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CHILDHOOD HOUSING AND ADULT EARNINGS:
A BETWEEN-SIBLINGS ANALYSIS OF HOUSING VOUCHERS AND PUBLIC HOUSING

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Childhood Housing and Adult Earnings: A Between-Siblings Analysis of Housing Vouchers and Public Housing
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ABSTRACT

We create a national-level longitudinal data set to analyze how children's participation in public and voucher-assisted housing affects age 26 earnings and adult incarceration. Naïve OLS estimates suggest that returns to subsidized housing participation are negative, but that relationship is driven by household selection into assisted housing. Household fixed-effects estimates indicate that additional years of public housing and voucher-assisted housing increase adult earnings by 4.9% and 4.7% for females and 5.1% and 2.6% for males, respectively. Childhood participation in assisted housing also reduces the likelihood of adult incarceration for males and females from all household race/ethnicity groups.

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1. Introduction

Over the last several decades, millions of children lived in Housing Choice Voucher (HCV)-supported or public housing, two of the largest subsidized housing programs run by the U.S. Department of Housing and Urban Development (HUD).[1] For these children, residential location, neighborhood amenities, peer composition, and the availability of household resources were shaped by their households' participation in subsidized housing. Given the mounting body of evidence that early characteristics and experiences can have lasting consequences for a range of adult outcomes (Aaronson 1998; Almond and Mazumder 2005; Black et al. 2007; Almond et al. 2009; Akee et al. 2010; Chetty and Hendren 2017), exposure to HCV-supported or public housing early in life could potentially have important implications for adult well-being. Yet, research on the long-term economic effects of assisted housing for resident children has been hampered by data and methodological limitations.

Though assisted housing programs in the United States have existed since the 1930s, researchers have only recently found convincing strategies to deal with the non-random selection of households into subsidized housing. A series of evaluations of HUD's Moving to Opportunity (MTO) program and research using administrative records from Chicago together with experimental and quasi-experimental variation in participation provide the most convincing evidence on the impacts of subsidized housing (Jacob 2004; Kling et al. 2005; Jacob and Ludwig 2012; Ludwig et al. 2012, 2013; Jacob et al. 2013, 2015; Chetty et al. 2016; Chyn 2016).[2] With the exception of Chetty et al. and Chyn, these papers identify, at most, modest differences in short- and long-term such as physical and mental health, criminal behavior, and adult labor market outcomes.[3]

However, much of this research estimates differences between the outcomes of children from households in project-based subsidized housing and the outcomes of children from households that received tenant-based housing vouchers, and thus does not permit inference

[1] We focus on the cohort of children who were 13-18 in 2000 with participation in either public housing or HCV housing in the 1997-2005 period. In 2000, there were approximately 3 million children under 18 in public housing or HCV-assisted housing.

[2] Earlier work estimates the effect of either public housing or HCV-assisted housing on short- and long-term outcomes by employing instrumental variables strategies (Currie and Yelowitz 2000; Newman and Harkness 2000) or propensity score matching (Carlson et al. 2012a, 2012b).

[3] Chetty et al. (2016) link MTO data to administrative tax records on college attendance, earnings, and adult residential locations. They find that voucher recipients who had agreed to move to considerably lower poverty neighborhoods, on average, live in better neighborhoods, are more likely to have attended some college, and have higher earnings as adults, but only if the MTO-driven moves occurred prior to age 13.

about the effects of assisted housing programs relative to unsubsidized housing. Notable exceptions are the papers examining the Chicago HCV lottery, which use data from one city and compare HCV-assisted housing with unsubsidized housing.[4]

While the MTO and Chicago HCV lottery papers arguably identify internally valid estimates, their limited geographic coverage along with MTO's experiment-specific features (households in the experimental group were required to move to low poverty census tracts and they received counseling support to help them find an apartment and adapt to their new circumstances) threaten the external validity of the results.[5] Public and HCV-assisted housing opportunities are not uniform across housing authorities (HAs), they vary considerably with respect to structure type, physical proximity to amenities, ease of availability (i.e., waitlist times and area median income thresholds), tightness of the rental housing market, access to lower poverty neighborhoods, and characteristics of participating households. Furthermore, while the five metropolitan areas included in the MTO experiment[6] account for an important share of assisted housing participants, the households residing in public or HCV-assisted housing in these cities are observably different from public and HCV-assisted housing participants in the United States as a whole.[7]

In this paper, we estimate the long-term effects of teenage participation in HCV-supported and public housing on adult earnings and incarceration. To do so, we develop a national dataset that combines 2000 and 2010 Census information with comprehensive longitudinal administrative data on housing assistance, residential location, and earnings. The integrated data permit us to identify nearly the universe of youths aged 13-18 in 2000, and to observe demographic information, household structure, housing assistance, neighborhood

[4] See Jacob and Ludwig (2012), Jacob et al. (2015), and Chyn (2016). These papers use administrative data from the city of Chicago along with a HCV lottery to compare tenant-based housing vouchers to unsubsidized housing. The first paper tests for effects on adult labor supply, the second explores how long-term health, schooling, and criminal behavior are affected, and the third examines long-term labor market outcomes.

[5] Chyn (2016) raises another generalizability related concern with MTO and the Chicago HCV lottery: because all participating households had to apply for the program, the returns they experience may not be representative of the expected return to HCV housing for eligible households. He presents results that indicate that households who elected to participate in the lottery may be negatively selected on the expected return to HCV housing.

[6] The five PHAs included in the MTO experiment are Baltimore, Boston, Chicago, Los Angeles, and New York City.

[7] See columns 1 and 3 of Appendix Tables A2 and A3 which displays summary statistics for households participating in public and HCV-assisted housing in all housing authorities, in housing authorities that participated in the MTO experiment, and in housing authorities that did not participate in the MTO experiment. Relative to the full set of public and HCV-assisted housing participants in the United States, households participating in MTO housing authorities are more likely to be Black non-Hispanic, face substantially longer waitlist times, and reside in neighborhoods with higher poverty rates (for public housing).

characteristics, and parents' earnings over their teenage years. The longitudinal nature of the data enables us to follow these teenagers into adulthood, where we observe their quarterly labor market earnings and whether they are incarcerated in April 2010. To our knowledge, this is the first paper to estimate the long-term economic effects of both public and HCV-supported housing for a large nationally representative sample. We contrast the impacts of both programs with each other as well as with unsubsidized housing.

We employ a household fixed-effects (HFE) specification that exploits variation in children's exposure to HCV-supported and public housing participation within households. Exposure differences are largely a product of household moves into and out of housing combined with sibling age differences and the teenagers aging out of the household at different times. This between-siblings approach allows us to isolate the effect of each type of subsidized housing on adult outcomes from observed and unobserved household-level heterogeneity that may affect both program participation and adult outcomes. We observe cross-sibling differences in participation for about 282,000 teenagers, or 24% of the full sample of 1.172 million. These differences in participation are generated by roughly equal numbers of household entries and exits from each program and we therefore observe roughly equal numbers of older siblings and younger siblings with more subsidized housing participation.

Our results confirm that selection into subsidized housing matters. Whereas Ordinary Least Squares (OLS) estimates indicate a substantial negative effect of housing subsidies when young on later adult earnings, the HFE estimates are generally positive and statistically significant. For females we find that each additional year spent in public housing as a teenager generates a 4.9% premium for young adult earnings. The corresponding estimate for HCV-assisted housing is 4.7% per year of participation. For males, the estimates are 5.1% and 2.6% for public and HCV-assisted housing, respectively. We find the largest impacts on earnings for females from non-Hispanic Black households in HCV-assisted housing and for females from Hispanic households in public housing, who earn an additional 7.0% and 7.1% from additional years of teenage assisted housing participation. Translating the primary effects on age 26 earnings into expected changes in lifetime earnings suggests that each additional year of teenage public housing participation increases total discounted lifetime pre-tax earnings by $45,400 for females and $47,300 for males, while each additional year of teenage HCV-assisted housing increases total discounted lifetime pre-tax earnings by $43,600 for females and $24,100 for males.[8]

The results for 2010 incarceration closely follow our earnings estimates, both overall and for the sex by race/ethnicity subgroups. For teenagers from non-Hispanic Black households, each additional year of HCV-assisted housing reduces the likelihood of being incarcerated in April 2010 by 9.7% for males and 22.6% for females—evaluated at the mean incarceration rate for the overall sample—and they contrast sharply with the OLS estimates which suggest a positive association between subsidized housing participation and incarceration, especially for Black non-Hispanic males.[9] The estimates for public housing suggest similarly sized reductions in the likelihood of 2010 incarceration for children from Black non-Hispanic households: 9.7% for males and 19.4% for females.

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 teenage 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 main results are unaffected by the inclusion of controls for parents' earnings while children are teenagers, suggesting there is little relationship between within-household differences in teenage subsidized housing participation and parents' earnings.

To explore in more detail whether total parents' earnings differ from their typical level around the time of a move in or a move out of subsidized housing, we conduct an event study analysis. The results indicate that moves out of either program are not associated with meaningful changes in parents' earnings in the calendar year of a move or in the year prior; similarly, there is no significant change in parents' earnings in the year prior to a move into

[8] All dollar figures are in 2000 US$. The increase in the Consumer Price Index (CPI-U) from 2000 to 2017 was 42.1%.
[9] Previous research using a HCV lottery in Chicago found no significant effect of childhood HCV receipt on adult criminal outcomes (Jacob et al. 2015).

either public or HCV-assisted housing. We estimate declines in parents' earnings in the calendar year that sample households move into either program suggesting that, if anything, our preferred estimates may *understate* the true causal benefits of subsidized housing participation.[10] The event study results therefore also fail to uncover evidence that our main estimates are driven by time-varying economic shocks.

To continue assessing the likelihood that time-varying unobserved heterogeneity is driving our main results we split the analysis sample and estimate separate treatment effects in areas with long expected wait times for public and HCV-assisted housing (greater than 9 months on average) and areas with shorter expected wait times. If parents adjust subsidized housing participation in response to economic shocks, so that children with more exposure to the better economic circumstances also experience more teenage subsidized housing (and the converse), we would expect this source of bias to be more pronounced in areas where households are able to quickly move into public or HCV-assisted housing. We find no differences in the treatment effects between areas with long and short wait times.

Similarly, one might be concerned that the HFE estimates are confounded by unobserved non-economic shocks; for example, adults could exert more parenting effort or otherwise change behavior in ways that positively influence potential outcomes for children. If these changes are also associated with an increased likelihood of entering assisted housing—perhaps because parents are more willing to exert effort applying for government programs—this could generate positive bias in our treatment effects. Household removal from assisted housing for disciplinary reasons would similarly lead to positive bias in our estimates if the behaviors leading to the disciplinary problems are more harmful for younger children. Critically, the positive bias in the treatment effects would be driven by households moving into a program in the former scenario and by households moving out of a program in the latter scenario. We find no differences in the estimated impact of either public or HCV-assisted housing between households that moved in and those that moved out of the programs.

Though it remains theoretically possible that these potential sources of bias could both exist, 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, in addition to exerting exactly the same amount of positive bias, both confounders would also need to be orthogonal to the time-varying measures

[10] Which will be true if lower parents' earnings while a teenager depress potential child outcomes.

of parents' earnings we include as a control in the HFE specifications, and be unaffected by whether parents are able to quickly move their family into assisted housing (as measured by whether households live in an area with long or short assisted housing wait times). It is unlikely that there exist biases that satisfy all of these conditions simultaneously, and therefore unobserved time-varying non-economic shocks are not likely to be driving the estimates.

We view unobserved child-level characteristics as a less likely source of bias. In contrast to decisions over how to allocate health- or education-related resource across children, the decision to participate in subsidized housing is made at the household level. Parents have limited scope to adjust subsidized housing participation to benefit some children but not others. In addition, to generate upward bias, parents would have to form accurate expectations about the *difference* in future adult outcomes for their children and systematically move into subsidized housing programs so that the children they expect to have better adult outcomes are exposed to more subsidized housing as teenagers; the required parental accuracy in forecasting long-term outcomes for children and the necessary responsiveness of subsidized housing participation to changes in parental expectations seem unreasonable. Regardless, our baseline empirical specifications control flexibly for the child-level characteristics most likely to be correlated with teenage subsidized housing participation and adult outcomes that are available in the data—we include a full set of age by male and household race/ethnicity by male indicators, and our findings are robust to flexibly controlling for child birth order.

Finally, we test whether the results are affected by the early departures of teenagers for events expected to improve (e.g., post-secondary education) or harm (e.g., juvenile incarceration) potential adult outcomes. We do so by implementing a household fixed-effects instrumental variables (HFEIV) strategy that uses the age differences between siblings and the observed subsidized housing participation of the head of household in 2000 to predict public housing and HCV-assisted housing participation for each child. The HFEIV strategy discards any variation in subsidized housing not driven by the timing of moves made by the head of household, so departures from the household before age 18 are ignored unless the head of household also moves. The HFEIV results follow the same qualitative pattern as the primary estimates: the point estimates remain economically large and positive for male and female children in both public and voucher-assisted housing and they are never significantly different from their HFE counterparts.

The remainder of the paper proceeds as follows. Section 2 describes the subsidized housing programs we study and discusses how they might affect labor market earnings and incarceration. Section 3 presents our research design. Section 4 discusses the data infrastructure and describes the study sample. Section 5 presents the primary empirical results, Section 6 explores extensions and robustness checks, and Section 7 concludes.

2. Background on Subsidized Housing and Adult Outcomes

2.1 Subsidized and Unsubsidized Housing in the United States[11]

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 federal subsidies for construction and ongoing management and operations performed by local public housing agencies. Because construction subsidies were not sufficient to cover maintenance, the federal government instituted operating subsidized (in 1974) and imposed a rent ceiling—the maximum rent that each family could be charged—currently set at 30 percent of family income. In 1970 there were approximately 1 million units of public housing and construction continued slowly thereafter with the program reaching a peak of 1.4 million units in operation in 1994. Since 1994 participation in public housing has declined to just under 1.3 million in 2000 and about 1.1 million in 2013, reflecting, in part, the demolition of severely distressed projects under the HOPE VI program.

Enacted in 1974, the Housing Choice Voucher 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", while still capping household contributions to 30% of income in most cases. The HCV program has grown rapidly over the past two decades, with participation rising from 1.1 million households in 1990 to 1.8 million in 2000 and to nearly 2.4 million in 2013.[12]

HUD rental assistance is not an entitlement and serves only a fraction of the households that meet the basic income requirements. HUD estimates that in 2013, at least 7.72 million unassisted very-low-income (and eligible) households paid more than 50 percent of their income in rent (Steffin et al. 2015).

2.2 Potential pathways from child housing subsidies to adult outcomes

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[11] We thank David Hardiman and Todd Richardson of HUD for providing substantive clarifications for the section.
[12] In this paper, we do not consider other HUD rental assistance programs (see Appendix A for details).

There are a number of channels through which childhood participation in subsidized housing might affect later adult outcomes. Both HCV and public housing provide a positive income effect for households. By relaxing the budget constraint faced by participating households, these programs may enable parents to devote more time and financial resources to develop the human capital of children residing in the household (Dahl and Lochner 2012; Aizer et al. 2014; Jacob et al. 2015). This increase in human capital would suggest that childhood residence in assisted housing should improve adult labor market outcomes and decrease adult incarceration.

Beyond the direct income effects, assisted housing may help households to avoid some of the most acute consequences of high housing expenditure, including 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. They find that these relocations account for roughly a quarter of all moves and can result in moves to substandard housing or cause further relocations.

However, other pathways could generate a negative relationship between subsidized housing participation in childhood and adult well-being. Newman (1972) argues that the design of some public housing projects is not conducive to community watchfulness and leads to isolation and crime. Schill (1993) documents the distressed state of public housing with a backlog of unmet maintenance and modernization needs that could create a harmful living environment for children. Both building structure-related mechanisms predict a negative relationship between childhood participation in public housing and adult outcomes.

Oreopoulos (2003) proposes that public housing participation might affect outcomes through peer or neighborhood effects. If, as argued by Oreopoulos (2003), assisted housing units are located in worse neighborhoods (i.e., neighborhoods with higher crime rates and lower quality schools) than participants' counterfactual housing options, then public and HCV-assisted housing could have negative neighborhood and peer effects and therefore decrease adult well-being.

The impact of HCV-assisted and public housing participation during childhood need not be the same. Indeed, the perception that public housing might have especially deleterious effects partly motivated the shift in subsidized housing policy in the U.S. to providing housing choice through vouchers. In the absence of discrimination on the part of potential landlords, housing choice voucher housing should offer households increased neighborhood choice. As such, the potential adverse consequences of public housing projects (e.g. negative peer effects) might be avoided while the positive income effects would be preserved.

Alternatively, public housing projects may offer increased stability for residents. Whereas voucher recipients and private market households are forced to search for open rental units, public housing residents receive housing at pre-determined prices (subject to adjustment for household income) in known locations. Further increasing the search ***cost***s faced by HCV-assisted households is the possibility that some landlords prefer not to rent units to households using HCVs. As a result, a significant fraction of families that are offered a voucher are unable to successfully locate housing on which to use it (Finkel and Buron 2001). Public housing participants, with Public Housing Authorities as their landlords, do not face this type of discrimination or search cost.

There may also be heterogeneous impacts of assisted housing for different demographic groups. For instance, some MTO research uncovers larger benefits of the program for girls than boys (Kling et al. 2005; Ludwig et al. 2013). To account for the possibility that treatment effects differ across demographic groups, in our empirical analysis we allow the effects of assisted housing to vary by sex and race/ethnicity.

In sum, there is no clear prediction as to how subsidized housing participation while young will affect long-term outcomes. Nor is there a strong prediction about which type of subsidized housing will have more advantageous or deleterious effects.

3. Research Design

3.1 Household fixed effects model

Our goal is to identify the causal effect of living in subsidized rental housing as a teenager on adult earnings and incarceration. To do so, we specify a linear, constant HFE regression model for each outcome, y, of child i as:

$$y_{if} = \gamma_f + \boldsymbol{H}'_{if}\boldsymbol{\beta}_{\boldsymbol{HFE}} + \boldsymbol{X}'_{if}\boldsymbol{\phi} + \epsilon_{if} \qquad (1)$$

where f indexes the household including child i in the year 2000. The outcome y_{if} is either the inverse hyperbolic sine of total age 26 earnings or an indicator for whether child i is incarcerated in 2010.[13] The explanatory variables of interest, $\boldsymbol{H}_{if}$, are separate measures of the

[13] We use the inverse hyperbolic sine (IHS) of earnings rather than the more traditional log of earnings because estimated coefficients can be interpreted in the same way as with a log-transformed dependent variable but, unlike with the log of earnings, IHS is defined for zero earnings. The IHS is defined as $\log[y_i + (1 + y_i^2)^{0.5})]$ where y_i is

number of years spent in public housing and HCV-assisted housing while a teenager, and the HFE estimates of their impact on the outcomes are represented by $\boldsymbol{\beta_{HFE}}$. Throughout the text we focus our analysis on this "dose" version of subsidized housing treatment.[14]

The vector $\boldsymbol{X_{if}}$ includes child-specific control variables, including an indicator for whether the child is male, a full set of age dummies, an interaction between whether the child is male and the age dummies, and when pooling across household races an interaction between the household race/ethnicity and whether the child is male. We also interact each of the subsidized housing measures with the male indicator to allow for heterogeneous effects by child sex, and we estimate separate regressions for each race/ethnicity to allow all coefficients to vary along this dimension. In some specifications, $\boldsymbol{X_{if}}$ also includes controls for the average block group percent poverty that each child experienced while a teenager, the inverse hyperbolic sine of average annual parents' earnings while the child was a teenager, and a full set of child birth order indicators. All time-invariant household-level characteristics are subsumed in the household fixed effects, γ_f . Lastly, ϵ_{if} is a zero-mean error term which we cluster by household.

We recognize that the error term includes all unobserved time-varying household-level characteristics and all unobserved child-level characteristics that affect the outcomes. If, after conditioning on household fixed effects, these factors are correlated with subsidized housing participation and adult outcomes, then our estimates of the impact of subsidized housing may be biased. As described in the introduction, we explore a variety of robustness checks in our analysis to alleviate such concerns.

The HFE regression estimates the effect of subsidized housing participation on labor market outcomes and adult incarceration using only variation in housing participation and outcomes across teenagers *within the same household*. In practice, each dependent and independent variable is demeaned at the household level and ordinary least squares (OLS) is run using the demeaned values for everyone in the sample. While we retain individuals from households with no between-sibling difference in assisted housing participation, only observations from households with some within-household difference in teenage subsidized

total earnings for individual i (see Burbidge et al. 1988). Annual earnings are deflated to their year 2000 purchasing power equivalent using the U.S. city average annual purchasing power for all urban consumers (CPI-U).

[14] In unreported results, we also estimate a dummy version of our models, where the treatments are indicators for whether the individual ever resided in each program while a teenager. The results from these dummy specifications closely mirror the dose versions.

housing participation help to identify $\boldsymbol{\beta}_{\boldsymbol{HFE}}$. Consider a household in the year 2000 with both a 17 year-old and a 14 year-old which does not enter HUD-subsidized housing until 2003. The older sibling, who we assume ages out of the household in 2002, would have $H_i = 0$ and the younger sibling would have $H_j = 3$[15] and therefore this household would contribute to the identification of β_{HFE}. As we document in the next section, there is ample within-household variation in assisted-housing exposure to help identify the effect of interest.

Griliches (1979) provides a summary of the early literature that makes use of sibling fixed effects and points out potential issues. More recent studies include Royer (2009), which uses over 3,000 twin pairs and twin fixed effects to estimate the effect of birth weight on long-term outcomes; Currie and Walker (2011), which uses mother fixed effects to estimate the impact of the introduction of EZ-Pass in New Jersey and Pennsylvania on infant health outcomes; and Currie et al. (2010), which employs sibling fixed effects to identify the relationship between early childhood health problems and outcomes in early adulthood. An especially relevant siblings study is Aaronson (1998), which estimates the effect of neighborhood characteristics on children's educational outcomes using sibling fixed effects specifications.

Previous research has also used a between-siblings methodology to study intergenerational economic mobility (e.g., Page and Solon 2003; Vartanian and Buck 2005; Levine and Mazumder 2007; Chetty and Hendren 2015). These studies have the same motivation for employing a household fixed-effects strategy as we do: to abstract from unobserved time invariant family attributes. As emphasized in many of these papers, we recognize that within-household variation in unobserved characteristics may bias the household fixed effects results. We address these concerns with through a series of different robustness checks.

4. Data

4.1 Sample Construction

We use confidential microdata from the Census Bureau, including administrative files and censuses, as well as linked public use data to construct a dataset of children eligible for assisted housing, their housing exposure, and their long-run outcomes (see Appendix A for a detailed exposition of the data sources). We characterize households using responses to the 2000 Census short form, including geographic location, housing tenure (rent or own), and, for each

[15] This is a slight abuse of notation. Here we use H_j to denote the generic entry in the vector $\boldsymbol{H_j}$, corresponding to the program that the household enters.

person, household relationship types and demographics (age, sex, race, and ethnicity). Assisted housing participation from 1997 to 2005 is taken from HUD's Public and Indian Housing Information Center (PIC) file, an annual administrative record submitted by housing authorities for the housing occupancy verification process that lists households by authority, subsidy type, and project, and includes application and move in dates as well as identifying information and demographics for each participant. Earnings from wage and salary jobs come from the Census Bureau's Longitudinal Employer-Household Dynamics (LEHD) Infrastructure Files, an employer-employee matched dataset assembled from quarterly earnings records from states and for federal workers. The jobs data, which begin for most states in the 1990s, cover approximately 96 percent of private non-farm wage and salary employment (Stevens 2007). Jobs data for federal workers are included beginning in 2011. Adult incarceration is defined using the group Quarters reporting in the 2010 Census. Finally, we identify location from an annual place of residence file assembled by the LEHD program, which – when administrative records are available – gives a census block of residence from 1999 onwards.

Starting with the 2000 Census households as a frame, we integrate the files to create a sample of children from households which are likely eligible for housing assistance. We identify households with two or more children aged 13 to 18 on April 1, 2000, the reference date for the 2000 Census, who will turn 26 years old in 2008 to 2013, a period spanned by the LEHD earnings data and including the 2010 Census.[16] The Census Bureau uses personal identifying information to link respondents to unique identifiers, with about 89 percent successfully linked. We use these identifiers to link the children, as well as Person 1 (on the Census) and any spouse, to LEHD earnings records, housing assistance records, the annual place of residence data, and the 2010 Census. To limit the sample to likely eligible households, we require that, while a child is 13-18, the sum of LEHD reported earnings for the adults (Person 1 and spouse) be no greater than 50 percent of the Area Median Income (AMI); below 50% AMI households are classified by HUD as being "very low income" and are typically considered eligible for both public housing and HCV-assisted housing.[17] Although we have no wealth information, we further restrict the sample to require that households be renters in 2000. We also drop households residing in 119 counties that were served by housing authorities that participated in HUD's Moving to Work (MTW) demonstration program. This sample restriction is made because MTW

[16] Age 26 earnings are used as an outcome in some previous studies of intergenerational economic mobility (e.g., Chetty and Hendren 2015). It is likely that most individuals will have completed their education by that age.
[17] We base the AMI calculation on the household size and response location in 2000.

relaxed reporting requirements for housing authorities, so retaining these households would compromise our ability to link persons with housing assistance.

Having started with 2.8 million children aged 13-18 in 2000, our data integration requirements and restrictions give us a sample of 1.172 million children in sibling households (and 673,000 for our sample linked to the 2010 Census). See Appendix A for a full description of the sample construction as well as our methodology for re-weighting the restricted sample to better match the broader population. All subsequent estimates are population-weighted, although our main results are not sensitive to the application of weights.

For this sample, we use the linked files to define our dependent and explanatory variables as well as to allocate households to subsamples. We construct household level race/ethnicity indicators for whether the household is White non-Hispanic (White), Black non-Hispanic (Black), other race non-Hispanic (Other), or Hispanic. We measure the "dose" of treatment for both public housing and HCV-assisted housing as the count of years a child resided in each type while aged 13-18. For children aged 17 or 18 in 2000, whom we do not observe in HUD-PIC data when they are 13 or 14 (in 1995 and 1996), we impute participation in those years based on a household's move-in date in 1997 (if they participated then) and add those years to the treatment count.[18] As noted above, we use LEHD to calculate household income as the inverse hyperbolic sine of average parents' annual earnings while a child is 13-18, with the goal of controlling for possible unobserved, time-varying characteristics. We link individuals to the annual place of residence file (where available), and by census block, to the 2000 Census summary file, to calculate average observed neighborhood poverty rate (measured at the block group level) while a child is 13-18. Lastly, we calculate the inverse hyperbolic sine of each child's LEHD earnings in the year they turn age 26 (as well as other earnings outcomes) and create an indicator for whether they are observed in a correctional facility on April 1, 2010.

4.2 Summary Statistics

Our analysis sample closely resembles the characteristics of housing-subsidy eligible households in the United States. The geographic exclusions of residents (based on the 2000 Census residential location) in counties containing HAs that entered MTW during the study period do not appear to distort the representativeness of the sample. Appendix Tables A2 and A3 indicate that the housing authorities located in the 3,025 non-MTW counties have similar characteristics as the public and HCV programs overall. For the year 2000, our non-MTW areas

[18] Our results are robust to omitting this imputation and removing 17-18 year-olds entirely.

cover 91% of public housing residents and 93% of HCV residents. As mentioned in the introduction, this coverage is substantially higher than is available for existing experimental studies, such as MTO, which covers HAs where 20% and 12% of public housing and HCV households reside, respectively.

Table 1 presents summary statistics for housing subsidy-eligible teenagers from the counties included in our sample.[19] The first column presents summary statistics for the sample used in estimation – youth aged 13-18 in 2000 living with another sibling aged 13-18 in 2000 whose parents earned less than 50% of AMI. This sample is subdivided further, into those that lived in households not in subsidized housing anytime during the 1997-2005 study period (column 2), and those that lived in households receiving a subsidy at some point during this period (column 3); the latter are then subdivided further into those that themselves never lived in subsidized housing while aged 13-18 (column 4) and those that did (column 5).

A comparison of columns 2 and 3 shows that there are substantial differences in age 26 earnings, with those in subsidized households earning 24% less at age 26. In addition, Black non-Hispanics make up a larger portion of the subsidized sample (47% versus 22%), parents' earnings are lower in the subsidized sample, and a higher portion of the subsidized sample lived in single-parent households (77% versus 60%). In contrast, the comparison between columns 4 and 5 uncovers only small differences.[20] This similarity suggests, unsurprisingly, that children who never participated in subsidized housing themselves but that come from households where at least one child did participate, more closely resemble subsidized housing participants.

To help introduce the within-household variation in subsidized housing participation, Figure 1 displays the distribution of within-household differences; that is, each youth's own subsidized housing participation net of the household mean among all 13 to 18 year-olds (in 2000), that we use to identify our regression model. The figure is based on the full sample described in Table 1, Column 1, but they are also required to be from households with at least some within-household difference in subsidized housing participation among the household

[19] Confidentiality restrictions preclude us from releasing summary statistics for the entire sample of 13-18 year-old children from the 2000 census.

[20] Only 15% of children in the ever-subsidized household sample received no subsidy between the ages 13-18. We focus on estimates of a dose treatment variable, allowing for variation in the number of years of subsidy receipt among those children from households that were ever subsidized.

members aged 13-18.[21] The distribution is unimodal and symmetric around zero, with an overwhelming majority of teenagers within 2 years of the household mean participation.

Table 1 also presents the fraction of our sample observed in the 2010 Census as well as the incarceration rate among those found in 2010. Those not receiving a housing subsidy had the lowest incarceration rate, just as they had higher adult earnings. In households ever receiving a housing subsidy, 73% of children were linked to a 2010 Census response. Of these, 5.4% of the children who did not reside in subsidized housing while a teenager were observed in an adult correctional facility in 2010, while only 4.5% of those who did reside in some form of subsidized housing while a teenager were found in an adult correctional facility in 2010. These rates rise to 7.9% and 6.6% for children in Black non-Hispanic households, underscoring the high prevalence of adult incarceration for our study sample as well as the potential for housing to explain these differences.

Appendix Table A4 shows more details on the within-household variation in assisted housing we use for identification. Entries and exits from assisted housing contribute approximately equally to the within-household variation in housing participation. This balance in moving patterns helps to decrease the likelihood that any particular source of unobserved time-varying heterogeneity could explain our findings as well as ensuring that there is no relationship between child age or birth order and the within-household differences in assisted housing.[22] Table A4 also shows that the within-household differences in assisted housing are meaningful in size. For households that move into or out of assisted housing during our study period, we find that children, on average, have about three quarters of a year more (or less) exposure than the mean participation for their household. This implies that for a two-child household that moves during the study period, on average, there is a difference of a year and half between the teenage participation of the sibling with more exposure and the sibling with less exposure.

5. Empirical Results

5.1 All households

[21] The restriction that teenagers have some within-household variation is made for expositional purposes. The subsample displayed in Figure 1 therefore excludes the 41.7% of HCV participants and 69.3% of public housing participants with no between-sibling variation that are included in our main empirical sample.

[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.

The OLS results in column 1 of Table 2 are highly susceptible to bias from selection based on both time-varying and time-invariant unobservable factors. The point estimates suggest that there is a statistically significant negative relationship between both public and HCV-assisted housing participation and age 26 earnings.

The HFE (between-siblings) results in column 2, which control for all household level time-invariant heterogeneity, paint a dramatically different picture. The negative relationships in the OLS specification completely disappear. Both living in public housing and living in a HCV-subsidized unit lead to positive and significant effects on age 26 earnings for males and females. The "All Households" panel of Table 3 displays the implied treatment effects along with the results of tests of whether there is no difference in the treatment effects between males and females or for either sex between public housing and HCV-assisted housing. The estimates imply that each additional year of voucher housing increases female and male earnings by 4.7% and 2.6%, respectively, while an additional year of public housing increases female and male earnings by 4.9% and 5.1%, respectively. We are able to reject the null hypothesis of no difference between the effects of voucher housing for males and females, with females receiving significantly larger benefits than males. [23]

Since we include individuals with zero earnings (through our use of the inverse hyperbolic sine transformation), assigning a dollar amount to the estimated coefficients depends on where in the distribution the estimated effects are evaluated. In what follows, we use the mean of the total earnings at age 26 for those young adults who lived in households that received some housing subsidy while they were a teenager ($9,716 in 2000 dollars).[24]

The results indicate that each additional year of HCV participation increases age 26 earnings for females by about $457 and increases age 26 earnings for males by $253. For public housing, the point estimates suggest that each additional year of public housing participation increases age 26 earnings for females by $476; for males, the corresponding increase is $496. We note that an overwhelming majority of teenagers fall within 2 years of the household mean

[23] We check for heteroscedasticity in our main HFE specifications by regressing the squared predicted error term on the treatment indicators and the same set of controls included in the main regressions. The relationship between the assisted housing indicators and the squared error terms is always small in magnitude, below 0.03 in absolute value, and only statistically significant for one of the four assisted housing by male groups: years in voucher housing interacted with the male indicator. We conclude that heteroscedasticity is unlikely to produce bias in the treatment effects. Results are available upon request.

[24] We use the same figure for all groups when we make these calculations. See Appendix Table A6 for details.

participation and therefore appropriate caution must be taken in extrapolating these estimates beyond the within-sample range of variation.

The third, fourth, and fifth columns in Table 2 present results from HFE specifications that, in addition to the controls in column 2, also include a control 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 2 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.[25]

We also estimate HFE specifications with an indicator for whether individuals worked at all during their age 26 year. Appendix Table B1 presents these results. The results closely match those presented in Table 2 for Age 26 earnings. The HFE treatment effects indicate that additional time spent in the HCV program while a teenager increases the likelihood of being employed at age 26 by 0.5 percentage points for females and 0.3 percentage points for males. The corresponding estimates for public housing are a 0.5 percentage point increase for both females and males.

5.2 Race/ethnicity subsamples

To further explore the results in Table 2, we investigate how the estimates differ by household race/ethnicity. That is, we estimate equation (1) separately for non-Hispanic White households, non-Hispanic Black households, and Hispanic households. The control variables are unchanged from Table 2, but the indicators for household race/ethnicity by sex are now subsumed by the male dummy variable. The estimated treatment effects are summarized in Table 3 with complete results reported in Appendix Tables B5, B6, and B7, respectively.[26]

Comparing results across the three subgroups in Table 3, we find either a positive effect or no effect of public and voucher assisted housing on age 26 earnings for all household race/ethnicities. We do, however, observe some important differences. The positive effects for females in Table 2 are driven by females in Black non-Hispanic and Hispanic households,

[25] 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.
[26] The sample size did not permit robust results for Other race non-Hispanics.

whereas males appear to benefit in all three race/ethnicity samples. The point estimates for non-Hispanic Black females suggest they receive an earnings premium of about 7.0% per year in HCV housing and 5.5% per year in public housing. Non-Hispanic Black males also see their adult earnings increase, by about 3.0% and 5.1% per year of residence in HCV-assisted and public housing; Non-Hispanic White males earn 3.4% and 6.5% for additional years of HCV-assisted and public housing. The estimates for White non-Hispanic females are small and not significantly different from zero for either program. Finally, age 26 earnings increase for Hispanic males by 3.0% and 5.1%, and by 4.5% and 7.1% for Hispanic females, for HCV and public housing, respectively. To facilitate the interpretation of these treatment effects, Appendix Table A6 presents the implied differences in age 26 earnings in 2000 U.S. dollars, evaluated at the mean age 26 earnings for teenagers who spent some time in subsidized housing as a teenager ($9,716).

For no household race/ethnicity/sex cell are the effects of HCVs and public housing significantly different statistically from one another. Given the prevailing view of public housing in the United States, this lack of significant differences is perhaps somewhat surprising. It must be noted, however, that public housing programs differ greatly across geographic areas and frequently are quite unlike the oft-cited worst-case scenarios. We find that public housing residence in childhood has substantial positive benefits for age 26 earnings for all but one race/ethnicity/sex group, with white non-Hispanic females being the lone exception.

There is, however, some heterogeneity in the effects by sex: females benefit more than males from HCVs in the pooled and Black non-Hispanic samples, and males benefit more than females from HCVs and public housing in the White non-Hispanic sample.

5.3 Adult incarceration

Table 4 presents estimates of the effect of subsidized housing on adult incarceration, using the same controls as our main HFE results in Table 2. For the full sample, we find that an additional year of HCV housing reduces the likelihood of 2010 incarceration for females and males by 0.4 and 0.1 percentage points, respectively. Based on the overall mean adult incarceration rate for the sample, these correspond to a 12.9 percent and 3.2 percent reduction in adult incarceration. Similarly, a year of public housing reduces incarceration for females and males by 0.5 and 0.3 percentage points (16.1 and 9.7 percent), respectively. In columns 2, 3, and 4, we find similar patterns for each of the household race/ethnicity subsamples. The largest reductions in adult incarceration are found for females in Black non-Hispanic households: 0.7

and 0.6 percentage points for an additional year of HCV-assisted and public housing. The effects for males from Black non-Hispanic households are 0.3 percentage point decreases in adult incarceration for both public and HCV-supported housing.[27]

Although the effects of youth subsidized housing participation on adult incarceration presented in Table 4 are independently important, they are also likely to be closely related to the earnings effects shown in Tables 3 and 4.[28] Adult incarceration could lead to decreases in expected adult earnings because of incapacitation effects, recidivism, reduced self-sufficiency, or because formerly incarcerated individuals receive a negative earnings premium from disinvestment in human capital or from having a criminal record (Mueller-Smith 2014). However, the direction of causality is not so obvious. A reduction in potential earnings could also increase the likelihood of incarceration through various behavioral and environmental pathways. Kling et al. (2005) present evidence on how neighborhood poverty affects youth criminal behavior.

While a comprehensive analysis of the relationship between adult incarceration and adult earnings is outside the scope of this paper, we do attempt to gauge how important the observed association between youth subsidized housing and incarceration may be for explaining our earnings results. In Table 5, for each sex by race/ethnicity group, we calculate the share of the observed effect of youth subsidized housing participation on age 26 earnings that can be potentially explained by the incarceration effects presented in Table 4. To obtain these figures, we multiply the effect of a year of additional subsidized housing participation on the likelihood of 2010 incarceration by the average association between 2010 incarceration and age 26 earnings.[29] We then divide this expected earnings difference by the direct effect of housing on earnings (the estimates shown in Table 3), and multiply the resulting fraction by 100 to get an estimate of the percent of the earnings estimates that could be explained by the observed

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[27] We also estimate (in unreported results) OLS versions with the same controls as in Table 2 but without household fixed effects. The OLS specifications with controls for observable factors suggest a positive and statistically significant relationship between time spent in subsidized housing as a teenager and incarceration for both public and HCV-assisted housing. The effects are especially large for Black non-Hispanic males.

[28] Note that for this sample, the indicator for 2010 incarceration may be measured at ages 23 to 28, spanning the age 26 earnings outcome. Since we do not have information on the duration or frequency of incarceration, we do not attempt to disentangle the sequence of earnings changes and incarceration episodes.

[29] This latter association is based on household fixed effects specifications with the inverse hyperbolic sine of age 26 earnings as the dependent variable and an indicator for 2010 incarceration as the explanatory variable of interest. These specifications also include a full set of age by male and household race/ethnicity by male fixed effects.

differences in incarceration.[30] Table 5 does not report results for sex by race/ethnicity groups where the earnings effect was not statistically significant, instead displaying "(0)".

Table 5 suggests that reductions in incarceration can account for approximately a quarter of the positive effect of subsidized housing on earnings. This pathway has the greatest explanatory potential for females from Black non-Hispanic households: explaining roughly 60% for HCV-supported housing and 29% for public housing. We remain agnostic about whether the associations between subsidized housing participation and incarceration are a potential cause or a consequence of the main earnings effects, but the alignment and strength of the associations suggests that subsidized housing may have multi-dimensional long-term benefits for children, especially those in Black non-Hispanic households.

5.4 Implications for Lifetime Earnings and Cost-Benefit Analysis

While our main estimates suggest there is a statistically significant and economically meaningful increase in age 26 earnings from additional years spent in public and HCV-assisted housing as a teenager, this captures only a small fraction of the expected increase in lifetime earnings. We therefore follow Chetty et al. (2015) and Chyn (2016) and use the main treatment effects for age 26 earnings to estimate the expected benefit for lifetime earnings from an additional year of public or voucher-assisted housing. To do so, we make four key assumptions: (1) the household fixed-effects treatment effects shown in Table 3 are constant over the lifecycle for males and females; (2) the trajectory of lifetime earnings for the children in our sample follows the pattern suggested by the U.S. population average; (3) real earnings growth is 0.5% per year; and (4) the discount rate is 3%, slightly higher than the current 30-year Treasury bond rate.

To estimate the trajectory of lifetime earnings at the U.S. population average, we tabulate earnings[31] by age using the 2000 Census 5% sample microdata from the University of Minnesota's Integrated Public Use Microdata Series (Ruggles et al., 2017). Adding together annual earnings from 19 to 65—after applying a real wage growth rate of 0.5%—gives an undiscounted sum of lifetime earnings of $1.51 million in 2000 U.S. dollars for the average worker, and a present discounted value at age 12 of $618,000. Under the above assumptions and

[30] As with the incarceration outcomes, we restrict this sample to children in households with no attrition from 2000 to 2010. We note that these earnings effects are similar to the main sample estimates in Table 3, but are somewhat attenuated for several subgroups, particularly for boys in voucher housing.

[31] To parallel the LEHD earnings measure we use for the main analysis, we consider just wages, salary, commissions, bonuses, and tips from all jobs.

using the main treatment effects for age 26 earnings shown in Table 3, each additional year of teenage public housing participation increases undiscounted total pre-tax lifetime earnings by $45,400 for females and $47,300 for males; an additional year of teenage voucher-assisted housing increases undiscounted total pre-tax lifetime earnings by $43,600 for females and $24,100 for males.[32] The analogous estimates for discounted total pre-tax lifetime earnings are $24,700 (females) and $25,700 (males) for public housing and $23,700 (females) and $13,100 (males) for HCV-assisted housing.

For a household with two children, in expectation, this suggests that each additional year of public housing participation while both children are teenagers increases total discounted pre-tax lifetime income for the children by between $49,400 and $51,400 and each additional year of voucher-assisted participation increases total discounted pre-tax lifetime income for the children by between $26,200 and $47,400, depending on the sex of the two children. Clearly, childhood participation in assisted housing produces meaningful long-term economic returns by increasing expected adult earnings for children in beneficiary households.

With these estimates, we conduct a cost-benefit calculation from the perspective of the U.S. federal government. In doing so, we recognize that we only consider one of potentially many benefits of subsidized housing, and therefore the estimated benefits should be interpreted as a lower bound on the true lifetime benefits from teenage assisted housing participation.[33] We assume that the children in our sample fall into the bottom federal income tax bracket, file their taxes as singles or as married individuals filing separately, that they elect to take the standard deduction for their filing status, and that they earn above the standard deduction even in the absence of any teenage subsidized housing participation. As a result, the federal government receives 10% of the expected increase in lifetime earnings. For a household with two children, this implies an expected discounted benefit to the federal government of between $4,940 and $5,140 for each additional year of public housing and between $2,620 and $4,740 for each additional year of HCV participation while both children are teenagers.

[32] The mean age 26 total earnings for the individuals in our sample who never participate in subsidized housing while a teenager is 61.1% of the U.S. population average. We therefore calculate the estimated impacts on undiscounted lifetime earnings of an additional year of teenage participation in subsidized housing as being equal to TE x 0.611 x $1.51m, where TE is the relevant treatment effect from Table 3 (e.g., the estimated impact of an additional year of public housing for females: 0.047). The corresponding estimates for discounted lifetime earnings are calculated as TE x 0.611 x $618,000.

[33] Important omitted benefits include the immediate utility from the income transfer received by the participating household and any increased housing stability or positive long-term health effects generated by the subsidy. See Desmond et al. (2015) for a detailed discussion of the value placed on stability for poor households.

To calculate the cost to the federal government using publicly available "Picture of Subsidized Households" data from HUDUSER for the year 2000 (HUD, 2000). We compute the national average federal spending per unit per month for both public housing and the HCV program. For public housing, this is the sum of the operating subsidy and the capital improvement cost scaled by the number of occupied units; for the HCV program, it represents the total housing assistance payment plus an administrative cost (payment to landlords) divided by the total number of reported participating households. The results suggest that the average cost per year for a unit of public housing is $5,112 and the average cost per year for one year of HCV-assistance is $5,124. Therefore, even when we only consider the intergenerational financial benefit to the federal government from providing housing assistance to poor households, the public housing and HCV programs are expected to be almost cost-neutral in the long run through their impact on expected future tax revenue.

6. Robustness and Heterogeneity

While the HFE specifications eliminate unobserved time-invariant household-specific heterogeneity, they are still susceptible to bias from time-varying shocks or unobserved individual-level characteristics. For example, differences in adolescent incarceration or post-secondary attendance that may directly impact potential adult outcomes and also result in early household departures (and therefore within-household differences in teenage assisted housing participation) could be problematic for the estimates. And 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 additional robustness checks to further assess the likelihood that our results are biased by either source of potentially unobserved variation.[34]

Before turning to the 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

[34] 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 more later 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.

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.

6.1 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 teenage 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 2, 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 of the relationship between parents' earnings and changes in assisted housing participation; the event study analysis allows us to test how parents' earnings differ from their typical level around the calendar year of a move into or out of assisted housing. To do so, we collapse the data to the household-year level, generating a variable for the inverse hyperbolic sine of total parents' earnings and four indicators for whether the household was observed making any of the possible types of moves in every year of our data: a move out of public housing, a move into public housing, a move into HCV-assisted housing, or a move out of HCV-assisted housing. In each year, we also generate leads and lags of the move variables to produce indicators for whether the household makes each type of move in that calendar year, in the next calendar year, or in any previous calendar year. Appendix Table A5 displays some key summary statistics for the household-level sample used in the event study analysis. The event study estimates then are generated by estimating the following by OLS:

$$y_{ht} = \alpha_h + \alpha_t + \sum_{M \in \{PE,PD,VE,VD\}} \sum_{s=t+1}^{t-1} \beta_{Ms} M_{hs} + X'_{ht}\phi + \epsilon_{ht} \qquad (2)$$

where y_{ht} is the inverse hyperbolic sine of total parents earnings for household h in year t, α_h is a household fixed effect, α_t is a year fixed effect, M_{hs} is an indicator for whether household h made a move of type M in year t,[35] where M can be each of the four possible moves types—an entrance to public housing (PE), a departure from public housing (PD), an entrance to the HCV program (VE), or a departure from the HCV program (VD). X_{ht} includes a full set of state by year fixed effects and indicators for the count of children in household h of each age between 13 and 23 in year t, and ϵ_{ht} is an error term which we cluster at the household level. As shown by the interior summation, for each of the move indicators we include a set of indicators for whether the household makes that type of move in the next calendar year ($s = t + 1$), in that calendar year ($s = t$), or whether they made that type of move in any previous calendar year ($s = t - 1$). The omitted category is therefore moves of each type that occurred at least two years after the year ($s > t + 1$) when parents' earnings are observed. Because we include a full set of year fixed effects and household fixed-effects, identification of the coefficients of interest, the β_{Mt+1}, come from changes in parents' earnings that occur in the year prior to a move, relative to their level at least two years prior to a move. We include the move indicators for past moves and moves that occur in that calendar year to ensure that identification of the β_{Mt+1} coefficients does not use any variation in parents' earnings that could be caused by the moves.

Figure 3 displays the point estimates and 95% confidence intervals for the estimates on each of the four possible move indicators for the year prior to a move, β_{Mt+1}, and the year of the move, β_{Mt}. The coefficients should be interpreted as the percent change in total parents' earnings, relative to their level at least two years prior to the move. None of the 95% confidence

[35] We define a move for a given year if, when examining the subsidized housing participation of the teenagers who resided in the household in the year 2000, the household has at least one teenager participating in a program in the prior year but none participating in the year being considered (a move out), or if the household has no teenagers participating in the program in the prior year but at least one participating in the year being considered (a move in).

intervals for the year prior to a move exclude zero, suggesting that there is no change in parents' earnings in the year prior to a move into or out of public or HCV-assisted housing. The event study results thus help to dispel what we view as the most likely source of potential bias for the HFE estimates: unobserved time-varying changes in household economic conditions.[36]

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[37] and the behaviors that lead to the punishment independently affect child well-being, we would incorrectly attribute this to the changes in 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

[36] Interpreting estimates for the year of the move ($s = t$) is more nuanced. While there is no statistically significant change in parents' earnings in the year of household departure from public housing, we can reject the null of no change in parents' earnings in the calendar year of a move out of HCV-assisted housing, though the point estimate is small in magnitude—less than 0.025 in absolute value. There are also declines of roughly 10% in parents' earnings in the calendar year of a move into public and HCV-assisted housing. However, because the assisted housing data are chronologically coarse, we only observe a binary participation measure for each individual annually; we therefore can't accurately sequence the change in parents' earnings and the change in assisted housing participation within year t. Together with the lack of any changes in parents' earnings in the year prior to the moves, this suggests a plausible explanation for the observed differences in parents' earnings in the same calendar year of the moves—particularly for moves into subsidized housing—is that there is a short-term negative causal effect on parents' earnings. This would be consistent, in both sign and magnitude, with the findings in Jacob et al. (2013), which suggests that adult earnings decline by approximately 10% for households randomly allocated to receive a housing voucher through the Chicago Housing Voucher Lottery. For this reason, we do not view the changes in parents' earnings in year t as a threat to our household fixed-effects estimates; rather, we believe they capture part of the causal effect of the move.

[37] 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.

likely to have moved in during the study period. Appendix Table B2 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 B2, 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 2 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 6 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.

6.2 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 teenage 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.[38]

A second exercise explores the possibility that individual-level characteristics related to early departures from households may bias HFE estimates. If children from households that participate in assisted housing are systematically departing home before the age of eighteen for college, incarceration or another institution that might directly affect potential adult outcomes, HFE specifications would incorrectly attribute the observed differences in adult outcomes to the shorter duration of assisted housing residence for these children. The direction of the bias depending on the sign of the relationship between the omitted factor and the outcome of interest. In the event of education, this bias is likely to be negative (i.e., we would underestimate the impact of public or voucher-supported housing) while in the case of juvenile incarceration the bias is likely to be positive. To address these concerns, we implement a HFE instrumental variables specification (HFEIV) that uses the observed participation in public and HCV-assisted housing of the head of household from the 2000 Census, along with the birth dates of the

[38] Results available upon request.

teenagers in our sample, to define a predicted measure of teenage participation in both public and HCV-assisted housing. We then use these predicted participation measures as instruments for the observed participation of the teenager.

Table 7 reports household fixed-effects results using the actual treatment (also found in column 2 of Table 2), using the predicted treatment instead of the actual treatment, and household fixed effects instrumental variables estimates which instrument for the actual treatment with the predicted treatment. In all columns we transform the earnings variable into a distributional measure, giving the earnings percentile of each child in their age 26 year among all children in the sample. We do so to ensure that the outcome is more robust to outliers and less sensitive to small within-household differences in earnings which may be particularly troublesome as the HFEIV estimates use only a fraction of the total within-household variation in subsidized housing. The HFE estimates follow the same pattern as those displayed in Table 2: the effect of public housing and HCV-assisted housing on age 26 earnings is positive, with larger effects of HCV-assisted housing for females than males and slightly larger effects of public housing for males than females.

Turning to the estimates that use the predicted treatment measures (HFE PRED), there is little movement in the HCV estimates relative to the HFE estimates. As expected given the strong first stage (shown at the bottom of Table 7), the HFEIV estimates closely track both the HFE and HFE PRED results. The effect of HCVs for females remains large, positive, and statistically significant, while the male interaction is negative but small enough that males are still expected to receive an earnings premium from time spent in voucher housing. While the HFEIV female public housing estimate remains positively signed, it is imprecisely estimated and not significantly different from zero. That said, we are unable to reject that the effect of public housing for females is equal when using HFE (the observed participation measure) and the HFEIV strategy. In fact, The HFEIV estimates are never significantly different from either the HFE estimates which use observed participation or the HFE PRED estimates. The HFEIV estimates therefore confirm that the early departure of children from subsidized households is not driving our main results.

6.3 Heterogeneity by public housing characteristics

Given that housing subsidy programs are implemented by local housing authorities, the programs can vary considerably across geographic areas. As discussed in the introduction, previous research has identified potential concerns with large and low-income public housing projects, some of which is classified as severely distressed housing. Although we do not have information on the overall quality, upkeep, or crime rates in housing projects, we can examine these hypotheses indirectly by identifying especially large or especially low-income housing projects. In Appendix Tables B3 and B4, we examine whether public housing projects in the upper quartile of size or the lower quartile of resident income have differential effects on children (we do not consider characteristics of voucher housing, where subsidies are tied to the recipient and may be transferred across locations).

The results provide little evidence that large or low-income projects are worse for individuals who reside in them as teenagers. In the pooled sample, these public housing projects do not have any differential effect on age 26 earnings relative to projects in the bottom three quartiles of size or the top three quartiles of household income for either males or females. In the race/ethnicity sub-samples, there is some weak evidence that especially large public housing projects are less beneficial for Hispanic males and low-income public housing projects are less beneficial for Hispanic females. If anything, White non-Hispanic and Hispanic males seem to benefit more from particularly low-income public housing projects. Together, we find little evidence to support the theory that especially large or low-income public housing projects have differential effects on the age 26 earnings of individuals who reside in them as teenagers. We note, however, that these measures are only general and indirect characterizations of project quality and that using improved measures of public housing project quality could yield different results.

7. Conclusion

Despite the exposure of millions of children in low-earning households to subsidized rental housing and the potential for these programs to have effects on long-term outcomes, the existing literature lacks a well-identified comparison of public housing, HCV-assisted housing, and private market housing. This study estimates the long-term effects of living in public housing and HCV-assisted housing as a teenager on age 26 earnings and incarceration, enabling the direct comparison of both programs to each other and to private market housing.

We estimate household fixed effects models that identify the impact of assisted housing by exploiting only variation within households. This between-siblings approach allows us to isolate the effect of each type of subsidized housing on adult outcomes from observed and unobserved household-level differences that may affect both program participation decisions and adult outcomes. We find that the substantial negative effects of subsidized housing in OLS specifications are attributable to the selection of households into assisted housing. After accounting for this household-level selection, subsidized housing participation as a teenager yields substantial positive effects on age 26 earnings for both females and males.

We use the age 26 earnings effects to estimate expected lifetime earnings benefits and find that each additional year of teenage public housing participation increases total discounted pre-tax lifetime earnings in 2000 US$ by $45,400 for females and $47,300 for males while additional years of teenage HCV participation increase total discounted pre-tax lifetime earnings by $43,600 for females and $24,100 for males. The increase in lifetime earnings is sufficiently large that a cost-benefit analysis implies that subsidized housing is approximately cost neutral in the long run, even when only considering the implied increase in tax revenue from the intergenerational increase in earnings. We also find substantial reductions in the likelihood of adult incarceration, particularly for non-Hispanic Black males and females.

There remain limitations to our analysis. First, our results apply to just two of the largest HUD-subsidized housing programs—public and housing choice voucher-assisted housing. The project-based housing voucher program, which serves a somewhat higher proportion of elderly households and a lower proportion of families with children, is not considered, nor is the Low Income Housing Tax Credit program. Second, our results may not be representative of all subsidized households. We exclude from our estimates households with only younger children, and those with just one teenager. However, the sub-population for which we estimate treatment effects—households with two or more teenagers born within a 6-year range—represent a large and important fraction of subsidy-eligible households. While this is a formative period, other research has suggested that early childhood circumstances may be even more important predictors of long-term outcomes. Future work should investigate whether exposure to subsidized housing during earlier periods of life has long-term implications as well.

Public and HCV-assisted housing participation while a teenager has meaningful and beneficial effects on both age 26 earnings and incarceration. Though the increased neighborhood choice afforded to participating households suggests there could be higher returns to HCV-assisted housing than public housing, we find no evidence that children who grow up in HCV-assisted housing do better than children who group in public housing as adults. One possibility is that, without financial incentives or intensive counseling, households that enter the HCV program are unlikely to move to better neighborhoods. Future research should explore how the local rental housing market as well as the physical and social characteristics of public housing projects affect the long-term effects of both HCV-assisted and public housing.

References

Aaronson, Daniel. 1998. "Using Sibling Data to Estimate the Impact of Neighborhoods on Children's Educational Outcomes." *Journal of Human Resources* 33(4): 915-946.

Abravanel, Martin, Robin Smith, Margery Turner, Elizabeth Cove, Laura Harris, and Carlos Manjarrez. 2004. *Testing Public Housing Deregulation: A Summary Assessment of HUD's "Moving To Work" Demonstration.* Washington DC: The Urban Institute.

Abowd, John, John Haltiwanger, and Julia Lane. 2004. "Integrated Longitudinal Employee-Employer Data for the United States." *American Economic Review* 94(2): 224-229.

Aizer, Anna, Shari Eli, Joseph P. Ferrie, and Adriana Lleras-Muney. 2014. "The Long Term Impact of Cash Transfers to Poor Families." NBER Working Paper No. 20103.

Akee, Randall K.Q., William E. Copeland, Gordon Keeler, Adrian Angold, and E. Jane Costello. 2010. "Parents' Incomes and Children's Outcomes: A Quasi-Experiment Using Transfer Payments from Casino Profits." *American Economic Journal: Applied Economics* 2(1): 86-115.

Almond, Douglas, Lena Edlund, and Marten Palme. 2009. "Chernobyl's Subclinical Legacy: Prenatal Exposure to Radioactive Fallout and School Outcomes in Sweden." *Quarterly Journal of Economics* 124(4): 1729-1772.

Almond, Douglas and Bhashkar Mazumder. 2005. "The 1918 Influenza Pandemic and Subsequent Health Outcomes: An Analysis of SIPP Data." *American Economic Review* 95(2): 258-262.

Ashenfelter, Orley and Alan Krueger. 1994. "Estimates of the Economic Return to Schooling from a New Sample of Twins." *American Economic Review* 84(5): 1157-1173.

Black, Sandra E., Paul J. Devereux, and Kjell G. Salvanes. 2007. "From the Cradle to the Labor Market? The Effect of Birth Weight on Adult Outcomes." *Quarterly Journal of Economics* 122(1): 409-439.

Burbidge, John B., Lonnie Magee, and A. Leslie Robb, 1988. "Alternative Transformations to Handle Extreme Values of the Dependent Variable" *Journal of the American Statistical Association* 83(401): 123-127.

Burt, Martha. 2001. "Homeless Families, Singles, and Others: Findings from the 1996 National Survey of Homeless Assistance Providers and Clients." *Housing Policy Debate* 12(4): 737-780.

Carlson, Deven, Robert Haveman, Thomas Kaplan, and Barbara Wolfe. 2012a. "Long Term Earnings and Employment Effects of Housing Voucher Receipt." *Journal of Urban Economics* 71(1): 128-150.

Carlson, Deven, Robert Haveman, Thomas Kaplan, and Barbara Wolfe. 2012b. "Long-term Effect of Public Low-Income Housing Vouchers on Neighborhood Quality and Household Composition." *Journal of Housing Economics* 21: 101-120.

Chetty, Raj, Nathaniel Hendren, Patrick Kline, and Emmanuel Saez. 2014. "Where is the land of Opportunity? The Geography of Intergenerational Mobility in the United States." *Quarterly Journal of Economics* 129(4): 1553-1623.

Chetty, Raj and Nathaniel Hendren. 2015. "The Effects of Neighborhoods on Intergenerational Mobility: Childhood Exposure Effects and County Level Estimates." Working Paper.

Chetty, Raj, Nathaniel Hendren, and Lawrence Katz. 2015. "The Effects of Exposure to Better Neighborhoods on Children: New Evidence from the Moving to Opportunity Experiment." *American Economic Review* 106(4): 855-902.

Chetty, Raj, Nathaniel Hendren, Frina Lin, Jeremy Majerovitz, and Benjamin Scuderi. 2016. "Childhood Environment and Gender Gaps in Adulthood." National Bureau of Economic Research Working Paper # 21936.

Chetty, Raj and Nathaniel Hendren. 2017. "The Impacts of Neighborhoods on Intergenerational Mobility I: Childhood Exposure Effects." National Bureau of Economic Research Working Paper # 23001.

Chyn, Eric. 2016. "Moved to Opportunity: The Long-Run Effect of Public Housing Demolition on Labor Market Outcomes of Children." University of Michigan Working Paper, at https://economics.nd.edu/assets/186186/chyn_moved_to_opportunity_jmp_12_12_2015.pdf.

Collinson, Robert and Peter Ganong. 2016. "The Incidence of Housing Voucher Generosity." Working Paper, at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2255799.

Currie, Janet, Mark Stabile, Phongsack Manivong, and Leslie L. Roos. 2010. "Child Health and Young Adult Outcomes." *Journal of Human Resources* 45: 517-548.

Currie, Janet, and Reed Walker. 2011. "Traffic Congestion and Infant Health: Evidence from EZ-Pass." *American Economic Journals-Applied Economics* 3: 65-90.

Currie, Janet and Aaron Yelowitz. 2000. "Are Public Housing Projects Good For Kids?" *Journal of Public Economics* 75: 99–124.

Dahl, Gordon B. and Lance Lochner. 2012. "The Impact of Family Income on Child Achievement: Evidence from the Earned Income Tax Credit." *American Economic Review* 102(5): 1927-1956.

Desmond, Matthew, Carl Gershenson, and Barbara Kiviat. 2015. "Forced Relocation and Residential Instability among Urban Renters." *Social Service Review* 89(2): 227-262.

Finkel, Meryl and Larry Buron. 2001. "Study on Section 8 Voucher Success Rates." *Volume I: Quantitative Study of Success Rates in Metropolitan Areas.* U.S. Department of Housing and Urban Development, Office of Policy Development and Research.

Griliches, Z. 1979. "Sibling Models and Data in Economics: Beginnings of a Survey." *Journal of Political Economy* 87: S37-S64.

HUD. 2000. "Picture of Subsidized Households." [dataset]. Retrieved from https://www.huduser.gov/portal/datasets/assthsg.html.

Jacob, Brian A. 2004. “Public Housing, Housing Vouchers, and Student Achievement: Evidence from Public Housing Demolitions in Chicago.” *American Economic Review* 94(1): 233-258.

Jacob, Brian A. and Jens Ludwig. 2012. “The Effects of Housing Assistance on Labor Supply: Evidence from a Voucher Lottery.” *American Economic Review* 102(1): 272-304.

Jacob, Brian A., Jens Ludwig, and Douglas L. Miller. 2013. “The Effects of Housing and Neighborhood Conditions on Child Mortality.” *Journal of Health Economics* 32(1): 195-206.

Jacob, Brian A., Max Kapustin, and Jens Ludwig. 2015. “The Impact of Housing Assistance on Child Outcomes: Evidence from a Randomized Housing Lottery.” *Quarterly Journal of Economic* 130(1): 465-506.

Kling, Jeffrey R., Jens Ludwig, and Lawrence F. Katz (2005) “Neighborhood Effects on Crime for Female and Male Youth: Evidence from a Randomized Housing Voucher Experiment.” *Quarterly Journal of Economics* 120(1): 87-130.

Levine, David and Bhashkar Mazumder. 2007. “The Growing Importance of Family: Evidence from Brothers’ Earnings.” *Industrial Relations* 46(1): 7-21.

Lubell, Jeffrey M., Mark Shroder and Barry Steffen. 2003. “Work Participation and Length of Stay in HUD-Assisted Housing.” *Cityscape: A Journal of Policy Development and Research* 6(2): 207-223.

Ludwig, Jens, Greg Duncan, Lisa Gennetian, Lawrence Katz, Ronald Kessler, Jeffrey Kling, and Lisa Sanbonmatsu. 2012. “Neighborhood Effects on the Long-Term Well-Being of Low-Income Adults.” *Science* 337(6101): 1505-1510.

Ludwig, Jens, Greg Duncan, Lisa Gennetian, Lawrence Katz, Ronald Kessler, Jeffrey Kling, and Lisa Sanbonmatsu. 2013. “Long-term Neighborhood Effects on Low-Income Families: Evidence from Moving to Opportunity.” *American Economic Review* 103(3): 226-231.

Mills, Gregory, Daniel Gubits, Larry Orr, David Long, Judie Feins, Bulbul Kaul, Michelle Wood, Amy Jones and Associates, Cloudburst Consulting, and the QED Group. 2006. *The Effects of Housing Vouchers on Welfare Families.* Washington, DC: U.S. Department of Housing and Urban Development, Office of Policy Development and Research.

Mueller-Smith, Michael. 2015. “The Criminal and Labor Market Impacts of Incarceration.” Working Paper, University of Michigan Department of Economics, at http://www.antoniocasella.eu/nume/Mueller-Smith_2014.pdf.

Newman, Sandra and Joseph Harkness. 2000. “Assisted Housing and the Educational Attainment of Children.” *Journal of Housing Economics* 9: 40-63.

Newman, Sandra and Joseph Harkness. 2002. “The Long-Term Effects of Public Housing on Self-Sufficiency.” *Journal of Policy Analysis and Management* 21: 21-43.

Newman, Oscar. *Defensible Space: Crime Prevention Through Urban Design*. New York: Macmillan. 1972.

Olsen, Edgar O., Catherine A. Tyler, Jonathan W. King, and Paul E. Carrillo. 2005. “The Effects of Different Types of Housing Assistance on Earnings and Employment.” *Cityscape: A Journal of Policy Development and Research* 8(2): 163-187.

Oreopoulos, Philip. 2003. “The Long-Run Consequences of Living in a Poor Neighborhood.” *Quarterly Journal of Economics* 118(4): 1533-1575.

Page, Marianne and Gary Solon. 2003. “Correlations between Brothers and Neighboring Boys in Their Adult Earnings: The Importance of Being Urban.” *Journal of Labor Economics* 21(4): 831-855.

Pei, Zhuan, Jorn-Steffen Pischke, and Hannes Schwandt. 2017. “Poorly Measured Confounders are More Useful on the Left than on the Right.” NBER Working Paper No. 23232.

Popkin, Susan J., Diane K. Levy, Laura E. Harris, Jennifer Comey, Mary K. Cunningham, and Larry F. Buron. 2004. “The HOPE VI Program: What about the Residents?” *Housing Policy Debate* 15(2): 385-414.

Quigley, John, and Steven Raphael. 2004. “Is Housing Unaffordable? Why Isn’t It More Affordable.” *Journal of Economic Perspectives* 18(1): 191-214.

Raphael, Steven. 2005. “The Socioeconomic Status of Black Males: The Increasing Importance of Incarceration,” in Alan Auerbach, David Card, and John Quigley (eds.), *Poverty, the Distribution of Income, and Public Policy*, Russell Sage Foundation: New York.

Royer, Heather. 2009. “Separated at Girth: Estimating the Long-Run and Intergenerational Effects of Birthweight Using Twins.” *American Economic Journal: Applied Economics* 1: 49-85.

Ruggles, S., K. Genadek, R. Goeken, J. Grover, and M. Sobek. 2017. “Integrated Public Use Microdata Series: Version 7.0.” [dataset]. Minneapolis: University of Minnesota. Retrieved from https://doi.org/10.18128/D010.V7.0.

Schill, Michael H. 1993. “Distressed Public Housing: Where Do We Go from Here?” *The University of Chicago Law Review* 60(2): 497-554.

Shroder, Mark. 2002. “Does Housing Assistance Perversely Affect Self-Sufficiency? A Review Essay.” *Journal of Housing Economics* 11: 381-417.

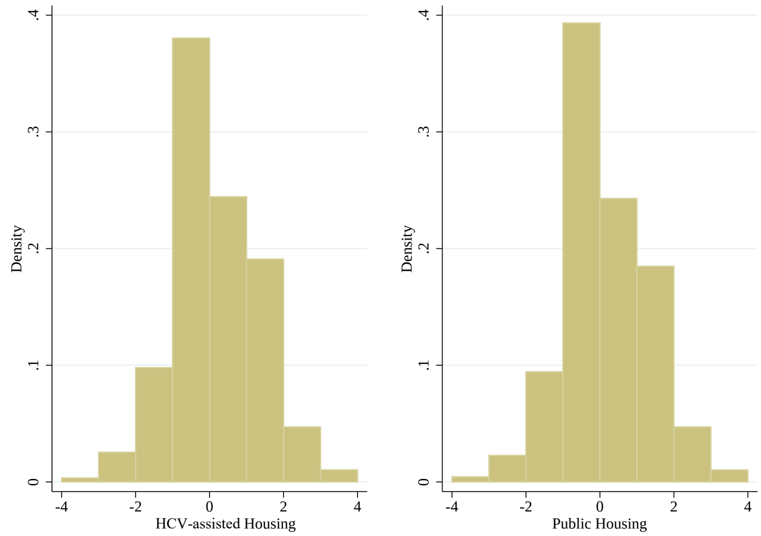
Steffen, Barry L., George R. Carter, Marge Martin, Danilo Pelletiere, David A. Vandenbroucke, and Yung-Gann David Yao. 2015. “Worst Case Housing Needs.” U.S. Department of Housing and Urban Development, Office of Policy Development and Research.

Stevens, David. 2007. “Employment that is Not Covered by State Unemployment Insurance Laws.” U.S. Census Bureau LEHD Technical Paper No. TP-2007-04.

Tatian, Peter A. and Christopher Snow. 2005. “The Effects of Housing Assistance on Income, Earnings, and Employment.” *Cityscape: A Journal of Policy Development and Research* 8(2): 135-161.

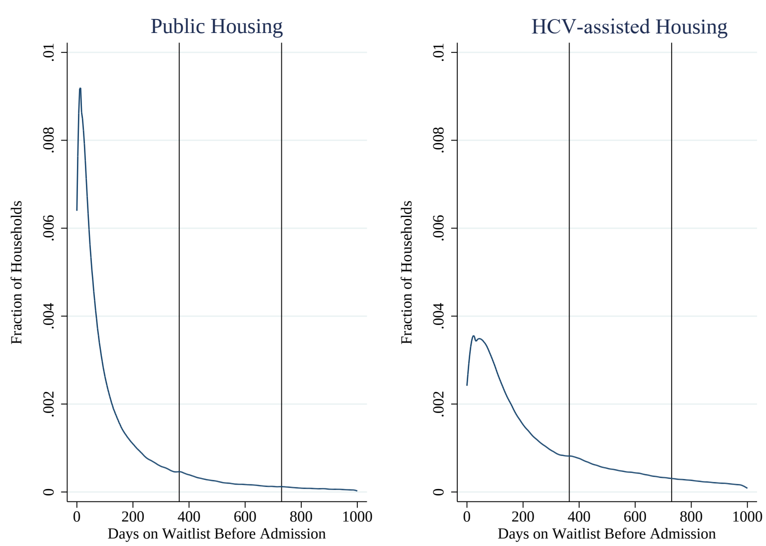
Thomas Vartanian and Page Walker Buck. 2005. “Childhood and Adolescent Neighborhood Effects on Adult Income: Using Siblings to Examine Differences in OLS and Fixed Effect Models.” *Social Service Review* 79(1): 60-94.

Figure 1: Within-Household Differences in Subsidized Housing Participation



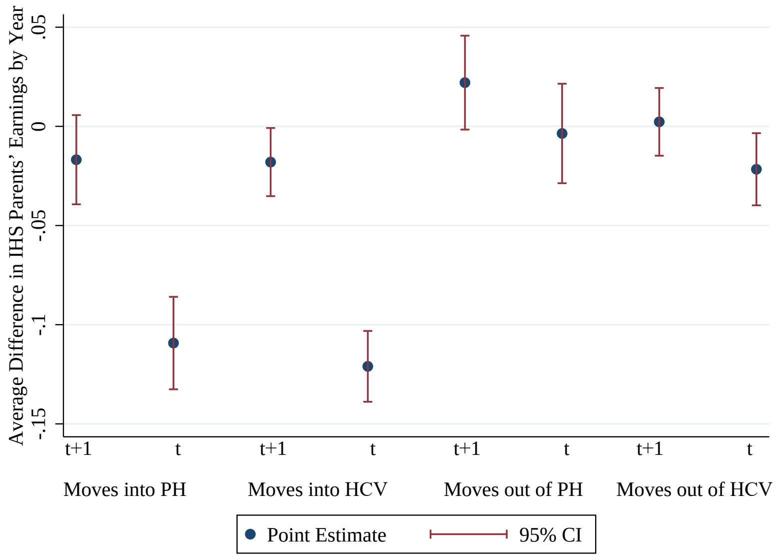
Notes:
Figure displays the distribution of within-household differences in public housing and HCV-assisted housing participation for teenagers in the main sample. Within-household differences are topcoded to have an absolute value no greater than four and individuals from households with no differences in program participation are omitted. Of individuals in households with some HCV-assisted housing participation, 0.428 have no within-household variation. Of individuals in households with some public housing participation, 0.699 have no within-household variation. Each bin represents a one year difference in program participation.

Figure 2: Days on a Waitlist Prior to Program Admission in 2000



Notes:
Figure displays the distribution of days spent on the waiting list before admission for households found in both public and HCV-assisted housing in the year 2000. The sample is limited to households with non-missing admission and waitlist information who gained admission to their program no earlier than 1995. 0.116 of public housing households spent >1 year and 0.033 spent >2 years on a waitlist prior to admission. 0.287 of HCV-assisted housing households spent >1 year and 0.108 spent >2 years on a waitlist prior to admission.

Figure 3: Event Study Estimates of Changes in Parents' Earnings in Years Before a Move



Notes:
Figure displays coefficients from household fixed effects regressions of the inverse hyperbolic sine of total parents' earnings on indicators for whether the household changed public housing (PH) or housing choice voucher (HCV) assisted housing participation in the calendar year t, in the next calendar year, or whether the household changed their participation in either program at any previous year in the study period. In addition to the move indicators, the models include household fixed effects, year fixed effects, state by year fixed effects, and counts of the number of children in the household of each age between 13 and 23. A household is designated as having moved out of public housing or the HCV program in a year if in the year prior at least one child was observed in the program but in the current year no child was observed in that program. A household is designated as having moved into public housing or the HCV program if in the year prior no child was observed in the program but in the current year at least one child is observed in the program. The t+1 coefficients correspond to the indicator for whether there was a move in the subsequent year while the t coefficients correspond to there being a move in the current year. The mean annual inverse hyperbolic sine of parents' earnings for the full sample is 5.874. For each coefficient, the point estimate and 95% confidence interval are shown with confidence intervals based on heteroskedasticity-robust standard errors clustered at the household level.

Table 1: Summary Statistics for Analysis Sample

	13-18 in 2000 with at least one other sibling 13-18				
			In household that received a subsidy		
	Total (1)	In households not receiving any housing subsidy (2)	Total (3)	Never lived in subsidized housing while 13-18 (4)	Lived in subsidized housing while 13-18 (5)
Household size in 2000	5.355	5.331	5.415	5.669	5.369
Age in 2000	15.415	15.456	15.313	15.525	15.275
Male	0.499	0.504	0.487	0.507	0.483
White non-Hispanic household	0.345	0.402	0.203	0.230	0.198
Black non-Hispanic household	0.289	0.216	0.470	0.448	0.474
Hispanic household	0.285	0.295	0.258	0.256	0.258
Other non-Hispanic household	0.082	0.087	0.069	0.065	0.070
Block group % poverty while 13-18	0.113	0.109	0.121	0.120	0.122
Inverse hyperbolic sine parents' earnings	7.889	8.069	7.441	7.589	7.415
Total parents' earnings while 16-18	$36,056	$39,625	$27,189	$29,106	$26,848
Single-parent household	0.647	0.599	0.767	0.743	0.771
Public housing resident while 13-18	0.085	0.000	0.296	0.000	0.348
HCV recipient while 13-18	0.168	0.000	0.585	0.000	0.689
Years in public housing ages 13-18	0.295	0.000	1.026	0.000	1.209
Years in HCV housing ages 13-18	0.593	0.000	2.067	0.000	2.434
Total labor market earnings 2008-2013	$69,571	$74,695	$56,840	$55,801	$57,024
Total labor market earnings age 26	$11,818	$12,681	$9,673	$9,428	$9,716
Total number of years worked 2008-2013	4.240	4.310	4.068	3.998	4.080
Observed in 2010 Census	0.764	0.778	0.730	0.721	0.731
Incarcerated in 2010	0.031	0.025	0.046	0.054	0.045
Observations	1,172,000	840,000	333,000	50,000	282,000

Notes:
Excludes teenagers in owner-occupied housing, those from households earning above 50% of area median income in the year and teenagers who lived in counties that participated in HUD's Moving to Work program prior to 2005. Based on authors' tabulations of matched 2000 and 2010 Census, HUD-PIC, and LEHD files. See text for more details. Number of observations rounded to the nearest thousand.

Table 2: The Effect of Teenage Residence in HUD-Subsidized Housing on Age 26 Earnings
All Household Race/Ethnicities

	Dose Treatment (Years Spent in Program)				
	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	-0.015**	-0.021***	-0.020**	-0.020**	-0.018**
	(0.006)	(0.008)	(0.008)	(0.008)	(0.008)
Public Housing	-0.081***	0.049***	0.049***	0.054***	0.054***
	(0.006)	(0.013)	(0.013)	(0.013)	(0.013)
Public Housing*Male	0.015*	0.002	0.003	-0.008	-0.006
	(0.008)	(0.011)	(0.011)	(0.011)	(0.011)
IHS Average Parents' Earnings			0.025*		0.023*
			(0.013)		(0.013)
IHS Average Parents' Earnings*Male			0.006**		0.009***
			(0.003)		(0.003)
Average Block Group % Poverty				-1.729***	-1.751***
				(0.323)	(0.324)
Average Block Group % Poverty*Male				1.588***	1.639***
				(0.187)	(0.188)
Demographic Controls	yes	yes	yes	yes	yes
Household Fixed Effects	no	yes	yes	yes	yes

Notes:
Number of observations 1,172,000 rounded to the nearest thousand. See text for a detailed sample description. The dependent variable in each column is the inverse hyperbolic sine (IHS) of total earnings at age 26. Column 1 presents ordinary least squares (OLS) estimates. All remaining columns present household fixed effects (HFE) estimates. All columns include controls for male by age and male by household race. Column 3 (HFE EC) also includes a control for the IHS sine of parents' average annual earnings while a teenager and its interaction with whether the child was male. Column 4 (HFE BGC) includes a control for the average block group percent poverty in the block group of residence between the ages of 13 and 18 and its interaction with a male indicator. Column 5 (HFE LC) includes both the parents' earnings and block group percent poverty controls, along with interactions with the male indicator. In cases where the teenager's block group of residence is unknown, the average block group percent poverty in their county of residence is used. Race and ethnicity is assigned at the household level using information from the 2000 Census. Subsidized housing participation is defined using a count of the number of years each individual ever lived in each type of subsidized housing while a teenager. Robust standard errors clustered at the household are displayed below each point estimate. *** p<0.01, ** p<0.05, * p<0.1. Based on the authors' tabulations from matched Census 2000-LEHD-PIC file.

Table 3: Household Fixed Effects Estimates
By Gender, Subsidy Type, and Race/Ethnicity

	Dose Treatment (Years Spent in Program)		
	Housing Voucher (HCV) Treatment Effect	Public Housing (PH) Treatment Effect	Are Subsidy Effects Different? (HCV vs. PH)
	(1)	(2)	(3)
All Households			
Females (F)	0.047***	0.049***	No
	(0.010)	(0.013)	
Males (M)	0.026***	0.051***	No
	(0.010)	(0.014)	
Are Subsidy Effects Different? (F vs. M)	Yes***	No	
Non-Hispanic White Households			
Females (F)	0.006	-0.000	No
	(0.020)	(0.035)	
Males (M)	0.034*	0.065*	No
	(0.020)	(0.035)	
Are Subsidy Effects Different? (F vs. M)	Yes*	Yes**	
Non-Hispanic Black Households			
Females (F)	0.070***	0.055***	No
	(0.014)	(0.017)	
Males (M)	0.030**	0.051***	No
	(0.014)	(0.018)	
Are Subsidy Effects Different? (F vs. M)	Yes***	No	
Hispanic Households			
Females (F)	0.045**	0.071***	No
	(0.021)	(0.027)	
Males (M)	0.030	0.051*	No
	(0.021)	(0.028)	
Are Subsidy Effects Different? (F vs. M)	No	No	

Notes:
All columns present household fixed effects estimates of the impact of subsidized housing participation as a teenager on the inverse hyperbolic sine (IHS) of total age 26 earnings. Teenage participation in each subsidized housing program is defined as the count of the number of years as a teenager spent in the program. Estimates do not control for parents' earnings as a teenager or average block group percent poverty as a teenager but include a male indicator, a full set of age in years by male fixed effects, and, in the All Household Rows, male by household race interactions with non-Hispanic White by Male as the omitted category. See Tables 3 and C1-C3 for observations rounded to the nearest thousand. Robust standard errors clustered at the household are displayed below each point estimate. *** p<0.01, ** p<0.05, * p<0.1. Based on the authors' tabulations from matched Census 2000-LEHD-PIC file.

Table 4: Subsidized Housing and Adult Incarceration

	2010 Incarceration			
	All Households	White Households	Black Households	Hispanic Households
	(1)	(2)	(3)	(4)
HCV Housing	-0.004***	-0.002**	-0.007***	-0.003***'
	(0.001)	(0.001)	(0.001)	(0.001)
HCV Housing*Male	0.003***	0.002***	0.004***	0.003***
	(0.000)	(0.001)	(0.001)	(0.001)
Public Housing	-0.005***	-0.005***	-0.006***	-0.003**
	(0.001)	(0.002)	(0.001)	(0.001)
Public*Male	0.002***	0.002*	0.003**	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Observations	673,000	291,000	160,000	168,000
Demographic Controls	yes	yes	yes	yes
Household fixed effects	yes	yes	yes	yes

Notes:
Table displays household fixed effects estimates of the effect of teenage subsidized housing participation on 2010 incarceration in an adult correctional facility as observed in the 2010 census. Participation in subsidized housing is captured by a count of the number of years each individual ever resided in public housing or HCV-supported housing while between the ages of 13 and 18. Treatment is observed between 1997 and 2005 and imputed for 1995 and 1996 when possible. To be included in the sample individuals must be in households that did not have any attrition between the 2000 and 2010 census. To adjust for this, we re-weight the observations by the inverse probability that a household would not lose any observations between 2000 and 2010, using household race indicators, the number of people in the household the number of teenagers in the household, whether the household rented in 2000, whether the household lived rent free (but did not own) their household in 2000, and state fixed effects as predictors. Heteroskedasticity-robust standard errors clustered at the household level are shown in parentheses below each point estimate.
* p<.1, ** p<.05, *** p<.01

Table 5: Subsidized Housing, Incarceration, and Adult Earnings

	Subsidized Housing, Incarceration, and Earnings			
	All Households	White Households	Black Households	Hispanic Households
	(1)	(2)	(3)	(4)
(A) Effect of Subsidized Housing on Age 26 Earnings				
HCV Housing:				
Females	0.041	0.027	0.042	0.047
Males	0.016	0.063	-0.003	0.030
Public Housing:				
Females	0.061	-0.007	0.072	0.083
Males	0.051	0.021	0.064	0.047
(B) Effect of Subsidized Housing on 2010 Incarceration				
HCV Housing:				
Females	-0.004	-0.002	-0.007	-0.003
Males	-0.001	0.000	-0.003	0.000
Public Housing:				
Females	-0.005	-0.005	-0.006	-0.003
Males	-0.003	-0.003	-0.003	-0.002
(C) Association Between Age 26 Earnings and 2010 Incarceration				
Females	-3.012	-2.499	-3.575	-2.547
Males	-3.757	-3.487	-3.819	-3.827
(D) % Of Earnings Effect Explainable by 2010 Incarceration [(B)(C)]/(A)*				
HCV Housing:				
Females	29	(0)	60	17
Males	(0)	0	(0)	(0)
Public Housing:				
Females	25	(0)	29	10
Males	22	(0)	17	(0)
Observations	673,000	291,000	160,000	168,000
Demographic Controls	yes	yes	yes	yes
Household fixed effects	yes	yes	yes	yes

Notes:
Table displays the percent of the earnings effects that can potentially be explained by different 2010 incarceration rates. (A) displays the household fixed effects estimates of subsidized housing participation while a teenager on the inverse hyperbolic sine (IHS) of age 26 earnings, using the sample of individuals, households, and weights from Table 4. (B) replicates the household fixed effects estimates of subsidized housing participation while a teenager on 2010 incarceration from Table 4. (C) shows the difference in the IHS of age 26 earnings between individuals who were incarcerated in 2010 and those not incarcerated in 2010, based on household fixed effects specifications that control for age and household race and which are estimated separately by sex. 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 housing on age 26 earnings is insignificantly different from zero. A (-) indicates that the predicted effect of the subsidized housing program on age 26 earnings and the predicted effect of the subsidized housing program on 2010 incarceration are of the same sign, which given the 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.

Table 6: Subsidized Housing Residence and Adult Earnings
By Average Time Spent on a Waitlist

	All households	
	Dose Treatment (Years Spent in Program)	
	<=9 Months Wait	>9 Months Wait
	(1)	(2)
HCV Housing	0.040***	0.053***
	(0.014)	(0.014)
HCV Housing*Male	-0.012	-0.027**
	(0.011)	(0.011)
Public Housing	0.051***	0.050**
	(0.017)	(0.022)
Public Housing*Male	-0.003	0.005
	(0.014)	(0.017)
Male	0.515***	0.352***
	(0.041)	(0.046)
Observations	611,000	562,000
	P-value: Treatment effects are equal below and above 9 months wait	
Females in HCV Housing	0.494	
Females in Public Housing	0.961	
Males in HCV Housing	0.917	
Males in Public Housing	0.803	

Notes:
Each column presents a household fixed effects estimate of HUD-subsidized housing participation while a teenager on the inverse hyperbolic sine (IHS) of total age 26 earnings. Average wait time for public housing and HCV-assisted housing in a county is calculated as the weighted housing authority average of the mean days spent on a waitlist prior to admission each program. The weights used for each average are the number of teenagers observed in each housing authority-program type-county cell in the year 2000. The overall average county-level wait time is then the arithmetic mean of the public housing and HCV-housing county-level average wait time. Counties are classified as having a wait of above nine months if this average is greater than 273 days and below nine months if it is less than or equal to 273 days. The bottom panel displays p-values from tests of whether the effect is the same in counties with long (>9 months) and short (<=9 months) wait times. Robust standard errors, clustered at the household level, are displayed under each estimate. *** p<0.01, ** p<0.05, * p<0.1.

Table 7: Subsidized Housing Residence and Adult Earnings
Predicting Observed Subsidized Housing Participation using the Head of Household in 2000

	Dose Treatment (Years in Program)			
	OLS	HFE	HFE PRED	HFE IV
	(1)	(2)	(3)	(4)
HCV Housing	-0.667***	0.271***	0.258***	0.325***
	(0.028)	(0.062)	(0.088)	(0.115)
HCV Housing*Male	-0.045	-0.173***	-0.195***	-0.224***
	(0.040)	(0.051)	(0.050)	(0.058)
Public Housing	-0.878***	0.237***	0.047	0.081
	(0.038)	(0.085)	(0.131)	(0.179)
Public Housing*Male	0.228***	0.062	0.087	0.094
	(0.055)	(0.069)	(0.072)	(0.080)
First Stage Estimates				
	Public Housing	Male*Public Housing	HCV Housing	Male*HCV Housing
Predicted HCV Housing	-0.011***	-0.002***	0.762***	-0.051***
	(0.001)	(0.001)	(0.003)	(0.002)
Predicted HCV Housing*Male	0.000	-0.008***	0.001	0.869***
	(0.000)	(0.000)	(0.002)	(0.002)
Predicted Public Housing	0.729***	-0.085***	-0.012***	0.001
	(0.006)	(0.004)	(0.002)	(0.001)
Predicted Public Housing*Male	-0.016***	0.897***	0.002***	-0.014***
	(0.003)	(0.003)	(0.001)	(0.001)
Kleinbergen-Paap rk Wald	4568.090			

Notes:
Number of observations = 1,172,000 rounded to the nearest thousand. Table presents only the coefficients on the housing subsidy measures and their interactions with a male indicator. In each column the percentile in the earnings distribution when age 26 is the dependent variable. Treatment is defined using a count of the number of years the individual participated in each program between the ages of 13 and 18. See the main text for a more detailed description of the sample. Columns 1 and 2 of the top panel present OLS and HFE estimates. Column 3 defines participation using the observed subsidized housing participation of the head of household and the ages of household members rather than using the observed participation of each individual. Column 4 presents household fixed effects instrumental variables estimates using the predicted treatment based on the head of household participation and the individual's age in 2000 as instruments for observed participation. A full set of male by age fixed effects and male by household race fixed effects are included as controls. The bottom panel presents the first stage estimates corresponding to the four endogenous variables. Kleinbergen-Paap Wald statistic is also shown at the bottom of the table. Robust standard errors clustered at the household are displayed below each point estimate. *** p<0.01, ** p<0.05, * p<0.1.

For Online Publication

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 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

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

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] Table A1 presents 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 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

[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.

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. The most significant reporting shortfalls are for pre-1997 data, and 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 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.

Table A1 presents 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

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[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).

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.

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

[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.

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).

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 119 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 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.

[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 A2 and A3 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). Clearly, our sample closely resembles the national population in assisted housing across all of the characteristics available in the data.
[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.

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 households with a parents' earnings-to-AMI measure below 0.5. 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

[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.

at some point between 1997 and 2005. This is the main sample for our analysis of the impact on earnings. Because not all of 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 673,000.[18]

The predicted participation measures used in the HFE PRED and HFE IV specifications are calculated in the following way. In any given year, if the head of household is in subsidized housing and the child is in the 13-18 year-old age range, then the predicted participation measure indicates that the child is in subsidized housing in that year. If either the child is not between the ages of 13 and 18 or the head of household is not observed in subsidized housing, then the predicted participation measure will take on a value of zero for that year. As with our main treatment measures, we sum up the predicted years spent in voucher housing and the predicted years spent in public housing while each individual was between 13 and 18 years of age.[19]

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.

[19] The household-predicted housing subsidy measure could also be thought of as another, noisy measure of child housing subsidy. For an example of how a one noisy measure can be used to instrument for another, see Ashenfelter and Krueger (1994). In that study, IV first-differences estimates turn out to be substantially higher than first-differences estimates with no IV, suggesting that noise was attenuating the baseline result. In any event, the results in Table B2 suggest that measurement error is not importantly affecting our results.

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 "dose" 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).[20] 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.[21] 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. 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.

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[20] 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. We use this match, in tandem with the age of each child, to define an alternative subsidized housing participation measure which is discussed in more detail in Section 6.2.

[21] 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.

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.[22]

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 2 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).

A.5 Summary Statistics

To help better understand the within-household variation in public and voucher-assisted housing Table A4 displays summary statistics for teenage subsidized housing exposure, disaggregated by household assisted housing participation in the first year of our data (1997). The full sample includes 1,172,000 children aged 13-18 in 2000. 994,000 (84.7%) come from households that did not participate in assisted housing in 1997, 62,000 (5.3%) come from households that resided in public housing in 1997, and 118,000 (10.1%) come from households that resided in HCV-assisted housing in 1997. While 313,000 children were in a household that received some housing assistance during the 1997-2005 period, not all of these households have between-sibling differences in teenage subsidized housing participation and therefore contribute to identifying the treatment effects in our household fixed-effects model. For example, a

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

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, 98,000 children have some within-household difference in teenage public housing and 187,000 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 0.993 and 0.972 years, respectively.[23] A two-child household at the mean within-household difference in public housing participation (0.993 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, 43,000 children entered public housing and another 90,000 entered the HCV program as teenagers. Likewise, among subsidized households in 1997, 53,000 children exited public housing and 94,000 children exited the HCV program during our study period. This suggests that roughly the same number of households exited and entered both programs during our study period.

The mean within-household difference in assisted housing participation is near three-quarters of a year—ranging from a minimum of 0.674 years to a maximum of 0.822 years—for children exposed to any of the four possible changes in assisted housing: moves into public or HCV-assisted housing and moves out of public or HCV-assisted housing. 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.[24]

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[23] Calculated as the mean within-household variation scaled by the fraction of individuals in the sample with some variation. For example, for public housing: 0.993 = 0.083/(98,000/1,173,000).

[24] 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.

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Table A1: Characteristics of Households in Public and HCV Housing in 2000

	Public Housing (1)	HCV Housing (2)
Number of people per unit	2.260	2.653
	(0.459)	(0.371)
Monthly tenant payment (rent+utilities)	210.118	227.348
	(54.390)	(59.291)
Household income per year (USD)	10,333.221	10,666.891
	(2,555.877)	(2,021.567)
Months on waiting list	14.844	28.067
	(12.801)	(16.534)
Months since moved in	105.777	52.223
	(57.661)	(23.882)
% of households with most income from welfare	11.017	12.172
	(6.593)	(7.406)
% area median income	25.046	23.020
	(6.041)	(3.571)
% households with children	43.971	60.962
	(15.513)	(11.439)
% minority	68.299	60.235
	(32.858)	(30.963)
% 62 or older	32.277	17.183
	(14.819)	(8.594)
% with 0 or 1 bedrooms	52.263	25.990
	(26.771)	(12.443)
% with 2 bedrooms	22.925	39.516
	(13.845)	(7.348)
% with 3 bedrooms	24.779	34.516
	(15.813)	(11.380)
Total households	1,080,359	1,447,688

Notes:
Statistics computed from HUDUSER public use Picture of Subsidized Housing data in the year 2000. Figures reflect only households and housing authorities with reported data. Standard deviations appear in ().

Table A2: Public Housing Participant Characteristics
For All HAs, non MTW HAs, and MTO HAs

	All (1)	Non-MTW HAs (2)	MTO HAs (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)	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 housing authorities (HAs), in non Moving to Work HAs which are retained in the main sample of this paper (non MTW), and Moving to Opportunity (MTO) HAs. For each characteristic, the mean and standard deviation in all HAs are shown in Column 1, the mean and standard deviation for non MTW HAs are shown in Column 2, and the mean and standard deviation for MTO HAs 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 Public housing through that HA. Standard deviations appear in (). Numbers based on Authors' calculations using HUDUSER Picture of Subsidized Households data from the year 2000.

Table A3: HCV-Supported Housing Participant Characteristics
For All HAs, non MTW HAs, and MTO HAs

	All (1)	Non-MTW HAs (2)	MTO HAs (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)	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 housing participants in all housing authorities (HAs), in non Moving to Work HAs which are retained in the main sample of this paper (non MTW), and Moving to Opportunity (MTO) HAs. For each characteristic, the mean and standard deviation in all HAs are shown in Column 1, the mean and standard deviation for non MTW HAs are shown in Column 2, and the mean and standard deviation for MTO HAs 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 housing through that HA. Standard deviations appear in (). Numbers based on Authors' calculations using HUDUSER Picture of Subsidized Households data from the year 2000.

Table A4: Within-Household Variation in Public Housing and HCV in the Estimation Sample

Household Status	Count (1)	Share (2)	Mean Years PH (3)	Mean Years HCV (4)	# with Variation in PH (5)	# with Variation in HCV (6)	Mean WHH Diff. in PH (7)	Mean WHH Diff. in HCV (8)
No subsidy in 1997	994,000	0.847	0.132	0.273	45,000	93,000	0.043	0.091
Never Entered	865,000	0.870	0.000	0.000	11,000	21,000	0.012	0.026
Entered PH	43,000	0.043	2.914	0.198	33,000	5,000	0.674	0.096
Entered HCV	90,000	0.091	0.089	3.005	4,000	70,000	0.038	0.733
In PH in 1997	62,000	0.053	3.259	0.320	48,000	8,000	0.804	0.132
Never Left PH	9,000	0.145	6.000	0.006	6,000	0	0.699	0.028
Left PH	53,000	0.855	2.799	0.372	42,000	8,000	0.822	0.149
In HCV in 1997	118,000	0.101	0.068	3.449	5,000	86,000	0.036	0.719
Never Left HCV	24,000	0.203	0.000	6.000	0	13,000	0.008	0.609
Left HCV	94,000	0.797	0.085	2.800	5,000	73,000	0.043	0.748
Full Sample	1,172,000	1.000	0.295	0.593	98,000	187,000	0.083	0.155

Notes:
Table presents population counts (rounded to the nearest 1000), shares, mean subsidized housing participation between the ages of 13 and 18, and the mean absolute value of between sibling variation in teenage subsidized housing participation for different sub-groups of the overall estimation sample. The Full Sample row of the table also displays values for the full estimation sample. The No subsidy in 1997 group includes all teenagers who were in a household where no teenagers were participating in public or housing choice voucher (HCV) assisted housing in the year 1997. This group is subdivided in to three sub-groups: those that never entered subsidized housing, those that entered public housing, and those that entered HCV housing. The sub-group classification is done using the observed participation of each teenager while they were between the ages of 13 and 18. The PH in 1997 group includes all teenagers who were in a household where at least one teenager participated in public housing in 1997. This group is subdivided into two sub-groups: teenagers who remained in public housing for each year between the ages of 13 and 18 and teenagers who left public housing at some point. The HCV in 1997 group includes all teenagers who were in a household where at least one teenager participated in HCV-assisted housing in 1997. This group is subdivided into teenagers who remained in HCV housing for each year between the ages of 13 and 18 and those that left the HCV program at some point. Column 1 shows the number of teenagers in each row and Column 2 displays the share of teenagers represented by the count in Column 1, either the share of all teenagers (for the rows corresponding to the primary classifications) or the share of teenagers in the relevant primary classification (for the rows corresponding to the sub-groups). Columns 3 and 4 show the mean years spent in public and HCV-supported housing between the ages of 13 and 18 for the teenagers in the row. Columns 5 and 6 show the count of teenagers in the row with some within-household variation in teenage public or HCV-supported housing participation and Columns 7 and 8 show the mean within-household (WHH) difference (in absolute value) in public and HCV-assisted housing for the teenagers in the row.

Table A5: Summary Statistics for Parents' Earnings and Changes in Assisted Housing

	All Sample Households (1)	Households with a Between Sibling Difference in Participation (2)
Inverse Hyperbolic Sine Parents' Annual Earnings	6.254	5.776
	(3.543)	(3.603)
Parents' Annual Earnings	10822.270	8063.074
	(10332.609)	(7992.257)
Any Move in or Move out of Subsidized Housing	0.296	0.950
	(0.455)	(0.218)
Any Move into Public Housing	0.092	0.288
	(0.286)	(0.450)
Any Move into HCV Housing	0.161	0.522
	(0.366)	(0.499)
Any Move out of Public Housing	0.090	0.310
	(0.282)	(0.460)
Any Move out of HCV Housing	0.159	0.534
	(0.365)	(0.498)
Number of Moves into or out of Subsidized Housing	0.589	1.947
	(1.074)	(1.161)
Number of Moves into Public Housing	0.111	0.352
	(0.365)	(0.598)
Number of Moves into HCV Housing	0.194	0.637
	(0.475)	(0.690)
Number of Moves out of Public Housing	0.108	0.374
	(0.361)	(0.604)
Number of Moves out of HCV Housing	0.193	0.649
	(0.477)	(0.688)
Number of Households	537000	121000

Notes:
Table presents means and standard deviations (in parentheses) for parents' earnings and moves into and out of subsidized housing during the 1997-2005 period. The sample in column 1 is limited to households used to estimate our main empirical results. Column 2 further restricts the sample to only those households in our estimation sample with some across sibling difference in teenage subsidized housing participation. The means are calculated using one observation per household and weighted using the hosuehold weights described in the main text. The parents' earnings averages are based on the total annual earnings for both the head of household and the spouse of the head of household in each year. We identify a household has having moved into or out of a program in a given year if in the prior year at least one teenager participated in the program and in the current year no teenager is participating in the program (a move out) or if in the prior year no teenagers participated in the program and in the current year at least one teenager is participating in the program (a move in).

Table A6: Converting Treatment Effects to Dollar Amounts (2000 USD)

	Treatment Effect (1)	Marginal Effect (2000 USD) (2)
All		
Female Public Housing	0.049	476.084
Male Public Housing	0.051	495.516
Female HCV	0.047	456.652
Male HCV	0.026	252.616
White non-Hispanic		
Female Public Housing	0	0
Male Public Housing	0.065	631.540
Female HCV	0.006	58.296
Male HCV	0.034	330.344
Black non-Hispanic		
Female Public Housing	0.055	534.380
Male Public Housing	0.051	495.516
Female HCV	0.07	680.120
Male HCV	0.03	291.480
Hispanic		
Female Public Housing	0.071	689.836
Male Public Housing	0.051	495.516
Female HCV	0.045	437.220
Male HCV	0.03	291.480

Notes:
Note: Table presents marginal effets of participation in public and HCV-assisted housing using the main results from Table 4. In all cases, we calculate the marginal effects in 2000 USD at the mean age 26 earnings for teenagers who spent some time in subsidized housing as a teenager ($9,716). For a given treatment effect β, marginal effects at the mean for teenagers who spent some time in subsidized housing as a teenager (y) are calculated as $\mathrm{ME}(\beta) = 0.5 \times \beta \times (\mathrm{e}^{\mathrm{y}} + \mathrm{e}^{\text{-y}})$.

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Table B1: The Effect of Teenage Residence in HUD-Subsidized Housing on Age 26 Employment
All Household Race/Ethnicities

	Dose Treatment (Years Spent in Program)				
	OLS	HFE	HFE EC	HFE BGC	HFE LC
	(1)	(2)	(3)	(4)	(5)
HCV Housing	-0.004***	0.005***	0.005***	0.005***	0.005***
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
HCV Housing*Male	-0.001**	-0.002**	-0.001*	-0.001*	-0.001*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Public Housing	-0.006***	0.005***	0.005***	0.005***	0.005***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Public Housing*Male	0.001	-0.000	-0.000	-0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Male	0.017***	0.026***	0.022***	0.013***	0.007
	(0.002)	(0.003)	(0.004)	(0.004)	(0.004)
IHS Average Parents' Earnings			0.002		0.002
			(0.001)		(0.001)
IHS Average Parents' Earnings*Male			0.000		0.001**
			(0.000)		(0.000)
Average Block Group % Poverty				-0.138***	-0.140***
				(0.032)	(0.032)
Average Block Group % Poverty*Male				0.137***	0.141***
				(0.019)	(0.019)
Age by Male Fixed Effects	yes	yes	yes	yes	yes
Male by HH Race Effects	yes	yes	yes	yes	yes
Household Fixed Effects	no	yes	yes	yes	yes

Notes:
Number of observations 1,172,000 rounded to the nearest thousand. See text for a detailed sample description. The dependent variable in each column is an indicator for whether the individual worked in the calendar year they were age 26. Column 1 presents ordinary least squares (OLS) estimates. All remaining columns present household fixed effects (HFE) estimates. All columns include controls for male by age and male by household race. Column 3 (HFE EC) also includes a control for the inverse hyperbolic sine (IHS) of parents' average annual earnings while a teenager and its interaction with whether the child was male. Column 4 (HFE BGC) includes a control for the average block group percent poverty in the block group of residence between the ages of 13 and 18 and its interaction with a male indicator. Column 5 (HFE LC) includes both the parents' earnings and block group percent poverty controls, along with interactions with the male indicator. In cases where the teenager's block group of residence is unknown, the average block group percent poverty in their county of residence is used. Race and ethnicity is assigned at the household level using information from the 2000 Census. Subsidized housing participation is defined using a count of the number of years each individual ever lived in each type of subsidized housing while a teenager. Robust standard errors clustered at the household are displayed below each point estimate. *** p<0.01, ** p<0.05, * p<0.1. Based on the authors' tabulations from matched Census 2000-LEHD-PIC file.

Table B2: Treatment Effect Heterogeneity by Subsidized Housing Participation in 1997

	All households	
	No Interactions	HH in Subsidized Housing in 1997
	(1)	(2)
HCV Housing	0.047***	0.045***
	(0.010)	(0.015)
HCV Housing*Male	-0.021***	-0.017
	(0.008)	(0.013)
Public Housing	0.049***	0.053**
	(0.013)	(0.021)
Public*Male	0.002	0.015
	(0.011)	(0.018)
HCV Housing*HH in Subsidized Housing in 1997		-0.001
		(0.020)
HCV Housing*HH in Subsidized Housing in 1997*Male		0.003
		(0.019)
Public Housing*HH in Subsidized Housing in 1997		-0.011
		(0.028)
Public Housing*HH in Subsidized Housing in 1997*Male		-0.011
		(0.025)

Notes:
Table presents household fixed effects estimates of years of teenage participation in subsidized housing on the inverse hyperbolic sine of total age 26 earnings. Column 1 replicates the dose specification from the main results. See main text for a more detailed description of the sample. Column 2 additionally includes interactions between the number of teenage years spent in each housing program type and whether the teenager's household participated in subsidized housing in the first available year of administrative data (1997). Robust standard errors, clustered at the household level, are displayed under each estimate. *** p<0.01, ** p<0.05, * p<0.1.

Table B3: Subsidized Housing Residence and Adult Earnings
Differentiating Large Public Housing Projects

	Dose Treatment (Years spent in program)			
	All Households	White Households	Black Households	Hispanic Households
	(1)	(2)	(3)	(4)
HCV Housing	0.047***	0.006	0.070***	0.045**
	(0.010)	(0.020)	(0.014)	(0.021)
HCV Housing*Male	-0.021***	0.029*	-0.039***	-0.015
	(0.008)	(0.015)	(0.012)	(0.016)
Public Housing	0.041***	0.003	0.050**	0.042
	(0.015)	(0.036)	(0.020)	(0.034)
Public Housing*Male	0.016	0.069**	-0.006	0.030
	(0.013)	(0.029)	(0.017)	(0.027)
Public Housing*Large Public Housing	0.030	-0.033	0.020	0.071
	(0.030)	(0.129)	(0.040)	(0.056)
Public Housing*Large Public Housing*Male	-0.049*	-0.059	0.004	-0.125***
	(0.025)	(0.121)	(0.034)	(0.046)
Observations	1,172,000	464,000	336,000	279,000
Mean of dependent variable	6.981	7.101	6.444	7.352

Notes:
Each column displays a household fixed effects estimate of the impact of teenage participation in subsidized housing on the inverse hyperbolic sine of total age 26 earnings. Each type of subsidized housing participation is defined using a count of the number of years the individual participated in that program while between the ages of 13 and 18. See the main text for a more detailed description of the sample. Large public housing projects are defined as projects in the top quartile of total population over the 1997 to 2005 period. A full set of male by age fixed effects and male by household race fixed effects are included as controls. Robust standard errors clustered at the household are displayed below each point estimate. *** p<0.01, ** p<0.05, * p<0.1.

Table B4: Subsidized Housing Residence and Adult Earnings
Differentiating Low-Income Public Housing Projects

	Dose Treatment (Years spent in program)			
	All Households	White Households	Black Households	Hispanic Households
	(1)	(2)	(3)	(4)
HCV Housing	0.047***	0.006	0.070***	0.045**
	(0.010)	(0.020)	(0.014)	(0.021)
HCV Housing*Male	-0.021***	0.029*	-0.039***	-0.015
	(0.008)	(0.015)	(0.012)	(0.016)
Public Housing	0.051***	-0.007	0.045**	0.085***
	(0.015)	(0.038)	(0.020)	(0.029)
Public Housing*Male	-0.005	0.042	0.012	-0.055**
	(0.012)	(0.031)	(0.017)	(0.022)
Public Housing*Low Income Public Housing	-0.010	0.031	0.041	-0.180**
	(0.034)	(0.102)	(0.041)	(0.087)
Public Housing*Low Income Public Housing*Male	0.038	0.180*	-0.066*	0.391***
	(0.031)	(0.103)	(0.037)	(0.079)
Observations	1,172,000	464,000	336,000	279,000
Mean of dependent variable	6.981	7.101	6.444	7.352

Notes:
Each column displays a household fixed effects estimate of the impact of teenage participation in subsidized housing on the inverse hyperbolic sine of total age 26 earnings. Each type of subsidized housing participation is defined using a count of the number of years the individual participated in that program while between the ages of 13 and 18. See the main text for a more detailed description of the sample. Low income public housing projects are defined as projects in the bottom quartile of person-weighted median household income over the 1997 to 2005 period. A full set of male by age fixed effects and male by household race fixed effects are included as controls. Robust standard errors clustered at the household are displayed below each point estimate. *** p<0.01, ** p<0.05, * p<0.1.

Table B5: The Effect of Teenage Residence in HUD-Subsidized Housing on Age 26 Earnings
White non-Hispanic Households Only

	Dose Treatment (Years Spent in Program)				
	OLS	HFE	HFE EC	HFE BGC	HFE LC
	(1)	(2)	(3)	(4)	(5)
HCV Housing	-0.149***	0.006	0.004	0.008	0.006
	(0.008)	(0.020)	(0.020)	(0.020)	(0.020)
HCV Housing*Male	0.034***	0.029*	0.032**	0.024	0.028*
	(0.012)	(0.015)	(0.015)	(0.015)	(0.015)
Public Housing	-0.161***	-0.000	-0.001	0.006	0.005
	(0.016)	(0.035)	(0.035)	(0.035)	(0.035)
Public Housing*Male	0.063***	0.065**	0.068**	0.054*	0.057**
	(0.022)	(0.028)	(0.028)	(0.028)	(0.028)
IHS Average Parents' Earnings			0.027		0.026
			(0.020)		(0.020)
IHS Average Parents' Earnings*Male			0.016***		0.018***
			(0.005)		(0.005)
Average Block Group % Poverty				-3.135***	-3.160***
				(0.621)	(0.622)
Average Block Group % Poverty*Male				3.235***	3.302***
				(0.386)	(0.387)
Demographic Controls	yes	yes	yes	yes	yes
Household Fixed Effects	no	yes	yes	yes	yes

Notes:
Number of observations 464,000 rounded to the nearest thousand. See text for a detailed sample description. The dependent variable in each column is the inverse hyperbolic sine of total age 26 earnings. Column 1 presents ordinary least squares (OLS) estimates. All remaining columns present household fixed effects (HFE) estimates. All columns include controls for male by age and male by household race. Column 3 (HFE EC) also includes a control for the inverse hyperbolic sine (IHS) of parents' average annual earnings while a teenager and its interaction with whether the child was male. Column 4 (HFE BGC) includes a control for the average block group percent poverty in the block group of residence between the ages of 13 and 18 and its interaction with a male indicator. Column 5 (HFE LC) includes both the parents' earnings and block group percent poverty controls, along with interactions with the male indicator. In cases where the teenager's block group of residence is unknown, the average block group percent poverty in their county of residence is used. Race and ethnicity is assigned at the household level using information from the 2000 Census. Subsidized housing participation is defined using a count of the number of years each individual ever lived in each type of subsidized housing while a teenager. Robust standard errors clustered at the household are displayed below each point estimate. *** p<0.01, ** p<0.05, * p<0.1. Based on the authors' tabulations from matched Census 2000-LEHD-PIC file.

Table B6: The Effect of Teenage Residence in HUD-Subsidized Housing on Age 26 Earnings
Black non-Hispanic Households Only

	Dose Treatment (Years Spent in Program)				
	OLS	HFE	HFE EC	HFE BGC	HFE LC
	(1)	(2)	(3)	(4)	(5)
HCV Housing	-0.041***	0.070***	0.070***	0.068***	0.068***
	(0.006)	(0.014)	(0.014)	(0.014)	(0.014)
HCV Housing*Male	-0.032***	-0.039***	-0.041***	-0.036***	-0.037***
	(0.009)	(0.012)	(0.012)	(0.012)	(0.012)
Public Housing	-0.067***	0.055***	0.057***	0.059***	0.059***
	(0.007)	(0.017)	(0.017)	(0.017)	(0.017)
Public Housing*Male	0.005	-0.005	-0.007	-0.011	-0.012
	(0.011)	(0.014)	(0.014)	(0.015)	(0.015)
IHS Average Parents' Earnings			0.064**		0.062**
			(0.026)		(0.026)
IHS Average Parents' Earnings*Male			-0.021***		-0.017***
			(0.006)		(0.006)
Average Block Group % Poverty				-1.627***	-1.550***
				(0.542)	(0.543)
Average Block Group % Poverty*Male				1.496***	1.340***
				(0.320)	(0.325)
Demographic Controls	yes	yes	yes	yes	yes
Household Fixed Effects	no	yes	yes	yes	yes

Notes:
Number of observations 336,000 rounded to the nearest thousand. See text for a detailed sample description. The dependent variable in each column is the inverse hyperbolic sine of total age 26 earnings. Column 1 presents ordinary least squares (OLS) estimates. All remaining columns present household fixed effects (HFE) estimates. All columns include controls for male by age and male by household race. Column 3 (HFE EC) also includes a control for the inverse hyperbolic sine (IHS) of parents' average annual earnings while a teenager and its interaction with whether the child was male. Column 4 (HFE BGC) includes a control for the average block group percent poverty in the block group of residence between the ages of 13 and 18 and its interaction with a male indicator. Column 5 (HFE LC) includes both the parents' earnings and block group percent poverty controls, along with interactions with the male indicator. In cases where the teenager's block group of residence is unknown, the average block group percent poverty in their county of residence is used. Race and ethnicity is assigned at the household level using information from the 2000 Census. Subsidized housing participation is defined using a count of the number of years each individual ever lived in each type of subsidized housing while a teenager. Robust standard errors clustered at the household are displayed below each point estimate. *** p<0.01, ** p<0.05, * p<0.1. Based on the authors' tabulations from matched Census 2000-LEHD-PIC file.

Table B7: The Effect of Teenage Residence in HUD-Subsidized Housing on Age 26 Earnings
Hispanic Households Only

	Dose Treatment (Years Spent in Program)				
	OLS	HFE	HFE EC	HFE BGC	HFE LC
	(1)	(2)	(3)	(4)	(5)
HCV Housing	-0.068***	0.045**	0.042**	0.045**	0.043**
	(0.009)	(0.021)	(0.021)	(0.021)	(0.021)
HCV Housing*Male	-0.014	-0.015	-0.011	-0.017	-0.012
	(0.012)	(0.016)	(0.016)	(0.016)	(0.016)
Public Housing	-0.085***	0.071***	0.068**	0.076***	0.074***
	(0.011)	(0.027)	(0.027)	(0.028)	(0.028)
Public Housing*Male	0.003	-0.020	-0.015	-0.030	-0.025
	(0.016)	(0.021)	(0.021)	(0.021)	(0.021)
IHS Average Parents' Earnings			0.010		0.010
			(0.025)		(0.025)
IHS Average Parents' Earnings*Male			0.020***		0.021***
			(0.006)		(0.006)
Average Block Group % Poverty				-0.854	-0.884
				(0.575)	(0.575)
Average Block Group % Poverty*Male				0.924***	0.995***
				(0.315)	(0.315)
Demographic Controls	yes	yes	yes	yes	yes
Household Fixed Effects	no	yes	yes	yes	yes

Notes:
Number of observations 279,000 rounded to the nearest thousand. See text for a detailed sample description. The dependent variable in each column is the inverse hyperbolic sine of total age 26 earnings. Column 1 presents ordinary least squares (OLS) estimates. All remaining columns present household fixed effects (HFE) estimates. All columns include controls for male by age and male by household race. Column 3 (HFE EC) also includes a control for the inverse hyperbolic sine (IHS) of parents' average annual earnings while a teenager and its interaction with whether the child was male. Column 4 (HFE BGC) includes a control for the average block group percent poverty in the block group of residence between the ages of 13 and 18 and its interaction with a male indicator. Column 5 (HFE LC) includes both the parents' earnings and block group percent poverty controls, along with interactions with the male indicator. In cases where the teenager's block group of residence is unknown, the average block group percent poverty in their county of residence is used. Race and ethnicity is assigned at the household level using information from the 2000 Census. Subsidized housing participation is defined using a count of the number of years each individual ever lived in each type of subsidized housing while a teenager. Robust standard errors clustered at the household are displayed below each point estimate. *** p<0.01, ** p<0.05, * p<0.1. Based on the authors' tabulations from matched Census 2000-LEHD-PIC file.