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Is geography destiny? Disrupting the relationship between segregation and neighborhood outcomes

Christine Leibbrand^{a,*}, Ryan Gabriel^b, Chris Hess^d, Kyle Crowder^c

^a Department of Sociology, University of Washington, 211 Saverly Hall, Seattle, WA 98195, United States

^b Department of Sociology, Brigham Young University, 2033 JFSB, Provo, UT 84062, United States

^c Department of Sociology, University of Washington, 225 Saverly Hall, Seattle, WA 98195, United States

^d Rutgers University, Center for Urban Research Education and Department of Public Policy and Administration, 321 Cooper St. Room 201, Camden, NJ 08102, United States

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ABSTRACT

Considerable research has shown that, in the cross-section, segregation is associated with detrimental neighborhood outcomes for blacks and improved neighborhood outcomes for whites. However, it is unclear whether early-life experiences of segregation shape later-life neighborhood outcomes, whether this association persists for those who migrate out of the metropolitan areas in which they grew up, and how these relationships differ for blacks and whites. Using the Panel Study of Income Dynamics from 1979 to 2013, we find that the level of segregation experienced during adolescence is associated with significantly worse neighborhood outcomes in adulthood for blacks. However, migrating out of the metropolitan area an individual grew up in substantially moderates these relationships. In contrast, adolescent segregation is associated with improved, or not significantly different, neighborhood outcomes in adulthood for whites. These findings have important implications for theorizing about the mechanisms linking segregation and neighborhood outcomes and for considering potential means of assuaging racial disparities in harmful neighborhood exposures.

1. Introduction

Since the publication of Massey and Denton's *American Apartheid* in 1993, there has been growing attention to, and awareness of, the detrimental effects of racial residential segregation on blacks' wellbeing. Metropolitan-level segregation tends to concentrate poverty and its resultant disadvantages, including higher levels of crime, single motherhood, welfare receipt, and high school dropout in particular neighborhoods and clusters of neighborhoods, frequently those that contain high proportions of blacks (Bruch, 2014; Massey and Denton, 1993; Quillian, 2012). In doing so, segregation creates swaths of disadvantage and inequality within metropolitan areas and is associated with deleterious individual and neighborhood outcomes for blacks (Bruch, 2014; Charles, 2003; Massey and Denton, 1993; Mouw, 2000; Quillian, 2012; Sharkey, 2013; Sharkey and Faber, 2014; Squires and Kubrin, 2005; Subramanian et al., 2005; Wagmiller, 2007; Williams and Collins, 2001). By concentrating disadvantage in the areas in which blacks live, segregation can also improve whites' outcomes by concentrating advantage in predominantly white residential spaces (Flippen, 2010; South and Crowder, 1997; South et al., 2011; St. John 2002). As such, segregation frequently corresponds with higher levels of inequality across

* Corresponding author.

E-mail addresses: cleibb@uw.edu (C. Leibbrand), ryangabriel@byu.edu (R. Gabriel), hesscl@uw.edu (C. Hess), kylecrow@uw.edu (K. Crowder).

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racial groups in terms of both residential context and individual wellbeing.

However, very few studies have explored whether early-life experiences of metropolitan-level segregation follow individuals throughout their life course and impact their long-term outcomes, especially their long-term neighborhood outcomes. The growing literature on the ways in which early-life experiences influence later-life outcomes suggests theoretical reasons for expecting that segregation is a strong determinant of residential outcomes later in life (Chetty et al., 2016; Dannefer, 2003; Elder et al., 2003; Sharkey and Elwert, 2011; Sharkey, 2013; Wodtke et al., 2011). Moreover, one of the few studies that has explored the relationship between childhood exposure to segregation and later-life outcomes, found that childhood segregation was associated with worse neighborhood outcomes in adulthood for blacks (Pais, 2017). Yet, no research has investigated these relationships for migrants, so it is unknown whether early-life exposure to metropolitan-level segregation continues to shape neighborhood outcomes for blacks who move out of the segregated metropolitan areas of their youth or whether early-life experiences of segregation are primarily detrimental for blacks who stay in the metropolitan areas they grew up in.

This is an important investigation given recent findings by Leibbrand (2018) that moving out of the metropolitan areas, states, and/or regions in which individuals grew up corresponds to significant reductions in blacks' exposure to neighborhood poverty in adulthood, relative to what they experienced in adolescence. These findings indicate that migration substantially disrupts early-life, local neighborhood contexts and their associations with blacks' later-life outcomes. However, the Leibbrand and Crowder study solely focused on neighborhood poverty, rather than segregation, we therefore have no knowledge of whether migration would disrupt segregation's broader and, as noted above, pervasive associations with blacks' outcomes. Indeed, segregation influences individuals' access to opportunities and disadvantage in ways that extend beyond one's local neighborhood and that can structure individuals' lives and outcomes in uniquely comprehensive ways. As a result, the influence of segregation may endure across time and place, though we do not know whether this is the case. Conversely, it is unclear whether any benefits associated with segregation for whites follow them throughout their life course, or whether these benefits are interrupted by the decision to move to a different metropolitan area.

To explore these gaps in our understanding, we use data from the Panel Study of Income Dynamics (PSID) linked to U.S. Census data to examine the associations between metropolitan-level segregation experienced during adolescence and two primary neighborhood outcomes in adulthood: poverty rates and the percentage of black residents. Investigating these two neighborhood outcomes has the benefit of aligning our study with research that assesses racial disparities in the association between segregation and neighborhood socioeconomic and racial composition outcomes, while providing a holistic picture of how segregation shapes neighborhood outcomes in diverse ways (Charles, 2003; Massey and Denton, 1993; Quillian, 2012; South and Crowder, 1997, 1998; South et al., 2011). Additionally, we assess whether migrating out of the metropolitan area an individual grew up in moderates these relationships. We conduct separate models by race because solely attending to these relationships for blacks may underestimate the extent to which adolescent exposure to segregation increases racial disparities in neighborhood outcomes in adulthood if segregation simultaneously improves whites' outcomes. Lastly, we examine the robustness of our results to other neighborhood outcomes and to moves of varying distances.

Our investigation contributes to the literature on racial stratification by highlighting the persistent and enduring ways segregation is associated with racial disparities in neighborhood socioeconomic status and racial and ethnic composition. As such, it demonstrates that the value of combatting segregation may be underestimated without accounting for the cumulative impact segregation has on individuals' outcomes throughout their life course. Examining these relationships across migration status is also important because it indicates possible mechanisms through which segregation could harm the life chances of blacks and help those of whites, while shedding light on potential means for ameliorating racial disparities in outcomes.

2. Background

2.1. *The potential influence of early-life segregation on later-life outcomes*

2.1.1. *Socioeconomic mechanisms*

While there is considerable evidence demonstrating that living in segregated metropolitan areas is harmful for blacks, few studies have explored whether the effects of segregation are persistent over the life course.¹ The large body of research on segregation strongly suggests it may have long-term impacts on black households and especially on black adolescents. For instance, researchers have demonstrated that the isolated black neighborhoods that characterize segregated metropolitan areas exhibit higher levels of high school dropout and lower standardized test scores and school quality (Krivo and Peterson, 1996; Massey and Denton, 1993; Orfield and Lee, 2005; Rumberger and Palardy, 2005; Saporito, 2003; Sharkey, 2013; Sharkey and Faber, 2014; Squires and Kubrin, 2005). Likewise, disadvantaged neighborhood contexts have important, deleterious effects on socioeconomic status, particularly influencing adolescents' patterns of educational attainment (Galster and Sharkey, 2017).

Additionally, segregation is associated with considerably fewer grocery stores in black residential areas relative to white residential areas (Morland et al., 2002), greater exposure to pollution (Crowder and Downey, 2010; Houston et al., 2004; Kravitz-Wirtz et al., 2016; Woo et al., 2018), and lower access to medical care facilities and doctors (Hayanga et al., 2009), all of which may have particularly negative effects for developing adolescents. In sum, the findings from these studies suggest that segregation has detrimental associations with young blacks' socioeconomic and health outcomes, which may, in turn, limit their formation of human

¹ The important exception being Pais, 2017 study.

capital and their future abilities to move into and/or stay in advantaged residential areas.

Conversely, early-life exposure to segregation may improve whites' later-life outcomes by increasing the probability that whites live in non-poor and higher-income neighborhoods (South and Crowder, 1997). Because higher-income neighborhoods frequently claim higher-quality schools and lower levels of crime, among other advantages, whites in segregated metropolitan areas may experience better long-term socioeconomic outcomes, resulting in improved abilities to move into and stay in advantaged neighborhoods in adulthood (Kane et al., 2006; Leventhal and Brooks-Gunn, 2000; Neckerman et al., 2009).

2.1.2. *The social structural sorting perspective*

Early-life experiences of segregation may also be associated with later-life neighborhood outcomes by shaping individuals' knowledge of, and information about, potential neighborhoods to move to in adulthood. This possibility is outlined in the *social structural sorting perspective*, which suggests that neighborhood outcomes are shaped, not only by economics, discrimination, and preferences—explanations frequently given for racial disparities in neighborhood attainment—but also by racial/ethnic differences in the housing search process which is, itself, a product of social processes (Krysan and Crowder, 2017). Indeed, individuals engage in routine activities such as grocery shopping and going to work, church, or the doctor in similarly disadvantaged neighborhoods to the ones they live in, illustrating that even when people leave their home neighborhoods, they tend to travel in similar and likely proximate environmental contexts (Krivov et al., 2013). Segregation can exacerbate the inequitable effects of this process by grouping black communities in space so that segregated, disadvantaged communities are frequently surrounded by other segregated, disadvantaged communities, making it less likely that blacks living in these communities are exposed to advantaged neighborhoods (Massey and Denton, 1993). In contrast, by concentrating whites within clusters of relatively advantaged neighborhoods, segregation may increase whites' knowledge about, and access to, residential opportunities in advantaged areas. Thus, the social structural sorting perspective anticipates that segregation will be associated with persistently better neighborhood outcomes for whites and persistently worse neighborhood outcomes for blacks because it will shape the neighborhood knowledge both groups draw on when they choose places to live.

This process is likely to be especially important during adolescence because this is the period of time when individuals develop coherent life stories that inform their expectations about their future (Bohn and Berntsen, 2013; Habermas and Bluck, 2000; Johnson et al., 2011). As a result, the lack of exposure to different communities may constrain individuals' knowledge of, and abilities to envision and aspire to, different types of neighborhoods than the ones in which they grew up, even if they possess sufficient economic resources to move elsewhere. This lack of information would tend to hurt blacks' neighborhood outcomes, because they are more likely to originate in disadvantaged areas relative to whites, while enhancing whites' knowledge of advantaged residential spaces.

Further, early-life segregation may be associated with later-life neighborhood outcomes by geographically constraining kith and kin networks. Spring et al. (2017) observed that low-income adult children are particularly likely to stay in and move to neighborhoods in which their kin live. Because segregation often concentrates blacks in relatively small geographic areas, it may limit the distance black migrants can move without finding themselves distant from family and friends. Hence, even blacks who have the means to move to more advantaged areas might forego the opportunity so they can live near kith and kin (Massey and Denton, 1993). Conversely, because whites are more likely to originate in advantaged areas, they will be more likely to remain near kith and kin and reside in advantaged neighborhoods. Adolescents' residential contexts are expected to be more closely tied to their kith and kin networks than the residential contexts of adults, given that adolescents exhibit high likelihoods of living with family and given the local, school-based nature of adolescents' peer networks (Arnett, 2000). Thus, it is valuable to study the role of adolescents' residential contexts for shaping their adulthood outcomes because it is these early-life contexts that are likely to be especially impactful for shaping the social-based factors that inform where individuals will move to and live in adulthood.

2.2. *Does migration moderate the influence of segregation?*

The influence of segregation on human capital formation, individuals' information about potential neighborhoods, and the interaction of segregation with individuals' preferences to live near kith and kin indicate that it is likely that early-life experiences of segregation correspond to later-life neighborhood outcomes. Yet, it is unclear whether this would be the case both for individuals who stay in the metropolitan areas they grew up in and for those who leave. While the research by Leibbrand (2018) suggests that migration can disrupt the persistence of harmful neighborhood environments across the life course, segregation's uniquely comprehensive associations with individuals' outcomes and access to opportunities suggests that it is by no means a foregone conclusion that moving could disrupt the long-term disadvantaging influence of growing up in a highly segregated metropolitan area.

Examining the extent to which migration moderates the association between adolescent exposure to segregation and adulthood neighborhood outcomes offers numerous insights into the plausibility of potential mechanisms linking segregation and life-course outcomes. The mechanisms explored in the previous section suggest somewhat different expectations about whether and why migrating out of one's adolescent metropolitan area of residence might moderate the relationship between adolescent segregation and adulthood neighborhood outcomes. For example, adolescent experiences of segregation may be associated with adulthood neighborhood attainment outcomes by influencing human capital formation and individuals' resulting abilities to move to, and stay in, more advantaged neighborhoods later in life (Charles, 2003; Massey and Denton, 1993; Massey et al., 1987; Wagmiller, 2007; Williams and Collins, 2001). However, internal migration tends to be associated with improvements in individuals' economic wellbeing, in part, by exposing migrants to new social and economic opportunities (Clark and Withers 2002; Cooke et al., 2009; Knapp et al., 2013). Inter-metropolitan migration may therefore moderate the relationship between adolescent exposure to segregation and adulthood neighborhood outcomes by facilitating upward socioeconomic mobility. If this is the case, accounting for adulthood socioeconomic

status will partially or entirely explain away the relationship between adolescent segregation and adulthood neighborhood outcomes and the moderating effect of migration.

If factors emphasized in the *social structural sorting perspective* are important for explaining the relationship between adolescent segregation and adulthood neighborhood outcomes, then accounting for individuals' socioeconomic status will not explain away this relationship. Further, migrating may substantially moderate the relationship between adolescent segregation and adulthood neighborhood outcomes because individuals will not be able to rely on their past residential experiences to decide where to live. As such, migrants may be more likely to explore areas that differ from those they grew up in. This could correspond to mobility into whiter and wealthier neighborhoods for blacks and mobility into more economically and racially diverse neighborhoods for whites. Finally, migrating out of the metropolitan area an individual grew up in could disrupt peer networks and kinship ties that would otherwise keep blacks in segregated, disadvantaged neighborhoods and keep whites in advantaged neighborhoods.

We have little knowledge of which of these mechanisms may predominate or the role migration might play in moderating the relationship between adolescent exposure to segregation and adulthood neighborhood outcomes. It is important to examine these relationships because if migrating out of the metropolitan area an individual grew up in *does not* moderate the association between adolescent exposure to segregation and adulthood neighborhood outcomes, then it would indicate that early-life experiences with segregation have enduring negative influences on blacks' outcomes and durable positive influences on whites' outcomes that are persistent across time and space. In contrast, if migrating out of the metropolitan area an individual grew up in *does* moderate the association between adolescent segregation and neighborhood attainment in adulthood, it would suggest that migration may be an important means of disrupting the pernicious and enduring influence of segregation on blacks' outcomes. Investigating these possibilities also allows us to provide important, suggestive evidence for which mechanisms might be predominating in the relationship between segregation and neighborhood attainment for blacks and whites.

2.3. Hypotheses

Following these theoretical arguments, our study seeks to test the following hypotheses:

- 1) Metropolitan-level segregation in adolescence will be associated with residence in more disadvantaged and racially isolated neighborhoods in adulthood for blacks, even after accounting for adulthood socioeconomic status.
- 2) Migrating out of the metropolitan area an individual grew up in will moderate the negative association of adolescent segregation with adulthood neighborhood outcomes for blacks.
 - a. Adulthood socioeconomic status will partially explain the moderating effect of inter-metropolitan migration. However, given our expectation that the social mechanisms outlined by the *social structural sorting perspective* are also at work, this moderating effect will remain robust to the inclusion of adulthood socioeconomic characteristics.
- 3) Adolescent segregation will be associated with residence in more advantaged, predominantly white neighborhoods for whites, even after accounting for adulthood socioeconomic status.
- 4) Once adulthood socioeconomic status is accounted for, migrating out of the metropolitan area an individual grew up in may moderate the relationship between adolescent exposure to segregation and adulthood neighborhood outcomes for whites. This could be the case if migrating substantially disrupts the localized nature of individuals' neighborhood knowledge, perhaps prompting them to explore neighborhoods that are more economically and racially diverse.

3. Data and methods

3.1. Sample selection

For this analysis, we use the PSID from 1979 to 2013. The PSID is a nationally-representative, longitudinal survey that began surveying 18,000 members of approximately 4,800 families in 1968. Since that time, it has continued to survey the majority of those original family members and has followed the children of those original families as they break off to form their own households. The PSID is an advantageous survey to use for this analysis because it is one of the few data sources that allows us to examine adolescent experiences of segregation before individuals move out to form their own households. As such, we can explore the association between early-life experiences of segregation and adulthood outcomes in a longitudinal framework. Moreover, the PSID provides information about the geographic location of households, including the metropolitan areas and census tracts they live in. Because of this, we are able to study inter-metropolitan segregation and migration and their relationships with the characteristics of individuals' census tracts.

We restrict our analysis to interview years after 1979 because these are the years in which key variables, including employment status, are consistently available for single and partnered males and females. Because members of households tend to move together, we focus on one family member per household: either the household head or, in the case of partnered women (who are rarely considered household heads), the female spouse of the household head. The inclusion of multiple household members would lead to multiple moves being counted when only one household move is actually occurring.

We segment our data into a series of person-period observations that represent either the one-year or two-year intervals between PSID interviews (the PSID conducted annual interviews until 1997, after which it switched to biennial interviews). In total, our analysis includes 18,846 person-periods for blacks and 24,438 person-periods for whites. Utilizing person-periods allows us to examine residential outcomes at multiple points in time during adulthood and to explore how these adulthood residential outcomes may be dependent on exposure to segregation in adolescence as well as on contemporary, adulthood characteristics.

3.2. Outcomes

The outcomes of our analysis are represented by (1) the poverty rate of the neighborhood that the respondent resides in at the end of the observation period and (2) the percentage of black residents in the neighborhood that the respondent resides in at the end of the observation period. Both of our focal outcomes capture important elements of neighborhood quality. The neighborhood poverty rate reflects the level of socioeconomic disadvantage individuals are exposed to. As [Massey and Denton \(1993\)](#) illustrate, neighborhood poverty is associated with numerous deleterious outcomes and other components of neighborhood disadvantage, such as high school dropout rates, the prevalence of single-motherhood, and crime rates. The percentage of black residents in a neighborhood is frequently related to a neighborhood's socioeconomic status, but it is distinct from it as well, capturing the level of racial isolation blacks experience in their residential contexts.² This isolation may limit individuals' knowledge of more integrated neighborhoods to move to and tends to correspond to fewer community resources such as grocery stores and worse individual educational, health, and economic outcomes ([Chang et al., 2009](#); [Johnson, 2010](#); [Leventhal and Brooks-Gunn, 2000](#); [Mason et al., 2009](#); [Mendenhall et al., 2006](#); [Zenk et al., 2005](#)). We also examined the percentage of white residents in the neighborhood that the respondent resides in at the end of the observation period, but the results were almost the exact inverse of the results for the percentage of black residents and yielded no additional substantive information (results available upon request). Given that, we focus on the percentage of black residents because this is an important outcome in the neighborhood attainment literature and one frequently used to capture neighborhood-level racial isolation ([Clark 2007, 2008](#); [Crowder et al., 2012](#); [South and Crowder, 1997](#)). We also examine the robustness of our results to other outcomes including the percentage of Hispanic residents in the neighborhood and the logged average household income of the neighborhood.

The PSID's restricted-access Geospatial Match Files allow us to identify each respondent's census tract of residence, which we use to define an individual's neighborhood. Although the census tract is an imperfect definition of a neighborhood, census tracts approximate the concept of neighborhoods ([Jargowsky, 1997](#); [Lee et al., 2008](#); [White, 1987](#)). Utilizing this definition also allows us to be consistent with previous research (e.g. [Quillian, 2002](#)) and to capitalize on tract-level information, such as poverty rates and racial composition provided by the U.S. Census. Because tract boundaries often change between censuses, we utilize the Neighborhood Change Database (NCDB) to normalize tract boundaries between 1980 and 2010 to 2010 census boundaries ([GeoLytics, 2013](#)). Additionally, we employ linear interpolation/extrapolation to estimate tract-level and metropolitan-level characteristics for non-census years (see [Bruch, 2014](#)).

3.3. Focal independent variables

Our focal independent variables include the dissimilarity index for the metropolitan area the respondent lived in at age 17. The dissimilarity index measures the evenness of the racial distribution across census tracts in a metropolitan area. Specifically, dissimilarity measures the percentage of blacks that would need to migrate to different neighborhoods for each neighborhood to have the same percentage of blacks as the metropolitan area overall, where a value of 0 represents no segregation and a value of 1 signifies complete segregation.

We measure metropolitan-level segregation at age 17 because residential location at this age is relevant to a number of important developmental experiences. For example, in comparison to subsequent ages, individuals at age 17 are more likely to live with family and near childhood friends. Because individuals often live near kith and kin ([Spring et al., 2017](#)) and segregation tends to contain kin networks within circumscribed locations, the metropolitan area of residence at 17-years-old is likely to have a particularly important influence on individuals' future decisions of where to live. Moreover, individuals' residential locations at age 17, directly before they formally enter adulthood, may be particularly informative for informing their adulthood decisions of where to live and start their own households than residential locations at earlier ages. Finally, [Ihrke and Faber \(2012\)](#) find that only 10.1 percent of 10–17-year-olds moved out of their counties of residence during a five-year period, and this percentage would be lower for generally longer-distance inter-metropolitan moves. Thus, metropolitan residence at age 17 captures the segregation levels the vast majority of individuals experience during much of their adolescence and childhood.

Our other focal independent variable is a dummy variable representing whether the respondent had, by the beginning of the observation period, moved out of the metropolitan area they resided in at age 17. This variable takes a value of 1 if the respondent is living in a different metropolitan area from the one they resided in at age 17 during the observation period and takes a value of 0 if the respondent is living in the same metropolitan area as the one they resided in at age 17 during the observation period. These inter-metropolitan moves can occur at any time period and age when we observe individuals after they have formed their own households. We also examine the robustness of our results to moves of other types and distances, as described in the supplementary analysis section below.

² The related, but still distinct nature of these two outcomes is illustrated in the correlation matrix in [Appendix Table 1](#) which shows how the two focal outcome measures and the two supplementary outcome measures we examine are correlated with one another. The poverty rate of the neighborhood and percentage of black residents in the neighborhood are moderately, but not strongly correlated with one another for black and white respondents. None of the outcomes are strongly correlated (correlation > 0.7) with one another for either race, indicating that each captures a distinct element of the neighborhood environment.

3.4. Covariates

Numerous individual-, household-, and metropolitan-level characteristics are likely to influence our outcomes and/or our focal independent variables and, as a result, confound the relationships between them. Consequently, we control for a variety of characteristics in our multivariate regressions, including whether the head of the household is employed, the educational attainment of the respondent (in years), and the taxable family income of the household (measured in constant 2010 dollars) in order to account for the possibility that the respondent's adulthood socioeconomic status explains the association between adolescent segregation and adulthood neighborhood outcomes.³ Including measures of adulthood socioeconomic status further allows us to assess whether migration moderates the relationship between adolescent segregation and adulthood neighborhood outcomes because of its association with upward socioeconomic mobility in adulthood, or whether the moderating effect of migration is persistent across models and therefore potentially reflective of its role in lifting the restrictions segregation places on individuals' neighborhood knowledge and in disrupting kith and kin networks.

We control for the age of the respondent, marital status, and the number of children in the household because these characteristics are all negatively associated with migration probabilities, though older and married individuals may possess greater levels of socioeconomic resources that can be utilized to move to advantaged neighborhoods. Additionally, we hold constant housing characteristics including, persons per room (to account for crowding), whether the respondent is a homeowner, and whether the respondent has lived in the same house for 3 or more years. The former housing characteristic implies that families' housing resources are strained and that families may be more predisposed to move, whereas the latter two characteristics suggest that families may be satisfied with where they are living or may, at least, be more constrained in their ability to move to better neighborhoods. Moreover, we include controls for the year of observation and the number of years that have elapsed between surveys (1 or 2 years to account for the PSID's switch to a biennial survey in 1997).

Housing availability, the population composition of the metropolitan area, and the overall poverty level of the metropolitan area may shape individuals' neighborhood options, the opportunity structures to which they are exposed, and resultant neighborhood location. Thus, we control for the proportion of housing in the metropolitan area that was built in the last 10 years, the proportion of vacant housing in the metropolitan area, the proportion of the metropolitan population that is non-Hispanic black, the proportion of the population that is Hispanic, and the proportion of the metropolitan area that is in poverty. Finally, we control for the region the respondent lives in (Northeast (ref.), North Central, West, or South) to account for regional variations in opportunity structures.

With the exception of the number of years that have elapsed between surveys, all control variables are measured at the beginning of the observation period in order to ensure that the covariates are not, themselves, influenced by moves made by the respondent and all are measured as time-varying at level-1 in our multilevel models.

3.5. Analytic strategy

For this analysis, we use linear mixed-effects models (using Stata 14's *mixed* command) with individual- and metropolitan-level random intercepts. Including individual- and metropolitan-level random intercepts allows us to address the non-independence of including multiple observations for a given individual. This means that person-period observations are nested within individuals and individuals are nested within metropolitan areas. To account for heteroskedasticity in model errors, we also utilize robust standard errors.

To examine the potentially moderating influence of inter-metropolitan migration, we conduct interactions between the level of dissimilarity a respondent experiences at age 17 and a dummy variable indicating whether the respondent had moved out of the metropolitan area they grew up in by the observation year in question. To facilitate the interpretability of the results, we present tables of the results along with graphs of each of the predicted outcomes by the level of dissimilarity experienced at age 17. Utilizing these graphs provides a clearer illustration of how segregation experienced during adolescence is associated with neighborhood attainment in adulthood as well as how inter-metropolitan migration moderates these relationships. We do not present corresponding figures for whites because inter-metropolitan migration does not moderate these relationships for whites; hence, the graphs are not substantively informative.

4. Results

We first highlight the descriptive results in [Table 1](#), which are disaggregated by race and migration status. These results provide us with an initial indication of whether we observe race and migration-related disparities in neighborhood outcomes and metropolitan-level segregation.

Indeed, blacks live in substantially more impoverished, racially isolated neighborhoods than whites, though these gaps are smaller for migrants than for non-migrants. Moreover, blacks and whites exhibit similar average exposures to segregation in adolescence (as measured by the dissimilarity index), though blacks are considerably less likely than whites to live in different metropolitan areas from the ones they grew up in. In fact, while 31.39 percent of whites live in different metropolitan areas from the ones they grew up in, only 13.01 percent of blacks do so, indicating that blacks may be particularly stuck and/or tied to the residential contexts of their youth.

³ Because we are interested in how adolescent exposure to segregation is associated with later-life neighborhood outcomes, we solely examine individuals who belonged to families who were interviewed when respondents were 17-years-old and who later formed their own households.

Table 1
Descriptive characteristics by migration status and gender: *Panel Study of Income Dynamics, 1979-2013.*

| | Black Non-Migrants Mean/SD | Black Migrants Mean/SD | White Non-Migrants Mean/SD | White Migrants Mean/SD |
|--|-------------------------------|---------------------------|-------------------------------|---------------------------|
| Outcome and Focal Ind. Variable | | | | |
| Neighborhood Poverty Rate | 0.258 (0.146) | 0.173 (0.127) | 0.098 (0.082) | 0.088 (0.081) |
| Neighborhood Percent Black | 0.658 (0.309) | 0.363 (0.312) | 0.064 (0.117) | 0.069 (0.105) |
| Neighborhood Percent Hispanic | 0.064 (0.123) | 0.132 (0.170) | 0.076 (0.138) | 0.084 (0.110) |
| Logged Avg. Neighborhood Income | 10.213 (0.545) | 10.495 (0.550) | 10.641 (0.551) | 10.847 (0.554) |
| Dissimilarity at age 17 | 0.719 (0.110) | 0.708 (0.117) | 0.699 (0.119) | 0.700 (0.123) |
| Covariates | | | | |
| Female | 0.611 (0.488) | 0.512 (0.500) | 0.520 (0.500) | 0.500 (0.500) |
| Married | 0.375 (0.484) | 0.445 (0.497) | 0.654 (0.476) | 0.674 (0.469) |
| Number of children in family, origin | 1.328 (1.278) | 1.113 (1.254) | 0.995 (1.137) | 0.884 (1.098) |
| Age of respondent, origin | 30.765 (7.730) | 31.835 (8.076) | 30.564 (7.569) | 32.326 (7.818) |
| Years of education, origin | 12.169 (1.920) | 13.160 (2.349) | 13.120 (2.332) | 14.805 (2.705) |
| Family income, origin | 29.196 (26.123) | 40.552 (35.420) | 56.576 (56.730) | 72.243 (83.989) |
| HH head employed, origin | 0.686 (0.464) | 0.745 (0.436) | 0.820 (0.384) | 0.841 (0.366) |
| Homeowner, origin | 0.221 (0.415) | 0.238 (0.426) | 0.523 (0.499) | 0.524 (0.499) |
| Persons per room, origin | 0.708 (0.423) | 0.653 (0.423) | 0.568 (0.311) | 0.509 (0.257) |
| Lived in same house 3 + years, origin | 0.335 (0.472) | 0.258 (0.438) | 0.398 (0.489) | 0.339 (0.473) |
| Observation length | 1.314 (0.464) | 1.398 (0.490) | 1.333 (0.471) | 1.413 (0.492) |
| Year of observation | 1993.340 (9.316) | 1995.287 (9.583) | 1993.878 (9.139) | 1995.695 (9.043) |
| Prop. new housing, origin metro | 0.215 (0.087) | 0.215 (0.093) | 0.182 (0.088) | 0.198 (0.095) |
| Prop. vacant housing, origin metro | 0.078 (0.023) | 0.078 (0.029) | 0.072 (0.025) | 0.078 (0.042) |
| Prop. in poverty, origin metro | 0.124 (0.032) | 0.123 (0.036) | 0.115 (0.030) | 0.115 (0.028) |
| Prop. NH black, origin metro | 0.224 (0.095) | 0.175 (0.099) | 0.117 (0.090) | 0.115 (0.078) |
| Prop. Hispanic, origin metro | 0.067 (0.088) | 0.116 (0.124) | 0.084 (0.107) | 0.120 (0.109) |
| N | 16,395 | 2,451 | 16,768 | 7,671 |

This may be a result of blacks' lower average socioeconomic status. [Table 1](#) illustrates that black respondents have lower average levels of education and family income and are less likely to be employed, suggesting they may be less able to afford an inter-metropolitan move. This possibility is further supported by the fact that both black and white migrants in [Table 1](#) are more socioeconomically advantaged, on average, than black and white non-migrants.

4.1. Neighborhood Poverty

These initial descriptive results suggest that blacks tend to live in more disadvantaged neighborhoods than whites and are less likely to move from the residential contexts of their youth. Both of these descriptive findings may be due to the lower average socioeconomic status claimed by black respondents. It is unclear whether inter-metropolitan migration moderates these racial disparities in neighborhood attainment, particularly after individual and household socioeconomic characteristics are accounted for. Accordingly, we turn to [Table 2](#), which illustrates the multivariate results from the linear mixed effects models examining the relationships between inter-metropolitan migration, adolescent segregation (as measured using the dissimilarity index⁴), and neighborhood poverty rates by race.

In Model 1 of [Table 2](#), which does not include covariates, higher levels of adolescent segregation are associated with significantly higher adulthood neighborhood poverty rates for blacks. Moreover, Models 2 and 3 indicate that these relationships are robust to the inclusion of covariates that help capture individual and household socioeconomic and sociodemographic characteristics along with metropolitan opportunity structures. Individual and familial socioeconomic status in adulthood explain about 20 percent of the relationship between adolescent segregation and adulthood neighborhood poverty rates, and metropolitan characteristics explain 20 percent of the remaining relationship.

The continuing and meaningful significance of metropolitan-level segregation after the inclusion of a wide host of covariates suggests that adolescent exposure to segregation is associated with adulthood neighborhood poverty not merely or even largely through its association with human capital or through the greater proportion of impoverished neighborhoods in segregated areas. Rather, adolescent segregation may be associated with adulthood neighborhood poverty through alternative mechanisms such as its association with kith and kin networks and individuals' information about communities to move to. To further explore this possibility,

⁴ As a robustness check, we also examined these relationships using the isolation index, which measures individuals' exposure to members of their same race. We found that all of the relationships for all of the outcomes were consistent using this measure of segregation.

Table 2

The relationship between adolescent segregation, migration, and neighborhood poverty rates by gender: *Panel Study of Income Dynamics, 1979-2013*.

| | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 | Model 7 | Model 8 |
|---------------------------------------|------------------|----------------------------|-----------------------------|-----------------------------|-------------------|-----------------------------|-----------------------------|-----------------------------|
| | (Black) | (Black) | (Black) | (Black) | (White) | (White) | (White) | (White) |
| Focal Independent Variables | | | | | | | | |
| Dissimilarity at 17, origin | 0.153*** (0.033) | 0.120*** (0.035) | 0.095** (0.035) | 0.181*** (0.037) | -0.076*** (0.015) | -0.043** (0.015) | -0.025 ⁺ (0.013) | -0.035 ⁺ (0.021) |
| Covariates | | | | | | | | |
| Female | | 0.004 (0.005) | 0.005 (0.005) | 0.003 (0.005) | | -0.004 ⁺ (0.002) | -0.003 ⁺ (0.002) | -0.003 ⁺ (0.002) |
| Married, origin | | -0.016*** (0.004) | -0.017*** (0.004) | -0.016*** (0.004) | | -0.009*** (0.002) | -0.009*** (0.002) | -0.009*** (0.002) |
| Number of children in family, origin | | 0.002 (0.002) | 0.002 (0.002) | 0.002 (0.002) | | -0.001 (0.001) | -0.001 (0.001) | -0.001 (0.001) |
| Age of respondent, origin | | -0.001 (0.000) | -0.000 (0.000) | -0.000 (0.000) | | -0.001** (0.000) | -0.001*** (0.000) | -0.001*** (0.000) |
| Years of education, origin | | -0.008*** (0.001) | -0.008*** (0.001) | -0.007*** (0.001) | | -0.002*** (0.000) | -0.002*** (0.000) | -0.002*** (0.000) |
| Family income, origin | | -0.000*** (0.000) | -0.000*** (0.000) | -0.000*** (0.000) | | -0.000** (0.000) | -0.000** (0.000) | -0.000** (0.000) |
| HH head employed, origin | | -0.012*** (0.002) | -0.012*** (0.002) | -0.012*** (0.002) | | -0.001 (0.001) | -0.001 (0.001) | -0.001 (0.001) |
| Homeowner, origin | | -0.014** (0.005) | -0.013** (0.005) | -0.014** (0.005) | | -0.008*** (0.002) | -0.007*** (0.002) | -0.007*** (0.002) |
| Persons per room, origin | | 0.005 ⁺ (0.002) | 0.005* (0.002) | 0.005* (0.002) | | -0.000 (0.002) | -0.000 (0.002) | -0.000 (0.002) |
| Lived in same house 3 + years, origin | | 0.005* (0.002) | 0.007** (0.002) | 0.006* (0.002) | | 0.003** (0.001) | 0.004*** (0.001) | 0.004*** (0.001) |
| Observation length | | -0.021*** (0.006) | -0.010 ⁺ (0.005) | -0.011* (0.005) | | -0.005* (0.002) | -0.000 (0.002) | -0.000 (0.002) |
| Year of observation, destination | | 0.000 (0.001) | -0.001 (0.001) | -0.000 (0.001) | | 0.001*** (0.000) | 0.000* (0.000) | 0.000 ⁺ (0.000) |
| Prop. new housing, origin metro | | | -0.154 (0.118) | -0.145 (0.111) | | | -0.021 (0.022) | -0.022 (0.022) |
| Prop. vacant housing, origin metro | | | 0.260 ⁺ (0.158) | 0.210 (0.152) | | | 0.108 ⁺ (0.059) | 0.108 ⁺ (0.059) |
| Prop. in poverty, origin metro | | | 1.271*** (0.199) | 1.284*** (0.182) | | | 0.749*** (0.084) | 0.747*** (0.084) |
| Prop. NH black, origin metro | | | -0.145 (0.092) | -0.167* (0.078) | | | -0.110*** (0.026) | -0.109*** (0.026) |
| Prop. Hispanic, origin metro | | | -0.137 (0.085) | -0.135 ⁺ (0.070) | | | -0.053* (0.026) | -0.053* (0.026) |
| Northeast | | | Ref. | Ref. | | | Ref. | Ref. |
| Midwest | | | 0.004 (0.016) | -0.015 (0.013) | | | 0.009 (0.008) | 0.009 (0.008) |
| South | | | -0.034** (0.012) | -0.031** (0.011) | | | 0.013 ⁺ (0.008) | 0.013 ⁺ (0.008) |
| West | | | -0.045* (0.018) | -0.030* (0.014) | | | 0.016* (0.007) | 0.016* (0.007) |
| Mobility Interactions | | | | | | | | |
| Living in different metro from age 17 | | | | 0.061 ⁺ (0.035) | | | | -0.013 (0.018) |
| Different metro*dissimilarity at 17 | | | | -0.176*** (0.052) | | | | 0.018 (0.026) |
| Constant | 0.105*** (0.021) | -0.577 (1.093) | 1.730 (1.571) | 1.003 (1.524) | 0.162*** (0.011) | -1.634*** (0.379) | -0.873 ⁺ (0.476) | -0.823 ⁺ (0.483) |
| Variance Components | | | | | | | | |
| Between MSAs | 0.045*** (0.005) | 0.041*** (0.005) | 0.037*** (0.006) | 0.026*** (0.006) | 0.036*** (0.005) | 0.035*** (0.005) | 0.014*** (0.002) | 0.014*** (0.002) |
| Between Individuals | 0.100*** (0.004) | 0.090*** (0.004) | 0.090*** (0.004) | 0.088*** (0.003) | 0.064*** (0.002) | 0.061*** (0.002) | 0.061*** (0.002) | 0.061*** (0.002) |
| Residual | 0.097*** (0.004) | 0.096*** (0.004) | 0.095*** (0.003) | 0.094*** (0.003) | 0.048*** (0.001) | 0.047*** (0.001) | 0.047*** (0.001) | 0.047*** (0.001) |
| Observations | 18846 | 18846 | 18846 | 18846 | 24439 | 24439 | 24439 | 24439 |
| BIC | -29718.216 | -30350.846 | -30580.032 | -30808.710 | -71299.006 | -71626.603 | -71954.513 | -71936.182 |

Standard errors in parentheses.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Model 4 includes our inter-metropolitan migration dummy variable, which allows us to determine whether internal migration moderates the relationships we observe, potentially by disrupting kith and kin networks and the limitations segregation places on individuals' neighborhood knowledge. Indeed, Model 4 demonstrates that migrating out of the metropolitan area an individual grew up in significantly and substantially moderates the relationship between adolescent exposure to segregation and adulthood neighborhood poverty rates for blacks.⁵

To illustrate these relationships more clearly, Fig. 1 graphs the predicted neighborhood poverty rate exhibited by black respondents who have and have not moved out of the metropolitan areas they resided in at age 17 as the level of segregation experienced at age 17 increases. The level of segregation is graphed so that only individuals who live in metropolitan areas that have dissimilarity scores that are between 2 standard deviations above or below the mean dissimilarity score for blacks are included (mean = 0.718; 1 SD = 0.111). The predicted values for these graphs are calculated from the fully-specified multivariate results presented in Table 2, Model 4, with all covariates held at their means and with 95 percent confidence intervals included.⁶

Fig. 1 confirms the relationships exhibited in Table 1—increases in adolescent segregation levels are associated with significantly higher neighborhood poverty rates in adulthood for black respondents who remain in the metropolitan areas they grew up in. For those who move, these relationships are significantly and markedly more modest. Specifically, living in a metropolitan area with a dissimilarity score 1 standard deviation above the mean level of dissimilarity for blacks ($D = 0.829$) during adolescence is associated with an increase in adulthood neighborhood poverty rates of only 0.13 percentage points for black migrants relative to living in a metropolitan area with a dissimilarity score 1 standard deviation below the mean ($D = 0.607$). For non-migrants, this difference is 3.99 percentage points, which translates into a 18.43 percent increase in the neighborhood poverty rate for non-migrants. Consequently, migrating out of the metropolitan area blacks grew up in *does* moderate the relationship between adolescent segregation and adulthood neighborhood poverty rates.

In marked contrast, adolescent segregation is associated with significant or marginally significant *decreases* in neighborhood poverty rates for whites in both bivariate and multivariate models (Table 2, Models 5–8), though these associations are partially explained by the age of the respondent, homeownership status, individual and household socioeconomic characteristics, the observation length, and metropolitan characteristics. Moreover, migrating out of the metropolitan area an individual grew up in is not associated with significant changes in neighborhood poverty rates, nor does inter-metropolitan migration moderate the association between adolescent segregation and adulthood neighborhood poverty. Consequently, adolescent segregation exhibits a *protective* association with whites' adulthood neighborhood outcomes and migration does not significantly moderate this relationship.

4.2. Neighborhood percent black

Examining neighborhood racial composition provides an additional lens with which to understand the long-term relationship between segregation and neighborhood disadvantage. For black respondents, the results for neighborhood percent black (Table 3, Models 1–4) are very similar to the results for neighborhood poverty rates. In Model 1, increases in metropolitan-level segregation in adolescence are associated with significant increases in neighborhood percent black in adulthood. These relationships remain robust to the inclusion of covariates, with a quarter of the relationship between adolescent segregation and neighborhood percent black in adulthood being attenuated as a result of the inclusion of the variables representing socioeconomic status and year of observation. The inclusion of contextual characteristics (specifically the proportion of blacks in the metropolitan area) modestly strengthens the relationship between segregation and neighborhood outcomes. This could be because some blacks live in areas with lower levels of segregation because their metropolitan areas contain few blacks, though they may still be relatively racially isolated within those metropolitan areas. While the proportion of Hispanics in the metropolitan area does not strengthen or attenuate the focal relationships we observe, it is associated with significantly lower neighborhood racial isolation among blacks because blacks are more likely to share neighborhoods with Hispanics than they are with Asians or whites (Brown, 2006; Iceland, 2004; Lee et al., 2008).

Thus, as was the case for neighborhood poverty, individual and household socioeconomic and sociodemographic characteristics and metropolitan opportunity structures explain some of the deleterious relationship between adolescent segregation and adulthood neighborhood outcomes, but not the majority of it. Moreover, in Model 4, this relationship is significantly and substantially moderated for black migrants. Hence, adolescent exposure to segregation may harm adulthood neighborhood outcomes through mechanisms that inter-metropolitan migration fundamentally disrupts.

The differences across migrants and non-migrants are quite dramatic, as illustrated in Fig. 2. In the fully-specified multivariate models, black non-migrants who lived in metropolitan areas with dissimilarity scores 1 standard deviation above the mean during adolescence ($D = 0.829$) live in neighborhoods with 16.25 percentage points more blacks in adulthood than black non-migrants who lived in metropolitan areas with dissimilarity scores 1 standard deviation below the mean ($D = 0.607$), respectively. These differences are considerably more modest for migrants, with black migrants experiencing a non-significant -0.42 percentage point *decrease* in their neighborhood percent black in adulthood when they lived in a metropolitan area with a dissimilarity index 1 standard deviation

⁵ We also included fathers' and mothers' educational attainment as covariates for each of the outcomes to help account for the possibility that the relationship between adolescent segregation and neighborhood outcomes in adulthood is confounded by parents' socioeconomic status when respondents are young. Including parents' education strengthened the relationships we observed for blacks and did not change the relationships for whites, our findings for blacks might be conservative without including parents' socioeconomic status. However, the missingness for parents' education was high enough to prohibit including it in this analysis.

⁶ These results remain the same when covariates are allowed to freely vary rather than to be held at their means.

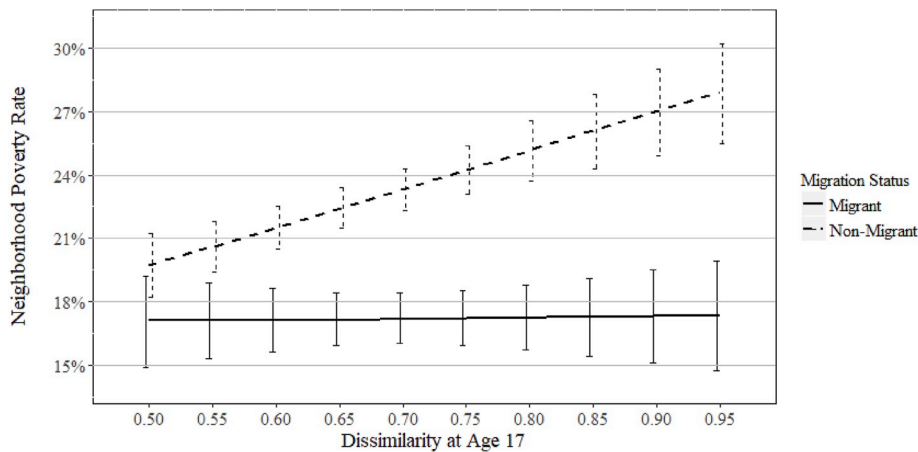


Fig. 1. The relationship between segregation experienced at age 17 and neighborhood poverty rates for inter-metropolitan migrant and non-migrant blacks: *Panel Study of Income Dynamics, 1979-2013*.

above the mean during adolescence relative to migrants who lived in a metropolitan area with a dissimilarity score 1 standard deviation below the mean during adolescence.

For whites (Table 3, Models 5–8), increases in adolescent segregation are associated with significant declines in neighborhood percent black in bivariate models. This relationship becomes non-significant once covariates are included. Model 8 adds the interactions with inter-metropolitan migration. However, inter-metropolitan migration does not significantly moderate the relationship between segregation and neighborhood percent black. Thus, as was the case for neighborhood poverty, adolescent segregation is largely not associated with whites' neighborhood racial composition outcomes once our theoretically-derived covariates are accounted for. This overall lack of significance could be a result of the historical legacy of segregation and the manner in which it has preserved and even enhanced advantaged, white spaces. Advantaged, predominantly white neighborhoods are far more readily available than advantaged, predominantly black neighborhoods. Hence, living in a white, advantaged neighborhood may be a default experience for most whites, leaving little room for variations in adolescent experiences of segregation to improve or harm neighborhood outcomes.

4.3. Supplementary analyses

4.3.1. Other outcomes

There are numerous other potential neighborhood outcomes that may be important for individuals' access to opportunities and for their wellbeing. We therefore examine the robustness of our results to outcomes including the percentage of Hispanics in the neighborhood, as this measure is increasingly important for understanding the racial and ethnic composition of blacks' neighborhoods and their racial isolation. We also explored whether our relationships hold when we examine logged average household income because this measure helps capture access to advantaged neighborhoods, rather than merely access to non-poor neighborhoods. For both outcomes, our conclusions remain the same. Among blacks, adolescent exposure to segregation is associated with higher percentages of Hispanics in one's adulthood neighborhood and lower neighborhood income (Table 4, "Across-Metro Moves" section). However, moving out of the metropolitan area one grew up in significantly moderates these relationships such that, after moving, there is no relationship between adolescent exposure to segregation and adulthood neighborhood income and there is a negative association between adolescent exposure to segregation and neighborhood percent Hispanic in adulthood for blacks. Our results for whites indicate that segregation has very little association with neighborhood outcomes. Hence, our relationships are robust to other components of neighborhood advantage and disadvantage.

4.3.2. Moves of varying distances

It is possible that our relationships could differ if we explore other types and distances of moves. Indeed, Leibbrand (2018) illustrated that inter-regional moves correspond to particularly dramatic declines in exposure to neighborhood poverty relative to inter-metropolitan and inter-state moves. It is therefore possible that we would see stronger relationships for longer-distance moves and weaker relationships for shorter-distance moves. Moreover, if we find no moderating effect for within-metro moves, this would add additional support for our expectation that it is longer-distance moves that substantially disrupt the residential context and, as such, individuals' neighborhood knowledge that moderate the relationship between segregation and neighborhood outcomes. In contrast, inter-metro, inter-state, and inter-regional moves all disrupt local residential knowledge. Thus, we would expect to find that all of these moves moderate the relationship between segregation and neighborhood outcomes and could do so to similar extents given the localized nature of daily rounds and residential knowledge (Krivo et al., 2013; Krysan and Crowder, 2017).

As Table 4 demonstrates, localized moves that are within-metro areas but across tracts largely do not moderate the relationship between segregation and neighborhood outcomes. There is a significant moderating effect associated with these moves for blacks for neighborhood percent black, though this moderating effect is substantially more modest than the moderating effect found for other

Table 3

The relationship between adolescent segregation, migration, and neighborhood percent black by gender: Panel Study of Income Dynamics, 1979-2013.

| | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 | Model 7 | Model 8 |
|---------------------------------------|------------------|----------------------------|-------------------|-----------------------------|------------------|-----------------------------|-----------------------------|-----------------------------|
| | (Black) | (Black) | (Black) | (Black) | (White) | (White) | (White) | (White) |
| Focal Independent Variable | | | | | | | | |
| Dissimilarity at 17, origin | 0.418*** (0.086) | 0.316*** (0.080) | 0.348*** (0.080) | 0.739*** (0.089) | -0.042* (0.018) | 0.010 (0.018) | -0.014 (0.017) | -0.012 (0.024) |
| Covariates | | | | | | | | |
| Female | | 0.018 ⁺ (0.010) | 0.019* (0.009) | 0.013 (0.010) | | 0.001 (0.003) | 0.001 (0.003) | 0.001 (0.003) |
| Married, origin | | -0.021** (0.008) | -0.022** (0.008) | -0.021** (0.008) | | -0.009*** (0.002) | -0.009*** (0.003) | -0.009*** (0.003) |
| Number of children in family, origin | | -0.003 (0.004) | -0.003 (0.004) | -0.003 (0.004) | | -0.002 ⁺ (0.001) | -0.002 ⁺ (0.001) | -0.002 ⁺ (0.001) |
| Age of respondent, origin | | -0.001 (0.001) | -0.001 (0.001) | -0.002* (0.001) | | -0.001* (0.000) | -0.001* (0.000) | -0.001* (0.000) |
| Years of education, origin | | -0.014*** (0.002) | -0.015*** (0.002) | -0.012*** (0.002) | | -0.001 (0.001) | -0.001 (0.001) | -0.001 (0.001) |
| Family income, origin | | -0.001*** (0.000) | -0.001*** (0.000) | -0.001*** (0.000) | | -0.000* (0.000) | -0.000* (0.000) | -0.000* (0.000) |
| HH head employed, origin | | -0.016** (0.005) | -0.017** (0.005) | -0.016** (0.005) | | -0.001 (0.002) | -0.001 (0.002) | -0.001 (0.002) |
| Homeowner, origin | | 0.028* (0.012) | 0.027* (0.012) | 0.025* (0.012) | | 0.000 (0.003) | 0.000 (0.003) | 0.000 (0.003) |
| Persons per room, origin | | 0.006 (0.006) | 0.007 (0.006) | 0.007 (0.006) | | -0.000 (0.003) | -0.000 (0.003) | -0.000 (0.003) |
| Lived in same house 3 + years, origin | | 0.021** (0.007) | 0.021** (0.006) | 0.018** (0.007) | | 0.005** (0.002) | 0.005** (0.002) | 0.005** (0.002) |
| Observation length | | 0.007 (0.009) | 0.008 (0.010) | 0.005 (0.009) | | 0.003 (0.004) | 0.003 (0.004) | 0.003 (0.004) |
| Year of observation, destination | | -0.002* (0.001) | -0.002 (0.001) | -0.001 (0.001) | | 0.001*** (0.000) | 0.001** (0.000) | 0.001** (0.000) |
| Prop. new housing, origin metro | | | 0.048 (0.161) | 0.006 (0.158) | | 0.020 (0.035) | 0.020 (0.035) | 0.020 (0.035) |
| Prop. vacant housing, origin metro | | | 0.287 (0.355) | 0.120 (0.337) | | 0.018 (0.063) | 0.018 (0.063) | 0.016 (0.063) |
| Prop. in poverty, origin metro | | | -0.253 (0.419) | -0.191 (0.383) | | 0.061 (0.085) | 0.061 (0.085) | 0.065 (0.085) |
| Prop. NH black, origin metro | | | 0.620*** (0.162) | 0.563*** (0.138) | | 0.303*** (0.042) | 0.306*** (0.042) | 0.306*** (0.042) |
| Prop. Hispanic, origin metro | | | -0.496** (0.156) | -0.450*** (0.120) | | -0.040 (0.031) | -0.040 (0.031) | -0.040 (0.031) |
| Northeast | | | Ref. | Ref. | | Ref. | Ref. | Ref. |
| Midwest | | | 0.074 (0.064) | 0.004 (0.054) | | 0.013* (0.006) | 0.012* (0.006) | 0.012* (0.006) |
| South | | | 0.056 (0.062) | 0.067 (0.057) | | 0.057*** (0.007) | 0.055*** (0.007) | 0.055*** (0.007) |
| West | | | -0.175** (0.066) | -0.103 ⁺ (0.055) | | -0.008 (0.007) | -0.009 (0.007) | -0.009 (0.007) |
| Mobility Interactions | | | | | | | | |
| Living in different metro from age 17 | | | | 0.334*** (0.098) | | | | 0.011 (0.016) |
| Different metro*dissimilarity at 17 | | | | -0.757*** (0.139) | | | | -0.007 (0.022) |
| Constant | 0.121* (0.058) | 4.569* (1.821) | 3.507 (2.548) | 1.417 (2.402) | 0.103*** (0.014) | -2.412*** (0.621) | -2.022** (0.654) | -2.064** (0.665) |
| Variance Components | | | | | | | | |
| Between MSAs | 0.170*** (0.011) | 0.165*** (0.010) | 0.119*** (0.017) | 0.075*** (0.013) | 0.052*** (0.005) | 0.052*** (0.005) | 0.024*** (0.005) | 0.024*** (0.005) |
| Between Individuals | 0.211*** (0.005) | 0.201*** (0.005) | 0.200*** (0.005) | 0.192*** (0.005) | 0.076*** (0.004) | 0.075*** (0.004) | 0.075*** (0.004) | 0.075*** (0.004) |
| Residual | 0.197*** (0.006) | 0.196*** (0.006) | 0.195*** (0.006) | 0.192*** (0.006) | 0.071*** (0.004) | 0.071*** (0.004) | 0.071*** (0.004) | 0.071*** (0.004) |
| Observations | 18846 | 18846 | 18846 | 18846 | 24438 | 24438 | 24438 | 24438 |
| BIC | -2610.864 | -2899.774 | -3114.451 | -3705.518 | -52745.499 | -52834.356 | -53186.454 | -53172.452 |

Standard errors in parentheses.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

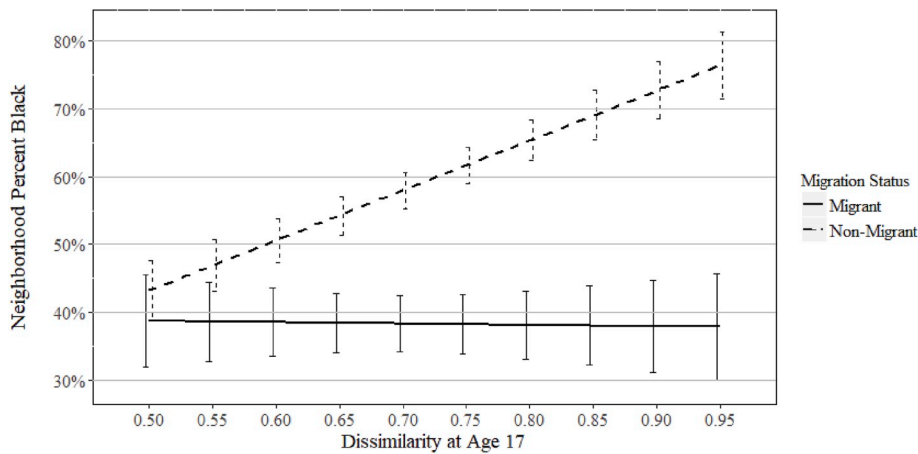


Fig. 2. The relationship between segregation experienced at age 17 and neighborhood percent black for inter-metropolitan migrant and non-migrant blacks: Panel Study of Income Dynamics, 1979-2013.

types of moves.⁷ In contrast, inter-state and inter-regional moves significantly and substantially moderate the relationship between segregation and each neighborhood outcome for blacks and are largely not associated with neighborhood outcomes for whites (though inter-regional moves are associated with a slight increase in neighborhood poverty rates and percent black for whites). The magnitudes of these moderating effects are extremely similar for inter-metro and inter-state moves, and modestly larger for inter-regional moves, as could be expected given that these moves tend to be especially dramatic. Consequently, inter-metropolitan, inter-state, and inter-regional moves moderate the relationship between segregation and neighborhood outcomes and do so to a largely similar extent.

4.3.3. The issue of selectivity

Although we have found compelling evidence that migration is an important means of ameliorating the associations between adolescent segregation and adulthood neighborhood outcomes for blacks, these relationships could be largely due to migrant selectivity. For example, migrants may be more prone to risk-taking and exploring new neighborhoods and it may be these characteristics that explain black migrants' improved neighborhood outcomes, rather than the migration event itself. Our controls help to address some of this selectivity. However, we cannot fully account for migrant selectivity using these models. Given that, we examine the robustness of our results using fixed effects models that examine within-person change in the relationship between segregation and adulthood neighborhood outcomes, with the individual representing our panel variable and "year" representing our time variable within panels. We solely examine these relationships for blacks and we replace our focal independent variable, "dissimilarity exposure at age 17," with a time-varying measure that differences current exposure to segregation in adulthood from exposure to segregation at age 17. In these models, we are examining whether worsening exposure to segregation in adulthood relative to adolescence is associated with worse neighborhood outcomes in adulthood. As such, it allows us to examine whether *in situ* changes in segregation are associated with neighborhood outcomes, as well as whether migration disrupts these relationships. Our models include the full suite of covariates used in Tables 2 and 3.

Our fully-specified multivariate results (Appendix Table 2) largely confirm the patterns we describe using the linear mixed-effects models. We find that those who experience higher levels of segregation in adulthood relative to adolescence experience higher neighborhood poverty rates, higher percentages of blacks, and lower incomes in their neighborhoods, relative to those whose exposure to segregation is stable or, especially, declining over time. However, for those who have left the metropolitan areas they grew up in, these relationships are significantly weaker for neighborhood poverty and income. For neighborhood percent black, migrants exhibit significantly lower levels of racial isolation in their neighborhoods regardless of the extent to which their exposure to segregation has changed, though this difference is more modest for individuals who have experienced increases in their exposure to segregation across their lifetimes. Inter-metropolitan migration does not moderate these relationships for exposure to Hispanics because there is no relationship to moderate in these models.

We also explored the extent to which inter-metropolitan migration moderates the relationship between adolescent exposure to segregation and adulthood neighborhood outcomes using marginal structural models with inverse probability weights. These models help account for migrant selectivity, though they are less intuitive to interpret than linear mixed-effects models. They do so by utilizing weights which incorporate baseline, lagged, and contemporaneous individual and contextual characteristics to predict the probability of selection into migration (see Wodtke et al. (2011) for a detailed example). Regression models are then weighted using these inverse probability weights such that the issue of (observed) selection into migration is attenuated, though the issue of unobserved selection

⁷ The sample sizes for these moves are smaller because we restrict the sample to individuals who stay within their metropolitan area so that we do not include long-distance movers within our comparison group and thereby create artificially modest relationships where inter-tract movers appear disadvantaged relative to the comparison population.

Table 4

Focal regression coefficients from fully-specified multivariate models assessing the relationship between adolescent segregation and neighborhood outcomes by types of migration status. *Panel Study of Income Dynamics, 1979-2013.*

| | Black | | | | White | | | |
|--|-----------------------------|-------------------|-------------------|--------------------|-----------------------------|-------------------|-------------------|--------------------|
| | % in Poverty | % Black | % Hispanic | Avg. HH Income | % in Poverty | % Black | % Hispanic | Avg. HH Income |
| Within-Metro, Across-Tract Moves | | | | | | | | |
| Dissimilarity at 17, origin ^a | 0.192*** (0.052) | 0.668*** (0.104) | -0.048 (0.036) | -0.431** (0.150) | -0.033 (0.026) | 0.021 (0.035) | -0.033 (0.046) | 0.194 (0.119) |
| Living in different tract from age 17 | 0.031 (0.027) | 0.104 (0.067) | -0.007 (0.015) | -0.050 (0.094) | 0.013 (0.019) | -0.007 (0.019) | -0.016 (0.026) | 0.023 (0.085) |
| Different tract*dissimilarity at 17 | -0.062 (0.037) | -0.212* (0.089) | 0.008 (0.022) | 0.105 (0.126) | -0.018 (0.027) | 0.015 (0.029) | 0.018 (0.035) | -0.038 (0.119) |
| Constant | -2.490 ⁺ (1.310) | -6.876*** (2.036) | -1.885* (0.851) | -63.889*** (3.039) | -0.366 (0.646) | -2.638** (0.871) | -2.519** (0.933) | -65.104*** (2.719) |
| Observations | 15751 | 15751 | 15751 | 15740 | 15421 | 15421 | 15421 | 15405 |
| Across-Metro Moves | | | | | | | | |
| Dissimilarity at 17, origin ^a | 0.189*** (0.035) | 0.668*** (0.104) | 0.119* (0.047) | -0.431** (0.150) | -0.033 (0.020) | 0.021 (0.035) | 0.014 (0.051) | 0.194 (0.119) |
| Living in different metro from age 17 | 0.066 ⁺ (0.034) | 0.277** (0.099) | 0.143*** (0.037) | -0.144 (0.116) | 0.009 (0.017) | -0.007 (0.019) | 0.001 (0.037) | 0.101 (0.089) |
| Different metro*dissimilarity at 17 | -0.181*** (0.050) | -0.685*** (0.140) | -0.181*** (0.050) | 0.403* (0.164) | -0.001 (0.023) | 0.015 (0.029) | -0.017 (0.052) | -0.116 (0.131) |
| Constant | 1.034 (1.519) | 1.660 (2.438) | -0.076 (0.990) | -72.767*** (4.192) | -0.870 ⁺ (0.465) | -2.184*** (0.643) | -2.798** (0.919) | -68.347*** (3.023) |
| Observations | 18846 | 18846 | 18846 | 18823 | 24439 | 24438 | 24438 | 24420 |
| Across-State Moves | | | | | | | | |
| Dissimilarity at 17, origin | 0.189*** (0.047) | 0.683*** (0.058) | 0.039 (0.031) | -0.454*** (0.105) | -0.022 (0.020) | -0.017 (0.024) | -0.014 (0.042) | 0.184* (0.072) |
| Living in different state from age 17 | 0.051 (0.039) | 0.222* (0.106) | 0.105** (0.038) | -0.052 (0.081) | -0.003 (0.016) | 0.017 (0.024) | -0.009 (0.028) | 0.121 (0.071) |
| Different state*dissimilarity at 17 | -0.163** (0.059) | -0.585*** (0.147) | -0.124** (0.047) | 0.272* (0.126) | -0.002 (0.022) | -0.004 (0.033) | 0.002 (0.041) | -0.125 (0.099) |
| Constant | 1.387 (1.308) | 3.704 (2.458) | -0.192 (0.773) | -72.759*** (4.985) | -1.447*** (0.425) | -2.175** (0.781) | -3.383*** (0.912) | -67.822*** (1.826) |
| Observations | 18971 | 18971 | 18971 | 18948 | 25040 | 25034 | 25034 | 25017 |
| Across-Region Moves | | | | | | | | |
| Dissimilarity at 17, origin | 0.208*** (0.043) | 0.897*** (0.036) | 0.011 (0.017) | -0.526*** (0.101) | -0.017 (0.020) | -0.003 (0.042) | 0.045 (0.049) | 0.253 (0.165) |
| Living in different region from age 17 | 0.181*** (0.032) | 0.657*** (0.131) | 0.104** (0.033) | -0.304*** (0.064) | 0.010* (0.005) | 0.037** (0.012) | 0.018 (0.020) | 0.110 (0.143) |
| Different region*dissimilarity at 17 | -0.331*** (0.055) | -1.167*** (0.191) | -0.116** (0.043) | 0.576*** (0.124) | -0.023 (0.013) | -0.043 (0.022) | -0.054 (0.043) | -0.083 (0.225) |
| Constant | 0.974 (1.703) | 4.498 (2.740) | -2.216* (1.123) | -72.399*** (6.162) | -1.599*** (0.335) | -1.727 (1.142) | -4.522*** (1.345) | -68.489*** (3.194) |
| Observations | 18971 | 18971 | 18971 | 18948 | 25040 | 25034 | 25034 | 25017 |

Standard errors in parentheses.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

^a Results are from fully-specified multivariate models, covariates include: marital status, number of children, educational attainment, household income, employment and homeownership status, residence in home for 3 + years, persons per room, observation length, region of residence, proportion of respondents in poverty in the metropolitan area, proportion of new housing in the metropolitan area, proportion of vacant residences in the metropolitan area, proportion of population that is black in the metropolitan area, and proportion of the population that is Hispanic in the metropolitan area (full set of results available upon request).

does remain. We found that these models yielded substantively identical conclusions to our linear mixed-effects models (results available upon request). Consequently, our supplementary analyses largely confirm that the patterns we observe are robust.

5. Discussion

In this paper, we used data from the Panel Study of Income Dynamics and multiple censuses to examine whether the level of segregation experienced during adolescence is associated with worse neighborhood outcomes for blacks and better neighborhood outcomes for whites in their adulthood. We also explored whether migrating out of the metropolitan area an individual grew up in moderates these relationships.

Consistent with our first hypothesis, we found that the level of segregation experienced during adolescence is associated with significantly worse neighborhood outcomes in adulthood for blacks. These findings suggest that the effects of early-life exposure to segregation are pernicious, long-lasting, and may continue to influence black individuals' neighborhoods into adulthood. Moreover, the relationship between early-life exposure to segregation and adult residential outcomes persists after accounting for a wide host of individual and contextual characteristics. Thus, segregation's association with residential trajectories appears to extend beyond economic mechanisms emphasized in past research, pointing to the potential influence of the social dynamics of residential mobility emphasized in the *social structural sorting perspective*.

This support for the *social structural sorting perspective* is reinforced by the moderating effects of longer-distance migration. Consistent with our second hypothesis, our results indicate that, for blacks, migrating out of the metropolitan area an individual grew up in is associated with a significant reduction in the harmful relationship between segregation experienced during adolescence and neighborhood attainment outcomes in adulthood. In fact, for all our outcomes, the relationship between adolescent exposure to segregation and adulthood neighborhood outcomes is close to zero for black migrants, indicating that inter-metropolitan migration is a particularly meaningful moderator. Importantly, this moderating effect is highly robust to the inclusion of individual socioeconomic and contextual characteristics and various strategies to account for the non-random selection into migration. Thus, migration may be able to reduce the impact of early-life exposure not just by shaping economic and sociodemographic conditions later in life but, as suggested by the *social structural sorting perspective*, by lifting the effects of circumscribed neighborhood knowledge and social ties to areas formed during adolescence.

For whites, adolescent segregation is associated with modestly improved adulthood neighborhood poverty rates, supporting Hypothesis 3. None of the relationships between segregation and neighborhood outcomes were moderated by inter-metropolitan migration, however. This finding is unsurprising given the very modest associations between segregation and neighborhood outcomes for whites. Nevertheless, it does not provide support for Hypothesis 4 where we anticipated that migration might disrupt whites' local neighborhood knowledge, perhaps prompting them to explore more economically and racially diverse neighborhoods. Thus, whites tend to live in whiter and wealthier neighborhoods regardless of the level of segregation they experience in adolescence and regardless of their migration status, highlighting the availability of white, low-poverty neighborhoods for whites.

Finally, we illustrate that our findings are robust to the examination of different outcomes, including the percentage of Hispanics in the neighborhood and neighborhood income, and our findings hold for all types of longer-distance moves. Specifically, inter-metropolitan, inter-state, and inter-regional moves all significantly and substantially moderate the relationship between segregation and neighborhood outcomes for blacks and they do so to a relatively similar extent. In contrast, intra-metropolitan moves largely do not moderate the relationships we observe. These findings offer suggestive support for our theoretical expectations that it is longer distance moves that disrupt local knowledge and social ties that moderate the relationship between segregation and neighborhood outcomes, as posited by the *social structural sorting perspective*.

5.1. Contributions

Our findings offer a number of contributions to the literature on segregation, neighborhood attainment, and migration. For blacks who remain in the metropolitan areas they grew up in, early-life segregation is associated with persistently worse neighborhood outcomes in adulthood, a finding that adds to the life course literature on the importance of early-life experiences. Individual socioeconomic status and metropolitan opportunity structures do not explain the majority of this relationship. Therefore, our results provide suggestive evidence that adolescent exposure to segregation may be harming outcomes through more socially-oriented mechanisms.

This possibility is reinforced by the finding that migrating out of the metropolitan area an individual grew up in offers substantial promise for improving blacks' residential outcomes. Our study builds on Leibbrand (2018) findings that migrating disrupts the association between early- and later-life neighborhood poverty by illustrating that migration also disrupts the broader, more comprehensive influences of segregation in important and substantial ways. We are also able to illustrate that the moderating effect of segregation holds for a wider range of outcomes than Leibbrand and Crowder investigated and is quite robust to numerous methodological techniques that help account for migrant selectivity. By illustrating that segregation does not tend to be associated with worse neighborhood outcomes for those who move out of the metropolitan areas they grew up in, our findings suggest that explanations for the relationship between segregation and neighborhood outcomes should focus on why individuals face difficulties leaving segregated, disadvantaged areas and thereby experience worse outcomes. In particular, our findings offer tentative support for the *social structural sorting perspective* as an explanation for the relationship between segregation and neighborhood outcomes, and for the influence of kith and kin networks on destination locations and choices.

Our findings are also highly informative for policymakers. The observation that migration substantially moderates the relationship

between adolescent segregation and adulthood neighborhood outcomes indicates possible avenues for ameliorating the detrimental associations of segregation with life course outcomes. For instance, our results could illustrate the value of facilitating inter-metropolitan moves for blacks interested in migrating. The persistence of this moderating effect with the inclusion of individuals' characteristics suggests that segregation may moderate these relationships through social mechanisms, such as by relaxing the constraints segregation puts on individuals' knowledge of other neighborhoods. Thus, a less disruptive policy implied by our findings is to enhance individuals' knowledge of local communities to move to that may differ in fundamental ways from their origin locations. The Baltimore Mobility Program and the Oak Park Regional Housing Center are two examples of programs and organizations that counsel potential movers about neighborhood options they may not be familiar with and, in doing so, enhance the probability that individuals will move into neighborhoods that do not closely resemble those they are moving from (Krysan and Crowder, 2017).

Moreover, our findings demonstrate the privileged position of whites, attested by the fact that advantaged, white spaces are often widely available and whites are far more likely to start in advantaged neighborhoods than blacks (Sharkey, 2013). Hence, whites rarely need to move or move far to find advantaged neighborhoods. In contrast, our results illustrate that blacks often need to engage in reasonably dramatic moves across metropolitan areas to experience improvements in their neighborhood outcomes. Consequently, although our findings offer hopeful possibilities for improving blacks' outcomes, they also demonstrate the enduring, protective effect segregation has for whites' outcomes and for maintaining racial disparities across the life course.

5.2. Limitations and future directions

A limitation of our analysis is its inability to fully explore potential mechanisms behind our relationships. The location of social networks and individuals' information about neighborhoods may provide important explanations for the relationships between segregation and neighborhood outcomes and may explain the strong moderating effect of longer-distance migration in these relationships. Assuming the advent of data with direct measures of the geographic structure of social networks, patterns of neighborhood knowledge, and their relationship to residential decision making, future research should continue to explore the utility of these social dynamics for explaining why early-life experiences of segregation are associated with later-life outcomes.

Furthermore, there are limitations associated with measuring whether a respondent has moved out of the metropolitan area they resided in at age 17, a strategy that does not distinguish individuals who moved before they turned 17. However, the majority of individuals under age 17 have not moved, and the vast majority of individuals under age 17 have not moved beyond their county of residence (Ihrke and Faber, 2012). Consequently, for most respondents, this measure captures individuals who have never moved out of their origin metropolitan area. Nevertheless, future research should examine the effects of a wider range of migration histories and early-life residential exposures on residential outcomes in adulthood.

Segregation has a powerful influence on individuals' and families' outcomes and wellbeing. "Geography is destiny," Napoleon is reputed to have said. Segregation's association with educational, occupational, physical and mental health, and a multitude of other outcomes, provides some support for this declaration. However, when individuals migrate to new metropolitan areas, they appear to disrupt the harmful relationship between segregation and neighborhood outcomes in important and fundamental ways and thereby improve their outcomes. Future scholars and policymakers should continue to investigate the ways in which migration can be harnessed and used to reduce racial disparities across the life course, in addition to focusing on ways in which the harmful influence of segregation can be mitigated for those who cannot or do not desire to move from their homes.

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Appendix Table 1. The correlations between the focal and supplementary outcome variables for blacks and whites Panel Study of Income Dynamics, 1979-2013

| | Poverty Rate | Percent Black | Percent Hispanic | Avg. HH Income |
|--------------------------|--------------|---------------|------------------|----------------|
| <i>Black Respondents</i> | | | | |
| Poverty Rate | 1.000 | | | |
| Percent Black | 0.5364 | 1.000 | | |
| Percent Hispanic | -0.0093 | -0.4021 | 1.000 | |
| Avg. HH Income | -0.6593 | -0.4043 | 0.1151 | 1.000 |
| <i>White Respondents</i> | | | | |
| Poverty Rate | 1.000 | | | |
| Percent Black | 0.3780 | 1.000 | | |
| Percent Hispanic | 0.3740 | 0.0549 | 1.000 | |
| Avg. HH Income | -0.4996 | -0.1506 | -0.0514 | 1.000 |

Appendix Table 2. The relationship between differenced exposure to segregation (Dissimilarity in adulthood – dissimilarity in adolescence) and adulthood neighborhood outcomes for inter-metropolitan migrant and non-migrant blacks: Panel Study of Income Dynamics, 1979–2013

| | Neighb. Poverty | Neighb. Percent Black | Neighb. Percent Hispanic | Logged Neighb. Income |
|--|-------------------|-----------------------|--------------------------|-----------------------|
| Living in different metro from age 17 | –0.059*** (0.009) | –0.161*** (0.023) | 0.002 (0.010) | 0.177*** (0.030) |
| Differenced dissimilarity ^b | 0.141* (0.055) | 0.275* (0.107) | –0.064 (0.044) | –0.625*** (0.142) |
| Different metro*Differenced Dissim. | –0.108* (0.053) | 0.260* (0.119) | –0.002 (0.059) | 0.423** (0.154) |
| Constant | 5.129 (5.141) | –4.299 (9.936) | –2.178 (2.777) | –37.379** (13.195) |
| Observations | 18846 | 18846 | 18846 | 18823 |
| BIC | –36886.008 | –9759.974 | –49577.216 | 59.161 |

Standard errors in parentheses.

⁺ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

a Results are from fully-specified multivariate models, covariates include: marital status, number of children, educational attainment, household income, employment and homeownership status, residence in home for 3 + years, persons per room, observation length, region of residence, proportion of respondents in poverty in the metropolitan area, proportion of new housing in the metropolitan area, proportion of vacant residences in the metropolitan area, proportion of population that is black in the metropolitan area, and proportion of the population that is Hispanic in the metropolitan area.

b Differenced exposure to segregation (Dissimilarity in adulthood – dissimilarity in adolescence).

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