis, we restricted the sample to the continental United States and excluded small developments (with fewer than 25 units), scattered site projects, and elderly developments, as these were not the primary targets of HOPE VI. We then restricted the sample to PHAs that contained at least one HOPE VI development and at least two other developments that never received a HOPE VI grant. These sample restrictions resulted in 401 unique HOPE VI developments and 2,159 non–HOPE VI public housing developments located within 168 distinct PHAs (the PHAs included in the analysis are listed in app. A).

We used the 1990, 2000, and 2010 decennial censuses and the 2005–9 American Community Survey (ACS) to obtain data on the neighborhoods containing and surrounding public housing developments. Block groups, our primary unit of analysis, are clusters of census blocks that typically contain between 600 and 3,000 people.[9] Block group boundaries may change over time, so we standardized them to constant 2000-year-census boundary definitions. This allows us to interpret change in a block group as actual change in population and housing composition rather than as an artificial change resulting from shifting block group boundaries. The 1990 and 2010 data were standardized to 2000 boundaries by Geolytics (2008, 2012) based on an algorithm derived from population-weighted aggregates of constituent blocks (see app. J of the Geolytics User Guide for more details on the weighting algorithm).[10] The 2005–9 five-year summary ACS data were already in 2000-block-group boundaries and did not require standardization. There was a small amount of missing data (<1% of cases) that varied across variables

[8] HUD awarded two types of grants—demolition and revitalization. Although the names differ there is substantial overlap in what the awards were used to fund, so we pool both types of grants in this analysis. Details on demolition grants are publically available on the HUD website. According to HUD, 287 demolition grants were awarded for $395 million between 1999 and 2003, and 262 revitalization grants were awarded $6.2 billion between 1993 and 2010.

[9] http://www.census.gov/geo/reference/gtc/gtc_bg.html.

[10] http://www.geolytics.com/pdf/Appendix-J.pdf.

due to census suppression of small counts. We restrict the analytic sample to block groups with nonmissing data on all of the dependent variables.

To create our analytic data set, we used the latitude and longitude coordinates of each public housing development to identify the census block group or groups in which it was located.[11] We refer to these as *public housing* block groups. There were 2,197 public housing block groups in 1990, and 420 later received a HOPE VI grant. We then identified block groups with queen adjacency (i.e., any border or corner touching) to each public housing block group. We call these *surrounding neighborhood* block groups. We identified 9,661 surrounding neighborhood block groups in 1990, of which 1,868 were adjacent to one of the 420 developments that later received a HOPE VI grant.[12] Block group data are not systematically available prior to 1990, so we used tract-level decennial census data from 1970, 1980, 1990, and 2000 to construct longer historical trends in key demographic, economic, and housing conditions prior to redevelopment.[13]

Measures

Outcomes

We measured the racial and economic composition of public housing and surrounding neighborhood block groups in three ways: population *shares*, population *diversity*, and population *counts*. In our analysis of population shares, we measured the racial composition of the neighborhood as the share of residents who are non-Hispanic white. (In supplementary analyses, available upon request, we also disaggregated the nonwhite category into non-Hispanic blacks and Hispanics.) We measured the economic composition of the neighborhood as the poverty rate—the share of residents living in families with incomes below the federal poverty line.

Changes in population shares can produce either more or less population diversity, depending on the starting levels, so we also assessed changes in

[11] In some cases (268 block groups), housing developments spanned more than one block group; in these cases, we combined data from multiple block groups to create the public housing block group measures. Similarly, in a number of cases (398 block groups), there was more than one housing development within a single block group; in these cases, we combined data from multiple developments to create the public housing block group measures. We retain the block group as the unit of analysis throughout.

[12] If a block group was adjacent to both HOPE VI and non–HOPE VI public housing, we assigned it to the HOPE VI category. Results are not sensitive to this decision; the findings remain the same if we exclude these block groups from the analysis.

[13] Tracts are aggregations of block groups that contain about 4,000 people on average. We obtained tract-level census variables standardized to year 2000 boundaries from the Geolytics Neighborhood Change Database (Tatian and Kingsley 2003).

population diversity. In our analysis of diversity, we measured racial-ethnic diversity as a four-group (Hispanic, non-Hispanic white, non-Hispanic black, and non-Hispanic other race) nominal entropy score. The entropy score measures how evenly the different groups are represented in the geographic unit. (White 1986; Iceland 2004), with a score of one equaling perfect diversity, where all groups are represented evenly (i.e., make up the same proportion of the population), and a score of 0 equaling perfect homogeneity, where only one group is present. To measure income diversity we created an ordinal entropy index based on five income categories representing quintiles of the city's household income distribution. The ordinal entropy score accounts for the fact that income categories have an inherent order, with some categories being closer together than others, and larger values of the ordinal entropy score indicate greater dispersion in the income distribution of the neighborhood. It assumes its maximum value of one when the two income groups at the lowest and highest extremes each constitute 50% of the geographic area (Reardon et al. 2006; Galster and Booza 2007; Freeman 2009).

Population shares and population diversity can change due to different underlying population dynamics. For example, the share of white residents in a neighborhood can increase either because the absolute number of white residents increases (from in-migration or fertility) or because the absolute number of nonwhite residents decreases (from out-migration or mortality). These two underlying population processes imply different reasons for neighborhood change—a net influx of white residents or a net reduction in nonwhite residents. Our third set of outcome measures therefore reflects changes in population counts—the change in the number of white residents, nonwhite residents, poor residents, and nonpoor residents—that we compare over time to understand the underlying population dynamics producing neighborhood change.[14] Census data do not contain the longitudinal information necessary to disentangle out-migration from in-migration, so the population count measure pools these two processes together and captures net migration over the course of a decade. In order to standardize for varying initial population sizes, we report these results in the form of percentage changes in the number of poor, nonpoor, white, and nonwhite residents.

[14] We cannot measure migration rates directly using census data, so changes in population counts combine population change due to residential mobility with population change due to fertility and mortality. Because nonwhite and poor adults have higher fertility rates and more youthful age distributions than their white and nonpoor counterparts, in the absence of any residential mobility we would expect the numbers of nonwhite and poor residents to increase more rapidly over time than the number of white and nonpoor residents. Thus, if we find evidence that the number of nonwhite or poor residents has declined at a faster pace than the number of white or nonpoor residents, this is likely a conservative estimate of the net migration that has occurred.

Control Variables

Housing developments were not randomly assigned to receive redevelopment grants; they were selected based on the extent of physical deterioration of the housing stock, high rates of crime and poverty, and management problems indicated by high vacancy rates and resident turnover. We compiled an extensive set of characteristics of housing developments and their surrounding neighborhoods using 1990 census block group data, 1970–90 census tract data, and 1993 public housing development administrative data to control for observed differences between HOPE VI and non–HOPE VI public housing developments. These measures capture the stated priorities for awarding HOPE VI grants, other factors that may have influenced the likelihood of applying for and receiving a grant, and the preredevelopment trends in our dependent variables between 1970 and 1990. Characteristics of the block groups containing and surrounding public housing developments were measured using the 1990 or 2000 census, whichever was the most recent prior to receiving a HOPE VI grant. Table 1 shows descriptive statistics for a subset of these measures in 1990, and appendix B contains a full list of the measures included in the analyses (full descriptive tables are available upon request).

Analytic Strategy

Prior research has compared racial and economic changes in HOPE VI developments to changes in all neighborhoods citywide using a difference-in-differences framework (Goetz 2010; Holin et al. 2010). We build on this analytic strategy in several ways. First, we do not assume that all other neighborhoods in a city are adequate counterfactuals for HOPE VI neighborhoods. We restrict our control group to other public housing neighborhoods that did not receive a HOPE VI grant, and we model selection into receiving a HOPE VI grant on the basis of an extensive set of observed covariates, which we combine into a single propensity score for efficiency reasons, as described below. Second, we construct additional counterfactual control groups based on public housing neighborhoods that were *failed HOPE VI applicants* and *future HOPE VI grantees*. Third, we conduct a falsification test to ensure that our results are not being driven by unobservable time trends. These additional steps are designed to enhance our confidence in a causal interpretation of our results by accounting for unobserved differences between HOPE VI and non–HOPE VI public housing developments.

Difference-in-Differences Framework

We estimate a difference-in-differences model to assess the effect of public housing redevelopment on neighborhood economic and racial composition.

TABLE 1
CHARACTERISTICS OF PUBLIC HOUSING BLOCK GROUPS IN 1990

	Block Group			
	Contains HOPE VI	Surrounds HOPE VI	Contains Other Public Housing	Surrounds Other Public Housing
Racial composition:				
Non-Hispanic black	.66	.40	.46	.49
Non-Hispanic white	.22	.46	.37	.33
Hispanic	.10	.11	.15	.15
Other race	.03	.03	.03	.03
Education and employment:				
Poverty rate	.53	.31	.36	.24
Median household income ($)	20,045	33,033	28,144	40,402
< high school diploma	.51	.41	.42	.35
College degree or more	.04	.08	.08	.10
Unemployment rate	.23	.13	.15	.11
Public assistance receipt	.37	.19	.24	.15
Management occupation	.13	.18	.18	.22
Service occupation	.31	.23	.24	.19
Population characteristics:				
Population size	1,475	1,042	1,451	1,189
Residence < 5 years	.51	.48	.51	.48
Residence >20 years	.17	.22	.17	.20
Female-headed households	.30	.14	.18	.12
Age under 18	.36	.26	.28	.25
Age 65 or older	.11	.14	.14	.13
Housing characteristics:				
Number of housing units	590	442	617	504
Median property value ($)	71,912	95,476	101,114	119,468
Median rent ($)	394	622	536	709
Renters	.76	.56	.68	.53
Population density (/sq. mi)	12,240	7,899	17,474	14,347
Housing age < 5 years	.03	.05	.05	.06
Housing age >50 years	.24	.31	.26	.31
Vacancy rate	.13	.12	.10	.09
Detached houses	.26	.47	.33	.47
N	420	1,868	1,777	7,793

NOTE.—Surrounding block groups defined by queen adjacency. Values are proportions unless indicated otherwise. All monetary values adjusted for inflation to 2010 USD.

We run these models on two different samples: (1) block groups that *contain* public housing and (2) block groups that *surround* public housing and capture broader spillovers of redevelopment. Our data are structured in a block group-year format, where each block group contributes three observations, one for each census decade (1990, 2000, and 2010). This model compares trends in the treated (i.e., HOPE VI) block groups to trends in untreated (i.e., Non–HOPE VI public housing) block groups, taking the form

$$X_{ijt} = \beta_1 + \beta_2(HOPEVI)_{ij} + \beta_3(Post)_{jt} + \beta_4(HOPEVI \times Post)_{ijt} + \beta_5(PScore)_{ij} + \alpha_j + \varepsilon_{ijt}, \quad (1)$$

where X is one of our dependent variables (population share, population diversity, or population count) for block group i at time t (where t equals 1990, 2000, or 2010) in PHA j. For our analysis of block groups that contain public housing, HOPEVI is a dichotomous variable that equals one if the block group contains a public housing development that received a HOPE VI award, and zero if the block group contains a non–HOPE VI public housing development. *Post* is a dichotomous variable that equals zero before the grant was awarded and one after the grant was awarded.[15]

The intercept β_1 is the mean on the dependent variable for the untreated public housing block groups prior to any redevelopment. The β_2 coefficient reports the mean difference between the treated block groups and the untreated block groups prior to redevelopment. The coefficient for *Post*, β_3, estimates the average change in a dependent variable between the preaward year and the postaward year for untreated block groups. Our difference-in-differences estimator of interest is β_4, which captures the extent to which the change in treated block groups deviates from the change in untreated block groups, net of the controls in the model. If β_4 is statistically significant, it indicates that trends in the dependent variable diverged for HOPE VI and non–HOPE VI block groups during the decade in which the HOPE VI grant was received.

Our models also include a vector of PHA fixed effects, $\boldsymbol{\alpha}$, which allows us to compare trends in treated and untreated neighborhoods located within the same PHA. We also cluster our standard errors at the development level to account for the fact that there can be multiple block groups associated with each development. After we run these models for block groups *containing* public housing to assess the direct effects of redevelopment, we run the same

[15] *Post* = 1 for the first time in year 2000 for block groups that received their first HOPE VI grant during the 1990s, and *Post* = 1 for the first time in 2010 for block groups that received their first HOPE VI grant during the 2000s.

models for our sample of block groups *surrounding* public housing to assess the indirect spillover effects of redevelopment.

The key assumption of the difference-in-differences model is that, in the absence of HOPE VI redevelopment, the treated and untreated neighborhoods would have experienced the same time trend on our outcome variables. We might be concerned about this "parallel trends" assumption if we believe that untreated neighborhoods differ from treated neighborhoods in ways that influence both their likelihood of HOPE VI receipt and their likelihood of experiencing change in economic and racial composition over time. For example, developments selected for HOPE VI had high levels of economic, physical, and social distress, but HUD and the local PHA also believed the developments had revitalization potential that may have occurred even without a HOPE VI award. The key challenge to generating an unbiased estimate of the effect of HOPE VI is identifying the appropriate counterfactual to satisfy this parallel trends assumption. As a first step to address this, all models control for tract-level trends in our dependent variables from 1970 to 1990, which control for ways in which the HOPE VI and non–HOPE VI neighborhoods were changing before the treatment. We then take several additional steps to identify appropriate counterfactuals.

Propensity Score Control

Our first strategy accounts for selection into receiving a HOPE VI award based on the extensive list of observable characteristics of housing developments and their neighborhoods listed in appendix B. We estimate a propensity score—the conditional probability of assignment to a treatment (in this case, HOPE VI)—given a vector of observed covariates capturing neighborhood characteristics in 1990, trends from 1970–90, as well as attributes of the public housing developments themselves measured in 1993. To do this, we first regress the HOPE VI treatment indicator on the covariates listed in appendix B. We then save the resulting predicted probabilities as the estimated propensity scores. These values report the predicted likelihood of receiving a HOPE VI grant based on observed characteristics. Statisticians have shown that adjusting for the propensity score is sufficient to remove bias due to the observed covariates, so we include the propensity score as a covariate in the difference-in-differences model instead of the individual covariates (Rosenbaum and Rubin 1983). Appendix B shows that there is common support, or overlap, in the distribution of propensity scores in the treated and untreated public housing neighborhoods, meaning that there were untreated public housing neighborhoods with propensity scores similar to those of the HOPE VI public housing neighborhoods (even though the former did not actually receive a grant).

Applicant Robustness Checks

Despite the extensive list of covariates included in our propensity score, one might worry that there are other unobserved ways in which the treated and untreated neighborhoods differ that are not captured by our covariates. To address this concern, we reestimate our difference-in-differences model using several alternative control groups. Our first robustness check involves a comparison to *failed applicants*—public housing developments that applied for, but failed to receive, a HOPE VI grant. Because the local PHA deemed these applicant developments distressed enough to warrant HOPE VI funding and devised revitalization plans for them, this group of failed applicants is likely more similar—along both observable and unobservable (to us) dimensions—to successful HOPE VI applicants than the full stock of public housing in that city. We obtained annual lists of HOPE VI applicants and identified the developments that applied for, but did not receive, a grant (Murphy 2012), and we use this group of failed applicants as the control group in our difference-in-differences model.

One still might be concerned that the failed applicants differ in some unobserved way from the successful applicants. Perhaps they were not as distressed as the successful applicants, or perhaps their revitalization plans were not as feasible. Our second robustness check addresses this concern by comparing treated neighborhoods to *future grantees*—public housing developments that had not yet received a HOPE VI grant at the time we observe the outcomes, but that ultimately do receive an award. Given the time structure of our data, this compares successful HOPE VI applicants in the 1990s to a control group of HOPE VI applicants who are successful for the first time in the 2000s. In both of these analyses, we also adjust for the propensity score of selection into HOPE VI awards. Although the alternative control groups of failed and future grantees cannot fully account for all aspects of unobserved selection into receiving a HOPE VI grant, collectively they offer a more plausible set of counterfactuals against which to assess what would have happened in the absence of HOPE VI.

Finally, to assuage potential concerns about any remaining bias due to unobserved selection into receiving a HOPE VI grant, we offer a falsification test of the parallel trends assumption: we ensure that we do not detect significant effects where there should be none. We take future grantees—those who receive grants for the first time in the 2000s—and make them a "placebo" treatment group in the 1990s difference-in-difference analysis. We run a model comparing this placebo treatment group to the main control group of untreated public housing. If we find significant differences between the placebo group and the untreated group between 1990 and 2000, this suggests that the parallel trends assumption has been violated: there is something other than HOPE VI that made the trajectories of the treated and untreated

neighborhoods diverge. If we find no significant differences between the placebo and untreated neighborhoods, however, this lends more confidence that the results we find are due to HOPE VI rather than to some other (unobserved) force that changed the racial or economic composition of the neighborhood.

Neighborhood Stratification Analysis

Prior research has identified strong persistence in the citywide hierarchies of neighborhood poverty rates and racial composition between 1970 and 1990 (Sampson and Morenoff 2006; Sampson 2009). If public housing redevelopment has fundamentally altered this system of neighborhood stratification, we would expect that the relative ranking of HOPE VI tracts improved more than other tracts in the same city. We test this hypothesis by computing the relative rank order of each census tract within a city in terms of its poverty rate and its share of nonwhite residents in each decade. We then regress the change in a tract's relative ranking across decades on a series of mutually exclusive dummy variables for whether the census tract contains a HOPE VI development, other public housing, or no public housing. If the coefficient on the HOPE VI dummy variable is significantly larger than the other categories, it suggests that the relative ranking of HOPE VI tracts increased more than other tracts and that they moved up in the hierarchy of neighborhoods within a given city. Because of data availability, we use census tracts to assess long-term neighborhood durability and change from 1970 to 2010.[16] Because tracts are larger than the block groups used in the preceding analyses, this analysis pools direct and indirect spillover effects and considers public housing neighborhoods as a whole.

RESULTS

Descriptive Trends in Public Housing Neighborhoods

Figure 1 displays trends in the average poverty rates of census tracts in our analytic sample between 1970 and 2010. Consistent with its focus on distressed public housing, tracts with developments that received HOPE VI grants had higher poverty rates than other public housing tracts. Trends in poverty rates varied little over time for nonpublic housing tracts, growing slightly between 1970 and 2010 (from 12% to 15%). Trends in poverty concentration between 1970 and 1990 and deconcentration between 1990 and 2010 were much more apparent for public housing tracts, highlighting their central contribution to national trends. Average poverty rates rose by about

[16] We use census tracts, rather than block groups, for this analysis because block group data are not systematically available prior to 1990, a limitation that prevents us from analyzing long-term pretreatment trends at the block group level.

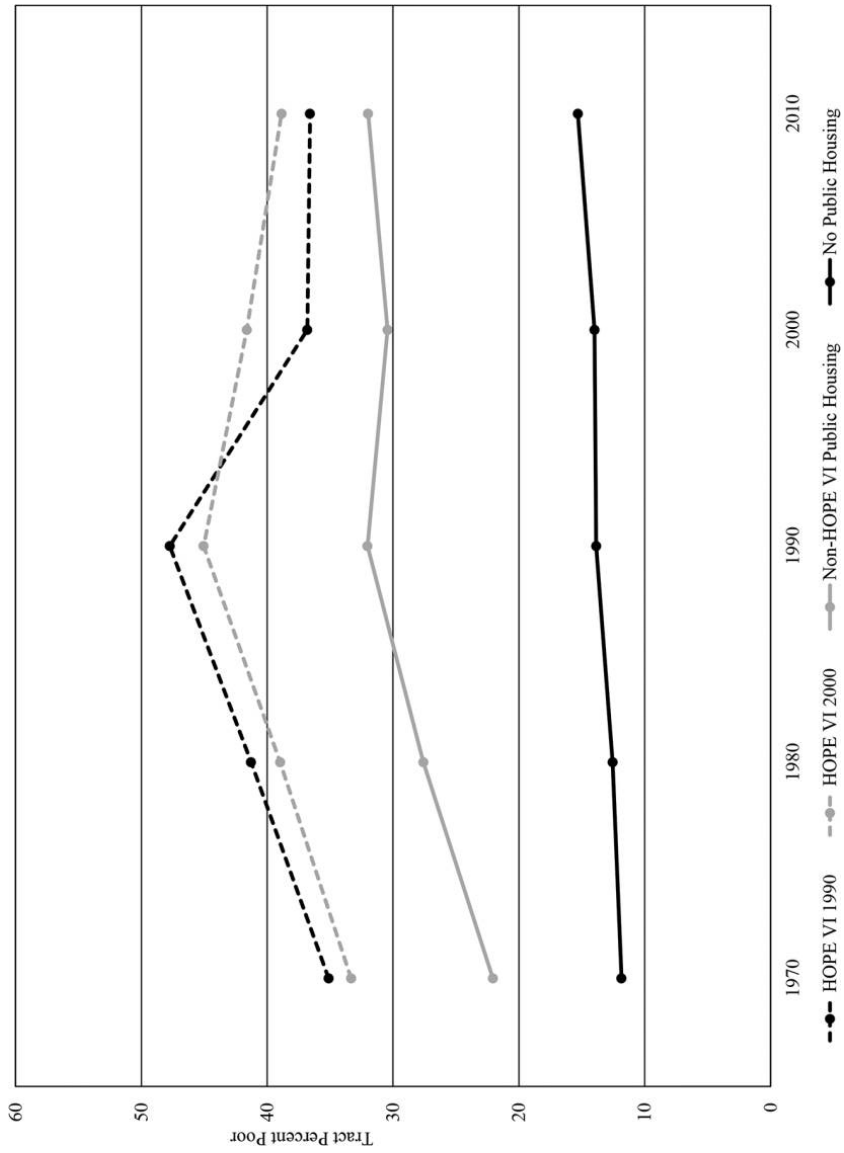

FIG. 1.—Average poverty rate in census tracts by presence of HOPE VI and public housing, 1970–2010

10 percentage points for public housing tracts between 1970 and 1990. By 1990, the average census tract containing public housing had a poverty rate exceeding 30%, and poverty rates in tracts with developments that eventually received HOPE VI awards exceeded 40%. Until 1990, HOPE VI and other public housing tracts followed parallel trends over time, but this changed in the 1990s when poverty rates declined substantially for HOPE VI tracts but only slightly for other public housing tracts.

Differential trends between public housing and nonpublic housing neighborhoods were less pronounced for racial composition than they were for poverty rates (fig. 2). The average census tract reduced its white population share between 1970 and 2010 regardless of public housing status. Public housing tracts tend to have smaller shares of white residents than nonpublic housing tracts, and HOPE VI tracts have even fewer white residents than other public housing tracts. Starting in 1990, the decline in white population shares tapered off in HOPE VI neighborhoods while it continued in other types of neighborhoods.

Direct Effects of Redevelopment on Racial and Economic Composition

We first estimate the direct impact of public housing redevelopment via HOPE VI on changes in racial and income composition within block groups containing public housing.[17] We present a series of tables that show the results for two sets of outcomes: population shares (table 2) and population diversity (table 3). Table 2 shows results from difference-in-differences regressions of shares of poor residents in models 1–3 and non-Hispanic white residents in models 4–6. Model 1 shows results for developments that received their first awards in the 1990s and their outcomes measured in 2000; this captures short-term changes for early awardees. Model 2 shows results for the same set of developments and their outcomes measured in 2010; this captures longer-term changes for the 1990s awardees. Finally, model 3 shows results for developments that received their first awards between 2000 and 2003 and outcomes measured in 2010 (for race) and 2005–9 (for poverty); this captures short-term changes for the 2000s awardees. All models control for the propensity score, PHA fixed effects, and the pretreatment tract-level trends in the outcome variables that adjust for ways in which treated and nontreated neighborhoods were changing prior to redevelopment.

Taken together, the results in table 2 indicate a significant and substantial direct effect of public housing redevelopment on block group poverty rates, and a smaller direct effect on racial composition. Recall that, in a difference-in-differences framework, the key test of the effect of redevelopment comes

[17] Because these block groups may also contain some nonpublic housing residents, the effects we identify here are conservative and can be interpreted as a lower bound.

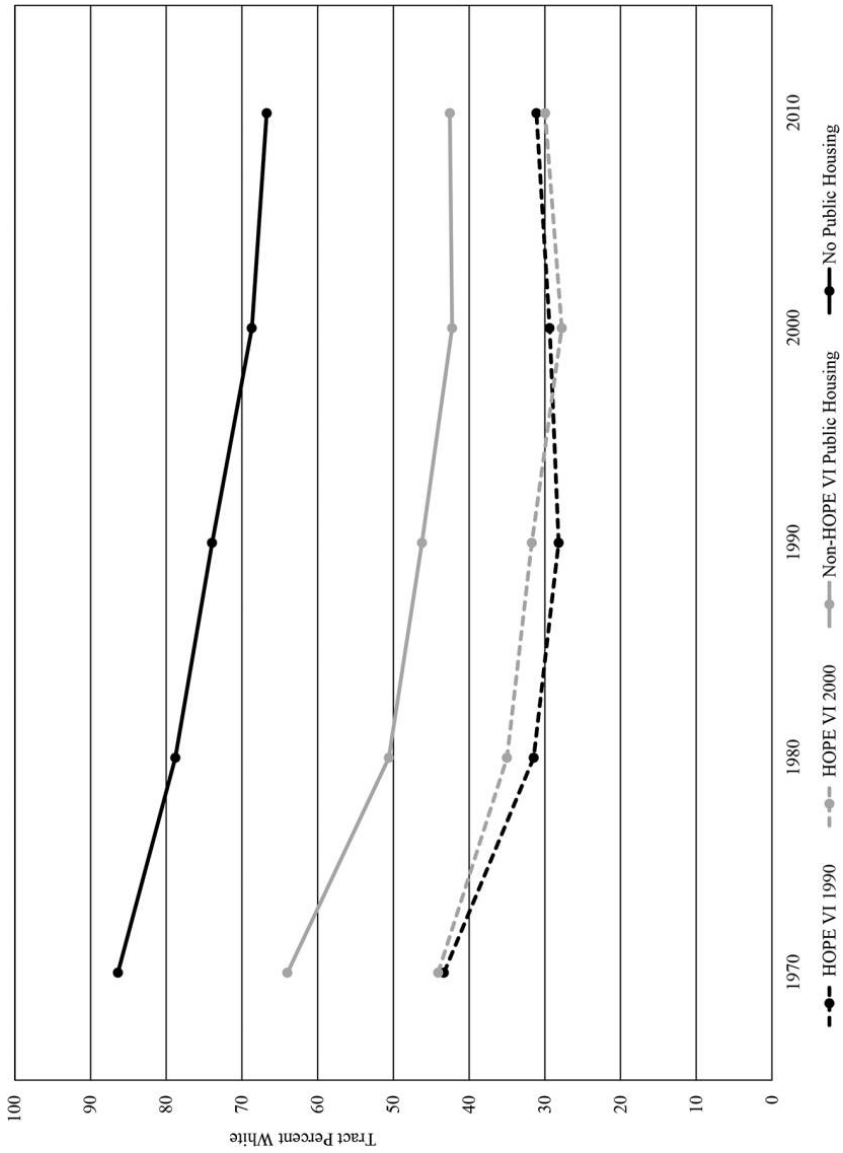

FIG. 2.—Average percentage of white residents in census tracts by presence of HOPE VI and public housing, 1970–2010

TABLE 2

EFFECT OF HOPE VI REDEVELOPMENT ON POVERTY AND RACIAL COMPOSITION IN BLOCK GROUPS CONTAINING PUBLIC HOUSING, 1990–2010

	%POOR			%NON-HISPANIC WHITE		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Redeveloped in	1990s	1990s	2000s	1990s	1990s	2000s
Outcome in	2000	2010	2010	2000	2010	2010
Constant	33.70***	33.90***	31.80***	40.70***	40.63***	36.34***
	(.53)	(.55)	(.55)	(.90)	(.88)	(.82)
HOPE VI redevelopment	3.54**	3.79**	2.82*	−5.39**	−7.01**	−6.41**
	(1.30)	(1.33)	(1.36)	(1.73)	(1.71)	(1.68)
Post	−2.09***	−1.72***	1.32***	−6.46***	−8.05***	1.98***
	(.29)	(.43)	(.36)	(.25)	(.38)	(.22)
Post × HOPE VI	−9.71***	−10.90***	−9.64***	4.56***	8.64***	3.97***
	(1.25)	(1.49)	(1.69)	(.75)	(1.18)	(.85)
Propensity score	.51***	.47***	.55***	−.48***	−.41***	−.43***
	(.03)	(.03)	(.04)	(.04)	(.04)	(.04)
PHA fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Pretreatment tract trends in DV	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,394	4,394	3,944	4,394	4,394	3,944
R^2	.50	.41	.39	.56	.54	.59

NOTE.—Difference-in-differences regressions. SEs are clustered to account for multiple block groups per public housing development. Propensity scores are scaled from 0 to 100. DV = dependent variable, which is %poor in models 1–3 and %non-Hispanic white in models 4–6.

* $P<.05$.

** $P<.01$.

*** $P<.001$.

TABLE 3

EFFECT OF HOPE VI REDEVELOPMENT ON POVERTY AND RACIAL POPULATION DIVERSITY IN BLOCK GROUPS CONTAINING PUBLIC HOUSING, 1990–2010

	HOUSEHOLD INCOME ENTROPY SCORE			ETHNORACIAL ENTROPY SCORE		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Redeveloped in	1990s	1990s	2000s	1990s	1990s	2000s
Outcome in	2000	2010	2010	2000	2010	2010
Constant	74.41***	74.55***	77.56***	33.78***	34.73***	46.11***
	(.53)	(.55)	(.52)	(.69)	(.67)	(.69)
HOPE VI redevelopment	−1.18	−1.27	−2.27	−1.77	−3.16*	−4.55**
	(1.29)	(1.34)	(1.33)	(1.49)	(1.52)	(1.64)
Post	2.26***	−.45	−2.98***	9.29***	15.20***	5.45***
	(.29)	(.39)	(.35)	(.32)	(.42)	(.27)
Post × HOPE VI	5.84***	7.47***	2.77	−.75	4.67**	4.38***
	(1.20)	(1.52)	(1.51)	(1.12)	(1.51)	(1.14)
Propensity score	−.36***	−.35***	−.36***	−.19***	−.14***	−.12***
	(.03)	(.03)	(.04)	(.03)	(.03)	(.04)
PHA fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Pretreatment tract trends in DV	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,394	4,394	3,944	4,394	4,394	3,944
R^2	.35	.28	.27	.45	.45	.44

NOTE.—Difference-in-differences regressions. SEs are clustered to account for multiple block groups per public housing development. Entropy scores and propensity scores are scaled from 0 to 100. DV = dependent variable, which is household income entropy score in models 1–3 and ethnoracial entropy score in models 4–6.

* $P<.05$.

** $P<.01$.

*** $P<.001$.

from the coefficient on the interaction term for time × redevelopment status. On average, the poverty rates of public housing block groups that received HOPE VI grants declined by about 10 percentage points in the short term following HOPE VI redevelopment, above and beyond changes that occurred in other public housing block groups during the decade. This was true both for block groups that received awards in the 1990s (model 1) and those that received awards in the 2000s (model 3). Model 2 shows a small additional decline in poverty rates during the 2000s for block groups redeveloped in the 1990s, yielding a longer-term poverty rate reduction of 11 percentage points. These effects are substantial relative to the baseline 37% poverty rate in HOPE VI block groups in 1990: poverty rates declined by about one-third in block groups that received HOPE VI grants, compared to just 5% within comparable public housing block groups that did not receive HOPE VI grants.

The second set of models in table 2 shows the direct effects of HOPE VI redevelopment on the racial composition of the public housing block groups. Here, we find more modest changes. In the 1990s, whites became a smaller share of residents in public housing block groups overall, with a six-percentage-point decline. This decline was significantly weaker in HOPE VI public housing block groups, which experienced only a one-percentage-point reduction in the share of white residents (table 2, models 4 and 5). Developments receiving HOPE VI grants during the 2000s also saw a larger increase in the share of white residents between 2000 and 2010 relative to comparable block groups that were not redeveloped (model 6). In other words, white residents retained their population shares in HOPE VI public housing block groups, but had a shrinking presence in other public housing block groups.

Table 3 presents results for diversity outcomes in order to assess whether the shifting population shares identified in table 2 resulted in greater income or racial diversity. The entropy scores range from a minimum of 0 to a maximum of 100. The constant terms indicate that income diversity was considerably higher than racial diversity in these neighborhoods in 1990. Model 1 shows that during the 1990s, household income diversity increased slightly in non–HOPE VI public housing block groups (from 74.4 to 76.7), but grew significantly more in HOPE VI block groups (from 73.2 to 81.3), or by about half of a standard deviation (SD = 19). There were few additional changes during the 2000s for HOPE VI block groups, even though income diversity in other public housing block groups declined (table 3, models 2 and 3).

Results for racial diversity are presented in the second set of models in table 3. Public housing block groups became significantly more racially diverse during both the 1990s and 2000s. The racial entropy score of the average public housing block group grew from 33.8 in 1990 to 43.1 in 2000 and to 49.9 in 2010, which is an increase of about two-thirds of a standard deviation. Growing ethnoracial diversity was significantly more pronounced for HOPE VI block groups during the 2000s (table 3, models 5 and 6).

Taken together, our findings for block groups containing public housing suggest large direct effects of public housing redevelopment on poverty rates and racial composition, which translated into greater income and racial diversity. Block groups containing redeveloped public housing experienced reductions in poverty rates of about 10 percentage points, retained their shares of white residents, and saw gains in both racial and income diversity of at least half a standard deviation, relative to changes that occurred within other comparable public housing block groups during this period.

Spillover Effects on Neighborhoods Surrounding Public Housing

Were the effects of redevelopment confined to the areas containing the public housing development, or did redevelopment have broader spillovers on the neighborhoods surrounding public housing? To answer this question, we reran our difference-in-differences models on the sample of block groups adjacent to public housing. These results are presented in tables 4 and 5. We find that redevelopment did have indirect spillover effects on surrounding neighborhoods, but these effects are smaller in magnitude than the direct effects and are confined to redevelopment that occurred in the 1990s.

Table 4 reports the difference-in-differences models for the share of poor residents in the block groups surrounding public housing. Neighborhoods surrounding public housing experienced small declines in poverty rates during the 1990s (about one percentage point), but neighborhoods surrounding public housing redeveloped through HOPE VI in the 1990s experienced an additional three-percentage-point decline in the poverty rate (table 4, model 1). From a base of a 26% poverty rate in areas adjacent to HOPE VI in 1990, this decline amounts to a 12% reduction beyond what would have occurred in the absence of redevelopment. There was little change due to redevelopment in the following decade (table 4, models 2 and 3). Results are similar for changes in the racial composition of neighborhoods surrounding public housing, which experienced declining shares of white residents during the 1990s. But this trend was significantly weaker in the neighborhoods around HOPE VI public housing—their shares of non-Hispanic whites fell by three percentage points less than the neighborhoods surrounding other comparable public housing (table 4, model 4). Again these spillover effects were concentrated in the 1990s, and we find no spillover effects for redevelopment that occurred during the 2000s (model 6).

How did shifting population shares affect residents' exposure to racial and economic diversity in the neighborhoods surrounding redeveloped public housing? The results of these analyses are presented in table 5. Neighborhoods surrounding HOPE VI developments became significantly more income diverse, although the magnitude of these effects is substantively small: income diversity grew by about one point (table 5, model 1) and

TABLE 4

SPILLOVER EFFECT OF HOPE VI REDEVELOPMENT ON POVERTY AND RACIAL COMPOSITION IN BLOCK GROUPS ADJACENT TO PUBLIC HOUSING, 1990–2010

	%POOR			%NON-HISPANIC WHITE		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Redeveloped in	1990s	1990s	2000s	1990s	1990s	2000s
Outcome in	2000	2010	2010	2000	2010	2010
Constant	22.33***	22.27***	20.94***	52.36***	52.44***	47.19***
	(.25)	(.26)	(.25)	(.49)	(.48)	(.46)
HOPE VI redevelopment	3.53***	3.50***	2.71***	−4.66***	−5.31***	−5.82***
	(.68)	(.69	(.67)	(1.16)	(1.15)	(1.09)
Post	−.68***	.65**	1.27***	−7.54***	−10.80***	−3.31***
	(.14)	(.19)	(.18)	(.13)	(.20)	(.12)
Post × HOPE VI	−3.27***	−3.17***	.57	2.85***	5.44***	.46
	(.53)	(.70)	(.64)	(.42)	(.63)	(.38)
Propensity score	.12***	.12***	.19***	−.25***	−.23***	−.29***
	(.01)	(.02)	(.02)	(.03)	(.02)	(.03)
PHA fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Pretreatment tract trends in DV	Yes	Yes	Yes	Yes	Yes	Yes
Observations	19,322	19,322	17,354	19,322	19,322	17,354
R^2	.25	.19	.20	.45	.45	.48

NOTE.—Difference-in-differences regressions. SEs are clustered to account for multiple block groups per housing development. Propensity scores are scaled from 0 to 100. DV = dependent variable, which is %poor in models 1–3 and %non-Hispanic white in models 4–6.

* $P<.05$.

** $P<.01$.

*** $P<.001$.

TABLE 5

Spillover Effect of HOPE VI Redevelopment on Poverty and Racial Population Diversity in Block Groups Adjacent to Public Housing, 1990–2010

	Household Income Entropy Score			Ethnoracial Entropy Score		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Redeveloped in	1990s	1990s	2000s	1990s	1990s	2000s
Outcome in	2000	2010	2010	2000	2010	2010
Constant	78.18***	78.36***	79.99***	32.72***	33.63***	45.44***
	(.20)	(.21)	(.21)	(.34)	(.33)	(.35)
HOPE VI redevelopment	−1.16*	−.71*	−1.34*	1.14	.73	−1.84*
	(.55)	(.57)	(.51)	(.83)	(.83)	(.83)
Post	1.25***	−1.66***	−2.86***	10.80***	17.00***	6.09***
	(.13)	(.16)	(.16)	(.16)	(.22)	(.14)
Post × HOPE VI	1.65***	1.04	−.49	−.79	.26	1.38***
	(.47)	(.62)	(.55)	(.53)	(.68)	(.42)
Propensity score	−.07***	−.08***	−.05***	−.04*	−.03	.03
	(.01)	(.01)	(.01)	(.02)	(.02)	(.02)
PHA fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Pretreatment tract trends in DV	Yes	Yes	Yes	Yes	Yes	Yes
Observations	19,322	19,322	17,354	19,322	19,322	17,354
R^2	.10	.08	.08	.33	.35	.31

Note.—Difference-in-differences regressions. SEs are clustered to account for multiple block groups per housing development. Entropy scores and propensity scores are scaled from 0 to 100. DV = dependent variable, which is household income entropy score for models 1–3 and ethnoracial entropy score for models 4–6.

* $P<.05$.

** $P<.01$.

*** $P<.001$

was confined to the 1990s (model 3). There were no spillover effects on surrounding neighborhoods in terms of racial diversity (models 5–7). Thus, we find little evidence that public housing induced spillover effects on surrounding neighborhoods that translated into appreciably more exposure to racial or income diversity.

We subjected our analyses to a number of robustness and falsification tests that are presented in appendix C. We find that the significant direct and indirect spillover effects of redevelopment on poverty rates and share of white residents hold when we compare redeveloped block groups to (a) block groups of failed applicants in the 1990s (who applied for but failed to receive a HOPE VI grant) and (b) block groups of future grantees (who had not received a grant by 2000, but did in the subsequent decade). In both cases, the magnitude of the effects is reduced by about one to two percentage points, but the substantive and statistical significance remains. We also conducted a falsification test that used a placebo treatment group—future grantees in the 2000s—to test for effects in the 1990s. Because this placebo treatment group had not yet received a HOPE VI grant, we would not expect to see effects in the 1990s; if we did, it would raise concern that there were unobserved time trends in redeveloped public housing for reasons other than HOPE VI for which our models did not account. Our findings pass this falsification test: we find no effects in the placebo group. While a full analysis of the heterogeneity in the effects of public housing redevelopment across different types of developments and across different cities is beyond the scope of the present study, the distribution of effects shows that our results were not driven by any particular outliers (see app. D).[18]

Consequences for Citywide Neighborhood Stratification

While our analyses above indicate substantively and statistically significant changes within redeveloped neighborhoods, were these changes large enough to alter the structure of neighborhood inequality within a city? In other words, did redevelopment boost public housing neighborhoods out of the ranks of the most disadvantaged neighborhoods in the city? We answer this question by computing the relative ranking of census tracts according to their poverty rate and their share of nonwhite residents within each city in our sample with larger relative rankings indicating greater disadvantage—larger poverty rates and larger shares of nonwhite residents. After ranking all tracts within a city from least to most disadvantaged, we adjust for the fact that cities have different numbers of census tracts by dividing each tract's ranking by the total

[18] A formal analysis of effect heterogeneity is outside the scope of the present article, but analyses that stratify the sample by the size (i.e., number of units) of the original public housing development reveal that effects were larger among larger housing developments.

number of tracts in the city, so that the relative ranking ranges from 0 (least disadvantaged) to 100 (most disadvantaged). This tract-level analysis combines both the direct effects from public housing block groups as well as the indirect spillover effects from the block groups surrounding public housing.

In 1970, just 7% of all nonpublic housing tracts fell into the poorest decile of a city's neighborhood poverty distribution, while one-quarter of public housing tracts and fully one-half of HOPE VI tracts were in the bottom decile (fig. 3). These patterns persisted between 1970 and 1990, indicating remarkably durable patterns of disadvantage in public housing neighborhoods. Between 1990 and 2010, however, the share of HOPE VI tracts that were in the bottom decile dropped from one-half to one-third (49%–32%), while there was little change in other types of tracts.

We then assessed the statistical significance of the changes in relative rankings over time for nonpublic housing tracts, public housing tracts, and HOPE VI tracts. The results of this analysis are presented in table 6. On average, the relative ranking of nonpublic housing neighborhoods changed little over time. The average neighborhood changed its relative position by less than 0.5 percentage points. Future HOPE VI tracts experienced little change in relative poverty rankings during the period of poverty concentration from 1970–90 (prior to redevelopment), dropping in the citywide ranking by 3% (table 6, model 1). During the redevelopment era of 1990–2010, however, this changed dramatically. HOPE VI tracts moved up the relative ranking of neighborhood

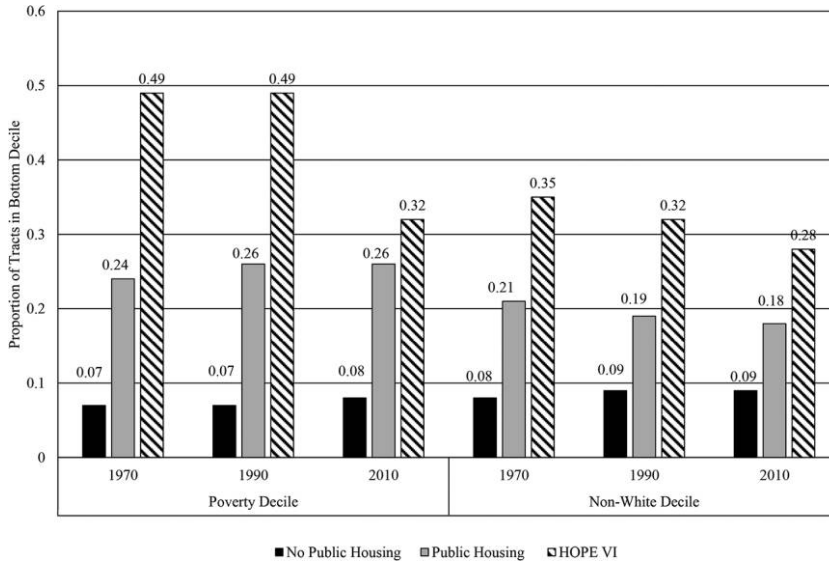

FIG. 3.—Share of census tracts in the most disadvantaged decile of the city, by presence of public housing.

TABLE 6
Change in Relative Neighborhood Disadvantage by Public Housing Status

	Change in Relative Rank			
	Poverty		Nonwhite	
	1970–90	1990–2010	1970–90	1990–2010
Constant	−.56***	.56***	−.19	.53***
	(.14)	(.13)	(.14)	(.11)
HOPE VI tract	3.27***	−9.40***	2.08*	−5.38***
	(.79)	(.73)	(.83)	(.66)
Other public housing tract	4.01***	−2.52***	1.16**	−3.20***
	(.41)	(.38)	(.43)	(.34)
PHA fixed effects	Yes	Yes	Yes	Yes
Observations	28,522	28,522	28,522	28,522

Note.—Relative rankings based on %poor and %nonwhite in tract within each city. Rankings range from 0 to 100, with larger values indicating greater disadvantage. Constant refers to nonpublic housing census tracts.

* $P<.05$.

** $P<.01$.

*** $P<.001$.

poverty in their respective cities by a full 9%, on average, which means they became less poor than about 9% of the other neighborhoods in their respective cities (table 6, model 2). This represents considerably more change in relative status than what they had experienced in the earlier period, and considerably more change than what happened within other types of neighborhoods during the same period.

Models 3 and 4 in table 6 present the changes in relative neighborhood rankings based on race. There is more stability in relative neighborhood rankings by race than there is by poverty, with no significant change in rankings between 1970 and 1990. There was also little change in the relative ranking of the average nonpublic housing tract during the HOPE VI era of 1990–2010, with the average tract changing by only about 0.5% (model 4). Census tracts that contained HOPE VI developments experienced more change during 1990–2010, moving up 5% in the relative ranking of neighborhoods in terms of their shares of nonwhite residents. This change in relative rank for HOPE VI tracts in terms of race was only about half the magnitude of the change in relative rank in terms of poverty rate, however, indicating greater change in neighborhood hierarchies of income than of race.

Taken together, the results from table 6 and figure 3 indicate that public housing redevelopment had a significant impact on durable patterns of inequality among neighborhoods by income and, to a lesser extent, race. After being overrepresented among the most disadvantaged neighborhoods in urban America across multiple decades, public housing neighborhoods moved

up the economic and racial hierarchies within their cities as a result of redevelopment.

Population Change, Gentrification, and Displacement

Our final research question asks whether the large-scale neighborhood changes we identified above resulted from a net influx of affluent residents, a net reduction in poor residents, or a combination of the two. The ideal data to answer this question would allow us to decompose the net change into that caused by increased out-migration versus decreased in-migration (Vigdor 2002; Ellen and O'Regan 2011). Census data are not publically available at this level of detail, however, so we follow the precedent of prior neighborhood change research and use changes in population counts to proxy for the net migration rates of different racial and income groups. Our analyses therefore pool together out-migration (sometimes referred to as direct displacement) and in-migration (sometimes referred to as indirect or exclusionary displacement) (Marcuse 1986; Davidson and Lees 2005).

Figure 4 presents the results of our difference-in-differences models separately for changes in the population of poor residents and the population of nonpoor residents, relative to the baseline subpopulation size.[19] Non–HOPE VI public housing block groups saw the number of poor residents decline (by about 10%) and the number of nonpoor residents increase slightly (by about 2%) during the 1990s. This is the baseline level of population change we might expect in public housing block groups in the absence of HOPE VI redevelopment. Relative to this, the change that occurred within public housing block groups redeveloped via HOPE VI is striking: HOPE VI block groups experienced a 75% decline in the number of poor residents. The number of nonpoor residents in HOPE VI block groups declined as well, although to a much smaller extent. Thus, on average the entire decline in poverty rates in HOPE VI block groups was produced by a net reduction in the number of poor residents.[20] There is no evidence that declining poverty rates in the average HOPE VI block group were driven by an influx of nonpoor residents.

[19] The percentage changes in fig. 4 divide the net population change for a particular subgroup by the population size for that subgroup at the start of the decade. The percentage changes are smaller if we calculate change relative to the total block group population rather than the subgroup population, but the relative differences between subgroups and treatment conditions remain the same.

[20] Another way that poverty counts could change is if a household's income changes enough to move it across the poverty line. The results we find here could not be driven by poor residents becoming less poor, however, since the number of poor and nonpoor residents declines. In additional analyses (not shown; available upon request), we replicated our poverty count analyses using education, a more stable indicator of economic status. Our results for the counts of residents without a high school degree and with a college degree mirror our findings for poor and nonpoor population counts.

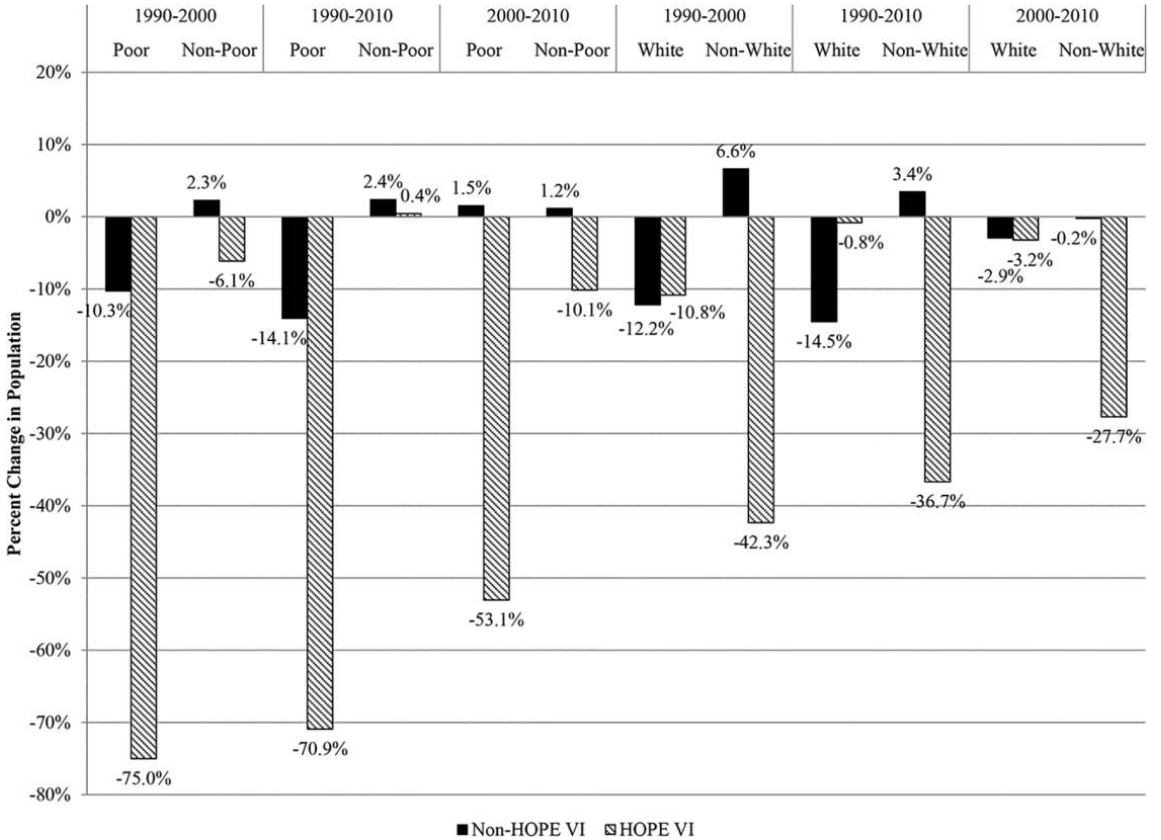

FIG. 4.—Percentage change in population within HOPE VI and non–HOPE VI block groups, by poverty status and race. $N = 4{,}394$ for the 1990s and 3,944 for the 2000s. Estimates from difference-in-differences regressions of the effect of HOPE VI redevelopment on percentage change in population size in block groups containing public housing. All models include controls for propensity score, PHA fixed effects, and tract trends in the dependent variables.

Of course, some of the short-term decline in the poor population could be due to the fact that HOPE VI redevelopment was still in progress at the time of the 2000 census. However, the depopulation of poor residents in redeveloped block groups persisted through 2010 as well, suggesting that the 2000 results were not merely due to temporary relocation but persisted after redevelopment was complete. We find a similar pattern of results for block groups redeveloped in the 1990s and in the 2000s, although the magnitude of depopulation was greater in the 1990s than in the 2000s. We also find a similar pattern of results when we look at racial population change: in HOPE VI block groups the population of white residents declined slightly but a steep reduction in the population of nonwhite residents occurred.[21]

We found a more muted pattern of displacement in the neighborhoods surrounding HOPE VI developments (see fig. 5). Neighborhoods surrounding both HOPE VI and non–HOPE VI public housing saw their nonpoor populations grow during the 1990s, but this happened significantly less in block groups surrounding HOPE VI than in block groups surrounding other public housing. In the block groups around HOPE VI public housing, however, the number of poor residents declined by about 18% during the 1990s, while the number of poor residents in other comparable public housing declined by just 1%. These patterns persisted in the following decade. Consistent with the results for population shares and diversity presented above, however, we found little population change among the neighborhoods surrounding public housing redeveloped via HOPE VI during the 2000s. Notably, we also found little evidence of growth in the nonpoor population in the block groups surrounding HOPE VI developments in any decade, suggesting little net increase in those residents.

In terms of race, neighborhoods surrounding public housing experienced significant white population loss and significant nonwhite population gain between 1990 and 2010, in line with broader population trends in urban America during this period. These changes were much more muted in the neighborhoods surrounding HOPE VI developments. Block groups surrounding HOPE VI developments experienced significantly less white population loss and significantly less nonwhite population gain, relative to the block groups surrounding other public housing. Taken together, the population change results

[21] Not all of the reduction in the population of poor and nonwhite residents is necessarily due to outmigration; some of the net population loss could be due to a lack of in-migration as well (Vigdor 2002; Freeman 2005). The census data do not contain the longitudinal information necessary to track out-migration, but we can measure in-migration via a question that asks whether the respondent lived in the same house five years ago, which was asked in the 1990 and 2000 decennial censuses. In supplemental analyses (available upon request), we examined the rates of in-migration for white and nonwhite residents and found little difference in the rates of in-migration between redeveloped and nonredeveloped public housing, suggesting that much of the net population loss of nonwhite residents we found above were due to disproportionate out-migration.

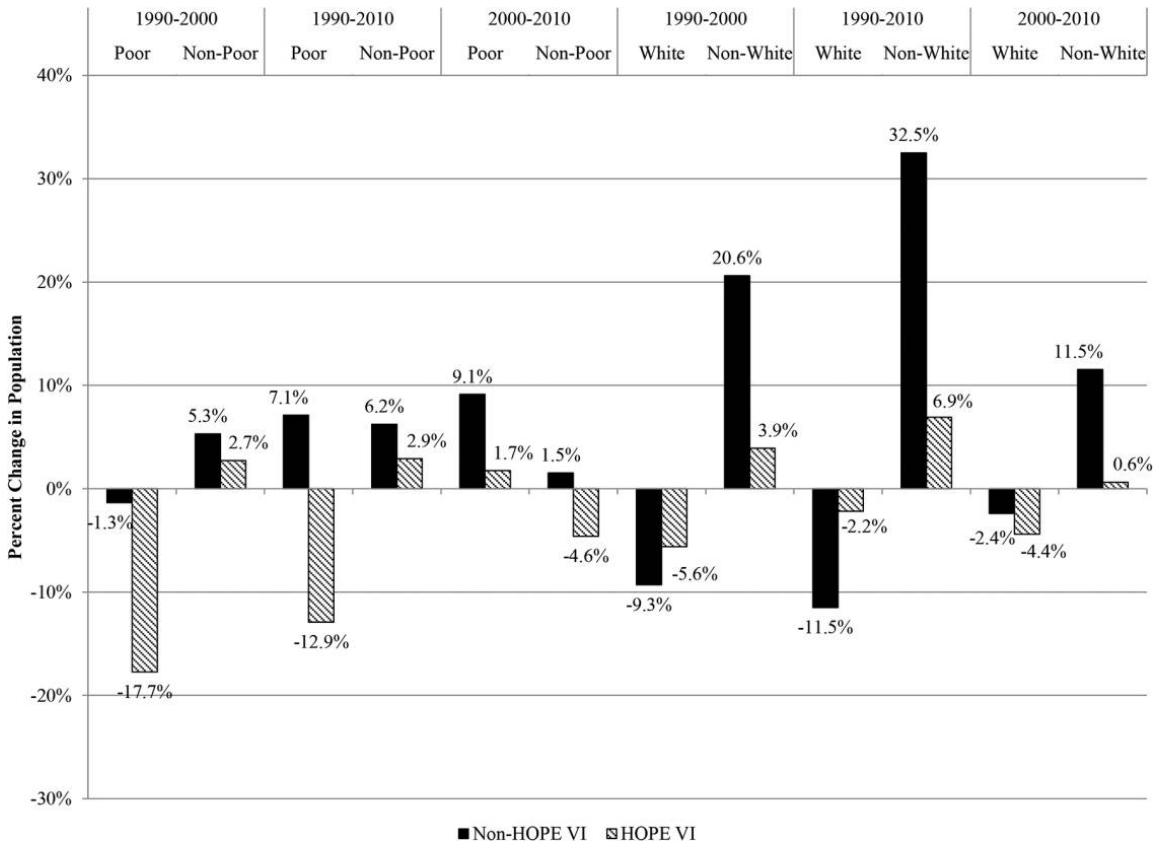

FIG. 5.—Percentage change in population within block groups surrounding HOPE VI and non–HOPE VI public housing, by poverty status and race. $N = 19{,}322$ in the 1990s and 17,354 in the 2000s. Estimates from difference-in-differences regressions of the effect of HOPE VI redevelopment on percentage change in population size in block groups adjacent to public housing. All models include controls for propensity score, PHA fixed effects, and tract trends.

suggest that spillover effects from HOPE VI redevelopment were fueled mainly by the loss of poor and nonwhite residents, rather than via an increase in nonpoor or white residents.

DISCUSSION

Neighborhoods are a central dimension of racial and economic stratification in the United States, and housing policy has played a key role in producing—and sometimes mitigating—neighborhood inequality. In many ways, the public housing program reflects the historical ebbs and flows of public investment, disinvestment, and reinvestment in urban neighborhoods throughout the 20th century. Urban renewal legislation during the 1950s built high-rise public housing to accommodate those displaced by slum clearance (Hyra 2012; Goetz 2013), and the physical and economic decline of the public housing stock in the ensuing decades reflected a broader pattern of public neglect and disinvestment of inner-city neighborhoods. Amid broader economic changes, federal urban policy was again a key enabling force of poverty deconcentration during the 1990s, issuing more than $80 billion for inner-city redevelopment via placed-based initiatives (Hyra 2008, 2012; Goetz 2011*b*). Given this historical context, some academics and activists have argued that federally sponsored public housing redevelopment via HOPE VI is simply the latest incarnation of slum clearance designed to extract profit from inner-city neighborhoods while displacing disadvantaged populations (Crump 2002; Vale 2002, 2013; Imbroscio 2008; Fullilove 2009; Hyra 2012; Fraser et al. 2013).

Using a novel spatially integrated data set of public housing redevelopment between 1990 and 2010, this study found that public housing redevelopment via the federal HOPE VI program had significant direct and indirect effects on the economic and racial composition of neighborhoods. Our sample included the full universe of HOPE VI redevelopment grants, and we used a combination of propensity score and difference-in-differences methods as well as multiple counterfactuals and falsification tests that together allowed us to isolate the effects of redevelopment from other changes that likely would have occurred in the absence of redevelopment. We found that redevelopment via HOPE VI had a direct effect on block groups containing public housing, reducing poverty rates by about 10 percentage points and boosting white population shares by about six percentage points, relative to changes in comparable public housing over this time period. These changes increased racial and income diversity significantly. Redevelopment also had significant but smaller indirect spillover effects on surrounding neighborhoods, reducing poverty rates and nonwhite population shares by about three percentage points relative to what happened in neighborhoods surrounding other comparable public housing. We note, however, that these changes

were confined to the 1990s and were small enough that they did not substantively alter population diversity in the surrounding neighborhoods.

The neighborhood change induced by public housing redevelopment was ecologically significant, altering durable racial and economic hierarchies among urban neighborhoods. Neighborhoods with redeveloped public housing improved their ranking relative to other neighborhoods in the city by 10% in terms of poverty and by 5% in terms of race. We also found, however, that these statistically and ecologically significant changes for poor, minority *places* came from the net displacement of poor, minority *people*: virtually all of the change in neighborhood composition we observed came from a net reduction in the number of poor and nonwhite residents. Prior research using case studies of particular cities and developments has found that many poor residents were displaced— some voluntarily, others involuntarily— by the redevelopment process (Popkin et al. 2004; Chaskin and Joseph 2015), and many redevelopment plans created mixed-income units and reduced the density of the housing stock (Cisneros and Engdahl 2009). Other residents may have been displaced indirectly as prices increased in the surrounding neighborhoods. The decadal observation points available in census data also understate the full extent of residential churning that occurred over the course of a decade. Surprisingly, we found little net influx of nonpoor residents after two decades, despite the efforts to create mixed-income housing.

The patterns of net population change documented with census data are limited, however, because they cannot reveal how much of the loss in poor population was due to changing patterns of out-migration (direct displacement) versus in-migration (indirect or exclusionary displacement). Our assessment of the effects of public housing redevelopment depends in large part on how the original public housing residents are faring, but census data cannot tell us who leaves a neighborhood or where they go. The most comprehensive data we have on those displaced by HOPE VI come from the Urban Institute's HOPE VI Tracking Study, which followed residents of five HOPE VI developments from 2001 to 2005. In these developments, residents who were relocated typically moved to lower-poverty neighborhoods and reported greater satisfaction with their living arrangements, on average, than they did in public housing (Popkin et al. 2004, 2009), although those who relocated to other public housing reported no improvements on average. Even though overall neighborhood satisfaction improved, new challenges emerged as well, with voucher holders reporting instability and economic hardship on the private housing market (Popkin et al. 2004, 2009). Whether these findings hold for other developments, other housing markets, or over longer periods of time remains unclear. Researchers and policymakers desperately need better data that can track the location and well-being of former public housing residents—as well as the displaced residents of other gentrifying neighborhoods—more systematically.

The significant, albeit modest, spillover effects that we found for surrounding redeveloped public housing neighborhoods during the 1990s also underscores the influence that public housing has beyond its walls, and future research should examine in more detail the processes by which such spillovers occur. A small but growing number of case studies of particular developments and cities has found evidence of spillover effects of redevelopment on crime rates, new housing construction, and property values (Zielenbach 2002; Cahill, Lowry, and Downey 2011), as well as changes in the external stigma and reputations of public housing neighborhoods (Tach 2009; Bader 2011; Chaskin, Khare, and Joseph 2012; Fraser et al. 2013). Assessing the heterogeneity and mechanisms underlying spillover effects for a larger set of cities would help disentangle which features of neighborhoods and redevelopment plans produce the greatest amount of change and, perhaps, which forms of redevelopment can do so while mitigating displacement of existing residents.

Additional research on effect heterogeneity and mechanisms also would shed light on why the effects of redevelopment were larger for neighborhoods that received grants during the 1990s than those that received grants during the 2000s. This variation might be due to the extent of distress or size of the public housing developments or to conditions in the surrounding community such as racial composition, gentrification pressure, or geographic position within the broader metropolitan landscape. Heterogeneity in the effects of public housing redevelopment might also stem from the type of redevelopment that occurs, including the magnitude of housing density reduction, the priorities and rights afforded original residents, the income mix of the new development, or collaboration with for-profit housing developers and nonprofit community partners.

Gentrification scholars have long recognized the role of government intervention in spurring neighborhood change (Hackworth and Smith 2001; Lees, Slater, and Wyly 2008), and government place-based investments have been described as a central component of the broader resurgence of gentrification during the 1990s (Hyra 2012; Goetz 2011*b*; Hwang and Sampson 2014). Our results for public housing redevelopment via the federal HOPE VI program—which covers much of the public housing redevelopment since the 1990s—complicates the nexus between public housing and gentrification. HOPE VI brought in significant public, and sometimes private, investment and typically resulted in substantial improvements to the housing stock. Yet the vast majority of population change in neighborhoods redeveloped via HOPE VI stemmed from a disproportionate reduction in the number of poor, minority residents, and comparatively little influx of "the gentry"—more economically advantaged residents—over the course of two decades. As a result, public housing redevelopment via HOPE VI may be a distinct form of neighborhood socioeconomic ascent, characterized by reductions in housing den-

sity and poor population loss rather than an influx of more affluent residents (Owens 2012), at least as measured by poverty rates.

Our findings also have implications for theories of neighborhood effects. The changes in neighborhood poverty rates and racial and income diversity induced by public housing redevelopment are large enough to potentially influence the well-being of neighborhood residents exposed to these new contexts. While most research has focused on the short-term effects of relocation, important questions about the longer-term effects of redevelopment remain, particularly for children. Disentangling the mechanisms by which such neighborhood influences might occur is also an important step for future research. Qualitative case studies of mixed-income developments offer insights into the mechanisms by which poverty deconcentration may—or may not—influence resident well-being (Joseph et al. 2007; Graves 2010; Fraser et al. 2013; Chaskin and Joseph 2015), and future work should build on these foundational case studies by collecting systematic data on interpersonal processes, institutions, and amenities across a broader range of developments and a wider array of resident outcomes. For theoretical purposes, it will be important to disentangle the influence of neighborhood income mix from other changes that occurred as a result of redevelopment such as housing quality, management practices, and public investments in infrastructure and amenities.

We wish to underscore several limitations of this project, which present opportunities for future research. First, the decennial census data and the ACS data that allow us to track trends in particular places over time are not able to track outcomes for particular individuals, including the types of neighborhoods to which they move. Second, our analysis of HOPE VI redevelopment covers most public housing redevelopment that has occurred since the 1990s, but it does not include demolition, redevelopment, or renovations made by local housing authorities outside the purview of HOPE VI. Because such changes would be included in our control groups, our estimates of the effect of redevelopment are conservative. Our results may not apply to smaller-scale activities undertaken at the local level. Finally, although our use of propensity scores, difference-in-differences models, and multiple counterfactual and falsification tests represents an improvement over other observational studies, our findings are still based on observational data and thus concerns about omitted variable bias are not fully eliminated. Bias may persist if our models and robustness checks have not accounted for ways in which HOPE VI and non–HOPE VI neighborhoods would have changed differentially even in the absence of the HOPE VI intervention.

Despite these limitations, this research has important implications for federal and local housing policy. Housing redevelopment policies constitute significant public reinvestment in disadvantaged neighborhoods, but they have largely failed to mitigate either the extent of residential displacement or the negative outcomes of the relocation process. The current analysis suggests

that HOPE VI is no exception. In order to develop best practices, policymakers and practitioners must devote more attention to this problem across the suite of place-based policies and programs, and they must search for examples of places in which such issues have been managed successfully. More comprehensive policies may take steps such as maintaining the number of deeply subsidized units, giving low-income tenants a right to return to redeveloped projects, or offering significant supportive services during and following the relocation process. Future analyses that examine the heterogeneity in effects across these dimensions would offer an important evidence base for policy action.

More generally, our results highlight a fundamental tension within place-based approaches to urban policymaking. Residential displacement has been endemic throughout the resurgence of place-based initiatives in the domains of housing, economic, and community development since the 1990s (Vale 2013; Reynolds and Rohlin 2014; LeGower and Walsh 2014), and the results of the current study add to this evidence base. Such policies have also sometimes generated negative spillovers for other neighborhoods in a city by diverting investments away from some geographic areas and toward others (Givord, Rathelot, and Sillard 2013; Hanson and Rohlin 2013). Amid growing recognition of the limitations of place-based initiatives, there has been a softening of the "people versus place" distinction in the policy world. For example, Margery Turner, a leading housing scholar has recently advocated for "place conscious" community and economic development that considers the effects of policies on particularly disadvantaged areas, but stops short of restricting funding to only those areas (Turner 2015).

Since the Chicago school, sociologists have conceived of neighborhoods as important ecological units of social stratification within the broader urban landscape. Although early scholars focused on the fluidity of these ecological units (Park and Burgess 1925), recent work has documented high levels of persistence, especially for the most disadvantaged neighborhoods (Sampson and Sharkey 2008; Sampson 2012; Sharkey 2013). Public housing neighborhoods are socially and politically significant locations within cities that shape the fate of entire neighborhoods. While in the past they contributed to the concentration of poverty, this study finds that the substantial structural transformations induced by public housing redevelopment have fundamentally altered the urban landscape. As a result, public housing redevelopment has played a significant role in restructuring the position of many high-poverty neighborhoods within broader systems of urban place stratification (Logan 1978). Whether and how such policies have altered residents' lives remains an important question for future research.

APPENDIX A

Local Public Housing Authorities (PHAs) Included in Analytic Sample

AL001 Birmingham AL
AL002 Mobile/Prichard AL
AL047 Huntsville AL
AL048 Decatur AL
AL049 Gadsden/Hokes Bluff AL
AL077 Tuscaloosa AL
AL169 Prichard AL
AR004 Little Rock AR
AZ001 Phoenix AZ
AZ004 Tucson AZ
CA001 San Francisco CA
CA003 Oakland CA
CA004 Los Angeles CA
CA006 Fresno city CA
CA010 Richmond CA
CO001 Denver CO
CO002 Pueblo CO
CT003 Hartford CT
CT004 New Haven CT
CT007 Stamford CT
CT009 Middletown CT
CT020 Danbury CT
DC001 Washington DC
DE001 Wilmington DE
FL001 Jacksonville FL
FL002 St. Petersburg FL
FL003 Tampa FL
FL004 Orlando FL
FL005 Miami Dade County FL
FL007 Daytona Beach FL
FL010 Fort Lauderdale FL
FL011 Lakeland FL
FL032 Ocala FL
FL047 Fort Myers FL
FL073 Tallahassee FL
FL075 Clearwater FL
GA002 Savannah GA
GA004 Columbus GA
GA006 Atlanta GA
GA007 Macon GA
GA010 Marietta GA
GA062 Americus GA
GA095 Newnan GA
GA156 Montezuma/
Valdosta GA
IL001 East St. Louis city IL
IL002 Chicago IL
IL003 Peoria/West Peoria IL
IL004 Springfield IL
IL006 Champaign County IL
IL012 Decatur IL
IL083 Winnebago County IL
IN003 Fort Wayne IN
IN005 Muncie IN
IN011 Gary IN
IN015 South Bend IN
IN017 Indianapolis/
Beach Grove IN
IN023 Jeffersonville IN
KS001 Kansas City KS
KY001 Louisville KY
KY002 Covington KY
KY004 Lexington-Fayette KY
LA001 New Orleans LA
LA002 Shreveport LA
LA003 Baton Rouge LA
LA023 Alexandria LA
MA002 Boston MA
MA005 Holyoke MA
MD002 Baltimore MD
MD003 Frederick MD
MD006 Hagerstown MD
MI001 Detroit MI
MI005 Pontiac MI
MI006 Saginaw MI
MI010 Benton Harbor MI
MN002 Minneapolis MN
MN003 Duluth MN
MN006 Winona MN
MO001 St. Louis MO
MO002 Kansas City MO
MO007 Columbia MO

MS002 Laurel MS
MS004 Meridian MS
MS005 Biloxi MS
MT004 Helena MT
NC001 Wilmington NC
NC002 Raleigh NC
NC003 Charlotte NC
NC006 High Point NC
NC009 Fayetteville NC
NC011 Greensboro NC
NC012 Winston-Salem NC
NC013 Durham NC
NC016 Salisbury NC
NC035 Sanford NC
NJ002 Newark NJ
NJ005 Trenton NJ
NJ009 Jersey City NJ
NJ010 Camden NJ
NJ014 Atlantic City NJ
NJ021 Paterson NJ
NJ022 New Brunswick NJ
NJ025 Orange County NJ
NJ050 East Orange NJ
NV002 Las Vegas NV
NY001 Syracuse NY
NY002 Buffalo NY
NY003 Yonkers NY
NY005 New York NY
NY006 Utica NY
NY009 Albany NY
NY011 Niagara Falls NY
NY041 Rochester NY
OH001 Columbus OH
OH002 Youngstown city OH
OH003 Cuyahoga County OH
OH004 Cincinnati OH
OH005 Dayton OH
OH007 Akron OH
OH021 Springfield OH
OK073 Tulsa OK
OR002 Portland OR
PA001 Pittsburgh PA
PA002 Philadelphia PA
PA004 Allentown PA
PA006 Allegheny County PA
PA007 Chester PA
PA015 Fayette County PA
PA017 Washington County PA
PA020 Mercer County PA
PA024 Easton PA
PA046 Chester County PA
RI005 Newport RI
SC002 Columbia SC
SC003 Spartanburg SC
SC004 Greenville SC
SC057 North Charleston SC
TN001 Memphis TN
TN003 Knoxville TN
TN004 Chattanooga TN
TN005 Nashville-Davidson TN
TN006 Kingsport TN
TN007 Jackson TN
TN014 Fayetteville TN
TN017 Lebanon TN
TN033 Cookeville TN
TX003 El Paso TX
TX005 Houston TX
TX006 San Antonio TX
TX007 Brownsville TX
TX008 Corpus Christi TX
TX009 Dallas TX
TX014 Texarkana TX
TX017 Galveston TX
TX018 Lubbock TX
TX023 Beaumont TX
TX029 Mercedes TX
TX073 Pharr TX
VA001 Portsmouth VA
VA004 Alexandria VA
VA006 Norfolk VA
VA010 Danville VA
VA011 Roanoke VA
WA001 Seattle WA
WA002 King County WA
WA005 Tacoma WA
WI002 Milwaukee WI
WV001 Charleston WV
WV003 Wheeling WV

APPENDIX B

Components and Distribution of the Propensity Score

TABLE B1
INDEPENDENT VARIABLES INCLUDED IN THE PROPENSITY SCORE

Housing Development in 1993	*Census Block Group 1990 [2000]cont'd.*
Total units	% children enrolled in school
Occupancy rate	% children in private school
Median household income	Median household income
% residents single parent	% housing < 5 years old
% residents minority	% housing 5–10 years old
% residents elderly	Median age of housing
% residents disabled	Vacancy rate
	% housing with incomplete plumbing
Census Tract	% detached housing
% black 70 80, 90, [00]	% housing large buildings
% poor 70 80, 90, [00]	% residents living in block group < 5 years
	% residents living in block group 5–10 years
Census Block Group 1990 [2000]	% residents living in block group 10–20 years
Population count	Median property value
Family count	Median rent
Household count	% owner occupied
Population density	% overcrowded housing units
% receiving public assistance	% of nonfamily households
% below poverty line	% households with children
% 100%–200% poverty line	% female-headed households
% unemployed	% Non-Hispanic black
% out of labor force	% Hispanic
% in manufacturing occupation	% Non-Hispanic white
% in sales occupation	% Non-Hispanic other race
% in service occupation	Median household size
% no high school diploma	% residents female
% high school diploma	% residents < 18
% some college	% residents > 65
% college degree	Median age

NOTE.—Census data from 1970–90 used to estimate propensity scores for 1990s redevelopment, and census data from 1970–2000 used to estimate propensity scores for 2000s redevelopment.

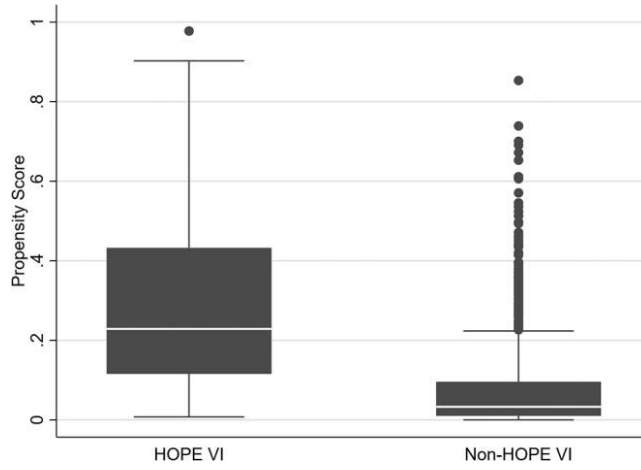

FIG. B1.—Distribution of estimated propensity scores for HOPE VI and non–HOPE VI public housing block groups.

APPENDIX C

TABLE C1
Robustness and Falsification Tests, Effect of HOPE VI Redevelopment on Poverty and Racial Population Shares in Block Groups Containing Public Housing, 1990–2000

	1990s Grantees vs. 1990s Failed Applicants		1990s Grantees vs. 2000s Grantees		Falsification: 2000s Grantees	
	%Poor	%Non-Hispanic White	%Poor	%Non-Hispanic White	%Poor	%Non-Hispanic White
Constant	40.10***	25.77***	44.72***	26.33***	32.90***	41.84***
	(2.96)	(4.03)	(2.08)	(2.72)	(.55)	(.94)
HOPE VI redevelopment	1.86	−.39	−1.90	−1.68	8.41***	−10.50***
	(3.41)	(4.10)	(2.17)	(2.65)	(1.36)	(2.18)
Post	−5.33**	−3.80**	−4.46***	−4.93***	−1.83***	−6.63***
	(1.68)	(1.23)	(1.21)	(.79)	(.29)	(2.71)
Post × HOPE VI	−6.47**	3.89*	−7.23***	3.03***	−2.02	1.50
	(2.16)	(1.46)	(1.81)	(1.11)	(1.23)	(.85)
Propensity score	Yes	Yes	Yes	Yes	Yes	Yes
PHA fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Pretreatment tract trends in dependent variable	Yes	Yes	Yes	Yes	Yes	Yes
Observations	604	604	838	838	3,890	3,890
R^2	.63	.71	.63	.70	.50	.58

Note.—Results are from difference-in-differences regressions. SEs are clustered to account for multiple block groups per housing development.

* $P<.05$.

** $P<.01$.

*** $P<.001$.

TABLE C2

ROBUSTNESS AND FALSIFICATION TESTS, SPILLOVER EFFECT OF HOPE VI REDEVELOPMENT ON POVERTY AND RACIAL POPULATION SHARES IN BLOCK GROUPS ADJACENT TO PUBLIC HOUSING, 1990–2000

	1990s GRANTEES VS. 1990s FAILED APPLICANTS		1990s GRANTEES VS. 2000s GRANTEES		FALSIFICATION: 2000s GRANTEES	
	%Poor	%Non-Hispanic White	%Poor	%Non-Hispanic White	%Poor	%Non-Hispanic White
Constant	27.00***	42.96***	3.13***	43.75***	21.42***	53.78***
	(1.42)	(2.34)	(0.98)	(1.64)	(.26)	(.52)
HOPE VI redevelopment	2.32	−1.82	−1.27	−1.48	6.48***	−9.01***
	(1.68)	(2.65)	(1.22)	(1.93)	(.71)	(1.24)
Post	−1.47	−8.29***	−1.60***	−6.88***	−.57***	−7.62***
	(.76)	(.66)	(.47)	(.43)	(.14)	(.14)
Post × HOPE VI	−2.47**	3.59***	−2.35***	2.18***	−.82	.50
	(.92)	(.77)	(.70)	(.59)	(.51)	(.48)
Propensity score	Yes	Yes	Yes	Yes	Yes	Yes
PHA fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Pretreatment tract trends in dependent variable	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,714	2,714	3,734	3,734	17,128	17,128
R^2	.34	.57	.34	.56	.26	.47

NOTE.—Tests are for difference-in-differences regressions. SEs are clustered to account for multiple block groups per housing development.

* $P<.05$.

** $P<.01$.

*** $P<.001$.

APPENDIX D

Density Plots of the Distribution of Change in HOPE VI and Non–HOPE VI Block Groups, 1990–2010

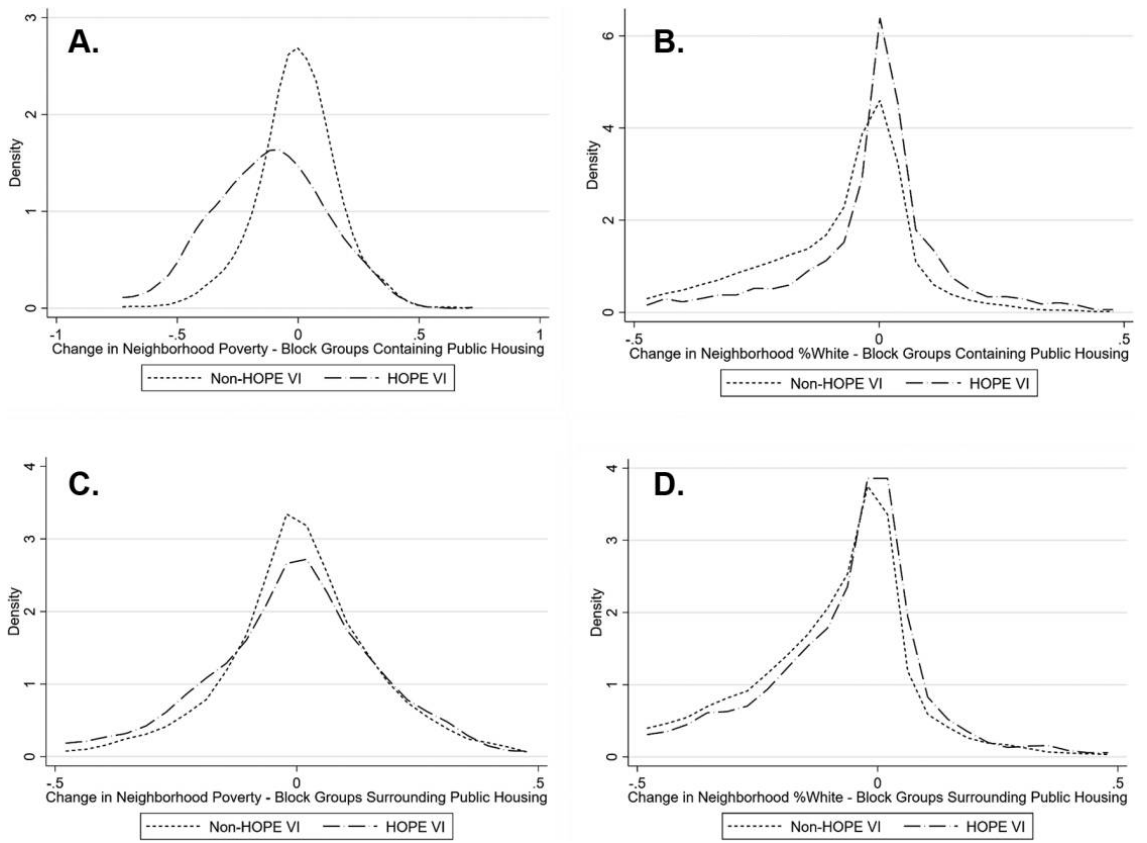

FIG. D1.—A. Change in neighborhood poverty—block groups containing public housing; B. change in neighborhood %white—block groups containing public housing; C. change in neighborhood poverty—block groups surrounding public housing; D. change in neighborhood %white—block groups surrounding public housing.

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