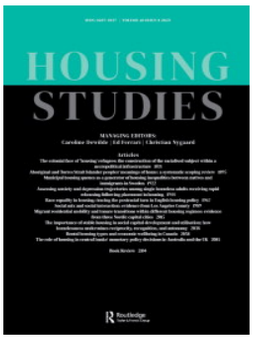

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Housing mobility in the Housing Choice Voucher program: the role of portability

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ABSTRACT

The U.S. Housing Choice Voucher (HCV) program aims to deconcentrate poverty by allowing voucher holders to find housing in the private market, and voucher portability is meant to enable households to use their vouchers across different housing markets. However, research shows that HCV households remain poverty-concentrated. Poverty concentration varies by race, such that Non-white-headed voucher households live in higher-poverty areas than Whites. In this study, we evaluate the degree to which this ostensibly race-neutral program can overcome the challenges of racial stratification in the housing market and to what extent voucher portability enables households to move to less poverty-concentrated areas. We use data on all voucher holders in Ohio and employ a discrete choice model with a multiscalar classification of population compositions by income groups to better understand the outcomes of HCV recipients' residential mobility. We find that portability may facilitate voucher holders' entry into high-income dominant neighbourhoods. We provide possible policy interventions for advancing the HCV recipients' residential mobility.

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Housing Choice Voucher; residential mobility; portability; poverty concentration

Introduction

The U.S. Housing Choice Voucher (HCV) program was created to provide affordable housing for low-income and qualifying households using rental subsidies. Distinct from project-based forms of affordable housing, the HCV program was designed to allow recipients to find a home in the private market, with dual goals of increasing affordability and deconcentrating neighbourhood poverty among low-income households.

Evidence suggests that the HCV program substantially reduces the housing cost burden among those enrolled. However, findings on poverty deconcentration are mixed. While some studies show participants have been able to move to neighbourhoods with lower levels of poverty concentration, others find little change for enrolled

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households (Deluca & Rosenblatt, 2010; Devine *et al.*, 2003; Galvez, 2010; Kleit *et al.*, 2016; McClure, 2010).

Some research suggests that individuals who use vouchers tend to stay geographically proximate to their prior, non-voucher address (Galvez, 2010). The lack of neighbourhood economic mobility may be due to the limitations of individual choice in a private housing market that is highly economically segregated (Finkel & Buron, 2001; Jacob, 2003; Sanbonmatsu *et al.*, 2011; Wood *et al.*, 2008). Individual choice is limited by market barriers, landlord discrimination and public housing authority (PHA) administrative constraints, among others, many of which may be endemic to the challenges of moving within a PHA.

One component of the voucher program – voucher portability – may enable recipients to shift housing markets by 'porting' their vouchers from one PHA's jurisdiction to another. HCV portability is meant to enable households to use their vouchers across different housing markets. However, there is little information about whether portability influences these outcomes. In this article, we focus on how voucher portability shapes the economic concentration of HCV holders. We hypothesize that portability will let households access and choose neighbourhoods that have lower levels of poverty concentration; however, the use of portability may vary by household characteristics and program administration.

Vouchers as a pathway to mobility and their limitations

In the late twentieth century, federal funding shifted out of the development and maintenance of public housing, which had been a primary form of affordable housing through the twentieth century. The Section 8 HCV program aimed to implement market-based solutions that were intended to deconcentrate the poverty associated with public housing projects (Hays, 2012). Administered by the U.S. Department of Housing and Urban Development (HUD), in theory, vouchers allow low-income families to access housing in previously inaccessible neighbourhoods (U.S. Department of Housing and Urban Development, 2010) by asking recipients to find a unit in the private market and contribute 30% of their income towards rent. The federal government pays the difference up to a locally defined 'payment standard' to the property owner who receives both rental subsidy and tenant rental contribution. The program implicitly relies on recipient households to choose neighbourhoods with lower poverty levels in the private market. Whether participants seek to do so is another matter.

Vouchers do appear to help participating households afford housing. Voucher recipients are more likely to live in affordable quality housing than non-voucher recipients (Colburn, 2019; Devine *et al.*, 2003; U.S. Department of Housing and Urban Development, 2000). However, findings on mobility and neighbourhood characteristics are substantially more varied. Multiple studies have found that the average neighbourhood 'quality' – mostly operationalized as poverty level – for voucher holders is no different than the areas of high poverty that renters of similar incomes access without a voucher (Devine *et al.*, 2003; Galvez, 2010; Lahr & Gibbs, 2002; McClure, 2006). This pattern may vary by number of moves: Feins and Patterson (2005) used longitudinal data on households with children between

1995 and 2002, concluding that while the first move did not lead to different neighbourhood conditions, subsequent moves results in higher neighbourhood incomes.

Some studies have found voucher households are able to move to lower-poverty neighbourhoods compared to other subsidized or similar households, but that they are rarely entering high-income areas. Carlson *et al.* (2008) examined the impact of vouchers for households in Wisconsin, showing small improvements in neighbourhood income for voucher holders compared with their matched cohorts without a voucher among those who received food stamps or TANF. Similarly, Deng (2007) found HCV households were less likely than Low-Income Housing Tax Credit (LIHTC) households to live in 'very low-income' neighbourhoods and more likely to live in 'low-income' neighbourhoods, a similar finding to Pendall (2000), who showed that 2% of HCV users lived in 'severely distressed' neighbourhoods and 17% in 'mildly distressed' neighbourhoods, compared to 5 and 23% of low-income renters. McClure and Johnson (2015) used HUD and census data to show HCV improved the ability to move into lower-poverty, less distressed areas. Focusing on economic integration, Owens (2015) examined metropolitan areas from 1980 to 2005, finding that voucher households experienced modest economic residential integration living in slightly higher income areas than previous housing; however, they were not breaking into high-income areas. Yet the poverty deconcentration by voucher holders is not uniform across all renters. Outcomes vary by race, such that White households appear to be able to leverage moves into higher-income neighbourhoods more frequently than their Black and Latinx counterparts. A study of vouchers in 303 metropolitan areas indicated Black households remained concentrated in higher poverty neighbourhoods (Pendall, 2000). Basolo and Nguyen (2005) examined HCV households by race, showing that Black and Hispanic households lived in neighbourhoods defined by higher poverty and more overcrowding than White households. For three-quarters of the Black and Hispanic households that did move, the move did not translate to lower neighbourhood poverty outcomes. Landlord discrimination against Black and Hispanic renter households also works to further racial segregation and exclusion (Hogan & Berry, 2011; Rosen *et al.*, 2021).

Challenges to the deconcentration of poverty

Analysing why vouchers may not lead to lower concentration of poverty, studies suggest that multiple components of the program design limit voucher usefulness. First, the payment standard for the voucher is determined by the fair market rent (FMR) – often only equivalent to the 40th percentile of rent within a metropolitan area, which means that, even with a voucher, residents are often only able to pay less than FMR. This may limit the ability of households to move to areas with substantially higher rental rates.

Second, households continue to face market barriers (Graves, 2016), especially in tight housing markets. Market conditions have been shown to impact voucher success rates – e.g. a shortage of affordable housing due to zoning and land regulations intentionally limited rental housing development (Colburn, 2019; Downs, 1991;

Malpezzi, 1996), tight rental markets (U.S. Department of Housing and Urban Development, 1999) and rent subsidy limitations (Patterson *et al.*, 2021). There is a correlation between rental properties, affordable housing availability and zoning restrictions (Schuetz, 2009; Song, 2021).

Third, landlord discrimination is another substantial barrier. Landlords may be unwilling to rent to voucher households given prejudices against low-income households or voucher users (Popkin *et al.*, 2000, 2002). Studies suggest that landlords view the program itself as administratively challenging, which may be exacerbated by lack of capacity for PHAs who are less responsive, less likely to pay rents on time and conduct inspections and paperwork less quickly (Garboden *et al.*, 2018; Varady *et al.*, 2016).

Furthermore, the success of the HCV program is constrained by limited resources to assist voucher holders combined with tough requirements and paperwork (Buron *et al.*, 2002; Metzger, 2014; Wood *et al.*, 2008). Voucher holders' lack of previous experience with the private market (Popkin *et al.*, 2002), lack of choices due to limited personal networks (Goetz, 2013; Greenlee, 2011; Patterson *et al.*, 2021) and limited education on how to use the voucher (Buron *et al.*, 2002; Wood *et al.*, 2008) make it substantially more difficult to use a voucher even if a household has access to one.

Geographic limitations either due to household preference or administrative boundaries of the PHA may reproduce existing patterns of stratification and segregation embedded within the housing market (Basolo & Nguyen, 2005; Hogan & Berry, 2011; Rosen *et al.*, 2021).

Portability as a potential intervention

Given these challenges, it is critical to understand how one aspect of the voucher program – portability – may alleviate some of the market pressures for households. Portability is a component of the HCV program that was incorporated in 1999 as a way to further the goal of deconcentrating poverty (Basolo, 2003).[1] The portability feature allows voucher holders to move to a rental unit outside the jurisdiction of the issuing PHA,[2] when a participant expresses interest in porting.[3] Climaco *et al.* (2008), focusing on mobility patterns of porting households from 1998 to 2005, demonstrated that 88% of all portability moves were made by households with extremely low incomes, with an average move of more than 25 miles, and about a third of the moves 100 miles away, usually from non-metro areas to metro areas. They also found positive neighbourhood outcomes: three-fifths of portability moves were made to census tracts with lower poverty rates.

Administrative barriers may limit porting. The PHA to which a porting household wants to move must issue them a voucher within two weeks of receiving the household's documentation. Documentation requirements vary by PHA and each PHA can set locally specific policies that dictate mobility; as such they act as a gatekeeper. It is also at the discretion of the receiving PHA whether to bill the sending PHA on behalf of the porting family or to absorb the family into its own programmatic budget.[4] Given the scarcity of local resources, most PHAs opt to bill for porting tenants, in some cases reducing the ability of other PHAs to serve their local

population. If an accepting PHA opts to bill the sending PHA, the sending PHA remains responsible for all payments, which can create extra paperwork and financial burden, overwhelming case managers, housing inspectors and program managers (Greenlee, 2011). PHAs that send individuals to areas with higher FMRs faced budgetary problems and thus could serve fewer people (Basolo, 2003; Greenlee, 2011).

These challenges tend to accumulate in large PHAs rather than small ones (Greenlee, 2011), and administrative burdens are not complemented with additional funds to help manage the program. In contrast, smaller PHAs might lack the capacity to handle such portability successfully; they tend to have insufficient staff to handle new or innovative initiatives and have a higher administrative cost per voucher household (Fischer & Sard, 2016). Additionally, some PHAs may avoid accepting porting households from cities or areas with negative impressions of the residents. The reputation of the PHA may exacerbate problems with porting in a tight housing market. A PHA known for delayed inspections, lease approvals, subsidy payments and landlord complaints is less likely to have willing landlords (Turner *et al.*, 2000).

Challenges in administration may affect resident outcomes. If the sending PHA is unable to transfer records and time-sensitive information, a tenant can be in violation of rules and may have their housing assistance terminated (Greenlee, 2011). Communication may also impede the transfer of Housing Assistance Payments. Residents are required to participate in an orientation session. PHAs may have different policies, which means the required orientation session provided by the initiating PHA may not cover the rules and procedures for the receiving PHA (Greenlee, 2011). Administration issues combined with tight housing market conditions may lead to a situation in which only a small subset of landlords in lower-income areas may be willing to allow voucher residents (Turner *et al.*, 2000).

Therefore, understanding portability is essential in studying the neighbourhood economic contexts of HCV holders. Based on previous studies, we ask, how does portability affect poverty concentration? How does this vary by HCV holders? We hypothesize that households that succeed in porting will be more likely to live in lower-poverty neighbourhoods (H1). Given the preponderance of evidence that both market and administrative barriers play, we predict that race plays a pivotal role: we hypothesize that Non-white households are more likely to live in higher-poverty/higher-minority neighbourhoods and more poverty-concentrated neighbourhoods than White households (H2). Furthermore, we suggest that PHA capacity affects residential location choice. If PHAs have more capacity, voucher households could be more successful in finding housing in a private market and using portability. So, we hypothesize that voucher households in higher-capacity PHAs might tend to live in lower-poverty/lower-minority neighbourhoods (H3).

Finally, focusing on the importance of portability and race, we hypothesize that households that have successfully utilized portability are more likely to overcome the obstacles involved in using portability. This, in turn, increases their chances of relocating to neighbourhoods with lower levels of poverty concentration. However, Non-white households may face barriers in moving to neighbourhoods with lower poverty concentration compared to Whites (H4).

We bring a new approach to measure poverty concentration: a multiscalar approach, as a way to better conceptualize poverty concentration outside a particular

census tract for two reasons. First, past studies have found that scale of poverty measurement matters. Previous studies predominantly use fixed-geographic areas to estimate the poverty level of neighbourhoods – e.g. poverty rates at the census tract level. However, using fixed-geographic areas creates a modifiable areal unit problem, which means that neighbourhood measurements can differ by a unit of analysis (Hennerdal & Nielsen, 2017). In other words, higher-poverty neighbourhoods at the larger census tract level might not be higher-poverty neighbourhoods at the smaller census block group level and vice versa. We attempt to examine the broad geography of economic concentration. Our multiscalar approach measures poverty concentration at multiple geographies extending from the local level to the surrounding areas (Clark *et al.*, 2015; Lee *et al.*, 2008). Second, the poverty multiscalar classifications consider all income groups, measuring both wealth concentration and poverty concentration. This approach provides an opportunity to measure population compositions by income groups, including concentration of economic disparities and clustering (Massey & Denton, 1988). In using this new measurement of poverty concentration to study HCV holders' location choices, we reveal dynamics of population composition by income groups at multiple geographic levels ranging from the neighbourhood to the region.

Data and methods

This study uses conditional logit modelling with simulation (Train, 2009) to understand the roles of voucher portability, household characteristics and PHA characteristics in the residential location choices of HCV holders in Ohio. The model estimates the odds of place-based characteristics on households selecting their current neighbourhood versus all other neighbourhoods within the same county of their chosen neighbourhood. We examine the location choices of 98,816 HCV holders as of January 27 2020. The U.S. Department of Housing and Urban Development (HUD) Region V Office provided information on 100,842 HCVs and the households who use them. The Region V Office included geocodes for these data down to the block group level, which we use as a proxy for neighbourhood. From the 100,842 vouchers, we exclude 1867 that do not have census block group information and 159 in census block groups that do not contain any rental housing units. This leaves an effective sample size of 98,816 vouchers for the analysis.[5]

Conditional choice model

Our multinomial conditional discrete choice model estimates the probability of a voucher holder choosing a particular neighbourhood (census block group) using a simulated choice set, and these models have been used frequently to model location choice (Ben-Akiva & Lerman, 1985; Ioannides & Zabel, 2008; Kleit & Galvez, 2011; McFadden, 1978; Train, 2009). We used a conditional logit model, which differs from logistic regression. Conditional logit models estimate the multiplicative effect of covariates on the odds of choosing the actual outcome location, with its characteristics, in contrast to other available options, conditioned within a set of choices. To generate the simulated choice set, we randomly select three non-selected block

groups for each voucher holder, rather than computationally exhaustive modelling the choice of an HCV holder to move to a certain block group versus every other block group in Ohio. We assume that households with vouchers can choose any neighbourhood within the same county. We have decided to limit the choices to the same county because these options are more realistic for voucher holders when making their decision, compared to the entire state. According to Ben-Akiva and Boccara (1995), a choice model should not overlook the issue of choice set generation by assuming that each individual chooses from the universal choice set, as this could lead to serious misinterpretation. For each of the 98,816 voucher holders, we took a random sample of three non-selected census block groups within the same county of the selected census block group among all the 8974 eligible block groups in Ohio. Of the 9238 census block groups in Ohio, 13 of them have no population and another 251 had no rental housing units, leaving the 8974 block groups.[6]

Conditional logit models use choice characteristics as predictors of an actual, revealed choice. In this model, the revealed choice is the HCVs' current neighbourhood and are measured as block groups. A model feature is that to include characteristics of individual voucher holders or their households, we must create an interaction effect between the characteristic of the individual and that of the place. To mitigate the inflation of Type I error associated with multiple hypothesis testing, we employed the Holm–Bonferroni procedure to adjust *p*-values and maintain control over the family-wise error rate (Holm, 1979). Furthermore, we use the BIC from Raftery (1995) to compare the goodness of fit of every model.

Neighbourhood level characteristics

To measure neighbourhood-level characteristics, we gather information about the neighbourhoods and jurisdictions in which the HCVs are located. 2019 American Community Survey 5-year Estimates (ACS) provides socio-economic and local housing market characteristics at the neighbourhood level through Social Explorer.[7] We also include the 2018–2019 Urban Suburban Rural Opportunity Index, developed by the Kirwan Institute and the Ohio Housing Finance Agency, which categorizes census tracts in Ohio as urban, suburban or rural (Sweeney *et al.*, 2019).[8]

We employ Source of Income Discrimination protections (SOI) as an indicator of discrimination. SOI, as an element of local fair housing legislation, prevents local landlords from using HCV receipt as a basis for refusing to rent to HCV holders. If a neighbourhood is within an SOI place, it is assumed that voucher households are less likely to face any discrimination in the process of housing search and utilizing vouchers. We obtain information on which places in Ohio have SOI areas from the Poverty & Race Research Action Council (PRRAC) (2021).[9] Using ArcMap, we coded each census block group by the percentage of census block group that overlapped with the SOI jurisdiction. Then we generate a categorical variable of whether a neighbourhood is within an SOI place, partially within an SOI place, or not within an SOI place.

The HCV program and its portability feature are meant to allow for location choice and, therefore, reduce poverty concentration. Hence, we create and utilize

multiscalar classifications of neighbourhoods, seeking to categorize the degree to which an HCV holder's neighbourhood is surrounded by similar, different or heterogenous places in terms of income levels. So, according to Clark *et al.* (2015), we generate poverty-multiscalar neighbourhood classifications in the following steps.

First, we created 12 bespoke neighbourhoods by merging census block groups based on two key criteria: proximity (distance) and population size. Essentially, we aggregated a smaller geographical unit (census block group) into larger, customized neighbourhoods using these factors. The 12 bespoke neighbourhoods consist of census block groups with more than 25 neighbours (population), census block groups with more than 50 neighbours, census block groups with more than 100 neighbours … doubling up to census block groups with 51,200 population *via* Equipop software (see Appendix A).[10] So, based on the geographic center of each census block group, the 12 bespoke neighbourhoods were selected. The 12 scales (bespoke neighbourhoods) range from a census block group to multiple census block groups progressively surrounding that first block group, going as large as a surrounding area with more than 51,200 neighbours (population). Second, we estimated the population proportion for three income groups – low-, moderate- and middle-income groups for the 12 bespoke neighbourhoods of each census block group.[11] In other words, each census block group has 36 contexts – three income groups by 12 bespoke neighbourhoods: the share of the low-income group in the 25 population, in the 50 population, 100, 200, 400, 800, 1600, 3200, 6400, 12,800, 25,600 and 51,200 population, the share of the moderate-income group in the 25 population, …, in 51,200 population, and share of the middle-income group in 25 population, …, in 51,200 population. Third, using these 36 contexts as variables for each census block group, we conducted an exploratory factor analysis and thus decided to use three factors to retrieve summary measures of the population compositions by three income groups of each census block group. Finally, we used these factor scores to classify neighbourhood types employing a *k*-means cluster analysis (see Appendix B). As a result, we chose four poverty-multiscalar neighbourhood classifications.

Each classification name represents the features of how areas with low-, moderate- and middle-earning groups are distributed across multiple geographic scales (see Table 1 and Figure 1). Class 1 is described as high-income dominant neighbourhood with the proportion of households earning low-, moderate- and middle-incomes are lower than the mean values of every census block group in Ohio (14%, 8.4% and 8.8% respectively) across all geographic scales. Class 2 is a middle-income dominant neighbourhood, but the shares of low- and moderate-income groups increase as the scale increases and become dominant at larger scales. Class 3 is a moderate-income dominant neighbourhood, particularly in small to medium scales. Class 4 is a low-income dominant neighbourhood, particularly in small- to medium-scales. The four classifications show the variations in compositions of income groups according to changes in geographic scales from a neighbourhood to a region (see Appendix C).

Class 1 has the lowest poverty rate; Class 4 has the highest among the four classifications (Table 1). Class 4 has the highest rates of households headed by people who identify as Non-whites and are experiencing unemployment, followed by Class 3, Class 2 and Class 1. On average, Class 4 of the housing market has the lowest median gross rent, the highest rental vacancy rates and the highest number of

Table 1. Neighbourhood characteristics by poverty-multiscalar neighbourhood classifications (Census Block Groups) ($N = 8{,}974$)[a].

Class	Description	*N*	%Poverty	%Non-white	%Unemployment	%Rental vacancy	Average median gross rent	Average #Occupied rental units
Class 1. High-income dominant	Low-, moderate-, and middle-income groups are all losing dominance across all scales.	4,648	8.27%	13.30%	3.87%	3.92%	$920	144
Class 2. Middle dominant, growing Low & Moderate	The middle-income group prevails across all scales, with the low- and moderate-income groups gaining dominance at larger scales.	1,582	15.05%	25.89%	6.62%	4.95%	$796	194
Class 3. Moderate-income dominant	Low-and-moderate-income groups dominate across every scale, with the moderate-income group being particularly prevalent at smaller and medium scales.	1,386	17.73%	31.90%	8.16%	4.67%	$757	199
Class 4. Low-income dominant	Low-and-moderate-income groups dominate across every scale, with the low-income group being particularly prevalent at smaller and medium levels.	1,358	45.77%	46.35%	13.11%	5.98%	$724	247
Total		8,974	16.60%	23.39%	6.42%	4.53%	$835	177

Mean value of census block groups in each classification.

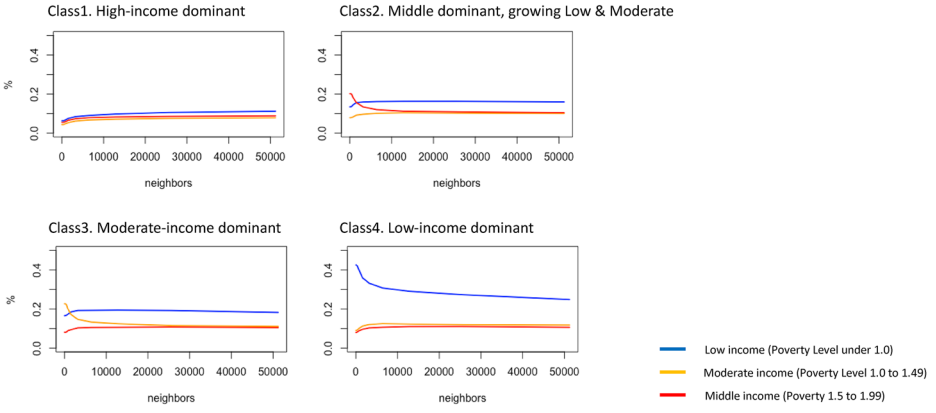

Figure 1. Graphs of poverty-multiscalar classifications.[23]

occupied rental housing units among the four classifications. In contrast, Class 1 has the tightest rental housing market – having, on average, the lowest rental vacancy rate and the highest median gross rent.

Portability and PHA attributes

The portability status of households may play an important role in neighbourhood outcomes of voucher households. Portability status refers to whether a household has moved into the current PHA from another PHA's service area. If a household has moved into the current PHA's service area, it is called a 'Port-In.' If it has not moved from one service area into the current PHA's service area, it is called a 'Not-Port'.

Additionally, experiences of mobility may depend on the characteristics of voucher holders. The choice of place to live can be influenced by household size (HH), household per-capita income (INC), race of head of households, length of voucher program participation (years) and other characteristics, all of which come from the HCV record.[12]

The management of PHAs can impact neighbourhood outcomes. To measure their capacity, we use the number of vouchers that PHAs manage (PHA size). The higher number of voucher cases can represent either better-performing PHAs or more administrative burdens. HUD's websites provide information on which PHAs are involved in innovative programs – either the Choice Neighbourhoods or the Rental Assistance Demonstration program (U.S. Department of Housing and Urban Development, n.d.-a). We obtain information about PHA involvement in Housing Mobility Programs from the report *Housing Mobility Programs in the U.S. 2020* (Weismann *et al.*, 2020); having a mobility program may indicate a greater capacity to foster mobility moves. However, we exclude the number of innovative programs since it shows a high Pearson correlation coefficient (0.917) with PHA size. We also add a variable containing the shares of a PHA's Port-Ins of the number of voucher cases for the host PHA, which may indicate PHAs' administrative burden or their willingness and experience to handle portability. Lastly, through a Freedom of Information Act request to HUD, we obtained the Section Eight Management Assessment Program (SEMAP) score in 2019. The

Table 2. Characteristics of voucher holders and their host PHA characteristics by porting status ($N = 98,816$)[a].

		Port-Ins	Not-Ports	Total
Neighbourhood attributes				
Neighbourhood Characteristics	SOI status			
	Not within SOI Place	94.43%	91.75%	92.19%
	Partially Within SOI Place	0.46%	0.76%	0.69%
	Within SOI Place	5.11%	7.49%	7.12%
	%Poverty (mean)	26.79%	27.30%	27.59%
	%Non-white (mean)	47.14%	45.27%	45.81%
	%Unemployment (mean)	8.88%	10.00%	10.00%
	Transit score (mean)	4.01	3.95	4.06
	USR Index			
	Urban	28.12%	37.77%	38.11%
	Suburban	53.05%	40.03%	41.06%
	Rural	18.83%	22.20%	20.82%
Local Housing Markets	%Rental Vacancy (mean)	5.77%	5.83%	5.76%
	Median Gross Rent (mean)[b]	$809	$748	$752
	#Occupied Rental Units (mean)	342	302	312
Household attributes				
Household Characteristics	Household Size (mean)	2.74	2.21	2.23
	Household Per-Capita Income[c]	$5,948	$7,156	$7,090
	Race of Head of Household			
	White	34.27%	41.67%	40.84%
	Black	64.35%	56.90%	57.69%
	Other	1.38%	1.42%	1.47%
	Years of Participation (mean)	7.24	8.40	8.09
	Family with Children (Yes)	62.89%	47.72%	47.74%
PHA Characteristics	PHA size (mean)	7,321	6,310	6,593
	#PHA-participating innovative programs (mean)	0.96	0.74	0.80
	PHA-participating mobility program (Yes)	12.94%	16.74%	15.88%
	PHA's share of portability (mean)	13.86%	7.65%	8.45%
	PHA's SEMAP Scores[d]	95.36	94.28	94.47
N		8,471	84,439	98,816

[a]Of the 98,816 households, approximately 5,906 have missing values for porting status. Consequently, the sum of port-ins and non-ports does not match the total number of households in the table.

[b]Among 8,974 census block groups, 1,554 have missing values in median gross rent. So, among the 92,910 vouchered households, 3,543 lack information pertaining to median gross rent. This results in 292 missing values for Port-ins and 3,251 for Not-Ports.

[c]Data from three voucher holders were assumed to be an outlier and excluded because their reported income exceeded 2.5 times the 80% threshold of the 2019 area median family income for New York City (Department of Housing and Urban Development, 2014).

[d]Among the 74 PHAs, 7 have missing values in SEMAP Scores. A total of 1,160 households with vouchers do not have SEMAP Scores, consisting of 101 Port-Ins and 1,057 Not-Ports. 1 PHA is not required to report as they are a part of the Moving to Work program. Small PHAs are required to certify every other year. For the remaining 6 PHAs, certification reporting for 2019 may not be necessary.

SEMAP score assesses the capacity of Public Housing Agencies (PHAs) that manage the HCV program for the host PHA.[13] As a result, our model considers PHA size, participation in a mobility program, share of Port-Ins and SEMAP score as the factors that measure PHA capacity.

Findings

Descriptive statistics: portability and location choice in Ohio

Table 2 shows descriptive statistics for the household characteristics of those who have ported into the current public housing authorities (Port-Ins), those who have

not ported in the current PHAs (Not-Ports), and total voucher households (Total).[14] Among 92,910 voucher households, about 9.1% of voucher holders have ported into their current PHAs.

A lower percentage of Port-Ins live in neighbourhoods with SOI protection than Not-Ports.[15] Furthermore, on average, Port-Ins live in neighbourhoods with a slightly lower percentage of poverty, a lower percentage of unemployment and higher median gross rent than Not-Ports. Neighbourhoods where Port-Ins live have a higher percentage of Non-white population than neighbourhoods of Not-Ports. Lastly, Port-Ins live in neighbourhoods with more rental housing and better transit accessibility.

As shown in Table 2, a higher percentage of Port-Ins are families with children compared to Not-Ports. A higher percentage of Port-Ins also live in suburban areas than do Not-Ports. On average, Port-Ins have a larger household size, lower per-capita household income and fewer years in the voucher program. Furthermore, the heads of households among Port-Ins are less likely to be White compared to those who are not Port-Ins. Among voucher holders, those who port tend to be in relatively higher-capacity PHAs in terms of the number of innovative programs and SEMAP scores than those who do not port. However, Port-Ins tend to be in PHAs that handle a greater number of voucher cases and higher shares of portability but have lower shares of PHAs that participated in a mobility program compared to Not-Ports.

Table 3 presents the distribution of neighbourhoods and voucher holders across multiscalar classifications of neighbourhoods. The four classifications range from the least poverty-concentrated (Class 1) to the most poverty-concentrated (Class 4). The census block groups show that Class 1 neighbourhoods make up about 51.8%, followed by Class 2 (17.6%), Class 3 (15.4%) and Class 4 (15.1%). In contrast, among neighbourhoods where voucher holders reside, Class 4 has the highest percentage at 32.7%, followed by Class 3 (23.7%), Class 1 (22.3%) and Class 2 (21.3%). This means that about 56.4% of voucher holders live in neighbourhoods where poverty concentration occurs at larger scales (Class 3) or across all geographic scales (Class 4).

As suggested in past literature, portability seems to help voucher holders move into high-income dominant neighbourhoods, as 25.8% of Port-Ins live in such areas. However, portability does not necessarily guarantee that voucher households leave the most poverty-concentrated neighbourhoods. Not-Ports share the same distribution of the four classifications with the overall voucher population. In other words, Not-Ports have the highest shares in Low-income dominant (Class 4), followed by Moderate-income dominant (Class 3), High-income dominant (Class 1) and Middle-income dominant (Class 2). However, Port-Ins differ in the second (Class

Table 3. Characteristics of Census Block Groups and Voucher Holders by Poverty-Multiscalar Classifications

	Census Block Groups		Voucher Holders		Portability Status		Race of head of household		
	# Neighbourhoods	% Neighbourhoods	#Voucher Holders	%Voucher Holders	% Port-Ins	% Not-Ports	White	Black	Other
Class1	4,648	51.8%	22,073	22.3%	25.8%	22.2%	30.4%	16.6%	21.4%
Class2	1,582	17.6%	21,040	21.3%	19.4%	21.7%	22.6%	20.3%	24.2%
Class3	1,386	15.4%	23,399	23.7%	19.6%	24.5%	23.3%	24.0%	22.8%
Class4	1,358	15.1%	32,304	32.7%	35.2%	31.6%	23.7%	39.1%	31.5%
Total	8,974	8,974	98,816	98,816	8,471	84,439	40,355	57,009	1,452

1) and third (Class 3), suggesting that they may have increased mobility compared to Not-Ports.

Focusing on household characteristics, Black households are more likely to live in the most poverty-concentrated neighbourhoods than are White and Other races. In contrast, only 16.6% of Black households live in high-income neighbourhoods, which is fewer than the 30.4% of White households and 21.4% of households of Other races. Black households are most likely to live in Class 4 (the most poverty-concentrated area), but least likely to live in Class 1 (the least poverty-concentrated area). Comparatively, White households are most likely to live in Class 1, with high income dominant and are least likely to live in Class 2, Middle dominant, growing Low and Moderate neighbourhoods, a different pattern than Black households or Other race households.

These descriptive statistics provide us with a snapshot of how portability and race influence poverty concentration in neighbourhoods for voucher households. Portability may not lead voucher households out of poverty-concentrated neighbourhoods but could facilitate their entry into high-income dominant neighbourhoods. Additionally, race continues to play a significant role in the locational choices of voucher households.

Models and results

While the descriptive results indicate that a lower percentage of Port-Ins live in SOI areas than those who do not port (Table 2), these patterns of location choice selection may be associated with other factors. We begin modelling location choice with only neighbourhood characteristics and whether the neighbourhood is located in a jurisdiction with SOI (Table 4, Model 1). With Model 1 as the base model, we build our models iteratively to examine the effects of portability and other household characteristics (Table 4, Models 2 to 4), explore the effects of PHA characteristics (Table 4, Models 5 and 6) and analyse the levels of poverty concentration by using poverty-multiscalar classifications instead of poverty rates (Table 5, Models 7 to 9).

Based on Model 1 in Table 4, which considers only the neighbourhood attributes, the impacts of Source of Income Protection laws (SOI) are mixed. When neighbourhoods are partially within SOI places, the odds of voucher households choosing the selected neighbourhood option, compared to an alternative, are 1.16 times higher than neighbourhoods within Non-SOI places.[16] Yet, the estimated coefficient for living in neighbourhood fully within SOI Places relative to neighbourhoods within Non-SOI places is not statistically significant. This pattern may be because only 3% of the neighbourhoods in Ohio are located in jurisdictions with SOI protections as of 2019.

Voucher holders tend to live in neighbourhoods with higher shares of poverty, Non-whites and unemployment. They are also more likely to live in suburban or urban neighbourhoods than rural ones. Regarding local housing markets, they are more likely to live in neighbourhoods with higher rental vacancy rates and numbers of occupied rental units and neighbourhoods with lower median gross rents. The odds ratio can be interpreted as follows: for every one-unit increase in poverty rates, the odds of voucher households choosing the current neighbourhood option increase by

Table 4. Conditional Logit Estimates: portability, other household characteristics, and PHA capacity (Models 1 to 6)[a].

	Variables	Model 1 (Base)	Model 2 (%Poverty by Portability)	Model 3 (%Poverty by household characteristics)	Model4 (%Nonwhites by household characteristics)	Model 5 (%Poverty by PHA capacity)	Model 6 (%Poverty and %Nonwhites by household and PHA capacity)
		Coef. (se)	Coef. (se)	Coef. (se)	Coef. (se)	Coef. (se)	Coef. (se)
Neighbourhood Characteristics	*SOI (vs. within Non-SOI Place)*						
	Partially within SOI Place	0.150(0.054)*	0.216(0.055)***	0.217(0.055)***	0.225(0.056)***	0.216(0.056)**	0.218(0.056)**
	Within SOI Place	−0.049(0.026)	−0.006(0.027)	−0.006(0.027)	−0.048(0.027)	−0.067(0.028)	−0.071(0.028)
	%Poverty	0.885(0.031)***	0.922(0.033)***	2.219(0.102)***	3.230(0.111)***	2.652(0.391)***	1.543(0.437)**
	%Non-white	2.043(0.02)***	2.157(0.021)***	2.175(0.021)***	−0.173(0.084)	−0.097(0.084)	2.317(0.433)***
	%Unemployment	0.315(0.054)***	0.262(0.056)***	0.246(0.056)***	0.170(0.056)*	0.255(0.057)***	0.260(0.057)***
	USR Index (vs. Rural)						
	Suburban	0.739(0.021)***	0.746(0.021)***	0.740(0.021)***	0.796(0.021)***	0.775(0.021)***	0.778(0.021)***
	Urban	0.848(0.022)***	0.784(0.023)***	0.782(0.023)***	0.866(0.023)***	0.860(0.023)***	0.867(0.023)***
	%Rental Vacancy Rate	0.563(0.042)***	0.603(0.043)***	0.600(0.043)***	0.595(0.044)***	0.589(0.044)***	0.600(0.044)***
	Median Gross Rent	−0.001(0.000)***	−0.001(0.000)***	−0.001(0.000)***	−0.001(0.000)***	−0.001(0.000)***	−0.001(0.000)***
	#Occupied Rental Units	0.002(0.000)***	0.002(0.000)***	0.002(0.000)***	0.002(0.000)***	0.002(0.000)***	0.002(0.000)***
%Poverty by Portability	%Poverty*Port-In (vs. Not-Port)		−0.238(0.087)*	−0.259(0.088)*	−0.232(0.090)	−0.392(0.093)***	−0.393(0.093)***
%Poverty by Household Characteristics	*%Poverty by Race of Head of Household (vs. White)*						
	Black			−0.130(0.055)	−1.478(0.060)***	−0.923(0.068)***	−0.921(0.069)***
	Other			−0.070(0.213)	−0.805(0.236)**	−0.585(0.237)	−0.583(0.237)
	%Poverty by HH			0.017(0.025)	−0.006(0.028)	−0.010(0.028)	−0.008(0.028)
	%Poverty by Log (INC + 1)			−0.076(0.009)***	−0.076(0.010)***	−0.077(0.010)***	−0.078(0.010)***
	%Poverty by Years			−0.049(0.004)***	−0.052(0.004)***	−0.045(0.004)***	−0.044(0.004)***
	%Poverty by Fam w/Child			−0.517(0.078)***	−0.617(0.087)***	−0.648(0.087)***	−0.649(0.087)***
%Nonwhite by Household Characteristics	*%Non-white by Race of Head of Household (vs. White)*						
	Black				2.793(0.048)***	2.729(0.048)***	2.725(0.051)***
	Other				1.772(0.184)***	1.738(0.184)***	1.734(0.184)***
	%Non-white by HH				0.053(0.021)	0.050(0.021)	0.044(0.021)
	%Non-white by Log (INC + 1)				−0.005(0.008)	−0.004(0.007)	−0.004(0.008)
	%Non-white by Years				0.013(0.003)***	0.013(0.003)***	0.012(0.003)**
	%Non-white by Fam w/Child				0.197(0.065)*	0.198(0.065)*	0.207(0.065)*

(*Continued*)

Table 4. Continued.

	Variables	Model 1 (Base)	Model 2 (%Poverty by Portability)	Model 3 (%Poverty by household characteristics)	Model4 (%Nonwhites by household characteristics)	Model 5 (%Poverty by PHA capacity)	Model 6 (%Poverty and %Nonwhites by household and PHA capacity)
		Coef. (se)	Coef. (se)	Coef. (se)	Coef. (se)	Coef. (se)	Coef. (se)
%Poverty by PHA Capacity	%Poverty by PHA size					−0.000(0.000)***	−0.000(0.000)***
	%Poverty by PHA participating in mobility program (Yes vs. No)					−0.449(0.131)**	−0.103(0.144)
	%Poverty by PHA's share of portability					3.950(0.434)***	3.729(0.456)***
	%Poverty by PHA's SEMAP Score					0.005(0.004)	0.017(0.004)**
%Nonwhite by PHA Capacity	%Non-white by PHA size						0.000(0.000)*
	%Non-white by PHA participating in mobility program (Yes vs. No)						−0.728(0.121)***
	%Non-white by PHA's share of portability						0.193(0.421)
	%Non-white by PHA's SEMAP Score						−0.026(0.004)***
Goodness of Fit	Likelihood Ratio	57,398	52,897	53,210	56,910	57,442	57,488
	BIC	216,693.3	204,829.7	204,585.6	200,954.4	200,468.6	200,467.9
N		$n = 395,264$	$n = 371,640$	$n = 371,640$	$n = 371,640$	$n = 371,640$	$n = 371,640$

[a]All *p*-values presented have been adjusted using the Holm–Bonferroni procedure to control the family-wise error rate and minimize the likelihood of Type I errors. Unadjusted *p*-values are not reported.

*$p < .05$.

**$p < .01$.

***$p < .001$.

Table 5. Conditional logit outcomes: poverty concentration (Models 7 to 9)[a].

	Variables	Model 7: Poverty-multiscalar	Model 8: Poverty-multiscalar by portability	Model 9: Poverty-multiscalar by Race
		Coef. (se)	Coef. (se)	Coef. (se)
Neighbourhood Characteristics	*SOI (vs. within Non-SOI Place)*			
	Partially within SOI Place	0.168(0.055)**	0.237(0.055)***	0.237(0.056)***
	Within SOI Place	−0.013(0.027)	0.030(0.027)	0.028(0.027)
	Poverty-multiscalar (vs. High-income dominant)			
	Middle dominant, growing Low & Moderate	0.514(0.012)***	0.541(0.013)***	0.475(0.018)***
	Moderate-income dominant	0.573(0.013)***	0.610(0.014)***	0.529(0.018)***
	Low-income dominant	0.578(0.013)***	0.588(0.014)***	0.475(0.020)***
	%Non-white	1.911(0.020)***	2.025(0.021)***	1.997(0.021)***
	%Unemployment	0.499(0.051)***	0.453(0.053)***	0.450(0.053)***
	USR Index			
	Suburban (vs. Rural)	0.704(0.021)***	0.712(0.021)***	0.717(0.021)***
	Urban (vs. Rural)	0.791(0.022)***	0.724(0.023)***	0.723(0.023)***
	%Rental Vacancy Rate	0.593(0.043)***	0.630(0.044)***	0.627(0.044)***
	Median Gross Rent	−0.001(0.000)***	−0.001(0.000)***	−0.001(0.000)***
	#Occupied Rental Units	0.002(0.000)***	0.002(0.000)***	0.002(0.000)***
Multisicalar Classifications by Portability	*Poverty-multiscalar (vs. High-income dominant)*Port-In (vs. Not-Port)*			
	Middle dominant, growing Low & Moderate*Port-In (vs. Not-Port)		−0.187(0.043)***	−0.204(0.043)***
	Moderate-income dominant*Port-In (vs. Not-Port)		−0.293(0.043)***	−0.312(0.043)***
	Low-income dominant*Port-In (vs. Not-Port)		−0.099(0.040)*	−0.118(0.040)*
Multisicalar Classifications by Race Heads of Household	*Poverty-multiscalar (vs. High-income dominant)*Black (vs. White)*			
	Middle dominant, growing Low & Moderate* Black (vs. White)			0.146(0.025)***
	Moderate-income dominant*Black (vs. White)			0.179(0.025)***
	Low-income dominant*Black (vs. White)			0.223(0.025)***
	*Poverty-multiscalar (vs. High-income dominant)*Other (vs. White)*			
	Middle dominant, growing Low & Moderate*Other (vs. White)			0.378(0.103)**
	Moderate-income dominant*Other (vs. White)			0.276(0.106)*
	Low-income dominant*Other (vs. White)			0.251(0.103)*
Goodness of Fit	Likelihood Ratio	59,404	54,919	55,020
	BIC	214,709.9	202,854.3	202,821.7
N		$n = 395,264$	$n = 371,640$	$n = 371,640$

[a]All *p*-values presented have been adjusted using the Holm–Bonferroni procedure to control the family-wise error rate and minimize the likelihood of Type I errors. Unadjusted *p*-values are not reported.

*$p < .05$.

**$p < .01$.

***$p < .001$.

a factor of 2.42, holding all other variables constant. In other words, the odds ratio (2.42), greater than 1, implies a positive association between poverty concentration and the odds of choosing the current neighbourhood. In contrast, for every one-unit increase in median gross rent, the odds of voucher households choosing the selected neighbourhood decline by a factor of 0.999, holding all other variables constant. This implies a negative association between median gross rent and the odds of choosing the current neighbourhood. In summary, the base model results indicate that voucher holders are likely to live in places with a supply of rental housing that they can afford.

Generally, our modelling proceeds as follows. We add the interaction of neighbourhood poverty with portability (Table 4, Model 2), household characteristics (Table 4, Model 3) and PHA capacity (Table 4, Model 5). We add the interaction of the percent Non-white in the neighbourhood with household characteristics (Table 4, Model 4). Finally, we add the interaction of percent poverty and percent Non-white with their interactions with household and PHA capacity (Table 4, Model 6). The BIC indicates that the most inclusive model, Model 6, has the best fit.

Our first hypothesis—that households that have ported into the current PHAs (Port-Ins) are more likely to live in neighbourhoods with lower poverty rates than those who have not ported (Not-Ports)—is supported. To test this hypothesis, we interact households' port status and socioeconomic characteristics with neighbourhood level characteristics and add them to the base model (Table 4, Model 2). The results of Model 2 show that porting in and its interaction with the poverty rate has a statistically significant association with a reduction in neighbourhood poverty rates; the same is true for Models 3, 5 and 6. On average, Port-Ins are more likely to live in lower-poverty neighbourhoods, all else being equal and accounting for PHA capacity.

Our second hypothesis is that Non-white households are more likely to reside in neighbourhoods with higher poverty levels, as compared to their White counterparts. Our models with poverty rates do not support the second hypothesis. After accounting for the interaction effects between neighbourhood-level poverty rates, Non-white rates and household-level race, our findings show that voucher holders whose heads of household are Black tend to live in lower-poverty neighbourhoods compared to households headed by White householders (Table 4, Model 4). These findings hold constant even after including interaction effects between neighbourhood characteristics (poverty rates in Model 5 and Non-white rates in Model 6) and the PHA capacity indicators.

Furthermore, in our third hypothesis we proposed that households with vouchers in PHAs with higher capacity are more likely to reside in neighbourhoods with lower poverty. This hypothesis has been tested in Models 5 and 6 (Table 4). When we add the interaction of PHA characteristics with neighbourhoods' poverty rates, voucher holders within PHAs that manages a higher number of voucher cases and participate in a mobility program are more likely to live in neighbourhoods with lower poverty rates (Table 4, Model 5). However, voucher holders under PHAs that have higher shares of portability cases are less likely to live in neighbourhoods with lower poverty rates.

When we include an interaction of PHA characteristics with neighbourhoods' racial composition in a model, the direction of the effects for all PHA characteristics with neighbourhoods' poverty rates remain constant (Table 4, Model 6). However,

the significance of two variables changed: participation in the mobility program became statistically insignificant, whereas the SEMAP Score became significant. These results suggest that PHAs that manage more portability cases face a complicated capacity issue in meeting the neighbourhood dispersal goals of the HCV program. In other words, if PHAs manage a larger number of portability cases, it may not be easy for them to achieve the dispersal goals of the HCV program.

Among the six models, Model 6 shows the best fit with the smallest BIC of the three models, which indicates that Model 6 shows the best likelihood of predicting locational choices of voucher households among Models 1 to 6 (Table 4). Model 6 confirms our first hypothesis by demonstrating that Port-Ins are more likely to live in lower-poverty neighbourhoods. However, Model 6 also shows that Black heads of households are more likely to live in lower-poverty neighbourhoods than White heads of household. Conversely, Black heads of households are more likely to live in neighbourhoods with a higher percentage of Non-whites. This finding indicates that race plays a vital role in locational choices, holding all else constant. Finally, Model 6 shows that PHAs managing a higher number of voucher cases tend to place voucher households in lower-poverty neighbourhoods. PHAs participating in mobility program and having higher SEMAP Score tend to have voucher households living in neighbourhoods with lower rates of Non-white populations.

Lastly, our fourth hypothesis suggests that households who have effectively utilized portability are more likely to overcome the difficulties of relocating to neighbourhoods with lower poverty levels. However, we also anticipate that Non-white headed households may encounter more obstacles in moving to neighbourhoods with lower poverty levels compared to White households. To better understand these dynamics of poverty concentration in neighbourhoods, we use poverty-multiscalar classifications instead of poverty rates in Models 7 to 9 (Table 5). These classifications show varying patterns of low-, moderate- and middle-income groups across 12 different geographic scales (Clark *et al.*, 2015). As shown in Table 5, Model 7 shows that voucher households are generally less likely to live in High-income-dominant neighbourhoods than other neighbourhoods, where the shares of high-income group are higher across all scales compared to Ohio (Table 5, Model 7). However, interestingly, those voucher holders who port are more likely to live in High-income-dominant neighbourhoods than those who have not ported into the current neighbourhoods (Table 5, Model 8). Models with poverty-multiscalar classifications support this disparity by showing that households whose heads are Black or Other races are less likely to live in the least-poverty-concentrated neighbourhood (high-income dominant) than other neighbourhoods compared to White counterparts. Among the three models with poverty-multiscalar classifications, Model 9 has the best likelihood of predicting locational choices of voucher households among Models 7 to 9 (Table 5). Model 9 supports our fourth hypotheses by showing that Port-Ins and White heads of households are more likely to be in the least poverty concentrated neighbourhoods than counterparts.

To assess the robustness of our findings, we repeated the random selection of choice sets two additional times and conducted conditional logistic regressions with Holm–Bonferroni-adjusted *p*-values. Importantly, the main conclusions – regarding the direction and significance of our primary variables – remained consistent across all iterations, underscoring the robustness of our results. However, some covariates did show

variability in significance or direction in at least one iteration. Given that Models 6 and 9 demonstrate the best fit, reporting their changes is particularly informative. In Model 6, the interaction between poverty rate and household size turned positive in both additional runs but remained insignificant; the interaction between non-white rate and PHA size became insignificant in one iteration; and the interaction between non-white rate and PHA share of portability became negative but stayed insignificant in one iteration. In Model 9, the combined effect of moderate-income dominant neighborhood (Class 3) and Other race became insignificant in one iteration. While these specific variables should be interpreted with caution, the overall findings of the study are robust to different random selections.

Discussion and conclusion

This article examines how portability, race and PHA characteristics are associated with the economic and racial characteristics of the neighbourhoods in which voucher holders live, as a way to assess the HCV program's goals to provide affordable housing for low-income households in the private market, hopefully deconcentrating poverty among low-income households.

We find that voucher holders who port into their current PHAs live in lower-poverty neighbourhoods, confirming previous results (Climaco et al., 2008). Controlling for other factors, we find portability does allow households with vouchers to live in high-income dominant neighbourhoods. When considering poverty concentration at multiple geographic scales, voucher holders generally are less likely to live in high-income neighbourhoods than in other neighbourhoods. By contrast, voucher holders who have ported into their current PHAs are more likely to live in high-income neighbourhoods relative to those who do not port into the jurisdiction.

Considering poverty rates, Black-headed households with vouchers are more likely to live in lower-poverty neighbourhoods relative to White heads of household. However, there are stark differences in poverty concentration between White heads of household and Black heads of household; Black heads of household are more likely to be in neighbourhoods with higher concentrations of poverty and are less likely to live in high-income dominant neighbourhoods. This supports other research that has demonstrated that Black and other Non-white households may face more barriers in accessing neighbourhoods with lower poverty levels. Only 16.6% of Black households lived in high-income dominant neighbourhoods, whereas 30.4% of White and 21.4% of Other race households did.

PHA capacity has a somewhat complicated relationship with voucher households' neighbourhood characteristics. Voucher holders within PHAs managing a larger number of voucher cases are more likely to be in lower-poverty neighbourhoods. In contrast, if a PHA manages a larger number of portability cases, voucher households tend to live in neighbourhoods with higher poverty rates. In other words, the administrative burdens that PHAs are facing prevent PHAs from helping voucher households to live in socioeconomically integrated neighbourhoods.

Some questions remain unanswered by this study. First, this study looks only at one porting experience by households at a given point in time. We are unable to understand variations in poverty concentration for those who port multiple times or those who have never ported. The data used in this study are a snapshot at one point in time and do

not allow for an understanding of the impact of multiple moves or a history of porting. Second, the study does not account for households' preferences regarding neighbourhood quality. Exploring how these preferences influence the perceptions and outcomes of portability could provide a deeper understanding of this dynamic. Third, a comparison between the treatment group (households that have ported into their current PHAs) and a control group (same households without the portability option) is missing. Including this analysis would strengthen the findings and help to clarify whether the associations observed are causal. Fourth, investigating how portability varies between households led by Black or White heads of household presents another critical area for future research. Lastly, a limitation of this study is that some variable estimates were sensitive to the random selection of choice sets. Future research should consider alternative modelling approaches and larger, more comprehensive datasets to improve the stability of variable estimates and confirm the associations observed in this study. In other words, future research might focus on variations in neighbourhood characteristics and poverty concentration between Black heads of household and White heads of household who port. Together, these directions could significantly enrich our understanding of housing mobility and its broader implications.

Substantively, one of major findings of this study is that when voucher households are willing to use portability, it allows them to penetrate into wealthier neighbourhoods where only 22% of voucher households live in. However, interestingly, PHAs that have higher shares of portability cases have voucher households living in higher-poverty neighbourhoods. Therefore, we need to give PHAs that have higher shares of portability more support that is necessary to reduce administrative burdens. Furthermore, these administrative burdens should not prevent a willing voucher household from utilizing the portability option. In particular, to reduce the burden on accepting PHAs who opt to bill sending PHAs, policymakers should create an incentive program encouraging the accepting PHAs to absorb porting cases. It is also important to establish consistent and predictable PHA policies across PHAs to prevent voucher households from being burdened by different or unexpected policies. Such changes will further the HCV program's goal to deconcentrate poverty.

Furthermore, individuals who possess housing vouchers may face discrimination or lack of information when searching for housing. This is particularly true for Black heads of household who are more likely to reside in low-income neighbourhoods where poverty concentration exists within and beyond their communities compared to other groups. Laws that protect source of income may safeguard Black and other Non-white voucher holders from discrimination in the housing market. Broadening the geographic coverage of SOI laws may act to reduce discrimination in the housing market, which otherwise hinders voucher holders from finding available housing units, and may create a context where portability is easier to implement. Additionally, education or assistance programs to help in the search for rental housing will help Non-white households broaden their choice options.

Nonetheless, affordable rental housing for voucher households is in short supply. This paper results demonstrates that voucher households are more likely to live in neighbourhoods with a looser local housing market represented by higher rental vacancy rates and lower median gross rents. While methodologically this study allows for voucher holders to choose to move anywhere within the same county of

their current neighbourhood, choices for affordable housing might be more constrained given the limited availability of affordable rental housing units accessible to voucher households. Voucher households might have limited options because some neighbourhoods simply have less affordable housing from which to choose.

Notes

1. §982.353 of the final rule, effective November 22, 1999.
2. 42 U.S.C.A. § 1437f(r) (West, Westlaw, Current through P.L. 110-260 (excluding P.L. 110-234, 110-246, and 110-252) (approved 7-1-08)); 24 C.F.R. §§ 982.4 (definition of portability) and 982.353(b) (2007); HUD, Housing Choice Voucher Guidebook (7420.10G), Ch. 13. http://www.hud.gov/offices/adm/hudclips/guidebooks/7420.10G/index.cfm.
3. Housing Choice Voucher Portability Procedures and Corrective Actions – Revision of Family Portability Information, Form HUD- 52665, Notice PIH 2004-12 (July 19 2004), http://www.hud.gov/offices/pih/publications/notices/04/pih2004-12.pdf; renewed by Extension – Housing Choice Voucher Portability Procedures and Corrective Actions – Revision of Family Portability Information, Form HUD-52665, Notice PIH 2005-28 (July 15 2005), http://www.hud.gov/offices/pih/publications/notices/05/pih2005-28.pdf; renewed again by Extension – Housing Choice Voucher Portability Procedures and Corrective Actions – Revision of Family Portability Information, Form HUD-52665, Notice PIH 2006-25 (July 3 2006), http://www.hud.gov/offces/pih/publications/notices/06/pih2006-25.pdf.
4. If the payments are not received after two months, the PHA may ask HUD to intervene and transfer the voucher from the initial PHA to itself.
5. ChatGPT was utilized for coding assistance (OpenAI, 2024).
6. This analysis does not restrict choice sets based on the availability of rental housing units with rents below 110% of the local Fair Market Rents (the payment standard of HCV) due to missing gross rent data. Out of the 9238 census block groups, approximately 5798 have some missing values for gross rents, resulting in a discrepancy between the total number of rental units and the total number of units with gross rent information. The restriction of choice sets based on the availability of affordable rental housing units would greatly limit the housing options for voucher holders. Furthermore, voucher holders have the flexibility to choose rental units that exceed the payment standard. Therefore, the choice sets were not restricted based on gross rents for these reasons.
7. Missing values in median gross rent and unemployment rate set to the mean for the purpose of analysis.
8. We had planned to include a measure of transit access, the 2019 transportation accessibility score (AllTransit) from the Center for Neighbourhood Technology (CNT), which ranges from 0 to 10 and a higher value indicates stronger transit connectivity. However, the transit score is highly correlated with the percent of nonwhites (0.68). Therefore, while we included the transit score in the descriptive statistics, we omitted it from the analysis to avoid multi-collinearity.
9. According to the report, Ohio has six cities that have SOI protection before January 27th, 2020: Cincinnati, Lindale, South Euclid, University Heights, Warrensville Heights and Wickliffe (Poverty & Race Research Action Council, 2021).
10. Bespoke neighbourhoods are designed to reflect the unique characteristics of the surrounding areas for each census block group. However, it is worth noting that the surrounding neighbourhoods and regional contexts may vary significantly between the census block group located at the edge of the county and the one at the center of the county (Clark et al., 2015). To do so, according to Clark et al. (2015), this study uses 12 scales of bespoke neighbourhoods. These neighbourhoods consist of census block groups that have a population of more than 25, 50, 100, 200, 400, 800, 1600, 3200, 6400, 12,800, 25,600 and 51,200.
11. In this study, we use three income groups: a low-income group whose income ratio to the poverty level is less than 1.00, a moderate-income group whose income ratio

to the poverty level is from 1 to 1.49, and a middle-income group whose income ratio to the poverty level is from 1.50 to 1.99. The ratio of income to poverty level is from the 2019 American Community Survey (5-Year estimates) via Social Explorer. High-income group whose income ratio to the poverty level is 2.00 and above was not included in the process of creating the poverty-multiscalar classifications to avoid multicollinearity, which would have impeded exploratory factor analysis. However, we can estimate that the shares of high-income group will be represented by subtracting low-, moderate-, and middle-income groups from total (100%).

12. We applied a log transformation to annual household per-capita income after adding 1 to avoid undefined values resulting from zero income. Missing values and outliers in annual household per-capita income set to the mean for the purpose of analysis.
13. The SEMAP score measures whether PHAs help eligible families afford decent rental units with proper subsidies, as required by federal housing legislation. (U.S. Department of Housing and Urban Development, n.d.-b). Missing values in the SEMAP score set to the mean for the purpose of analysis.
14. Among 98,816 vouchers in our dataset, 92,910 cases have information about portability.
15. Among 8974 census block groups, 3.29 percent of census block groups are within an SOI place and 0.47 percent of census block groups are partially within an SOI place, and 7.8 percent of voucher holders live in SOI or partial SOI places.
16. The odds ratio is calculated by the exponential of coefficients. The exponential of 0.150 is approximately 1.16.
17. Mean value of census block groups in each classification.
18. Among 8974 census block groups, 1554 have missing values in median gross rent. So, among the 92,910 vouchered households, 3543 lack information pertaining to median gross rent. This results in 292 missing values for Port-ins and 3251 for Not-Ports.
19. Data from three voucher holders were assumed to be an outlier and excluded because their reported income exceeded 2.5 times the 80% threshold of the 2019 area median family income for New York City (U.S. Department of Housing and Urban Development, 2014).
20. Among the 74 PHAs, 7 have missing values in SEMAP Scores. A total of 1160 households with vouchers do not have SEMAP Scores, consisting of 101 Port-Ins and 1057 Not-Ports. 1 PHA is not required to report as they are a part of the Moving to Work program. Small PHAs are required to certify every other year. For the remaining 6 PHAs, certification reporting for 2019 may not be necessary.
21. All *p*-values presented have been adjusted using the Holm–Bonferroni procedure to control the family-wise error rate and minimize the likelihood of Type I errors. Unadjusted *p*-values are not reported.
22. All p-values presented have been adjusted using the Holm–Bonferroni procedure to control the family-wise error rate and minimize the likelihood of Type I errors. Unadjusted *p*-values are not reported.
23. *X*-axis indicates the number of population (geographic scales). *Y*-axis indicates the shares of each income group (median value).
24. LI indicates low-income group; MI is moderate-income group and MD is middle-income group. The number next to the letter represents 12 scales of bespoke neighborhoods.

Disclosure statement

No potential conflict of interest was reported by the authors.

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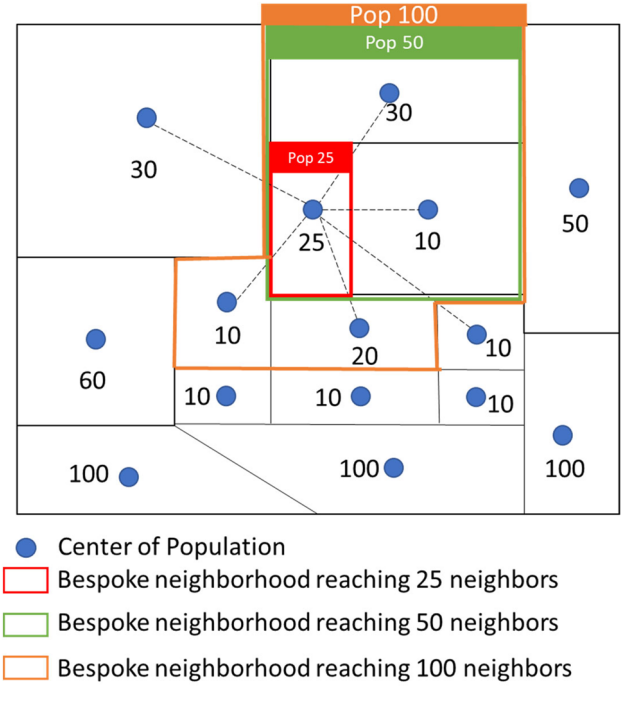
Appendix A. How to generate bespoke neighborhoods



Appendix B. Factor loadings[24]

	Factor 1	Factor 2	Factor 3
LI25	0.99	0.08	0.03
LI50	0.99	0.08	0.03
LI100	0.99	0.08	0.03
LI200	0.99	0.09	0.03
LI400	0.98	0.10	0.04
LI800	0.92	0.14	0.07
LI1600	0.85	0.19	0.11
LI3200	0.79	0.23	0.14
LI6400	0.74	0.25	0.16
LI12800	0.69	0.26	0.17
LI25600	0.64	0.26	0.17
LI51200	0.59	0.25	0.16
MI25	0.14	0.98	0.05
MI50	0.14	0.98	0.05
MI100	0.14	0.99	0.06
MI200	0.14	0.98	0.06
MI400	0.15	0.97	0.06
MI800	0.20	0.86	0.10
MI1600	0.27	0.71	0.14
MI3200	0.35	0.59	0.18
MI6400	0.42	0.50	0.21
MI12800	0.45	0.43	0.22
MI25600	0.46	0.38	0.24
MI51200	0.45	0.33	0.23
MD25	0.04	0.03	1.00
MD50	0.05	0.03	1.00
MD100	0.05	0.03	1.00
MD200	0.05	0.03	1.00
MD400	0.06	0.03	0.98
MD800	0.08	0.07	0.87
MD1600	0.13	0.12	0.70
MD3200	0.19	0.18	0.56
MD6400	0.26	0.23	0.47
MD12800	0.31	0.25	0.39
MD25600	0.33	0.27	0.34
MD51200	0.34	0.27	0.29

Given the principal component analysis, I choose to use three factors, which explain about 87.89% of the neighborhoods' population composition patterns. Factor 1 indicates high loadings of the low-income groups at lower scales and moderate- and middle-income groups at larger scales and, at the same time, balance between low-income group and moderate-and-middle-income groups. In other words, while the low-income groups show higher factor loadings, the modertate- and middle-income groups show lower factor loadings. Factor 2 shows high factor loadings of the moderate-income group at smaller scales and, simultaneously, the balance between moderate-income group and the low- and middle-income groups. Factor 3 captures the high loadings of the middle-income group especially at smaller scales and the balance between the middle-income group and low-and-moderate income groups. After choosing the final factor loading matrix, I estimate factor scores for categorizing neighbourhood types.

Appendix C. Median value of each classification in poverty-multiscalar classifications

		Small scale				Medium scale				Large scale			
#Population		25	50	100	200	400	800	1600	3200	6400	12800	25600	51200
Class 1	Low	0.063	0.063	0.063	0.063	0.063	0.066	0.075	0.084	0.090	0.097	0.106	0.112
	Moderate	0.044	0.044	0.044	0.044	0.044	0.047	0.053	0.061	0.067	0.071	0.075	0.079
	Middle	0.054	0.054	0.054	0.055	0.055	0.058	0.066	0.073	0.079	0.082	0.085	0.088
Class 2	Low	0.134	0.134	0.134	0.135	0.136	0.145	0.156	0.159	0.162	0.163	0.163	0.160
	Moderate	0.079	0.079	0.079	0.079	0.080	0.083	0.092	0.096	0.101	0.104	0.102	0.100
	Middle	0.202	0.202	0.202	0.202	0.200	0.181	0.156	0.134	0.120	0.112	0.109	0.104
Class 3	Low	0.165	0.165	0.165	0.166	0.167	0.173	0.185	0.192	0.193	0.194	0.192	0.182
	Moderate	0.227	0.227	0.227	0.227	0.224	0.201	0.171	0.147	0.133	0.124	0.115	0.111
	Middle	0.081	0.081	0.081	0.081	0.081	0.088	0.094	0.103	0.105	0.106	0.108	0.105
Class 4	Low	0.425	0.425	0.426	0.425	0.419	0.399	0.360	0.332	0.308	0.291	0.273	0.249
	Moderate	0.090	0.090	0.090	0.090	0.093	0.101	0.112	0.120	0.125	0.123	0.120	0.117
	Middle	0.079	0.080	0.080	0.080	0.083	0.088	0.096	0.103	0.106	0.110	0.110	0.106