Online Appendix for "Childhood Housing and Adult Outcomes: A Between-Siblings Analysis of Housing Vouchers and Public Housing"

By Fredrik Andersson, John C. Haltiwanger, Mark J. Kutzbach, Giordano Palloni, Henry O. Pollakowski, and Daniel H. Weinberg

APPENDIX A. PROGRAM BACKGROUND, DATA, AND SUMMARY STATISTICS

A.1 Subsidized and Unsubsidized Housing in the United States[1]

The federal Public Housing program began with the New Deal era enactment of the United States Housing Act of 1937. Initially the program consisted of subsidies for construction provided by the federal government and ongoing management and operations performed by local government public housing agencies. By 1970, there were approximately 1 million units in the public housing program and construction continued slowly thereafter with the program reaching a peak of 1.4 million units in operation in 1994. Because construction subsidies were not sufficient for the maintenance of public housing, the federal government instituted operating subsidies (in 1974) and imposed a rent ceiling—the maximum amount of rent that each family could be charged—which was initially set at 25% of family income but later raised to 30% of family income (in 1981). Since 1994, participation in public housing has steadily declined, to just under 1.3 million in 2000, and to about 1.1 million in 2013. The reduction in the number of available public housing units reflects, in part, the demolition of severely distressed projects starting in the 1990s, largely under the HOPE VI program. In these cases, some tenants were given housing vouchers to find housing elsewhere, while other tenants received units in different public housing projects (Popkin et al. 2004).

Enacted in 1974 as the Section 8 tenant-based rental assistance program, the Housing Choice Voucher (HCV) program provides rental assistance for low-income households through vouchers that prospective tenants take to private sector landlords of approved rental units; the vouchers allow the landlords to receive the full rental price, up to a "Fair Market Rent" (FMR). The HCV subsidy covers the difference between the rental cost of the unit (up to the FMR) and the household's rent contribution (typically 30% of its income). Households also have the option of paying a higher portion of their income for rent for units that charge rents above the FMR. The HCV program has grown rapidly over the past two decades. In 1990 there were about 1.1

[1] We thank David Hardiman and Todd Richardson of HUD for providing substantive clarifications for the section.

million voucher households. This figure rose to 1.8 million in 2000, and to nearly 2.4 million in 2013 (over 45% of U.S. subsidized housing).

In this paper, we do not consider other HUD rental assistance programs, the most prominent of which, the Section 8 project-based rental assistance program, also began in 1974 and provides an additional 1.2 million units of affordable housing. That program serves a somewhat higher proportion of older households and a lower proportion of households with children.[2] Column 1 of Tables A1 and A2 present the major subsidized housing programs and the number of households and units subsidized through each program over time. In 2000, there were nearly 5 million subsidized households, with 1.3 million in public housing and 1.8 million using HCVs.

We briefly describe conditions in private rental housing, the alternative for lower earning households eligible for housing subsidies. This is highly relevant because HUD rental assistance is not an entitlement and serves only a fraction of the households that meet the basic income requirements. As a point of comparison, both the public housing and HCV programs use a general rule that households pay 30% of their incomes for rent. HUD estimates that in 2013, at least 7.72 million unassisted very-low-income households paid more than 50% of their income in rent (Steffin et al. 2015). Quigley and Raphael (2004) note that among all renters, the overall share of income paid for rent rose from 19% in 1960 to 26% in 2000. Over the same time period, the rental share for households in the first income quintile rose from 47% to 55%, with 79% of those households spending more than 30% on rent in 2000.

One consequence of high housing expenditure and constrained liquidity is a high incidence of eviction and homelessness. Desmond et al. (2015), examining renters in Milwaukee, find higher rates of forced moves for low income households, including formal and informal eviction, landlord foreclosure, and building condemnations. These relocations account for roughly a quarter of all moves and can result in moves to substandard housing and cause further relocations. Burt (2001), examining a nationally representative sample of homeless people who use homeless assistance programs, finds that the most cited reason for homelessness is

[2] The Low Income Housing Tax Credit (LIHTC) program began with the 1986 Tax Reform Act, and was expanded by 40% in 2001. Unlike the "deep subsidies" provided by the other three programs discussed here, LIHTC provides "shallow subsidies" in that no ongoing operating costs are covered by the government. In this program, the U.S. government (through the Internal Revenue Service), provides tax credits to for-profit and non-profit developers to build income-restricted housing. In 1990, there were about 140,000 units with this number growing to almost 2 million units in 2010. While LIHTC housing has significant income limits for eligibility, this program typically does not provide housing for the very poor.

difficulties with paying rent. Due to the uneven geographical wealth distribution, residential segregation, and limited affordable housing in higher cost neighborhoods, low earning households are also likely to live in high poverty neighborhoods.

A.2 Data Sources

This project draws from several sources of confidential microdata at the Census Bureau as well as a number of public use files. From households responding to the 2000 Census of Population and Housing, we select the set of teenagers aged 13 to 18 on April 1, 2000.[3] The frame for the Census is the set of all addresses. A household, which we use in our fixed effects analysis, is the set of persons responding at an address.[4] Each household lists the relationship of all respondents to Person 1,[5] and we use these relationships to characterize family structure. The 2000 Census data also provide a geographic location, reported housing tenure (rent or own) and reported demographics (age, sex, race, and ethnicity) for each member of the household.[6]

The HUD-PIC files provide detailed information on public housing and housing voucher recipients during our study period from 1997 to 2005.[7] As part of their housing occupancy verification process, local housing authorities provide HUD with the identities of residents, which HUD then compiles into an annual relational database. HUD-PIC identifies the members within each household and includes fields for when a household applied for housing and when they moved in. For households participating in assisted housing in 1997, we use the administrative information on move in dates to fill in participation in 1995 and 1996 for individuals who were 18 in 2000 and in 1996 for individuals who were 17 in 2000. The most significant reporting shortfall is for housing authorities participating in HUD's Moving to Work (MTW) demonstration (see Abravanel et al. 2004). MTW relaxed reporting requirements for participating housing authorities, resulting in inconsistent data quality for some authorities

[3] Responses to the Census "short-form" are assembled in the Hundred-Percent Census Edited File (HCEF).
[4] We use the Master Address File ID (MAFID) to define a household as the set of responses collected from one address. MAFIDs, or addresses, constitute the residence frame for Census Bureau surveys.
[5] Throughout the paper and tables, we refer to this Person 1 as the Head of Household and the spouse of Person 1 as the spouse of the head of household.
[6] We chose to use all households in the U.S. rather than the 1-in-6 sample (who received the "long form") for the principal analysis in order to have a larger sample size. While the long form would allow us to include variables such as parent's education, such time-invariant explanatory factors are eliminated by a household fixed effects approach.
[7] PIC refers to Public and Indian Housing Information Center. The data file contains an annual extract of recipients of voucher-supported housing and public housing, submitted by housing authorities and providers. For other research using the HUD-PIC extract file, see Shroder (2002); Lubell et al. (2003); Olsen et al. (2005); Tatian and Snow (2005); and Mills et al. (2006). We do not use the HUD-TRACS (Tenant Rental Assistance Certification System) since those data apply to tenants in projects receiving project-based Section 8 subsidies. HUD-PIC was formerly known as Multifamily Tenant Characteristics System (MTCS).

during our study. We elect to exclude households in areas that participate in the MTW demonstration during our study period to avoid mismeasuring teenage assisted housing participation as a result of the inconsistent reporting.

Tables A1 and A2 present summary statistics for public housing and HCV-assisted households in 2000. The summary statistics are generated using publicly available data derived from the HUD-PIC records. Households in public housing have substantially longer housing tenures, are more likely to have members who are age 62 or older, and are less likely to have children than households in HCV-assisted housing.

The Census Bureau produces the Longitudinal Employer-Household Dynamics (LEHD) Infrastructure Files, an employer-employee matched dataset, which it develops in partnership with state data providers.[8] At its core are two administrative records files provided by states on a quarterly basis: (1) unemployment insurance (UI) wage records, giving the earnings of each worker at each employer, and (2) employer reports giving establishment-level data, also known as the Quarterly Census of Employment and Wages. The coverage is roughly 96 percent of private non-farm wage and salary employment (Stevens 2007). The data series of most states begin in the 1990s and there are approximately 130 million workers for all states and D.C. in 2010. We also include earnings records for federal workers, based on information from the U.S. Office of Personnel Management.[9] While the longitudinal data support the measurement of job histories, turnover measures, and employment status, this analysis focuses on annual earnings for parents and adult earnings for children.

To complement our analysis of adult earnings, we use information from the 2010 Census to measure adult incarceration. Specifically, we make use of Group Quarters reporting information to observe whether children in our sample were found in an adult correctional facility in April 2010. Raphael (2005) finds a strong relationship between the institutionalization totals from the 2000 Census group quarters data and separate calculations conducted by the U.S. Bureau of Justice Statistics.

[8] For a description of the LEHD Infrastructure Files and public statistics, see Abowd et al. (2004).

[9] LEHD is in the process of integrating data on self-employed individuals and independent contractors who are not covered in the UI files but are available from the Census Bureau's Business Register which contains the universe of all businesses including all sole proprietorships on an annual basis (whether the sole proprietor has employees or is a non-employer). This study does not make use of these new data. LEHD also excludes earnings from those in the military and those in the U.S. Postal Service (these exclusions might downwardly bias estimates of the effects of subsidized housing on earnings). Federal earnings data begin in 2011.

We introduce additional geographic data to address time-varying but spatially constant household factors. The LEHD program makes use of an annual place of residence file composed of federal administrative data known as the Composite Person Record (CPR). LEHD uses CPR residences, which begin in 1999, for imputation models and for the residence component of public use data. We use CPR geocodes to characterize a household's time varying residence location. For this analysis, the most precise neighborhood definition we use is a census block group, which has a target population of 600 to 3,000 people (most census tracts have three or four block groups). These geocodes may be linked with spatially constant neighborhood information, such as the poverty rate in 2000 (available from Census 2000's Summary File 3).

We supplement the confidential microdata with publicly available data from several different sources. These include information on the characteristics of households participating in HCV-assisted and public housing from HUDUSER and county and census-tract level characteristics from the 1990 and 2000 Censuses.

A.3 Data Integration

We first use the responses from the 2000 Census to construct a frame of children aged 13 to 18 and their households. Because our focus is on employment outcomes at age 26 and incarceration in 2010, we require that children be at least age 13 in 2000, meaning they will be at least 26 by 2013. The 18 year-olds in 2000 will be 26 in 2008. By age 26, young adults are likely to have entered the labor force even if they attained some higher education.[10] We cap the sample at age 18 and require that in 2000 the child be in a household with at least one adult. The included adult(s) may be parents, grandparents, or other caregivers (we refer to these adults as parents).[11] Based on the 2000 Census county of residence, we also exclude residents of counties participating in MTW, where a link with the HUD-PIC file would be expected to fail due to possible non-reporting.[12]

Person-level record matching is done by way of a Protected Identification Key (PIK), which is assigned to survey and administrative records based on personally identifying information. The 2000 Census and HUD-PIC files have a PIK for approximately 89 percent and 98 percent of person-records, respectively. All LEHD records have a PIK value, though a small

[10] Age 26 earnings are used in some studies of intergenerational economic mobility (e.g., Chetty and Hendren 2015).
[11] Specifically, we limit the adults to Person 1 and the spouse of Person 1, should there be a spouse.
[12] Columns 1 and 2 of Tables A1 and A2 show summary statistics for the households participating in public housing and the HCV program across all housing authorities and in all housing authorities that did not participate in MTW during our study period (i.e., those included in our empirical sample). Our sample closely resembles the national population in assisted housing across all of the characteristics available in the data.

share of them are not valid. We only retain Census 2000 households with a parent who has a PIK and at least two children aged 13 to 18 who have a PIK, are renters (see below), and have non-missing basic characteristics.[13] To restore the selected sample to representativeness, we reweight the sample.[14] We use PIKs to link both parents and children to HUD-PIC, LEHD earnings records, the CPR residence information, and the 2010 Census.

In addition to using LEHD earnings to construct outcome measures for the youth in our study, we use parents' LEHD earnings to determine sample eligibility and to construct an annual measure of household income for 1997 to 2005 to use as a control variable.[15] For each child, we calculate the inverse hyperbolic sine of average parents' earnings (the sum of earnings for the head of household and the spouse of the head of household in each year while the child was aged 13-18).

We take several steps to select a sample of teenagers from households likely to be eligible for housing assistance. HUD defines eligibility for its assistance programs based on family income as a percentage of Area Median Income (AMI), which adjusts for area income and for family size.[16] We therefore use each household's county of residence in 2000 and household size in 2000 matched to their average parents' LEHD earnings to create a ratio of parents' earnings to AMI; this ratio accounts for the differences in average earnings across metropolitan areas within the U.S. [17] Since local housing authorities typically require that a household earn less than 50% of AMI to be eligible for assistance, we retain only children in

[13] We exclude households including more than 15 residents or more than 10 teenagers. For cases where a PIK has been assigned to multiple individuals (less than 1 percent) we drop all cases, unless all observable characteristics (date of birth, race, ethnicity, gender, geographic location) are identical, in which case one record is retained.

[14] From the full sample of households with at least two children aged 13 to 18 in 2000, including records with no PIK, we estimate a logistic regression for whether or not that household also has at least two children with a non-missing PIK, with explanatory variables including the number of persons in a household, the number of children, housing tenure as well as person age, gender, race, ethnicity and state fixed effects based on the year 2000 location. We then reweight the records using the inverse of the probability of having a PIK, based on the model estimates. Our results are robust to excluding these weights.

[15] We require that for the time period in which each child is between 13-18 that we observe at least one year of earnings in the LEHD data infrastructure. This restriction eliminates teenagers in states that are not part of the LEHD program (e.g., Massachusetts) in our national sample. Not all states supplied data to LEHD back to 1997 so there are some limitations for using this measure as a control.

[16] Under most HUD programs, households pay 30% of their income for rent with HUD subsidizing the remainder to cover operating costs or up to a fixed local FMR. Actual program requirements vary by subsidy type, but generally require residents to earn at or below 80% of AMI (low income), with additional requirement dictating the percentage of residents that must be "very low income" (at or below 50% of AMI) or "extremely low income" (at or below 30% of AMI).

[17] We use average annual total labor income from years where the child is between 13 and 18 years of age. To avoid dropping observations that do not match to the Composite Person Record (CPR) we use the 2000 census residence county to define AMI. After 2005, HUD defines AMI using American Community Survey data; specified proportions of AMI are used as eligibility and priority criteria.

households with a parents' earnings-to-AMI measure below 0.5 in the main sample, using the minimum value across siblings when there are within-household differences. We additionally include households between 50% and 100% of AMI for a robustness exercise. This provides us with an analysis sample that includes only those widely eligible for the subsidized housing treatment. In addition, based on the housing tenure question from Census 2000, we require that the household be renters at that time. Given that we have no household wealth information, renter status helps to characterize a household as having limited assets and is also consistent with the housing assistance programs we consider, which are rental arrangements.

Of the 2.8 million children in our sample aged 13-18 in the U.S. in 2000, we end up with a final sample size of 1.17 million children in sibling households with parents who earned less than 50% of HUD's AMI, 28% of whom were in households that resided in subsidized housing at some point between 1997 and 2005. This is the main sample for our analysis of the impact on earnings. Because not all the children in our main sample are found in the 2010 Census (for example, they were not assigned a PIK in 2010 and therefore cannot be linked), we limit the estimation of effects on incarceration to the sibling groups (as defined by our 2000 households) where we can find all siblings in both 2000 and 2010. This longitudinal restriction reduces the sample size for the incarceration outcomes substantially, from 1,172,000 to 672,000.[18]

A.4 Variables

Because our aim is to estimate the effect of childhood environmental factors on later life outcomes, we derive most of our demographic characteristics from the base year 2000 Census short form responses, when subjects are still children. We describe children using age on April 1, 2000, gender, race, ethnicity, and household size. We also construct a household-level race/ethnicity variable to allocate households to race/ethnicity subsamples as follows. We decompose the sample into mutually exclusive groups, as follows: we define a household as Hispanic if any member reports being Hispanic, Black non-Hispanic (Black) if no member reports being Hispanic and at least one member reports being Black or African American, White

[18] The fraction of the sample remaining, 0.574, roughly corresponds with what one might expect given the 0.764 share of the 2000 sample being observed in the 2010 Census (Table 1). Considering a two-child household, the expected retention rate if retention of each child was independent would be 0.584. We re-weight observations by the inverse probability that a household would be fully accounted for in 2010, where this probability is predicted using household race/ethnicity indicators, the number of people in the household in 2000, the number of teenagers in the household in 2000, an indicator for whether the household rented their home in 2000, an indicator for whether the household lived rent free but did not own their home in 2000, and a set of state fixed effects. We note that we don't have this attrition problem for the main sample since LEHD has virtual universal coverage of employment and earnings outcomes with all workers having a PIK.

non-Hispanic (White) if no member reports being Hispanic or Black and at least one member reports being White, and Other non-Hispanic (Other) if no member reports being Hispanic, Black, or White.

We generate a treatment variable that counts the years a child resides in public housing or HCV-assisted housing (based on the PIK match to the HUD-PIC annual files from 1997 to 2005).[19] We consider a child to be a HUD-subsidized resident in a particular year if their PIK appears in the HUD administrative data *and* if that individual is no older than 18.[20] The maximum would be 6 years in HUD housing, which would be for a 13-year-old first residing in subsidized housing in or before 2000. We also generate indicators for the ages individuals are first and last observed in public and HCV-assisted housing using age as measured in the 2000 Census and the administrative HUD-PIC data. Our goal is to estimate the effect of these treatment measures on labor market and incarceration outcomes.

One possible spurious source of between-sibling variation is simple censoring of the subsidized housing treatment. We define treatment only for individuals between the ages of 13 and 18. However, for sample members who are 17 or 18 years of age in 2000, we are unable to observe their subsidized housing participation at age 13 (or age 14 for individuals aged 18 in 2000) because we use HUD administrative records beginning in 1997 (earlier records are less complete). As a result, it is possible that some of the within-household variation results from this left-censoring of treatment. Therefore, for those children who were 17 or 18 in 2000 and whose household resided in public housing in 1997, we impute housing treatment in the censored years based on the move-in date reported by that household in the HUD-PIC data. All reported results are for the treatment measures including the imputations for 17- and 18-year-olds, but we obtain similar estimates without the imputed treatment and when we completely remove 17 and 18 year-olds from the sample.

We use the average annual parents' earnings between the ages of 13-18 to control for differences in household economic circumstances across siblings. As we discussed above, changes in household income may be directly associated with moves into and out of subsidized housing. We therefore interpret the specifications with controls for parents' earnings as addressing possible unobserved, time-varying characteristics. However, we are cautious in

[19] The PIKs for the head of household and the spouse of the head of household for each child in our sample are also matched to the HUD-PIC file.

[20] We do not count individuals who are under 18 in 2000 but over 18 when we observe them in the HUD administrative data as being HUD residents.

interpreting these results as we acknowledge that parents' earnings could be affected by assisted housing participation.

We also consider additional within-household variation in some specifications. We use the mean of neighborhood poverty (measured at the census block group level) between the ages of 13-18 as a control variable in some specifications. Controlling for the average poverty rate when each sibling is between 13-18 is designed to capture one of the possible mechanisms for subsidized housing to impact adult outcomes. We identify a residence census block for each child from 1999-2005 where available (approximately 10% of children are missing a CPR residence in each year). When possible, we match the child residence to block group-level tabulations from Census 2000, giving neighborhood characteristics such as the poverty rate.[21]

For most households, the HUD-PIC data contain information on the date they entered a waitlist as well as the date they were granted admission to the program. In some cases the two dates are the same, indicating there was no wait for the program, but most households face non-trivial waiting periods. As noted in the main text, Figure 3 displays the distribution of wait times for individuals in voucher and public housing who entered subsidized housing no earlier than 1995 and who were found in subsidized housing in 2000. We restrict the entrance date to be after 1995 because data quality is lower in the early 1990s and because these waits are likely to be a better approximation to the waits experienced by the households in our sample. We identify the housing authority population average wait time and match these housing authority level waits to the geographic location of the households in our sample. This match is used to identify whether households lived in an area with a long average wait (nine months or more) or a short average wait (less than nine months).

We also use data from publicly available tabulations of the 1990 and 2000 Censuses and publicly available HUDUSER data from HUD to calculate the 1990 Census tract poverty rate, the 2000 metropolitan statistical area total number of inhabitants, and the ratio of median rent to area median income.

A.5 Summary Statistics

To help better understand the within-household variation in public and voucher-assisted housing Table A4 displays summary statistics for subsidized housing exposure, disaggregated by household assisted housing participation in the first year of our data (1997). The full sample

[21] We use the county-level average as a fallback for a small share of records.

includes 1,172,000 children aged 13-18 in 2000. 993,000 come from households that did not participate in assisted housing in 1997 and 179,000 come from households that were resided in either public or HCV-assisted housing in 1997. While 332,000 children were in a household that received some housing assistance during the 1997-2005 period, not all these households have between-sibling differences in subsidized housing participation and therefore contribute to identifying the treatment effects in our household fixed-effects model. For example, a household with two children, aged 13 and 15 in 2000, that enters public housing in 2000 and stays until 2001 would be observed as having two children with two years of teenage public housing participation each, and no within-household difference in subsidized housing participation. In total, 96,000 children have some within-household difference in teenage public housing and 190,000 have a within-household difference in teenage HCV-assisted housing. The mean within-household difference (in absolute value) in public and HCV housing exposure for these two groups are 0.952 and 0.962 years, respectively. A two-child household at the mean within-household difference in public housing participation (0.952 years) would thus have one child with nearly 2 additional years of public housing participation relative to the other.

This within-household variation is due, roughly in equal parts, to household entries and exits from subsidized housing. From the households not participating in subsidized housing in 1997, 45,000 children entered public housing and another 94,000 entered the HCV program as teenagers. Likewise, among subsidized households in 1997, 50,000 children exited public housing and 95,000 children exited the HCV program during our study period. Roughly the same number of households exited and entered both programs during our study period. In addition to implying that the variation used to identify the treatment effects is not overwhelmingly driven by either households exiting or households entering the two programs, this also decreases the likelihood that there is a systematic relationship between child age or birth order and teenage subsidized housing participation.[22]

A.6 Data Update

We note that relative to an earlier version of this paper the sample and measurement are largely the same. In developing the estimates for the current version, we improved the measurement of participation in public housing in 1995 for children who were 17 or 18-years-old

[22] When households move out of an assisted housing program while at least one child is still a teenager older children and lower birth order children will typically have higher levels of teenage program participation; when households move into an assisted housing program while at least one child is still a teenager younger children and higher birth order children will typically have higher levels of teenage program participation.

in 2000. While slightly more accurate, the updated data yield very similar results. For disclosure reasons, a few of the summary statistics shown in Table 1 and Appendix Table A3 could not be updated and therefore are shown using the previous measurement approach. The figures that could not be updated are nearly identical with the updated and previous approaches.

A.7 Tables and Figures

TABLE A1—PUBLIC HOUSING PARTICIPANT CHARACTERISTICS FOR ALL PUBLIC HOUSING AUTHORITIES, NON-MTW HOUSING AUTHORITIES, AND MTO HOUSING AUTHORITIES

	All (1)	Non-MTW PHAs (2)	MTO PHAs (3)
Household size	2.260	2.257	2.383
	(0.459)	(0.470)	(0.233)
Tenant monthly contribution	210.118	209.799	270.499
	(54.390)	(55.151)	(25.196)
Income mostly wages	26.911	27.230	30.345
	(9.869)	(10.096)	(6.246)
Income mostly welfare	11.017	10.472	16.264
	(6.593)	(6.565)	(4.056)
Household income (thousands of US$)	10.333	10.404	13.262
	(2.556)	(2.617)	(2.477)
% of area median income	25.046	25.487	27.614
	(6.041)	(5.564)	(6.253)
% single-parent household with children	31.503	31.584	25.190
	(13.269)	(13.684)	(4.346)
% Black non-Hispanic	49.752	47.456	55.408
	(33.296)	(32.844)	(17.026)
Mean time on waitlist (months)	15.374	14.189	17.587
	(32.560)	(33.708)	(15.939)
% minority in census tract	56.072	54.446	84.877
	(30.163)	(30.693)	(9.401)
% poverty in census tract	28.544	27.966	37.622
	(11.308)	(11.323)	(4.193)
Number of households	1,080,359	977,790	215,789

Notes:
Table displays summary statistics for Public Housing participants in all public housing authorities (PHAs), in non Moving to Work PHAs which are retained in the main sample of this paper (non MTW), and Moving to Opportunity (MTO) PHAs. For each characteristic, the mean and standard deviation in all PHAs are shown in Column 1, the mean and standard deviation for non MTW PHAs are shown in Column 2, and the mean and standard deviation for MTO PHAs are shown in column 3. "Income mostly wages" is the percent of participating households who receive the majority of their household income from wages and "Income mostly welfare" is the percent of participating households who receive the majority of their income from welfare. Minority includes Black non-Hispanics, Native American non-Hispanics, Asian non-Hispanics, and Hispanics. Summary statistics are computed using PHA-level means weighted by the number of households participating in public housing through that PHA. Standard deviations appear in (). Numbers based on Authors' calculations using HUDUSER Picture of Subsidized Households data from the year 2000.

TABLE A2—HCV-ASSISTED HOUSING PARTICIPANT CHARACTERISTICS FOR ALL PUBLIC HOUSING AUTHORITIES, NON-MTW HOUSING AUTHORITIES, AND MTO HOUSING AUTHORITIES

	All (1)	Non-MTW PHAs (2)	MTO PHAs (3)
Household size	2.653	2.636	2.738
	(0.371)	(0.379)	(0.086)
Tenant monthly contribution	227.348	226.804	225.122
	(59.291)	(59.025)	(37.787)
Income mostly wages	34.511	34.509	31.164
	(8.094)	(8.246)	(4.402)
Income mostly welfare	12.172	11.779	21.229
	(7.406)	(7.383)	(6.740)
Household income (thousands of US$)	10.667	10.595	11.239
	(2.022)	(2.016)	(0.970)
% of area median income	23.020	23.196	22.426
	(3.571)	(3.524)	(3.724)
% single-parent household with children	44.864	44.858	39.421
	(12.000)	(12.166)	(6.006)
% Black non-Hispanic	41.771	40.440	52.465
	(31.599)	(31.282)	(21.370)
Mean time on waitlist (months)	28.630	27.996	35.430
	(19.380)	(19.223)	(13.574)
% minority in census tract	32.140	29.777	37.014
	(27.415)	(26.018)	(34.509)
% poverty in census tract	13.379	12.806	11.798
	(9.420)	(9.236)	(11.150)
Number of households	1,447,688	1,341,182	170,922

Notes:
Table displays summary statistics for HCV-assisted housing participants in all public housing authorities (PHAs), in non Moving to Work PHAs which are retained in the main sample of this paper (non MTW), and Moving to Opportunity (MTO) PHAs. For each characteristic, the mean and standard deviation in all PHAs are shown in Column 1, the mean and standard deviation for non MTW PHAs are shown in Column 2, and the mean and standard deviation for MTO PHAs are shown in column 3. "Income mostly wages" is the percent of participating households who receive the majority of their household income from wages and "Income mostly welfare" is the percent of participating households who receive the majority of their income from welfare. Minority includes Black non-Hispanics, Native American non-Hispanics, Asian non-Hispanics, and Hispanics. Summary statistics are computed using HA-level means weighted by the number of households participating in the HCV-assisted housing through that PHA. Standard deviations appear in (). Numbers based on Authors' calculations using HUDUSER Picture of Subsidized Households data from the year 2000.

TABLE A3—SUMMARY STATISTICS BY HOUSEHOLD RACE/ETHNICITY AND SEX

	All HH (1)	White HH (2)	Black HH (3)	Hisp HH (4)
Males and Females				
Total labor market earnings age 26 (US$)	11,820	12,410	8,888	13,250
Inverse hyperbolic sine age 26 earnings	6.987	7.086	6.437	7.367
Worked in age 26 year	0.709	0.714	0.674	0.736
Observed in 2010 Census	0.765	0.798	0.704	0.784
Incarcerated in 2010	0.033[a]	0.018	0.059	0.024
Observations	1,172,000	464,000	336,000	279,000
2010 Census observations	672,000	291,000	160,000	167,000
Females				
Total labor market earnings age 26 (US$)	11,130	11,030	9,364	12,150
Inverse hyperbolic sine age 26 earnings	7.138	6.949	7.095	7.361
Worked in age 26 year	0.729	0.709	0.741	0.742
Observed in 2010 Census	0.803	0.829	0.762	0.818
Incarcerated in 2010	0.005	0.005	0.008	0.004
Observations	585,000	229,000	172,000	139,000
2010 Census observations	350,000	149,000	87,000	86,000
Males				
Total labor market earnings age 26 (US$)	12,520	13,760	8,388	14,350
Inverse hyperbolic sine age 26 earnings	6.835	7.221	5.746	7.374
Worked in age 26 year	0.688	0.72	0.604	0.731
Observed in 2010 Census	0.726	0.767	0.643	0.75
Incarcerated in 2010	0.059	0.032	0.123	0.045
Observations	586,000	235,000	164,000	140,000
2010 Census observations	322,000	142,000	72,000	81,000

Notes:
HH is household. Table displays summary statistics for the main empirical sample by household race/ethnicity and sex for the outcomes explored in the paper. Race and ethnicity is assigned at the household level using information from the 2000 Census. Sample includes individuals aged 13-18 in 2000 and from a household below 50% area median income in non-owner occupied housing in 2000. Incarceration sample includes the main sample individuals from households that have no attrition between the 2000 and 2010 Censuses. [a] denote statistics from a previous version of the paper that were not updated due to disclosure restrictions because of a slight change in the sample used to estimate sample means. Based on authors' calculations from matched 2000 Census, HUD-PIC, and LEHD files. Number of observations rounded to the nearest thousand.

TABLE A4—WITHIN-HOUSEHOLD VARIATION IN PUBLIC AND HCV-ASSISTED HOUSING

	Observations (1)	Mean Years PH (2)	Mean Years HCV (3)
Panel A. All households			
No subsidy in 1997	993,000	0.130	0.273
In subsidized housing in 1997	179,000	1.178	2.353
All	1,172,000	0.292	0.593
Panel B. With within-household variation in public housing	Observations	Mean WHH difference in PH	Mean WHH difference in HCV
No subsidy in 1997	45,000	0.927	
In subsidized housing in 1997	50,000	1.006	
All	96,000	0.952	
Panel C. With within-household variation in HCV-assisted housing	Observations	Mean WHH difference in PH	Mean WHH difference in HCV
No subsidy in 1997	94,000		0.961
In subsidized housing in 1997	95,000		0.963
All	190,000		0.962

Notes:
HCV is Housing Choice Voucher-assisted housing; PH is public housing; WHH is within household. Table presents counts, shares, mean assisted housing participation between the ages of 13 and 18, and the mean absolute value of between sibling variation in 13 to 18-year-old participation for different sub-groups of the overall sample. Each row presents statistics for either the full sample (All), the subset of the full sample from households where no member was participating in public or HCV-assisted housing in 1997 (No subsidy in 1997), and the subset of the full sample from households where at least one member was participating in public or HCV-assisted housing in 1997 (In subsidized housing in 1997). Panel A shows statistics for all households by sub-group. Panel B limits the data to households with an observed within-household difference in public housing participation between the children residing in the household and between the ages of 13 and 18 in the year 2000. Panel C limits the data to households with an observed within-household difference in HCV-assisted housing participation between the children residing in the household and between the ages of 13 and 18 in the year 2000. Column 1 displays the count of individuals in each row, Column 2 presents the share of total observations that this count corresponds to, Columns 3 and 4 present the mean years of public housing or HCV-assisted housing participation between 13 and 18 for the individuals in the row in Panel A. In Panels B and C Columns 3 and 4 present the mean within-household (WHH) difference (in absolute value) in public and HCV-assisted housing for the observations in that row. Sample includes individuals aged 13-18 in 2000 and from a household below 50% area median income in non-owner occupied housing in 2000. Based on authors' calculations from matched 2000 Census, HUD-PIC, and LEHD files. Number of observations rounded to the nearest thousand.

TABLE A5—WITHIN-HOUSEHOLD VARIATION IN PUBLIC AND HCV-ASSISTED HOUSING IN THE ESTIMATION SAMPLE

	All sample households (1)	Households with a change in assisted housing (2)
Inverse Hyperbolic Sine Parents' Annual Earnings	6.258	5.841
	(3.56)	(3.587)
Parents' Annual Earnings	10,830	8,284
	(10,330)	(8,158)
Any within-household variation in assisted housing	0.224	0.725
	(0.417)	(0.447)
Any Move into Public Housing	0.092	0.312
	(0.289)	(0.463)
Any Move into HCV Housing	0.161	0.545
	(0.367)	(0.498)
Any Move out of Public Housing	0.09	0.303
	(0.286)	(0.46)
Any Move out of HCV Housing	0.159	0.538
	(0.365)	(0.499)
Number of Moves into or out of Subsidized Housing	0.605	2.049
	(1.126)	(1.157)
Number of Moves into Public Housing	0.11	0.374
	(0.371)	(0.606)
Number of Moves into HCV Housing	0.194	0.658
	(0.478)	(0.684)
Number of Moves out of Public Housing	0.108	0.365
	(0.368)	(0.603)
Number of Moves out of HCV Housing	0.193	0.653
	(0.479)	(0.69)
Households	537,000	157,000

Notes:
Table presents means and standard deviations (in parentheses) for parents' earnings and measures of different moves into and out of assisted housing programs during the 1997-2005 study period. The sample in Column 1 includes all households used in the main empirical sample. The sample in Column 2 restricts the sample to those households used in the event study analysis that have at least one change in assisted housing participation during the study period. Total parents' earnings is the sum of LEHD earnings for the head of household and, if present, the spouse of the head of household based on relationships as defined using the 2000 Census. Households are identified as having moved into or out of a program in a year if in the prior year at least one member who was 13 to 18-years-old in 2000 participated in the program but none are participating in the current year (a move out) or if in the prior year no member was participating but in the current year at least one member is participating (a move in). Based on authors' calculations from matched 2000 Census, HUD-PIC, and LEHD files. Number of observations rounded to the nearest thousand.

B. Additional Tables and Figures

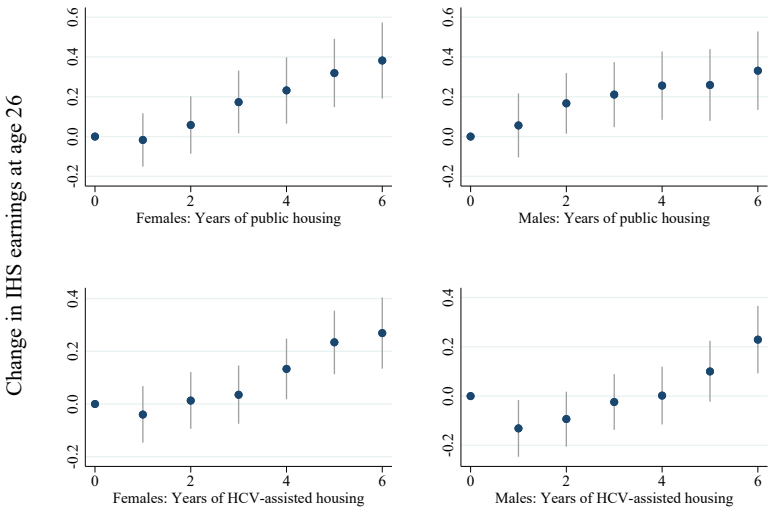

FIGURE B1. YEARS IN PUBLIC AND HCV-ASSISTED HOUSING AND IHS EARNINGS AT AGE 26

Notes:
HCV is Housing Choice Voucher-assisted housing. Figure displays the coefficient and 95% confidence interval for the number of years spent in public housing and HCV-assisted housing between the ages of 13 and 18, separately for males and females on the inverse hyperbolic sine (IHS) of earnings at age 26. The output is based on household fixed-effects regressions of IHS earnings at age 26 on a full set of indicators for time spent in each program (0,1,..,6), interactions between the participation indicators and whether the individual was male, and male by age and male by household race fixed effects. The sample includes individuals aged 13-18 in 2000 from households below 50% area median income in non-owner occupied housing.Race and ethnicity is assigned at the household level using information from the 2000 Census. 95% confidence intervals are based on robust standard errors clustered at the household level. Based on authors' calculations from matched 2000 Census, HUD-PIC, and LEHD files.

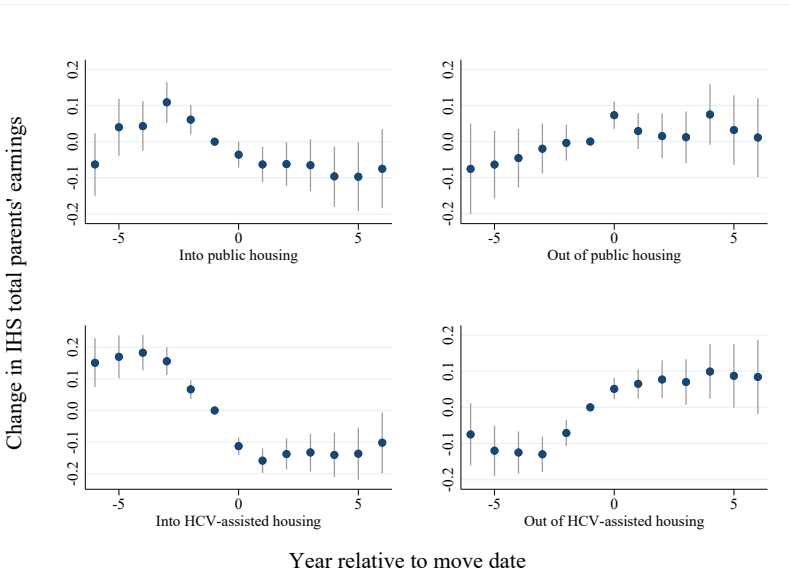

FIGURE B2. PARENTS' EARNINGS AND CHANGES IN ASSISTED HOUSING

Notes:
HCV is Housing Choice Voucher-assisted housing. Figure displays the coefficient and 95% confidence interval from an event study analysis of how the inverse hyperbolic sine (IHS) of total annual parents' earnings changes around the year of each of the four different types of moves possible in the data: a move into public housing, a move out of public housing, a move into HCV-assisted housing, or a move out of HCV-assisted housing. In all cases the output is based on a household fixed effects regression of IHS parents' earnings on a set of indicators indexing the year earnings are observed relative to the year of the move (with the year prior to the move as the omitted category), household race/ethnicity, state fixed effects interacted with year fixed effects for the year earnings are observed, and indicators for the number of children of each age based on the age distribution of children observed in the household in 2000. The sample is limited to households with two or more individuals aged 13-18 in 2000, below 50% area median income, in non-owner occupied housing, that made at least one move (into or out of public housing or into or out of HCV-assisted housing) during the study period. Race and ethnicity is assigned at the household level using information from the 2000 Census. 95% confidence intervals are based on robust standard errors clustered at the household level. Based on authors' calculations from matched 2000 Census, HUD-PIC, and LEHD files.

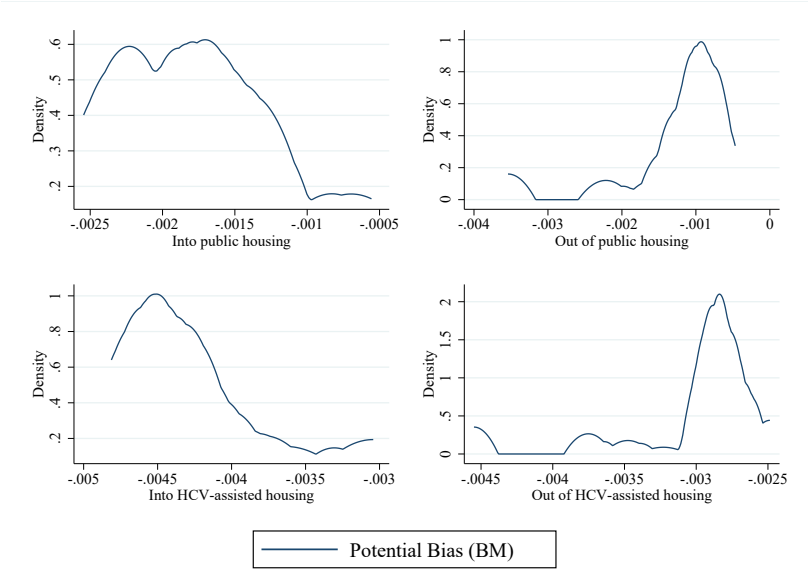

FIGURE B3. POTENTIAL BIAS FROM CHANGES IN PARENTS' EARNINGS BY MOVE TYPE

Notes:
HCV-assisted is Housing Choice Voucher-assisted housing; BM is Bastian and Michelmore (2018). Figure displays the distribution of potential bias based on the event study estimates shown in Figure B2 for the 50 potential age and move year possibilities that generate a within-household difference in 13-18-year-old assisted housing participation for a household with two 13-18-year-olds in 2000. For each of the 50 possible sibling age move-year scenarios, for the four possible move types (move into public housing, move out of public housing, move into HCV-assisted housing, move out of HCV-assisted housing) the expected difference in parents' earnings based on the coefficients in Figure B2 is multiplied by an estimated impact of the effect of the inverse hyperbolic sine of average annual parents' earnings between the ages of 13 and 18 from the elasticity of children's earnings between the ages of 22 and 27 with respect to parents' income between the ages of 13 and 18 from Bastian and Michelmore (2018). This measure of estimated total bias is then scaled by the difference in 13-18-year-old assisted housing participation in the scenario to get a per-year measure of bias. The density estimates are scaled so that the area under the curve is equal to 0.001 for exposition. Based on authors' calculations from matched 2000 Census, HUD-PIC, and LEHD files.

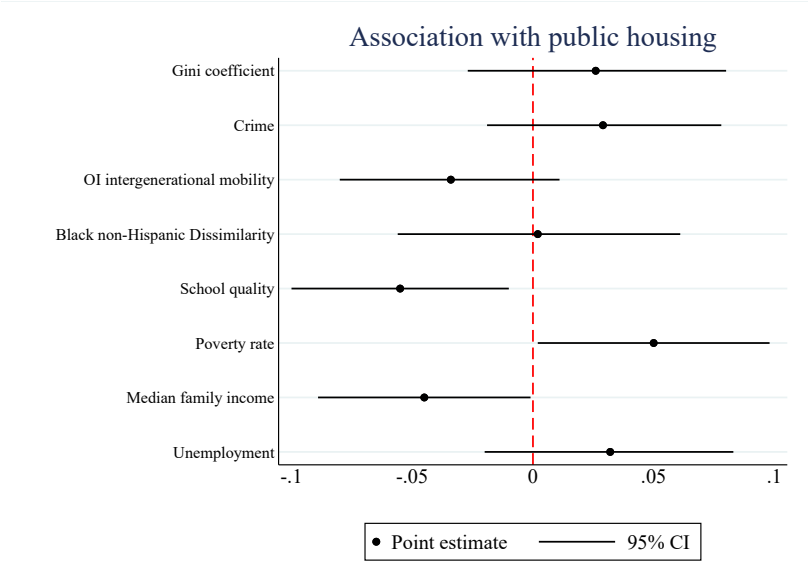

FIGURE B4. ASSOCIATIONS BETWEEN PUBLIC HOUSING TREATMENT EFFECTS AND COUNTY CHARACTERISTICS

Notes:
TE is treatment effect. Figure displays the associations between county- or state-level treatment effects and county- or state-level characteristics for public housing. Public housing and HCV-assisted housing treatment effects are calculated separately for large counties (those with more than 6,000 sample observations) and for state-level residuals (sample members in all other counties in each state). We then run OLS regressions of the treatment effects on a series of normzlied county or state-level aggregate characteristics, one at a time. All county and state-level characteristics are de-meaned and scaled by the standard deviation for the sample, so that the effects capture differences in standard deviations. An indicator for whether the observation is a county or state aggregate is included as a control. The crime index is calculated as the sum of murders, rapes, robberies, and assaults in a county in 2000 from the uniform crime reporting program, per 1,000 residents; the Black non-Hispanic dissimilarity index is a county-level measure of the proportion of Black non-Hispanic residents (or White non-Hispanic residents) who would need to have moved in 2000 in order for the distribution of Black and White non-Hispanics to be uniform across census tracts in the county; Gini coefficient is the county-level Gini coefficient of income inquality from 2000; The OI intergenerational mobility is the tract level mean percentile of individual income between 2014-2015 for children from households with parents at the 25th percentile of the national income distribution aggregated to the county-level; unemployment is the tract unemployment rate (scaled to be between 0-100) in 2000 aggregated to the county-level; poverty is the tract poverty rate (scaled to be between 0-100) in 2000 aggregated to the county-level; median family income is the tract-level median household income in 2000; the school quality index is a HUD-produced measure of the percentile rank (within-state) of school quaity in a census tract based on the share of 4th grade students proficient in math and reading for up to 3 schools within 3 miles of a block group centroid, and adjusted for the prevalence of economic disadvantage among the student population. All tract-level variables are aggregated to the county or state-level aggregate level using 2000 tract populations as weights. Based on authors' calculations from matched 2000 Census, HUD-PIC, and LEHD files Robust standard errors clustered at the county/state-aggregate level.

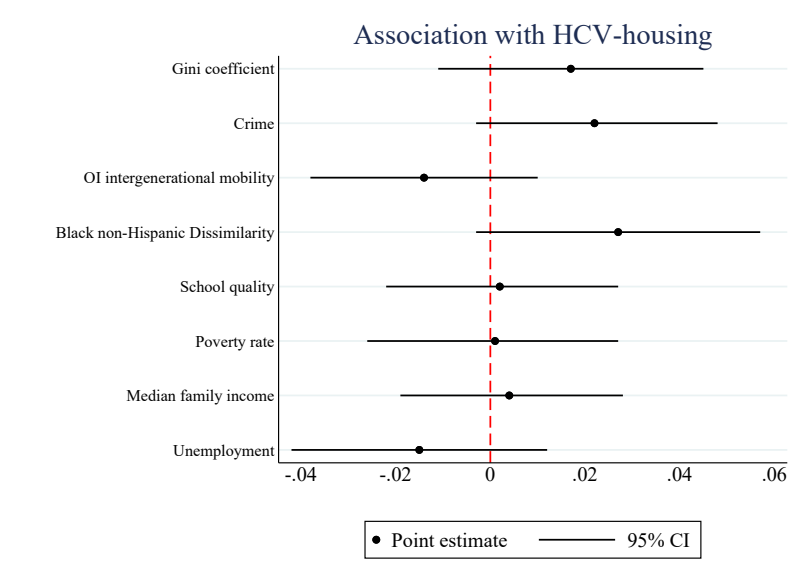

FIGURE B5. ASSOCIATIONS BETWEEN HCV-HOUSING TREATMENT EFFECTS AND COUNTY CHARACTERISTICS

Notes:
TE is treatment effect. Figure displays the associations between county- or state-level treatment effects and county- or state-level characteristics for HCV-assisted housing. Public housing and HCV-assisted housing treatment effects are calculated separately for large counties (those with more than 6,000 sample observations) and for state-level residuals (sample members in all other counties in each state). We then run OLS regressions of the treatment effects on a series of normzlied county or state-level aggregate characteristics, one at a time. All county and state-level characteristics are de-meaned and scaled by the standard deviation for the sample, so that the effects capture differences in standard deviations. An indicator for whether the observation is a county or state aggregate is included as a control. The crime index is calculated as the sum of murders, rapes, robberies, and assaults in a county in 2000 from the uniform crime reporting program, per 1,000 residents; the Black non-Hispanic dissimilarity index is a county-level measure of the proportion of Black non-Hispanic residents (or White non-Hispanic residents) who would need to have moved in 2000 in order for the distribution of Black and White non-Hispanics to be uniform across census tracts in the county; Gini coefficient is the county-level Gini coefficient of income inquality from 2000; The OI intergenerational mobility is the tract level mean percentile of individual income between 2014-2015 for children from households with parents at the 25th percentile of the national income distribution aggregated to the county-level; unemployment is the tract unemployment rate (scaled to be between 0-100) in 2000 aggregated to the county-level; poverty is the tract poverty rate (scaled to be between 0-100) in 2000 aggregated to the county-level; median family income is the tract-level median household income in 2000; the school quality index is a HUD-produced measure of the percentile rank (within-state) of school quaity in a census tract based on the share of 4th grade students proficient in math and reading for up to 3 schools within 3 miles of a block group centroid, and adjusted for the prevalence of economic disadvantage among the student population. All tract-level variables are aggregated to the county or state-level aggregate level using 2000 tract populations as weights. Based on authors' calculations from matched 2000 Census, HUD-PIC, and LEHD files Robust standard errors clustered at the county/state-aggregate level.

TABLE B1—TREATMENT EFFECTS IN 2000 US$

	Treatment effect (1)	Marginal effect in 2000 US$ (2)
All households		
Female public housing	.06	583.080
Male public housing	.059	573.362
Female HCV	.047	456.746
Male HCV	.027	262.386
White non-Hispanic households		
Female public housing	.004	38.872
Male public housing	.072	699.696
Female HCV	.006	58.308
Male HCV	.034	330.412
Black non-Hispanic households		
Female public housing	.062	602.516
Male public housing	.057	553.926
Female HCV	.07	680.260
Male HCV	.031	301.258
Hispanic households		
Female public housing	.088	855.184
Male public housing	.056	544.208
Female HCV	.044	427.592
Male HCV	.03	291.540

Notes:
HCV is Housing Choice Voucher-assisted housing. Table presents marginal effects in 2000 US$ from an additional year of participation in public or HCV-assisted housing using the main results from Table 3. In all cases, we calculate the marginal effects at the mean age 26 earnings for individuals in the sample who spent some time in assisted housing between the ages of 13 and 18. Sample includes individuals aged 13-18 in 2000 and from a household below 50% area median income in non-owner occupied housing in 2000. Based on authors' calculations from matched 2000 Census, HUD-PIC, and LEHD files. Number of observations rounded to the nearest thousand.

TABLE B2—ASSISTED HOUSING AND AGE 26 EARNINGS BY HOUSEHOLD RACE/ETHNICITY

	Inverse hyperbolic sine of earnings at age 26					
	White non-Hispanic		Black non-Hispanic		Hispanic	
	OLS	HFE	OLS	HFE	OLS	HFE
	(1)	(2)	(3)	(4)	(5)	(6)
HCV Housing	-0.149	0.006	-0.041	0.070	-0.069	0.044
	(0.009)	(0.02)	(0.006)	(0.014)	(0.009)	(0.021)
HCV Housing*Male	0.034	0.029	-0.032	-0.040	-0.013	-0.015
	(0.012)	(0.015)	(0.009)	(0.012)	(0.013)	(0.016)
Public Housing	-0.163	0.004	-0.068	0.062	-0.070	0.088
	(0.016)	(0.035)	(0.008)	(0.018)	(0.012)	(0.028)
Public Housing*Male	0.064	0.068	0.005	-0.005	-0.007	-0.032
	(0.016)	(0.028)	(0.012)	(0.015)	(0.016)	(0.021)
Male	0.362	0.354	-1.269	-1.199	0.105	0.179
	(0.034)	(0.044)	(0.04)	(0.051)	(0.044)	(0.056)
Observations	464,000	464,000	336,000	336,000	279,000	279,000
Demographic controls	yes	yes	yes	yes	yes	yes
Household Fixed Effects	no	yes	no	yes	no	yes

Notes:
HCV is Housing Choice Voucher-assisted housing. Table displays estimates of the impact of years spent in public or HCV-assisted housing on the inverse hyperbolic sine of earnings at age 26. Estimates are shown separately by household race/ethnicity. OLS columns display ordinary least squares estimates while HFE columns display household fixed effects (HFE) estimates. Years spent in public housing and years spent in HCV-assisted housing are counts of the number of years each individual was observed in the two programs between ages 13 and 18, which can take on values between 0 and 6. The assisted housing participation measures are interacted with whether the individual is male to allow the impacts to vary by sex. All columns include controls for male by age and male fixed effects. Race and ethnicity is assigned at the household level using information from the 2000 Census. Standard errors are clustered at the household level and shown beneath each estimate in parentheses. Sample includes individuals aged 13-18 in 2000 and from a household below 50% area median income in non-owner occupied housing in 2000. Based on authors' calculations from matched 2000 Census, HUD-PIC, and LEHD files. Number of observations rounded to the nearest thousand.

TABLE B3—THE EFFECT OF 13-18-YEAR-OLD RESIDENCE IN ASSISTED HOUSING ON AGE 26 EMPLOYMENT

	Any employment at age 26					
	White non-Hispanic		Black non-Hispanic		Hispanic	
	OLS	HFE	OLS	HFE	OLS	HFE
	(1)	(2)	(3)	(4)	(5)	(6)
HCV Housing	-0.012	0.001	-0.002	0.008	-0.005	0.004
	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)
HCV Housing*Male	0.003	0.003	-0.003	-0.004	-0.001	0
	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)
Public Housing	-0.012	0	-0.004	0.006	-0.005	0.010
	(0.002)	(0.004)	(0.001)	(0.002)	(0.001)	(0.003)
Public Housing*Male	0.006	0.007	-0.001	-0.002	0	-0.003
	(0.002)	(0.003)	(0.001)	(0.002)	(0.002)	(0.002)
Male	0.017	0.017	-0.131	-0.124	-0.005	0.002
	(0.003)	(0.004)	(0.004)	(0.005)	(0.004)	(0.006)
Observations	464,000	464,000	336,000	336,000	279,000	279,000
Demographic controls	yes	yes	yes	yes	yes	yes
Household Fixed Effects	no	yes	no	yes	no	yes

Notes:
HCV is Housing Choice Voucher-assisted housing. Table displays estimates of the impact of years spent in public or HCV-assisted housing on the likelihood of having any LEHD earnings in the age 26 calendar year. Estimates are shown separately by household race/ethnicity. OLS columns display ordinary least squares estimates while HFE columns display household fixed effects estimates. Years spent in public housing and years spent in HCV-assisted housing are counts of the number of years each individual was observed in the two programs between ages 13 and 18, which can take on values between 0 and 6. The assisted housing participation measures are interacted with whether the individual is male to allow the impacts to vary by sex. All columns include controls for male by age and male by household race fixed effects. Race and ethnicity is assigned at the household level using information from the 2000 Census. Standard errors are clustered at the household level and shown beneath each estimate in parentheses. Sample includes individuals aged 13-18 in 2000 and from a household below 50% area median income in non-owner occupied housing in 2000. Based on authors' calculations from matched 2000 Census, HUD-PIC, and LEHD files. Number of observations rounded to the nearest thousand.

TABLE B4—ALTERNATIVE FUNCTIONAL FORMS FOR THE LIKELIHOOD OF ADULT INCARCERATION

	Chamberlain-Mundlak controls	Two-step logit
	(1)	(2)
HCV Housing	-0.002	-0.001
	(0.001)	(0.001)[a]
HCV Housing*Male	-0.001	-0.001
	(0.001)[a]	(0.001)[a]
Public Housing	-0.004	-0.002
	(0.001)	(0.001)[a]
Public Housing*Male	0.000	0.000
	(0.001)	(0.001)[a]
Observations	672,000	672,000
Demographic controls	yes	yes
Household Fixed Effects	no	yes

Notes:
HCV is Housing Choice Voucher-assisted housing. Table displays logit-based estimates of the average marginal effect of additional time spent in public or HCV-assisted housing between the ages of 13 and 18 on the likelihood of being incarcerated at the time of the 2010 Census. Column 1 shows estimates from a logit with Chamberlain-Mundlak controls (including the household-level average of each right-hand-side variable as a control), without household fixed effects. Column 2 displays estimates of the average marginal effects based on the two-step logit proposed by Miller, Shenhav, and Grosz (2021).The two step logit first estimates a fixed effects logit using the sample of observations that have some variation in 2010 incarceration across siblings. Coefficients from the first-step logit are imposed for all individual-level right-hand-side variables in a second stage random effects logit. Average marginal effects for the full incarceration sample are then calculated using the formula from equation (30) in the appendix of Miller, Shenhav, and Grosz (2021).Years spent in public housing and years spent in HCV-assisted housing are counts of the number of years each individual was observed in the two programs between ages 13 and 18, which can take on values between 0 and 6. The assisted housing participation measures are interacted with whether the individual is male to allow the impacts to vary by sex. All columns include controls for male by age and male by household race/ethnicity fixed effects. To be included in the sample individuals must be in households that have no attrition between the 2000 and 2010 Censuses in addition to being aged 13-18 in 2000 and from a household below 50% area median income in non-owner occupied housing in 2000.To adjust for the non-random attrition, we re-weight observations by the inverse of the predicted probability that the household had no attrition between 2000 and 2010 based on a household-level probit of whether there is no attrition on household race/ethnicity, household size, the number of 13-18-year olds in the household, whether the household paid rent in 2000, and state fixed effects. Race/ethnicity is assigned at the household level using information from the 2000 Census. White households are White non-Hispanic and Black households are Black non-Hispanic. Standard errors are calculated using the Delta method, clustered at the household level, and shown beneath each estimate in parentheses. Based on authors' calculations from matched 2000 and 2010 Census, HUD-PIC, and LEHD files. Number of observations rounded to the nearest thousand. [a] denotes a standard error that rounds down to 0.000.

TABLE B5—ASSISTED HOUSING, INCARCERATION, AND AGE 26 EARNINGS

	All households (1)	White households (2)	Black households (3)	Hispanic households (4)
(A) Effect of assisted housing on IHS earnings at age 26				
HCV-assisted housing:				
Females	.047	.006	.07	.044
Males	.027	.034	.031	.03
Public housing:				
Females	.06	.004	.062	.088
Males	.059	.072	.057	.056
(B) Effect of assisted housing on 2010 incarceration				
HCV-assisted housing:				
Females	-.004	-.002	-.007	-.003
Males	-.001	0	-.003	0
Public housing:				
Females	-.005	-.004	-.007	-.004
Males	-.003	-.002	-.005	-.003
(C) Association between IHS earnings at age 26 and 2010 incarceration				
Females	-3.083	-2.63	-3.578	-2.551
Males	-3.924	-3.58	-4.121	-3.834
(D) % of earnings effect explainable by 2010 incarceration effects [(B)(C)/(A)]*				
HCV-assisted housing:				
Females	26.24	0	35.78	17.39
Males	14.53	0	39.88	0
Public housing:				
Females	25.69	0	40.4	11.6
Males	26.6	9.944	28.92	20.54
Observations	672,000	291,000	160,000	167,000
Demographic controls	yes	yes	yes	yes
Household Fixed Effects	no	yes	yes	yes

Notes:
HCV is Housing Choice Voucher-assisted housing. Table displays the percent of the IHS earnings at age 26 effects that can potentially be explained by differences in 2010 incarceration rates. (A) displays the household fixed effects estimates of assisted housing participation between ages 13 and 18 on the IHS of earnings at age 26, using the main sample. (B) replicates the household fixed effects estimates of the impact of assisted housing participation between the ages of 13 and 18 on 2010 incarceration using the sample from Table 4. (C) shows the differences in the IHS of earnings at age 26 between individuals who were incarcerated in 2010 and those not incarcerated in 2010, based on household fixed effects specifications that control for age by household race/ethnicity fixed effects and estimated separately for females and males. Finally, (D) shows the percent of the observed earnings difference that can potentially be attributed to the observed difference in incarceration, calculated as [(B)*(C)/(A)]. A (0) indicates that the estimated effect of public or HCV-assisted housing on the IHS of earnings at age 26 is not statistically significantly different from zero. A (-) indicates that the predicted effect of the assisted housing program on IHS of earnings at age 26 and the predicted effect of the assisted housing program on 2010 incarceration are of the same sign, which given the robust negative relationship between incarceration and age 26 earnings suggests that the incarceration association can not explain any of the observed effect on age 26 earnings. Sample includes individuals from households that have no attrition between the 2000 and 2010 Censuses in addition to being aged 13-18 in 2000 and from a household below 50% area median income in non-owner occupied housing in 2000. Race/ethnicity is assigned at the household level using information from the 2000 Census. White households are White non-Hispanic and Black households are Black non-Hispanic. Based on authors' calculations from matched 2000 Census, HUD-PIC, and LEHD files. Number of observations rounded to the nearest thousand.

TABLE B6—ADDING BIRTH ORDER FIXED EFFECTS

	With Birth Order FE (1)
HCV Housing	0.047
	(0.010)
HCV Housing*Male	-0.021
	(0.008)
Public Housing	0.049
	(0.013)
Public Housing*Male	0.002
	(0.011)
Male	0.455
	(0.031)
Observations	1,172,000

Notes:
HCV is Housing Choice Voucher-assisted housing. Table displays estimates of the impact of years spent in public or HCV-assisted housing on the inverse hyperbolic sine (IHS) of total earnings at age 26 with controls for birth order fixed effects. Years spent in public housing and years spent in HCV-assisted housing are counts of the number of years each individual was observed in the two programs between ages 13 and 18, which can take on values between 0 and 6. The assisted housing participation measures are interacted with whether the individual is male to allow the impacts to vary by sex. Controls for male by age and male by household race fixed effects are included. Race and ethnicity is assigned at the household level using information from the 2000 Census. The sample includes individuals aged 13-18 in 2000 from households below 50% area median income in non-owner occupied housing. Standard errors are clustered at the household level and shown beneath each estimate in parentheses. Based on authors' calculations from matched 2000 Census, HUD-PIC, and LEHD files. Number of observations rounded to the nearest thousand. Results are based on a previous iteration of the analysis data that measured participation in public housing in 1995 in a slightly different way. The results with more recent data are extremely similar.

TABLE B7—ASSISTED HOUSING AND AGE 26 EARNINGS WITH CONTROLS FOR PARENTS' EARNINGS AND BLOCK GROUP POVERTY

	OLS	HFE	HFE EC	HFE BGC	HFE LC
	(1)	(2)	(3)	(4)	(5)
HCV Housing	-0.062	0.047	0.047	0.047	0.046
	(0.004)	(0.010)	(0.010)	(0.010)	(0.010)
HCV Housing*Male	-0.014	-0.021	-0.020	-0.020	-0.018
	(0.006)	(0.008)	(0.008)	(0.008)	(0.008)
Public Housing	-0.077	0.060	0.060	0.065	0.065
	(0.006)	(0.014)	(0.014)	(0.014)	(0.014)
Public Housing*Male	0.012	-0.001	-0.000	-0.010	-0.009
	(0.008)	(0.011)	(0.011)	(0.011)	(0.011)
Male	0.364	0.454	0.399	0.304	0.224
	(0.024)	(0.031)	(0.040)	(0.035)	(0.045)
IHS Average Parents' Earnings			0.024		0.023
			(0.013)		(0.013)
IHS Average Parents' Earnings*Male			0.007		0.009
			(0.003)		(0.003)
Average Block Group % Poverty				0.000	-1.735
				55,800	(0.324)
Average Block Group % Poverty*Male				1.566	1.619
				(0.187)	(0.188)
Observations	1,172,000	1,172,000	1,172,000	1,172,000	1,172,000
Demographic controls	yes	yes	yes	yes	yes
Household Fixed Effects	no	yes	yes	yes	yes

Notes:
HCV is Housing Choice Voucher-assisted housing. Table displays estimates of the impact of years spent in public or HCV-assisted housing on the inverse hyperbolic sine (IHS) of total earnings at age 26. Column 1 presents ordinary least squares (OLS) estimates while columns 2-5 display household fixed effects (HFE) estimates. Years spent in public housing and years spent in HCV-assisted housing are counts of the number of years each individual was observed in the two programs between ages 13 and 18, which can take on values between 0 and 6. The assisted housing participation measures are interacted with whether the individual is male to allow the impacts to vary by sex. All columns include controls for male by age and male by household race fixed effects. Column 3 (HFE EC) also includes a control for the IHS of average parents' earnings while between the ages of 13 and 18 and its interaction with the male indicator. Column 4 (HFE BGC) includes a control for the average block group % poverty in the block group of residence between the ages of 13 and 18 and its interaction with the male indicator. Column 5 (HFE LC) includes both the parents' earnings and block group poverty controls along with their interactions with the male indicator. In cases where the block group of residence is unknown, the average block group % poverty in the county of residence is used. Race and ethnicity is assigned at the household level using information from the 2000 Census. Standard errors are clustered at the household level and shown beneath each estimate in parentheses. The sample includes individuals aged 13-18 in 2000 from households below 50% area median income in non-owner occupied housing.Based on authors' calculations from matched 2000 Census, HUD-PIC, and LEHD files. Number of observations rounded to the nearest thousand.

TABLE B8—ADJUSTMENTS FOR MULTIPLE HYPOTHESIS TESTING

	Treatment effect on the inverse hyperbolic sine of earnings at age 26		
	White non-Hispanic	Black non-Hispanic	Hispanic
	(1)	(2)	(3)
Female HCV-assisted housing	0.006	0.070	0.044
Unadjusted p-value	[0.768]	[0.000]	[0.032]
FDR q-value	[0.223]	[0.001]	[0.045]
Male HCV-assisted housing	0.034	0.031	0.030
Unadjusted p-value	[0.082]	[0.031]	[0.152]
FDR q-value	[0.069]	[0.045]	[0.080]
Female public housing	0.004	0.062	0.088
Unadjusted p-value	[0.907]	[0.001]	[0.002]
FDR q-value	[0.223]	[0.003]	[0.006]
Male public housing	0.072	0.057	0.056
Unadjusted p-value	[0.045]	[0.002]	[0.049]
FDR q-value	[0.052]	[0.006]	[0.052]
Observations	464,000	336,000	279,000
Demographic controls	yes	yes	yes
Household Fixed Effects	yes	yes	yes

Notes:
HCV is Housing Choice Voucher-assisted housing. Table displays treatment effect estimates of the impact of an additional year spent in public or HCV-assisted housing on the inverse hyperbolic sine of earnings at age 26 (from Table 3), p-values based on standard errors clustered at the household level (unadjusted p-values), and sharpened q-values that control for the false discovery rate (FDR q-values) for each treatment effect estimate. The false discovery rate controls for the expected proportion of rejections of the null hypothesis that are actually false (see Anderson 2008). Point estimates corresponding sharpened q-values are shown for the by household race/ethnicity results. Years spent in public housing and years spent in HCV-assisted housing are counts of the number of years each individual was observed in the two programs between ages 13 and 18, which can take on values between 0 and 6. All estimates are based on household fixed effects specifications that include controls for male by age and male by household race/ethnicity fixed effects. Race and ethnicity is assigned at the household level using information from the 2000 Census. Sample includes individuals aged 13-18 in 2000 and from a household below 50% area median income in non-owner occupied housing in 2000. Based on authors' calculations from matched 2000 Census, HUD-PIC, and LEHD files. Number of observations rounded to the nearest thousand.

TABLE B9—TIGHTENING AND RELAXING AGE RESTRICTIONS ON ASSISTED HOUSING PARTICIPATION

	Ages 14-17 (1)	Between 1995-2005 (2)
HCV Housing	0.055	0.021
	(0.012)	(0.007)
HCV Housing*Male	-0.031	-0.009
	(0.011)	(0.005)
Public Housing	0.066	0.019
	(0.018)	(0.009)
Public Housing*Male	-0.000	-0.000
	(0.015)	(0.007)
Male	0.453	0.450
	(0.031)	(0.031)
Observations	1,172,000	1,172,000
Demographic controls	yes	yes
Household Fixed Effects	yes	yes

Notes:
HCV is Housing Choice Voucher-assisted housing. Table displays household fixed effects estimates of the impact of years spent in public or HCV-assisted housing on the inverse hyperbolic sine (IHS) of earnings at age 26. In place of the main measures of assisted housing participation (a count of the number of years between 13 and 18 that each individual is observed in public or HCV-assisted housing), Column 1 uses the count of years between 14 and 17 that individuals are observed in each program thereby ignoring any variation that occurs at age 13 or age 18. Column 2 drops any age requirement for counting participation, instead simply counting the total number of years between 1995 and 2005 that each sample member is observed in public or HCV-assisted housing. Both specifications include controls for male by age and male by household race fixed effects. Race and ethnicity is assigned at the household level using information from the 2000 Census. Standard errors are clustered at the household level and shown beneath each estimate in parentheses. Sample includes individuals aged 13-18 in 2000 and from a household below 50% area median income in non-owner occupied housing in 2000. Based on authors' calculations from matched 2000 Census, HUD-PIC, and LEHD files. Number of observations rounded to the nearest thousand.

TABLE B10—INCLUDING ALL HOUSEHOLDS BELOW 100% AREA MEDIAN INCOME (AMI)

	Below 50% AMI	Below 100% AMI
	(1)	(2)
HCV Housing	0.047	0.049
	(0.010)	(0.009)
HCV Housing*Male	-0.021	-0.027
	(0.008)	(0.008)
Public Housing	0.060	0.061
	(0.014)	(0.013)
Public Housing*Male	-0.001	-0.008
	(0.011)	(0.01)
Male	0.454	0.483
	(0.031)	-0.027
Observations	1,172,000	1,433,000
Demographic controls	yes	yes
Household Fixed Effects	yes	yes

Notes:
HCV is Housing Choice Voucher-assisted housing. Table displays household fixed effects estimates of the impact of years spent in public or HCV-assisted housing on the inverse hyperbolic sine (IHS) of earnings at age 26. Column 1 replicates the main results in Table 2 restricting the sample to individuals from households below 50% area median income (AMI). Column 2 expands the sample used in the analysis to individuals from all households below 100% of AMI. All other sample restrictions are the same as for the main sample in Column 1. All columns include controls for male by age and male by household race/ethnicity fixed effects. Race and ethnicity is assigned at the household level using information from the 2000 Census. Standard errors are clustered at the household level and shown beneath each estimate in parentheses. Sample includes individuals aged 13-18 in 2000 from a household in non-owner occupied housing in 2000. Based on authors' calculations from matched 2000 Census, HUD-PIC, and LEHD files. Number of observations rounded to the nearest thousand.

TABLE B11—DIFFERENTIATING LARGE, LOW-INCOME, AND LARGE AND LOW-INCOME PUBLIC HOUSING PROJECTS

	Large PH interactions (1)	Low income PH interactions (2)	Large and low income PH interactions (3)
HCV Housing	0.047	0.047	0.047
	(0.01)	(0.01)	(0.01)
HCV Housing*Male	-0.021	-0.021	-0.021
	(0.008)	(0.008)	(0.008)
Public Housing	0.048	0.056	0.048
	(0.016)	(0.016)	(0.019)
Public Housing*Male	0.017	-0.008	0.009
	(0.013)	(0.013)	(0.016)
Public Housing*Large Public Housing	0.049		0.032
	(0.038)		(0.047)
Public Housing*Large Public Housing*Male	-0.026		-0.035
	(0.045)		(0.055)
Public Housing*Low Income PH		0.029	0.008
		(0.034)	(0.042)
Public Housing*Low Income PH*Male		0.028	0.011
		(0.044)	(0.053)
Public Housing*Large*Low Income PH			0.038
			(0.081)
Public Housing*Large*Low Income PH*Male			0.052
			(0.106)
Observations	1,172,000	1,172,000	1,172,000
Demographic controls	yes	yes	yes
Household Fixed Effects	yes	yes	yes

Notes:
HCV is Housing Choice Voucher-assisted housing; PH is public housing. Each column displays household fixed effects estimates of the impact of years spent in public or HCV-assisted housing on the inverse hyperbolic sine (IHS) of earnings at age 26 after adding interactions between the public housing participation measures and indicators for whether the individual ever resided in a large public housing project (Column 1), a low income public housing project (Column 2), or both the large and low income indicators as well as the triple interaction for projects that are both large and low income (Column 3). Large public housing projects are defined as those in the top quartile of total residents in 1997, low income public housing projects are those in the bottom quartile of person-weighted median household income between the 1997 and 2005 study period. All columns include controls for male by age and male by household race/ethnicity fixed effects. Race and ethnicity is assigned at the household level using information from the 2000 Census. Standard errors are clustered at the household level and shown beneath each estimate in parentheses. Sample includes individuals aged 13-18 in 2000 and from a household below 50% area median income in non-owner occupied housing in 2000. Based on authors' calculations from matched 2000 Census, HUD-PIC, and LEHD files. Number of observations rounded to the nearest thousand.

TABLE B12—HETEROGENEITY BY MSA AFFORDABILITY AND HOUSEHOLD MEAN PARTICIPATION

	Interaction with:	
	Mean household program participation	MSA median rent to AMI
	(1)	(2)
HCV Housing	0.003	0.047
	(0.022)	(0.010)
HCV Housing*Male	-0.035	-0.020
	(0.025)	(0.008)
Public Housing	0.051	0.060
	(0.032)	(0.014)
Public Housing*Male	0.022	0.000
	(0.037)	(0.011)
HCV Housing*HH mean participation	0.020	
	(0.008)	
HCV Housing*HH mean participation*Male	0.008	
	(0.006)	
Public Housing*HH mean participation	0.004	
	(0.011)	
Public Housing*HH mean participation*Male	-0.01	
	(0.008)	
HCV Housing*Rent to AMI		-0.027
		(0.176)
HCV Housing*Rent to AMI*Male		0.256
		(0.138)
Public Housing*Rent to AMI		-0.251
		(0.214)
Public Housing*Rent to AMI*Male		-0.016
		(0.161)

Notes:
HCV is Housing Choice Voucher-assisted housing; AMI is area median income; MSA is metropolitan statistical area. Table displays household fixed effects estimates of the impact of additional years spent in public or HCV-assisted housing on the inverse hyperbolic sine (IHS) of earnings at age 26. Column 1 allows for the effect of additional years in each program to vary with the mean participation in each program at the household level while Column 2 allows for the effect to vary with a measure of housing affordability at the MSA level by interacting the measures of assisted housing participation with the ratio of median rent to median AMI in 2000 for a four-person household in a two-bedroom home. The housing affordability measure is de-meaned for the sample prior to interacting it with the measures of assisted housing participation. All columns include controls for male by age and male by household race/ethnicity fixed effects. Race and ethnicity is assigned at the household level using information from the 2000 Census. Standard errors are clustered at the household level and shown beneath each estimate in parentheses. Main sample includes individuals aged 13-18 in 2000 and from a household below 50% area median income in non-owner occupied housing in 2000. Based on authors' calculations from matched 2000 Census, HUD-PIC, and LEHD files. Number of observations rounded to the nearest thousand.

TABLE B13—HETEROGENEITY BY HOUSEHOLD SIZE

	Two-child households (1)	Number of HH members aged 13-18 in 2000 (2)
HCV Housing	0.048	0.049
	(0.012)	(0.012)
HCV Housing*Male	-0.015	-0.012
	(0.01)	(0.01)
Public Housing	0.068	0.066
	(0.017)	(0.017)
Public Housing*Male	0.009	0.014
	(0.017)	(0.014)
HCV housing*3 Teen HH		-0.006
		(0.022)
HCV housing*3 Teen HH*Male		0.006
		(0.034)
HCV housing*4 Teen HH		-0.019
		(0.018)
HCV housing*4 Teen HH*Male		-0.050
		(0.028)
Public housing*3 Teen HH		-0.018
		(0.031)
Public housing*3 Teen HH*Male		0.009
		(0.046)
Public housing*4 Teen HH		-0.021
		(0.024)
Public housing*4 Teen HH*Male		-0.122
		(0.037)

Notes:
HCV is Housing Choice Voucher-assisted housing; PH is public housing; HH is household; 3 Teen HH and 4 teen HH are indicators for whether the household had 3 or 4 or more members between the ages of 13 and 18 in 2000. Table displays household fixed effects estimates of the impact of additional years spent in public or HCV-assisted housing on the inverse hyperbolic sine (IHS) of earnings at age 26. Column 1 restricts the sample to households with exactly two 13-18-year-olds in the year 2000. Column 2 uses the full empirical sample but adds interactions between indicators for whether the household had three or four 13-18-year-olds in 2000 (with two the omitted category), the assisted housing participation measures, and the male indicator. Households with more than four 13-18-year-olds in 2000 are grouped together in in the four-child category. All columns include controls for male by age and male by household race/ethnicity fixed effects. Race and ethnicity is assigned at the household level using information from the 2000 Census. Standard errors are clustered at the household level and shown beneath each estimate in parentheses. Main sample includes individuals aged 13-18 in 2000 and from a household below 50% area median income in non-owner occupied housing in 2000. Based on authors' calculations from matched 2000 Census, HUD-PIC, and LEHD files. Number of observations rounded to the nearest thousand.

TABLE B14—HETEROGENEITY BY METRO AREA SIZE

	By metro area size			
	Large	Not large	Small	Non-metro
	(1)	(2)	(3)	(4)
HCV housing	0.040	0.051	0.053	0.042
	(0.019)	(0.011)	(0.013)	(0.023)
HCV housing*Male	-0.022	-0.021	-0.027	0.011
	(0.014)	(0.009)	(0.011)	(0.019)
Public housing	0.051	0.062	0.049	0.099
	(0.027)	(0.016)	(0.018)	(0.03)
Public housing*Male	-0.033	0.011	0.022	-0.026
	(0.02)	(0.013)	(0.015)	(0.025)
Observations	340,000	832,000	600,000	232,000
Demographic controls	yes	yes	yes	yes
Household Fixed Effects	yes	yes	yes	yes

Notes: HCV is Housing Choice Voucher-assisted housing. The table displays household fixed effects estimates of the impact of additional years spent in public or HCV-assisted housing on the inverse hyperbolic sine (IHS) of earnings at age 26, estimated separately by the size of the 2000 place of residence. Column 1 displays estimates for households in large metro areas, or metropolitan statistical areas (MSAs) or primary metropolitan statistical areas (PMSAs) with populations greater than 2.5 million in 2000. Column 2 does the same for all other areas (Not large). Column 3 shows the estimates for households in small metro areas (those with populations less than 2.5 million in 2000), and Column 4 shows the estimates for households from non-metro areas. All specifications include controls for male by age and male by household race/ethnicity fixed effects. Race and ethnicity is assigned at the household level using information from the 2000 Census. Standard errors are clustered at the household level and shown beneath each estimate in parentheses. Sample includes individuals aged 13-18 in 2000 and from a household below 50% area median income in non-owner occupied housing in 2000. Based on authors' calculations from matched 2000 Census, HUD-PIC, and LEHD files. Number of observations rounded to the nearest thousand.

TABLE B15—ASSISTED HOUSING AND NEIGHBORHOOD CHARACTERISTICS IN ADOLESCENCE

	Public housing		HCV housing		Mean dep.
	Females	Males	Females	Males	variable
	(1)	(2)	(3)	(4)	(5)
Crime index	0.000	-0.001	-0.004	-0.003	4.489
	(0.001)	(0.001)	(0.001)	(0.001)	
Black non-Hispanic Dissimilarity	0.028	0.021	-0.006	0.001	51.94
	(0.011)	(0.012)	(0.008)	(0.008)	
Gini income inequality	0.027	0.028	0.005	0.006	45.40
	(0.003)	(0.003)	(0.002)	(0.002)	
OI intergenerational mobility	-0.034	-0.033	0.002	0.005	43.10
	(0.004)	(0.004)	(0.003)	(0.003)	
Unemployment	0.113	0.120	-0.011	-0.010	8.438
	(0.008)	(0.008)	(0.004)	(0.004)	
Poverty	0.308	0.319	-0.010	-0.010	18.69
	(0.017)	(0.017)	(0.009)	(0.009)	
Median household income	-222.000	-230.100	-14.300	-12.330	37,000
	(14.550)	(14.720)	(9.548)	(9.637)	
School proficiency index	-0.030	-0.037	-0.057	-0.059	40.65
	(0.022)	(0.022)	(0.015)	(0.016)	
Job accessibility index	0.082	0.058	-0.011	-0.018	49.99
	(0.020)	(0.020)	(0.013)	(0.013)	

Notes:
HCV is Housing Choice Voucher-assisted housing. Table displays estimates of the association between years spent in public or HCV-assisted housing and average neighborhood or county-level characteristics between the ages of 13 and 18. Column 1 presents the estimated association and standard error for females from additional years of public housing participation, Column 2 does the same for males. Column 3 presents the estimated association and standard error for females from additional years of HCV-assisted housing, and Column 4 does the same for males. All columns and rows are based on household fixed effects estimates run on the full empirical sample of 1,172,000. The crime index is calculated as the sum of murders, rapes, robberies, and assaults in a county in 2000 from the uniform crime reporting program, per 1,000 residents; the Black non-Hispanic dissimilarity index is a county-level measure of the proportion of Black non-Hispanic residents (or White non-Hispanic residents) who would need to have moved in 2000 in order for the distribution of Black and White non-Hispanics to be uniform across census tracts in the county; Gini coefficient is the county-level Gini coefficient of income inquality from 2000; The OI intergenerational mobility is the tract level mean percentile of individual income between 2014-2015 for children from households with parents at the 25th percentile of the national income distribution; unemployment is the tract unemployment rate (scaled to be between 0-100) in 2000; poverty is the tract poverty rate (scaled to be between 0-100) in 2000; median household income is the tract-level median household income in 2000; the school quality index is a HUD-produced measure of the percentile rank (within-state) of school quaity in a census tract based on the share of 4th grade students proficient in math and reading for up to 3 schools within 3 miles of a block group centroid, and adjusted for the prevalence of economic disadvantage among the student population; the job accessibity index is a HUD-produced estimate of the accessibility of jobs for a census tract. The index is based on a distance-weighted gravity model of the number of jobs scaled by the number of competing searchers, percentile-weighted at the CBSA-level. Years spent in public housing and years spent in HCV-assisted housing are counts of the number of years each individual was observed in the two programs between ages 13 and 18, which can take on values between 0 and 6. The assisted housing participation measures are interacted with whether the individual is male to allow the impacts to vary by sex. The estimates and standard errors shown for males are based on tests of whether the main effect and the male interaction are equal to zero. All columns include controls for male by age and male by household race fixed effects. Race and ethnicity is assigned at the household level using information from the 2000 Census. The sample includes individuals aged 13-18 in 2000 from households below 50% area median income in non-owner occupied housing.Standard errors are clustered at the household level and shown beneath each estimate in parentheses. Based on authors' calculations from matched 2000 Census, HUD-PIC, and LEHD files.

For Online Publication

APPENDIX C. ROBUSTNESS AND HETEROGENEITY: ADDITIONAL EVIDENCE

C.1 Adding Longitudinal Controls for Parents' Earnings and Block Group Poverty

Our HFE approach, while addressing several sources of bias that are problematic for OLS estimates, is still vulnerable to two types of potentially confounding variation: unobserved time-varying household-level heterogeneity and unobserved child-level characteristics that vary between siblings. If either of these are correlated with both 13-18-year-old subsidized housing participation and subsequent adult outcomes, they could bias treatment effects estimated through HFE specifications. We confirm that our main results are robust to a series of checks testing the relevance of these two potential sources of bias.

The comprehensive and longitudinal earnings data permit us to control for the most likely source of unobserved time-varying household heterogeneity—changes in the economic circumstances of the household that may vary across siblings, thereby affecting household eligibility for public and HCV-assisted housing and directly impacting potential adult outcomes for the children in the household. The third, fourth, and fifth columns in Table B7 present results from HFE specifications that, in addition to the controls in column 2, also include controls for the average total annual parents' earnings that each individual experienced between 13 and 18 and its interaction with a male dummy variable (in column 3), a control for average block group percent poverty that each child experienced between 13 and 18 years of age and its interaction with a male dummy (in column 4), and controls for both parents' earnings and block group poverty and their interactions with a male dummy (column 5).

We interpret the estimates in column 3 as a first test of whether our household fixed effects are effectively ridding the treatment effects of bias from unobserved, time-varying heterogeneity. Specifically, if our treatment effects do not change with the inclusion of average parents' earnings, then either the within-household differences in subsidized housing participation or the within-household differences in adult earnings (or both) are unrelated to within-household differences in parents' earnings. We find that the sibling who experiences higher average parental income has significantly higher earnings at age 26. However, controlling for changes in the household's economic circumstances yields essentially no change on the impact of either subsidized housing program—the subsidized housing coefficients in Columns 2 and 3 are nearly identical. This suggests that the HFE estimates are unlikely to be biased by time-

varying household level shocks, which themselves are likely to be strongly correlated with total parents' earnings.

Column 4 adds controls for differences in block group poverty across siblings. For females, block group poverty has a negative relationship with age 26 earnings, while for males the effect is not statistically different from zero. However, as with parents' earnings, adding block group poverty has no impact on the estimated effect of subsidized housing. Consider what this implies for the potential mechanism linking subsidized housing residence to changes in adult earnings. For HCV-assisted housing, where households are in principle able to move to lower poverty neighborhoods by using their HCV, the Column 4 results suggest that either HCV households do not typically move to substantially lower poverty neighborhoods, or that these moves to lower poverty neighborhoods do not generate earnings benefits for the children who reside in them for longer durations. Given the dense literature on the long-term effects of growing up in better neighborhoods (Aaronson 1998; Kling et al. 2005; Ludwig et al. 2012, 2013; Chetty et al. 2014; Chetty and Hendren 2015; Chetty et al. 2015, 2016) and related work by Collinson and Ganong (2016) which shows that inducing voucher recipients to move into better neighborhoods is difficult, the former explanation is more plausible: without additional incentives or assistance to help them move to lower poverty neighborhoods, many HCV recipients may remain in neighborhoods similar to where they lived prior to receiving their housing voucher.

Column 5 of Table B7 adds both time-varying within-household controls. Again, the main effects of these longitudinal controls indicate that block group poverty and parents' earnings are predictive of adult earnings, but their inclusion causes no change in the estimated effects of subsidized housing.[1]

C.2 Likely sign of bias from time-varying heterogeneity

While we believe the parents' earnings controls are a good proxy for most of the time-varying economic shocks that could generate bias, we recognize that they are an imperfect proxy; thus, the lack of movement in the treatment effects when we control for parents' earnings is not sufficient to rule out either possible source of bias. We therefore undertake several

[1] In results available upon request, we also follow the recommendations in Pei et al. (2017) and include the parents' earnings measure and the block group poverty measure as dependent variables in our main HFE specifications. We estimate coefficients below 0.005 (in absolute value)—less than one-tenth the size of the main results—for all household race/ethnicities and sexes, for both public housing and HCVs. This provides further evidence that the changes in teenage assisted housing participation are, at most, weakly related to these longitudinal measures.

additional robustness checks to further assess the likelihood that our results are biased by either source of potentially unobserved variation.

Before turning to these additional robustness checks, it is worth briefly discussing the likely sign of any bias from time-varying household-level heterogeneity. To be eligible for public or HCV housing, housing authorities typically require that a household be "very low income" (below 50% of AMI). As a result, we should expect there to be a negative relationship between household income and eligibility for assisted housing. If longer exposure to depressed economic conditions also negatively impacts potential adult outcomes for children, there may also be a negative relationship between within-household differences in assisted housing participation and within-household differences in adult outcomes. This should bias treatment effects estimated through HFE specifications downwards as we would incorrectly attribute the negative effect of poor household economic conditions to an increased likelihood of being eligible for assisted housing. Many household-level shocks that would increase the likelihood a household participates in subsidized housing would be expected to worsen potential adult outcomes for children. Homelessness, divorce or separation, the death or incarceration of an adult household member, or the change in disability status of a household member could all increase eligibility (or decrease the required wait time) for assisted housing, but would also be expected to negatively impact adult outcomes for children with more exposure. We discuss some potential scenarios below.

C.3 Time-varying household-level heterogeneity

If households' entries into or exits from assisted housing are correlated with other changes—for example, economic shocks to the household or differences in parenting effort or effectiveness—then HFE specifications may incorrectly attribute the impacts of these factors to the within-household differences in 13-18-year-old assisted housing. While it seems unlikely that there are time-varying factors correlated with both potential outcomes and assisted housing participation, but not with the longitudinal measure of parents' earnings included as a control in Table B7, simply adding the measure as a control is not sufficient to completely rule out this possible source of bias. Below we therefore conduct several additional tests designed to judge whether time-varying household-level heterogeneity could be contaminating our estimates.

We begin by estimating an event study specification to measure the relationship between parents' earnings and changes in assisted housing participation. We collapse the data to the household-year level and generate four indicators for whether the household was observed

making a move out of public housing, a move into public housing, a move out of HCV-assisted housing, or a move into HCV-assisted housing in all years between 1997 and 2005. We include indicators denoting whether the household made each move type in all years between 7 years prior and 7 years later, with one year prior serving as the omitted category and six and seven years prior and six and seven years later grouped together.[2] We restrict the event study sample to households that made at least one move during the study period. Appendix Table A5 displays summary statistics for the household-level sample overall and the subsample used in the event study analysis.

Event study estimates are generated through OLS estimation of:

$$y_{ft} = \alpha_f + \alpha_t + \sum_{m \in M}\left(\sum_{s=t-6}^{t-2} \beta_{ms} 1\{m_{fs} = 1\} + \sum_{s=0}^{t+6} \beta_{ms} 1\{m_{fs} = 1\}\right) + X'_{ft}\phi + \epsilon_{ft} \quad (2)$$

where y_{ft} is the inverse hyperbolic sine of total parents' earnings for household f in year t, α_f is a household fixed effect, α_t is a year fixed effect, $1\{m_{fs} = 1\}$ is the indicator function denoting whether household f made a move of type $m \in M$ in year s where M is the set of possible moves described above and $s = t - 1$ is the omitted year (the year prior to when earnings are observed). X_{ft} includes a full set of state by year fixed effects, and indicators for the count of children in household f of each possible age (between 10 and 23) in year t, and ϵ_{ft} is an error term clustered at the household level. Identification of the coefficients of interest (β_{ms}) is therefore driven by variation in the timing of each move type.

Figure B2 displays the point estimates and 95% confidence intervals for the estimates on each of the move indicators.[3] For public housing there are no strong pre-move trends in parents' earnings relative to the year prior to a move, particularly for moves out of public housing where none of the coefficients are distinguishable from zero. The point estimates for 2 and 3 years prior to a move into public housing are positive and different from zero but the pattern of pre-move earnings is not consistent. Nevertheless, we discuss potential implications below. Pre-move parents' earnings display a more noticeable pattern prior to moves for HCV-assisted housing. The coefficients are positive prior to moves into HCV housing and negative prior to moves out

[2] We classify a household as having moved out of an assisted housing program if at least one member is observed in the program in the previous year and no members are observed in the program in the current year. Similarly, a household is classified as having moved in if no member was in the program in the year prior and at least one member is in the program in the current year.

[3] We do not find evidence of higher earnings for parents after a move into or before a move out of assisted housing.

of HCV housing. The pre-move patterns suggest there may be negative time-varying selection into assisted housing, which could bias HFE estimates downwards.

To gauge the potential importance of these differences we conduct back-of-the-envelope calculations using the event study coefficients and estimates of the long-term impact of family income in childhood on adult income from research on the earned income tax credit (EITC) (Bastian and Michelmore 2018). We convert the quasi-experimental estimate of an additional $1,000 in annual 13 to 18-year-old parents' income from EITC on subsequent earnings measured between ages 22 and 27 in Bastian and Michelmore (2018) into an elasticity; this allows us to predict how the event study results are likely to affect future earnings for the sample based on plausibly exogenous variation in parents' income over the same age range for a low-income population. For a household with two children, we identify every combination of move year, move type (into or out of public or HCV-assisted housing), and child ages that results in a within-household difference in assisted housing participation. We then calculate the average difference in 13 to 18-year-old parents' earnings based on the event study coefficients for the relevant move type, multiply this difference by the EITC-based elasticity of child income with respect to family income between the ages of 13 and 18 (0.088), and scale the resulting number by the difference in years of assisted housing participation for the scenario being considered. The distribution of potential bias for each move type are shown in Appendix Figure B3. The results suggest that the main estimates are likely to be underestimated by no more than 0.0048 (for moves into HCV-assisted housing). The main HCV estimates would at most increase from 0.027 to 0.032 for males and from 0.047 to 0.052 for females; public housing estimates would at most increase from 0.059 to 0.063 for males and from 0.06 to 0.064 for females.

Non-economic time-varying household factors could also generate bias in the HFE estimates. For example, changes in parental effort at home—for example, exerting additional effort towards housing search or applying to government programs—could improve potential outcomes for children; this type of unobserved change, whereby parents "get their act together" in multiple ways simultaneously, would lead to positively biased estimates for households that move into assisted housing during the study period. Conversely, if households are removed from assisted housing for disciplinary reasons[4] and the behaviors that lead to the punishment independently affect child well-being, we would incorrectly attribute this to the changes in

[4] Among other reasons, HUD regulations enable tenancy to be terminated for criminal activity, illegal drug use, alcohol abuse, fleeing prosecution, custody or confinement, or violating a condition of probation or parole.

assisted housing participation. This would lead to positively biased estimates for households that move out of assisted housing during the study period. In both cases, we should expect to find a difference in the treatment effects between households that move into and households that move out of assisted housing. If both biases are important, we would still estimate a difference in the treatment effects for entries and exits as long as these biases are not exactly equal in magnitude.

To assess whether these potential confounders are important, we therefore estimate HFE specifications that include an interaction between the assisted housing measures (and the male interaction) and an indicator for whether each household was in assisted housing in 1997, the first year of data. Households with a between-sibling difference in assisted housing that participated in 1997 are likely to have moved out while those that did not participate in 1997 are likely to have moved in during the study period. Column 2 of Table 5 presents the results. For neither public nor HCV-assisted housing are any of the interactions significantly different from zero. Additionally, the main (non-interacted) coefficients are unchanged in magnitude, despite the inclusion of the interaction terms.

Though it remains theoretically possible that these potential sources of bias could both exist even with the results shown in Table 5, it would need to be the case that they generate exactly the same amount of positive bias in the treatment effects for households that move into assisted housing as they do for households that move out of assisted housing. Moreover, both confounders would also need to be orthogonal to the time-varying measures of parents' earnings we include as a control in the HFE specifications since the main results are robust to the inclusion or exclusion of this control. Given results presented below on the robustness of the results to areas with different waiting times, they would also need to be unaffected by whether parents are able to quickly move their family into assisted housing. It is unlikely that there exist biases that satisfy all of these conditions simultaneously, suggesting that changes in parental effort or behavior-related evictions from assisted housing are not driving the results.

As pointed out by Jacob and Ludwig (2012) and others, subsidized housing programs are frequently oversubscribed, leading to lengthy lags between when households apply for a program and when they are allotted a voucher or public housing unit. Households that apply to an oversubscribed subsidized housing program may end up with children exposed to different amounts of the program purely because of their mandated wait time. Figure 3 indicates that about 12% of public housing residents and 29% of housing voucher recipients faced wait times of 1 year or more. In areas where households are quickly able to adjust their assisted housing

participation—those with shorter wait times—it is more likely that unobserved and time varying characteristics will be correlated with within-household differences in assisted housing participation. On the other hand, in areas with long average wait times, this association should be weaker because of the larger expected gap between when households apply to the programs (and therefore the change that induced them to apply) and when they enter the program. Testing for differences in treatment effects between areas with longer wait times and those with shorter wait times offers another way to assess whether unobserved time-varying household characteristics are likely to bias the HFE results.

In Table 5 we present estimates for two subsamples that differ by whether the household resided in a county in 2000 with average subsidized housing wait times of less than or greater than 9 months (approximately the median county-level wait time). The HFE estimates are similar to the main results in Table 2 for households in both low and high wait time areas. In no case can we reject the hypotheses that the estimated treatment effects are the same in the two samples, further supporting the idea that the main results are not driven by unobserved time-varying factors.

C.4 Unobserved individual-level heterogeneity

The second potential threat to our HFE empirical strategy is unobserved individual-level characteristics that are correlated with both within-household differences in 13-18-year-old assisted housing participation and within-household differences in potential adult outcomes. Though we view this as a less likely source of bias, we still conduct several exercises intended to rule it out as a possible confounder.

First, the main HFE specifications include flexible controls for almost all the individual-level characteristics available in the data. Specifically, a full set of age fixed effects, a full set of age by male fixed effects, a full set of male-by-household race fixed effects, and a male indicator are included as controls in each specification. We also estimate specifications that include birth order fixed effects; not surprisingly given the observed balance in household entrances and exits from public housing and the HCV program shown in Table A4, the point estimates when including birth order fixed effects are nearly identical to those from our preferred HFE specification.

Another potentially confounding unobserved characteristic we do not discuss is between-sibling differences in pre-teen exposure to subsidized housing. While data limitations prevent us from controlling for precise measures of the amount of pre-teenage exposure, we confirm that

our main results are robust to controlling for whether the household was in subsidized housing as of the beginning of the sample period (discussed earlier in this section). Concerns of such omitted variable bias is also mitigated in that it is not immediately obvious that we should expect *differences* in teenage exposure to subsidized housing across siblings to be systematically correlated with differences in pre-teenage exposure to subsidized housing, since the expected sign of the correlation largely depends on whether older or younger siblings have more teenage exposures. If so, there is no reason to expect bias in the parameter estimates for teenage exposure even if pre-teenage exposure is omitted from the exposure.

Appendix D. MTW Counties Dropped from Analysis Data

Tulare (California), Kent (Delaware), Sussex (Delaware), Cook (Illinois), DeKalb (Illinois), DuPage (Illinois), Grundy (Illinois), Kane (Illinois), Kendall (Illinois), Lake (Illinois), McHenry (Illinois), Will (Illinois), Middlesex (Massachusetts), Blaine (Nebraska), Cheshire (New Hampshire), Burlington (New Jersey), Camden (New Jersey), Gloucester (New Jersey), Salem (New Jersey), Alamance (North Carolina), Davidson (North Carolina), Davie (North Carolina), Forsyth (North Carolina), Guilford (North Carolina), Randolph (North Carolina), Stokes (North Carolina), Yadkin (North Carolina), Portage (Ohio), Clackamas (Oregon), Columbia (Oregon), Multnomah (Oregon), Washington (Oregon), Yamhill (Oregon), Bucks (Pennsylvania), Chester (Pennsylvania), Delaware (Pennsylvania), Montgomery (Pennsylvania), Philadelphia (Pennsylvania), Clark (Washington), Island (Washington), King (Washington), Snohomish (Washington)

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APPENDIX E. DETAILS ON COMPARISON OF RESULTS TO LITERATURE

In this appendix we provide details for the calculations underlying the comparison of the HFE estimates to those in the existing literature shown in Table 8 and discussed in Section VIII.

The core building blocks for our comparison to other estimates are the estimated treatment effects (in 2000 US$) shown in Appendix Table B1. In each cell the table displays the expected increase in age 26 earnings from an additional year of public or HCV-assisted housing, calculated separately for males and females and by household race/ethnicity. All effects are calculated at the mean individual earnings at age 26 for the full sample. We also directly calculate the expected difference in age 26 earnings from an additional year of HCV-assisted housing relative to an additional year of public housing for every possible gender by household race/ethnicity cell.

Chetty, Hendren, and Katz 2016

Children in the MTO experiment all resided in public housing projects in high poverty census tracts in one of five cities (Baltimore, Boston, Chicago, Los Angeles, and New York City) at the time of randomization. Those randomly assigned to the Section 8 or experimental treatment groups were offered HCVs. Children were followed into adulthood and matched to their W-2-based earnings at age 26 in Chetty, Hendren, and Katz (henceforth CHK). As mentioned in the text, given that our empirical sample are between the ages of 13-18, we focus on the results for children aged 13-18 at random assignment.

1. Average across the experimental and S8 treatment effects displayed in Column 5 of Table 3 in CHK (-539 for the experimental arm and -15.11 for the S8 arm) with the share of the treated observations in each arm, taken from Table 1 of CHK for individuals matched to UI data, used to weight the treatment group-specific effects (959 children in the experimental group and 686 in the S8 group). The implied ITT effect is -320.394.
2. Convert this to a per-year effect, by scaling by the expected difference in 13-18-year-old participation driven by the program, 1.81 years. This is computed as the take-up gap (again weighted by the share of observations matched to UI data in the experimental and S8 arms) multiplied by 19 minus the average age at randomization for the older sample (15.1 years). The resulting per-year estimate is -177.19 (in 2012 US$)

3. Converted this to 2000 US$ using the consumer price index for all urban consumers (CPI-U). This yields an estimate in 2000 US$ of -132.9 for an additional year spent in HCV-assisted housing relative to public housing.
4. To get the corresponding figure from our results in Table B1, calculate the difference between the HCV and public housing estimates for men and women that are Black non-Hispanic, Hispanic, and White non-Hispanic separately and use the overall share of the W-2 sample in CHK that are male (0.503) to combine the effects across genders. This assumes that the same gender mix exists for each race/ethnicity group.
5. Calculate the weighted mean of the household race/ethnicity-specific differences, using the share of the CHK sample that was Black non-Hispanic (0.67), Hispanic (0.29), and White non-Hispanic (0.04) as weights. The result, -164.8 (in 2000 US$) appears in the last column of the CHK section of Table 8.

Sanbonmatsu et al. (2015)

Sanbonmatsu et al. (henceforth Sanbonmatsu) also rely on the MTO experiment. They do not show results that disaggregate using the same age categories, but they do show results separately for females and males. We rely on their estimates for the "grown child sample," those under 18 at baseline who were over age 20 in 2007. The children in Sanbonmatsu are, on average, 12.7 years of age at baseline. In addition to showing results that pool across males and females, we show gender-specific results as well.

1. Average across the TOT experimental versus control and section 8 versus control effects from Exhibit 5.8 using the share of observations in each treatment arm that match to unemployment insurance records as weights (1,887 in the experimental arm and 1,336 in the S8 arm) yielding a female TOT effect of 628.04, a male TOT effect of -3,166.47, and a pooled TOT effect of 1,567.75, all in 2009 US$.
2. Divide the TOT effects by the expected difference in years of participation at ages 18 and under (6.3) to get per year estimates in 2009 US$.
3. Convert the per-year estimates of the adult income-based benefit of time spent in HCV-housing relative to public housing into 2000 US$, giving estimates of 80.02 (for female), -403.43 (for males), and -199.74 (pooling across males and females).
4. Calculate the weighted mean of the household race/ethnicity-specific differences from our estimates in Table B1 for males, females, and pooling across genders, using the share of the Sanbonmatsu sample that was Black non-Hispanic (0.614), Hispanic (0.31), and White non-

Hispanic (0.076) as weights. The results, -83.34 (for females), -261.53 (for males), and -173.86 (pooling across genders) appear in the last column of the Sanbonmatsu section of Table 8.

Jacob, Kapustin, and Ludwig (2015)

Jacob, Kapustin, and Ludwig (henceforth JKL) focus on variation generated by the Chicago Housing Choice Voucher lottery for households who were in unsubsidized housing at the time of the randomization. While their primary focus is on schooling, health, and criminal behavior, they also show results for early adult labor market outcomes in the main text and the online appendix. Relative to the MTO-based studies discussed above, JKL differs in that it provides a comparison between HCV-assisted housing and unsubsidized housing, rather than HCV-assisted housing and public housing. We focus on the estimates for 6 to 18-year-olds at the time of their baseline survey. To facilitate the comparison, we make the assumption that the mean age for the sample is the midpoint of the age range (12). This implies 7 years of potential exposure to HCV-assisted housing for treated children in households who took up the program (~0.48 of the treatment group).

1. JKL provide IV estimates of the HCV-lottery on adult earnings (in 2013 US$) for males (91.73) and females (-145.43).
2. Because the IV estimates are already adjusted for differences in program take-up, to get per-year estimates, divide by the average number of years the program could have increased HCV-assisted housing (7 given the assumptions about the age distribution). This results in per-year estimates (in 2013 US$) of 13.10 for males and -20.78 for females.
3. Convert to 2000 US$ using the CPI-U yields per-year estimates of 9.69 for males and -15.36 for females.
4. Calculate the weighted mean of the household race/ethnicity-specific differences from our estimates in Table B1 for males and females, using the share of the JKL sample that was Black non-Hispanic (0.942), Hispanic (0.035), and White non-Hispanic (0.023) as weights. The results, 657.11 (for females) and 301.59 (for males) are shown in the last column of the JKL section of Table 8.

Chyn (2018)

Chyn (2018) estimates the long-run impacts of exposure to public housing project demolitions in disadvantaged neighborhoods on the future adult outcomes for resident

children. In Table 6 of the paper, Chyn shows 2SLS estimates of the impact of an additional year in public housing, relative to time spent in other housing situations, on earnings as an adult for children aged 7-18 at baseline. We assume that other housing situations are HCV-assisted housing as we have no information on the exposure to HCV-assisted housing for the sample, but descriptively Chyn (2018) reports that displaced households were provided with vouchers in lieu of their public housing unit.

1. The point estimate from the 2SLS specification in Chyn suggests that, relative to time spent in HCV-assisted housing, each additional year of public housing reduces annual earnings by 277.36 (in 2012 US$).
2. Convert this to 2000 US$ using the CPI-U to get a per-year impact of public housing of 208.03.
3. Identify the Black non-Hispanic differences (in this case PH-HCV) from our estimates in Table B1 for males and females (earlier data for the same sample (Jacob 2004) suggests the households are entirely Black non-Hispanic).
4. Use the reported share of the sample that is male (~0.485) as weights to calculate the overall, pooled difference from an additional year of public housing relative to HCV-assisted housing. The result, -83.83 is shown in the last column of the Chyn section of Table 8.