

Labor Market Improvement and the Use of Subsidized Housing Programs

By Nicholas Sly and Elizabeth M. Johnson

While total employment and wage growth fell substantially during the Great Recession and subsequently recovered, the total number of households using subsidized housing in the United States has been remarkably stable over the last decade. Improved employment outcomes, better employment opportunities, and higher wages all have the potential to assuage the need for subsidized housing programs by increasing household incomes. But at the national level, the relationship between labor market outcomes and subsidized housing use is unclear.

State-level data on labor market trends may paint a different picture of this relationship. Local public housing agencies (PHAs) allocate resources to various Department of Housing and Urban Development (HUD) programs based on local priorities. PHAs can choose, for example, to prioritize individuals who are homeless, households with particular housing needs, or households with children or single parents. Moreover, state-specific employment conditions and demographic factors may cause the use of subsidized housing to vary across states in a manner that national indicators do not capture.

In this article, we estimate how state-level changes in labor market conditions for particular sex, age, and race groups affect participation

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in a variety of subsidized housing programs. To connect households that participate in subsidized housing programs to the specific labor market conditions they face in their home states, we combine information from HUD about program enrollment for 2004–16 with data on labor market characteristics in the Current Population Survey (CPS) available from the U.S. Census Bureau.

We find that the use of housing choice vouchers, the largest subsidized housing program, tends to fall as more women and prime-age workers obtain employment. In contrast, we find that changes in race-specific employment outcomes do not substantially alter the use of subsidized housing programs within these racial groups. Overall, our results show the use of subsidized housing follows local, rather than national, labor market trends

Section I describes our data sources for labor market conditions and subsidized housing use and highlights disparities across U.S. states. Section II presents the empirical simultaneous equations model we estimate in reduced form to study the relationship between state-level labor market conditions and the use of subsidized housing programs by different demographic groups. Section III presents results that suggest sex- and age-specific labor market indicators are associated with the use of subsidized housing within these groups.

I. Measuring Subsidized Housing Use and Labor Market Conditions

Assessing the relationship between subsidized housing use and changes in employment outcomes requires information about both enrollment in subsidized housing and labor market conditions. We draw this data from two distinct sources. First, we use the Picture of Subsidized Households data set, available from HUD’s Office of Policy Development and Research, to identify the characteristics of households using subsidized housing. We next draw on the CPS, a monthly household-level survey conducted by the Bureau of Labor Statistics, to measure labor market outcomes.

Subsidized housing programs

The Picture of Subsidized Households data set is available at an annual frequency at the state level from 2004 to 2016. HUD compiles this

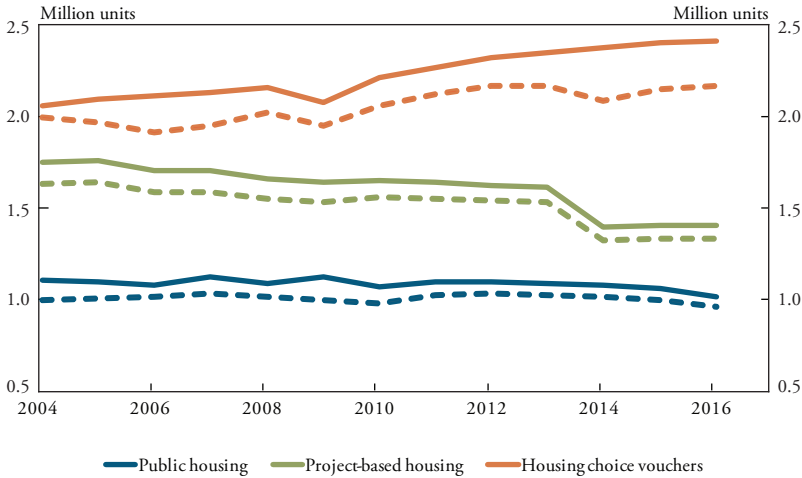
administrative data at the federal level from information in a database it uses to monitor the allocation of subsidized housing resources. Local property managers or PHAs collect and verify the individual entries in the database, meaning the data are highly reliable.¹ The information housing agencies collect includes the race of the head of household, the specific program in which they are participating, and other demographic characteristics such as age and sex of the head of household. HUD then aggregates the household-level data to the state level, reporting the fraction of households headed by individuals belonging to each demographic group that participate in each housing program in a given year. We convert these fractions to the total numbers of households using subsidized housing in each demographic group.

We extract information on three types of housing programs from the Picture of Subsidized Households data set. First, we observe the number of households in public housing, which consists of government-owned and managed properties intended to provide shelter to very low-income households. Second, we measure the number of households using housing choice vouchers (Section 8 vouchers), which provide subsidies to tenants who obtain housing on private markets—provided property owners are willing to accept the vouchers. Third, we observe the use of project-based housing programs including the Section 8, Section 202, Section 236, and Section 811 housing programs.² These programs provide subsidies to property owners or tenants and target low-income households, the elderly, and those with disabilities. They are all project-based in that they each subsidize housing at specific, privately owned properties, though the specific form of the subsidy differs across individual programs.

Altogether, public housing, vouchers, and project-based programs account for a majority of federally subsidized housing units. Chart 1 illustrates the relative size of each program: approximately 1 million households enrolled in public housing in 2016, while about 1.4 million and 2.4 million households used project-based housing and vouchers, respectively. The chart also shows that these numbers have been relatively stable over time. Total enrollment was similar 10 years earlier, as was the relative use of each program. Moreover, the number of households enrolled in each program remained steady from 2007 to 2009, a time when national employment levels fell dramatically. From a national perspective, aggregate labor market conditions appear to be unrelated to the overall use of subsidized housing.

Chart 1

Aggregate Use of Subsidized Housing over Time



Note: Solid lines represent total units, while dashed lines represent occupied units.

Sources: HUD Picture of Subsidized Housing and authors' calculations.

However, labor market conditions vary widely across states, as did their relative recoveries after the Great Recession. Housing needs and demographic characteristics are also quite different across states. To illustrate one of these differences, Map 1 shows the minority population share in each state in 2015 calculated using information from the CPS and race categories corresponding to HUD data, described below. Here, minority means nonwhite. Many states have a less than 10 percent minority population, as indicated by the lightest shade of blue, while many others have a more than 40 percent minority population, as indicated by the darkest shade of blue. These differences in population shares may cause the number of people in subsidized housing from each racial group to vary from state to state.

Labor market and population differences across states could lead to substantial differences in how public housing agencies allocate resources. For example, Map 2 illustrates differences in the use of specific HUD programs across states. Specifically, Map 2 shows the share of subsidized housing units that receive vouchers rather than project-based or public housing subsidies. For many states, vouchers are the majority program (indicated by the darker shades of blue), while in others, vouchers comprise less than half of all housing units (indicated by the lighter shades). Even though the use of subsidized housing

appears unrelated to national employment trends, state-level differences in the use of specific programs may be closely related to local employment conditions. Given these observed geographic differences, we use measures of state-level labor market conditions for workers with different demographic characteristics. Table 1 contains a complete set of summary statistics describing the use of subsidized housing in the United States.

State-level labor market conditions

We measure state-level labor market conditions using information from the CPS. This monthly survey includes information about each respondent's sex, age, race, occupation, labor force status, employment status, and wages. We aggregate individual observations to generate observations at the annual level for each state. These data allow us to calculate average wages and hours worked, as well as the total number of individuals employed in each sex, age, and race category. In addition, data on respondents' occupations allows us to measure total employment by skill level for each demographic group.

An important consideration when connecting subsidized housing use to labor market conditions is that HUD collects information about race in a different manner than many other U.S. federal data sources, including the CPS. In the underlying data used to compile the Picture of Subsidized Households, people identified as "Hispanic" are by definition not identified as any other race. By contrast, in the CPS and other data sources, "Hispanic" is typically treated as an ethnicity that individuals identifying as other races could also attribute to themselves. Another difference in the HUD data set is that the "white/Caucasian" category is defined as the absence of any other race label, including Hispanic. To ensure the observed race categories from the CPS match the HUD data, we use the individual responses in the household surveys to categorize race in a manner similar to HUD. Specifically, we first record those who say they are Hispanic as Hispanic. Then, we label those who say they are not Hispanic as being of the race they declare in the variable for race. To avoid assigning a race classification to those who claim multiple races and who do not identify as Hispanic, we categorize these individuals as belonging to "other."³

Table 1
Summary Statistics for Subsidized Housing Use

Variable	Mean	Standard deviation	Within standard deviation
Public housing			
Black	9,461.58	15,126.40	1,536.16
White	6,319.59	6,379.72	1,060.26
Hispanic	3,719.32	11,507.11	840.72
Asian	505.32	1,209.48	317.54
Native American	125.17	246.67	144.70
Young	1,379.45	1,575.95	426.87
Prime-age	8,374.36	11,901.14	741.98
Older	10,204.14	16,905.10	1,321.49
Female	33,098.66	40,740.96	1,344.07
Male	7,535.36	12,099.32	439.88
Project-based housing			
Black	10,123.05	11,532.72	1,978.53
White	14,354.10	13,569.56	2,799.82
Hispanic	3,830.88	8,340.88	816.34
Asian	1,393.82	4,491.12	652.00
Native American	240.81	390.41	186.12
Young	2,642.94	2,677.25	839.28
Prime-age	8,420.17	8,569.93	1,767.79
Older	18,643.90	21,758.72	2,228.17
Female	21,825.50	22,874.82	3,396.09
Male	7,928.12	9,110.13	1,012.04
Housing choice vouchers			
Black	18,765.80	22,887.94	3,368.04
White	14,359.66	16,743.66	2,546.13
Hispanic	6,244.86	14,589.70	2,396.44
Asian	1,124.18	4,984.60	569.09
Native American	323.00	546.80	193.54
Young	1,727.92	2,213.76	1,505.71
Prime-age	22,878.24	26,383.06	2,658.10
Older	15,999.29	25,491.16	4,697.21
Female	33,098.66	40,740.96	3,066.24
Male	7,535.36	12,099.32	1,663.88

Similarly, the age classifications HUD uses do not correspond to those commonly used in labor market research. In particular, HUD groups households headed by individuals age 25 to 50 into one category, which differs slightly from the typical classification of prime-age workers (workers age 25 to 54). We use the individual responses about age in the CPS to create age-specific measures of labor market conditions that correspond to those reported by HUD. However, for convenience, we refer to individuals age 25 to 50 as being of prime age.

Finally, we use individual responses in the CPS about workers' occupations to construct measures of the skill level of employment for workers in each race category. Our classifications of low-, middle-, and high-skill employment in the CPS follow Tüzemen and Willis. Table 2 reports summary statistics for the labor market variables. Because our empirical strategy (detailed in the next section) exploits variation in labor market conditions within states, Table 2 also reports standard deviations within states, which are calculated as the standard deviation in employment levels from state-specific averages observed over time. These statistics are quite different across sex, age, and race categories, and are therefore useful in facilitating comparisons across specifications.

II. An Empirical Model of Subsidized Housing Use

Several labor market characteristics could potentially influence the need for, and thereby the use of, subsidized housing programs. The total number of persons employed, the specific skill type of jobs available, wage levels, or even the labor force participation rate may all influence how much households rely on subsidized housing, with some being more important determinants than others. Focusing on state-level data, we distinguish improvements in a state's labor market conditions from other inherent differences across states and changes in national labor market conditions. In addition, we account for the fact that local housing agencies choose how to allocate scarce resources across different households and different demographic groups.

Specifically, to account for these factors, we estimate a simultaneous equations regression model. We model the number of households that use subsidized housing, $SH_Use_{st}^{dp}$, in a program, p , within each

Table 2
Summary Statistics for Labor Market Variables

Variable	Mean (thousands)	Standard deviation (thousands)	Within standard deviation (thousands)
Low-skill employment			
Black	73.73	88.97	11.48
White	273.82	237.09	16.93
Hispanic	104.38	242.22	29.67
Asian	25.27	55.36	9.77
Native American	4.79	5.03	2.17
Young	100.24	99.79	11.22
Prime-age	273.48	325.39	23.15
Older	112.75	132.19	27.06
Female	276.23	302.87	29.97
Male	210.24	250.73	23.32
Middle-skill employment			
Black	129.70	154.33	17.31
White	751.49	639.49	79.35
Hispanic	208.62	507.00	36.41
Asian	45.32	109.60	10.93
Native American	7.71	9.36	2.91
Young	154.54	172.23	28.46
Prime-age	680.19	763.77	84.65
Older	320.16	326.19	42.81
Female	452.18	481.28	40.55
Male	702.70	771.99	61.44
High-skill employment			
Black	95.46	121.66	17.23
White	880.39	826.11	41.91
Hispanic	93.51	230.48	38.15
Asian	77.45	185.59	30.96
Native American	5.88	7.12	2.88
Young	49.23	55.54	8.31
Prime-age	741.78	828.12	50.75
Older	372.69	407.00	65.81
Female	589.92	634.76	56.40
Male	573.79	652.69	49.69

state, s , during each year, t , for each demographic group, d , according to:

$$SH_Use_{st}^{dp} = \alpha + LaborConditions_{st}^d \Psi^p + \sum_{d \in D, p' \in P} SH_Use_{st}^{dp'} \theta_1^{dp'} \\ + State_s + Year_t + X_{st} \beta^{dp} + \epsilon_{st}^{dp},$$

where $LaborConditions_{st}^d$ is a vector of demographic-specific labor market indicators including the number (in thousands) of high-, middle-, and low-skill jobs, the number of individuals not in the labor force, and the average wage within each state for each year. The demographic characteristics we consider are sex, race, and age.

The separate regression equations for each program and demographic group represent a linear system of simultaneous equations for each subsidized housing program, reflecting that local public housing agencies decide how to allocate subsidies across potential participants. To avoid the well-known simultaneity bias that arises in such circumstances, we solve the system of equations and estimate the reduced form specification:

$$SH_Use_{st}^{dp} = \alpha + \sum_{d \in D} LaborConditions_{st}^d \Gamma^{dp} + State_s + Year_t + X_{st} \Lambda^{dp} + \epsilon_{st}^{dp},$$

which incorporates labor market conditions from all corresponding demographic groups.

We include a state fixed effect, $State_s$, so that the estimates Γ^{dp} reflect changes in the use of subsidized housing programs observed as labor market conditions improve or deteriorate relative to state-specific averages. The state fixed effects are necessary to account for the persistent differences in labor market characteristics, demographics, and the administration of subsidized housing programs across states. We observe all 50 states and the District of Columbia, giving us 51 cross-sectional units.

The term $Year_t$ is a vector of indicator variables for each year that absorbs, among other things, changes in aggregate labor market conditions across the United States and aggregate changes in subsidized housing enrollment. Given the 2004–16 sample period, the year fixed effects are necessary to account for the large changes in aggregate labor market conditions across the United States that occurred during the Great Recession.

Finally, the vector of controls, X_{st} , contains a set of variables that may influence the use of subsidized housing beyond labor market determinants. The vacancy rate in local housing markets, for example, is a known determinant of the uptake of certain housing programs (Shroder). In addition, local PHAs may allocate housing resources based on the demographic composition of the area, so we include controls for the total state population that identifies with each demographic group. Because we control for total employment across skill levels and the total population of workers, the observed variation in the number of workers not in the labor force reflects movements of workers out of the labor force from unemployment.

Our analysis of statewide labor market conditions differs from studies that focus on the specific employment situation of households that participate in subsidized housing programs (for example, Chyn and others). Other researchers use information about individual respondents and find that non-labor-market characteristics such as the age of the head of household, a criminal record, the number of children in a household, and the children's academic performance also predict enrollment (Finkle and Buron; Abt Associates and others; Shroder). We do not observe these alternative determinants of subsidized housing use, nor do we observe the employment status of program participants. Moreover, we do not observe barriers to subsidized housing use such as discrimination by property owners (for example, many property owners choose not to accept housing choice vouchers) or the location of employment relative to affordable housing. Whether labor market improvements are sufficient for households to leave subsidized housing remains an empirical question.

III. The Relationship between Subsidized Housing and the Labor Market

We find enrollment in subsidized housing programs declines as labor market characteristics improve across three demographic characteristics—sex, age, and race. We distinguish use of public housing, project-based housing programs, and housing choice vouchers for each demographic group. Our parsimonious analysis reveals links between labor market conditions and the use of particular housing programs that are obscured when looking at aggregate data.

Use of subsidized housing by sex

Table 3 reports results for the use of subsidized housing programs among households where the head of household is male versus female. We report results for the three types of housing programs in separate columns. Each specification includes state and year fixed effects as well as the full set of controls. Robust standard errors that account for heteroskedasticity across states are reported in parentheses.

The estimates reported for housing choice vouchers indicate that the number of female-headed households in the program tends to fall as overall employment of women increases. The coefficient on “LowSkillEmp” for women is 87.0, indicating that use of vouchers in a given state falls by approximately 87 households when an additional 1,000 women obtain low-skill employment, holding all else constant including employment of men. The coefficients on “MiddleSkillEmp” and “HighSkillEmp” are qualitatively similar, indicating that when an additional 1,000 women are employed in middle- or high-skill jobs, 37 to 50 fewer women use vouchers to subsidize their housing expense. Each of the coefficients for low-, middle-, and high-skill employment is significant at a high degree of confidence.

The individual significance of employment at each skill level is noteworthy. As subsidized housing programs target low-income households who are more likely to have low-skill jobs, we might expect only low-skill employment to be associated with the use of vouchers. Indeed, the point estimate on low-skill employment is larger (in absolute value) than those for other skill levels. However, the individual significance of the coefficients on middle- and high-skill employment points to broader links between subsidized housing use and changes in the labor market.

The magnitude of the change in the number of households in subsidized housing that these estimates imply is economically meaningful. The typical variation in low-skill employment among women in our sample (specifically, one standard deviation from state averages) is approximately 29,970. The corresponding statistics for middle- and high-skill employment among women are approximately 40,540 and 56,400, respectively. This means that the typical change in household voucher use associated with varying employment levels is approximately 6,740 households per state. But this number understates the change nationwide. The estimated change in the number of housing choice vouchers

Table 3
**Sex-Specific Labor Market Outcomes and the Use
of Subsidized Housing**

Variable	Housing choice vouchers		Project-based housing		Public housing	
	Female (1)	Male (2)	Female (3)	Male (4)	Female (5)	Male (6)
LowSkillEmp(Female)	-87.02*** (25.83)	-18.08* (10.69)	8.679 (20.70)	3.779 (5.946)	-10.06 (13.32)	-3.752 (3.465)
MiddleSkillEmp(Female)	-50.33*** (16.02)	-27.03** (10.11)	33.86 (23.35)	12.81* (7.458)	-7.991 (13.02)	-3.320 (3.637)
HighSkillEmp(Female)	-36.96** (13.90)	-11.12 (9.179)	-12.99 (12.44)	3.319 (4.100)	-2.240 (4.926)	-0.0475 (1.931)
Wage(Female)	-354.1 (509.9)	194.2 (178.8)	-66.72 (346.5)	-197.1 (123.7)	159.6 (126.4)	-67.81* (35.44)
NILF(Female)	-45.02*** (16.46)	-20.80** (9.371)	16.47 (15.90)	8.787 (5.342)	-9.014 (9.359)	-3.283 (2.659)
Population(Female)	60.80*** (18.55)	21.02** (8.208)	20.58 (13.80)	0.891 (4.286)	-5.784 (9.406)	-0.951 (2.531)
LowSkillEmp(Male)	26.21** (13.03)	16.85*** (5.203)	-16.56 (12.30)	-6.948 (4.992)	7.732 (8.237)	-0.585 (2.987)
MiddleSkillEmp(Male)	26.31** (10.35)	14.75** (6.011)	-23.23** (11.38)	-9.623** (3.938)	8.987 (6.799)	2.580 (1.810)
HighSkillEmp(Male)	14.16 (9.050)	17.74** (6.863)	-38.23* (19.24)	-16.92** (7.212)	5.714 (7.032)	0.945 (2.399)
Wage(Male)	-266.1 (425.2)	-24.06 (106.3)	484.9 (333.8)	95.73 (115.9)	-128.7 (117.8)	-61.11 (44.10)
NILF(Male)	21.12** (9.691)	20.28*** (5.737)	-40.89*** (12.20)	-13.99** (5.544)	7.766 (7.397)	2.903 (1.866)
Population(Male)	-30.86*** (10.82)	-16.62*** (4.864)	-1.176 (7.784)	3.677 (2.960)	5.760 (7.193)	1.355 (1.761)
Vacancy	127.0 (110.7)	30.34 (39.08)	0.899 (106.0)	-47.26 (33.14)	72.59* (36.27)	-1.453 (10.16)
Observations	658	658	663	663	656	656
R ²	0.251	0.568	0.533	0.321	0.169	0.160

* Significant at the 10 percent level

** Significant at the 5 percent level

*** Significant at the 1 percent level

Notes: Robust standard errors are in parentheses. All specifications include state and year fixed effects. NILF refers to the number of people who are not in the labor force.

female-headed households use corresponds to enrollment within individual states, so the magnitude of a nationwide change in subsidized housing use is much larger. In addition, we observe the number of households, which often includes multiple family members in the same residence; families may, for example, include children or other individuals not in the labor force. Altogether, these facts indicate that the relationship between state-level employment and the use of vouchers is both statistically significant and economically meaningful.

The number of female-headed households enrolled in the voucher program appears responsive to changes in male employment as well. Specifically, the number of female-headed households using housing choice vouchers has a positive and statistically significant relationship with low- and middle-skill employment among men. We might expect the estimates on male employment to be negative if men and women tend to cohabitate and share their income. Instead, the positive estimate on male employment highlights that the relationship between low-skill employment and the use of vouchers varies systematically according to sex. Overall, the use of vouchers tends to fall as low-skill employment rises, as the combined effect for women's and men's employment is negative—but when more men fill low-skill jobs than women, the change in voucher use by female-headed households is relatively smaller.

In contrast to the evidence for female-headed households, the use of housing choice vouchers by male-headed households has only a weak association with labor market outcomes. The second column under vouchers in Table 3 corresponds to the results for male-headed households. The estimates in column (2) indicate that for every 1,000 men who obtain employment at any skill level, approximately 15 more households use vouchers to subsidize their housing expense; the point estimates are 16.9 for low-skill employment, 14.8 for middle-skill employment, and 17.7 for high-skill employment. Each of the estimates on male employment is significant at a high degree of confidence. However, the estimates on female employment in each respective skill level are negative and of a similar magnitude to those for male employment. Taken together, these results indicate that rising employment in general is not linked to changes in the overall use of housing vouchers by male-headed households.

Unlike the results for vouchers, the use of public housing and project-based housing programs appears unrelated to labor market conditions within states. The subsequent columns in Table 3 report results corresponding to these alternative programs for both men and women. Across each skill level of employment and for both male- and female-headed households, the estimated coefficients are generally not significant at any reasonable degree of confidence. Moreover, the point estimates are much smaller than those obtained for vouchers. From Table 3, we conclude that while sex is an important factor in explaining the relationship between labor market conditions and use of housing choice vouchers, it does little to help explain how employment conditions are linked with the use of other programs.

Use of subsidized housing by age

The use of subsidized housing programs may differ by age as well as sex. Table 4 reports results on the use of subsidized housing among households headed by individuals from different age groups. Analyzing subsidized housing use across age groups is important, because both labor force activity and housing needs vary systematically by age. Table 4 shows results for households headed by prime-age individuals—those age 25 to 50—as well as results for households headed by individuals age 51 and older.⁴ We continue to include state and year fixed effects and report robust standard errors in parentheses.

The estimates in the first column of Table 4 indicate a close relationship between employment and the use of housing choice vouchers among households headed by prime-age individuals. The coefficients are -50.2 for low-skill employment, -23.4 for middle-skill employment, and -50.5 for high-skill employment. These estimates suggest that fewer households headed by prime-age individuals use vouchers when employment for any skill level rises. Because Tables 3 and 4 estimate voucher use by different categories of households, the point estimates are not directly comparable. To facilitate comparisons, we calculate the change in voucher use implied by a one standard deviation increase in employment above state-level averages. We find that the typical improvement above state averages across skill levels implies 4,844 fewer households will use vouchers. This change in voucher use among households headed by prime-age individuals is smaller than

Table 4
**Age-Specific Labor Market Outcomes
 and the Use of Subsidized Housing**

Variable	Housing choice vouchers		Project-based housing		Public housing	
	Prime age (1)	Older (2)	Prime age (3)	Older (4)	Prime age (5)	Older (6)
LowSkillEmp	-50.52*** (14.81)	33.77 (24.18)	2.895 (5.873)	-26.32 (26.16)	-3.205 (5.325)	7.410 (15.67)
MiddleSkillEmp	-23.42* (13.03)	-24.40 (24.46)	-5.894 (4.349)	-12.81 (20.04)	-5.462* (2.776)	6.199 (13.71)
HighSkillEmp	-33.20** (13.92)	-7.146 (27.76)	-17.39* (10.21)	-31.17** (14.58)	-8.231** (3.204)	8.863 (14.97)
Wage	-406.7* (239.1)	346.9** (159.0)	69.02 (223.3)	-75.72 (122.1)	37.53 (63.24)	68.29 (102.4)
NILF	-13.84 (13.19)	-28.60 (21.56)	-13.50 (10.66)	-13.61 (19.97)	-7.143 (5.113)	-3.126 (13.49)
Population	29.66** (11.90)	29.10 (23.70)	11.87* (7.031)	14.29 (18.31)	6.101* (3.301)	-0.495 (13.06)
Vacancy	11.86 (92.19)	144.5* (77.91)	-76.77 (60.58)	-25.21 (70.34)	-16.73 (27.43)	64.09 (38.34)
Observations	658	658	663	663	656	656
R ²	0.384	0.839	0.512	0.363	0.306	0.189

* Significant at the 10 percent level

** Significant at the 5 percent level

*** Significant at the 1 percent level

Notes: Robust standard errors are in parentheses. All specifications include state and year fixed effects as well as controls for alternative age groups. NILF refers to the number of people who are not in the labor force.

the change for female-headed households in response to the same variation in employment; the changes for both groups, however, are similar in magnitude. Unlike prime-age workers, increases in employment among workers age 51 and older have no clear relationship with enrollment in the voucher program.

Columns (3) and (4) report the results for project-based housing programs and government-owned public housing. As with sex, age-specific labor market outcomes appear unrelated to the use of these alternative subsidized housing programs. Again, the use of voucher programs across states is the most closely linked to labor market conditions.

Use of subsidized housing by race

The final demographic distinction we consider is the use of subsidized housing across racial groups. Table 5 reports usage results for housing vouchers in Panel A, project-based housing in Panel B, and

public housing in Panel C. Within these panels, each column corresponds to the specific racial group reported for the head of household: column (1) shows results for households headed by black individuals, column (2) for white, column (3) for Hispanic, column (4) for Asian, and column (5) for Native American. As before, each specification includes state and year fixed effects as well as the full set of controls. Robust standard errors that account for heteroskedasticity across states are reported in parentheses.

The results from the previous sections demonstrate a link between voucher use and both sex- and age-specific labor market outcomes. However, Panel A suggests only a tenuous link between enrollment in the voucher program and race-specific changes in employment. Voucher use by households headed by white, black, Hispanic, and Native American individuals does not change as the number of workers employed in each racial group rises or falls.

The results for households headed by Asian individuals are an exception: the estimates in column (4) of Panel A indicate that gains in low- and high-skill employment are systematically correlated with the use of vouchers among households headed by Asian individuals. The magnitudes of the estimates are -23.8 , -41.9 , and -32.9 for low-, middle-, and high-skill employment, respectively, and all are significant at high degrees of confidence. Thus, improvements in employment conditions for Asian workers are associated with lower use of housing choice vouchers among households headed by Asian individuals. The expected change in the use of vouchers among households headed by Asian individuals is roughly the same as the corresponding change for prime-age individuals and women. However, it is important to bear in mind that the fraction of the population that is Asian is much smaller.

Panels B and C in Table 5 reveal a similar pattern for the other housing programs: only changes in Asian-specific labor market conditions appear to be associated with changes in a racial group's use of subsidized housing. For project-based housing, column (4) shows that the coefficients on low-, middle-, and high-skill employment are -41.4 , -47.9 and -48.6 , respectively, and are all significant at high degrees of confidence. For public housing, column (4) of Panel C shows coefficients of -20.2 , -8.5 , and -14.9 for low-, middle-, and high-skill employment, respectively, but only low levels of statistical confidence. Together, these

Table 5
**Race-Specific Labor Market Outcomes
 and the Use of Subsidized Housing**

Panel A: Housing Choice Vouchers

Variable	Black (1)	White (2)	Hispanic (3)	Asian (4)	Native American (5)
LowSkillEmp	-22.43 (22.68)	-23.96 (25.68)	-10.13 (28.13)	-23.78** (9.704)	-6.403 (4.327)
MiddleSkillEmp	-49.20* (25.76)	4.257 (15.25)	7.175 (8.689)	-41.86*** (7.137)	-0.254 (3.496)
HighSkillEmp	-45.45 (31.88)	8.966 (9.712)	27.34** (11.80)	-32.89*** (8.204)	3.051 (3.687)
Wage	70.52 (48.47)	-282.3 (186.0)	-171.2 (118.9)	5.797 (4.245)	-5.055 (3.374)
NILF	-25.34 (24.74)	-3.706 (14.51)	12.43 (12.04)	-28.75** (11.48)	2.906 (2.527)
Population	48.41** (23.57)	1.141 (12.43)	-6.655 (11.99)	33.51*** (9.012)	-1.473 (2.218)
Vacancy	33.39 (75.55)	41.01 (50.05)	67.71 (61.82)	5.697 (14.87)	-4.736 (5.892)
Observations	564	564	564	564	564
R ²	0.476	0.162	0.188	0.765	0.232

Panel B: Project-Based Housing

Variable	Black (1)	White (2)	Hispanic (3)	Asian (4)	Native American (5)
LowSkillEmp	-31.61 (20.93)	-5.594 (13.30)	-6.236 (6.561)	-48.59*** (16.49)	-7.758 (4.660)
MiddleSkillEmp	-13.56 (9.077)	6.712 (6.393)	-4.276* (2.392)	-47.85*** (7.831)	0.868 (3.773)
HighSkillEmp	-54.49* (27.25)	-22.28*** (8.025)	-13.08** (5.560)	-41.37*** (9.068)	1.453 (4.585)
Wage	-10.25 (29.39)	-179.2 (210.9)	0.754 (15.60)	0.480 (5.755)	-2.575* (1.344)
NILF	-19.96* (11.50)	-16.81** (7.674)	3.148 (3.903)	-58.11*** (16.07)	-0.912 (3.883)
Population	26.46 (16.22)	15.94** (7.230)	3.124 (3.286)	50.44*** (12.00)	-0.799 (2.885)
Vacancy	-83.86 (55.52)	-6.435 (49.30)	-20.44 (24.22)	-17.91* (9.544)	-3.699 (4.704)
Observations	567	567	567	567	567
R ²	0.519	0.720	0.378	0.735	0.534

Table 5 (continued)

Panel C: Public Housing

Variable	Black (1)	White (2)	Hispanic (3)	Asian (4)	Native American (5)
LowSkillEmp	-6.715 (27.21)	1.640 (7.461)	4.983 (4.719)	-20.20** (8.588)	3.283 (2.755)
MiddleSkillEmp	-27.18 (25.13)	14.36* (8.225)	8.139 (5.980)	-8.539* (4.963)	0.336 (1.951)
HighSkillEmp	-36.03 (35.03)	3.179 (3.784)	3.576 (3.840)	-14.90* (7.868)	9.051 (5.772)
Wage	28.25 (21.45)	-58.11 (125.7)	44.35 (44.56)	-4.787 (4.054)	-3.709 (2.439)
NILF	-23.46 (23.87)	10.56 (6.928)	3.473 (4.736)	-3.926 (3.219)	0.940 (1.917)
Population	20.18 (29.42)	-4.396 (4.177)	-4.562 (4.127)	10.25* (5.772)	-2.368 (1.949)
Vacancy	-53.04 (43.63)	41.24 (39.74)	33.58** (13.02)	12.86 (11.55)	1.368 (3.048)
Observations	562	562	562	562	562
R ²	0.215	0.368	0.228	0.281	0.204

* Significant at the 10 percent level

** Significant at the 5 percent level

*** Significant at the 1 percent level

Notes: Robust standard errors are in parentheses. All specifications include state and year fixed effects as well as controls for other race groups. NILF refers to the number of people who are not in the labor force.

results imply that the change in the use of public housing and project-based housing among households headed by Asian individuals as labor market conditions improve is similar to the change in the use of vouchers. For all other racial categories and housing programs, there appears to be little relationship between labor market improvements and the use of subsidized housing.

IV. Summary and Conclusion

Among the various subsidized housing programs in the United States, the housing choice vouchers program is most closely linked with changes in labor market conditions for different demographic groups. The housing choice vouchers program is the largest subsidized housing program administered by HUD, and we find that the relationship between the use of this program and state labor market conditions is both statistically significant and economically important. Among labor market developments,

changes in the level of employment are the relevant margin for determining the use of the housing choice vouchers program.

In addition, we find changes in age- and sex-specific labor market conditions are most closely linked to changes in the use of subsidized housing; in contrast, changes in race-specific labor market conditions provide little information about how participation in these programs evolves over time. The use of subsidized housing is often associated with individuals in low-skill employment. Thus it perhaps surprising that job gains across higher skill levels are also important factors when estimating the use of subsidized housing.

While our analysis finds links between changes in local and demographic-specific labor market conditions and the use of subsidized housing programs, changes in national labor market conditions do not demonstrate the same links. Because of the apparent differences in employment conditions across states, in housing needs across locations, and in the priorities of local public housing agencies, the use of subsidized housing does not typically follow national employment trends.

Endnotes

¹Local public housing agencies and project managers have been required to submit data on individual subsidized tenant income and eligibility, as well as demographic characteristics of subsidized tenants, to these databases since the 1990s.

²The programs differ significantly in both the populations they target and in how they distribute subsidies. For details on each program, see <https://www.hudexchange.info/programs/>

³We do not report summary statistics for the “other” race category in the CPS, because we do not include data on this group in our analysis. These statistics do not deviate substantially from those for reported race categories.

⁴We do not report results for households headed by younger individuals for the sake of brevity and because of a lack of significant estimates. However, we do include measures of labor market conditions among younger workers in each specification to avoid concerns about simultaneity bias.

References

- Abt Associates Inc., Gregory Mills, Daniel Gubits, Larry Orr, David Long, Judith Feins, Bulbul Kaul, Michelle Wood, Amy Jones and Associates, Cloudburst Consulting, and the QED Group. 2006. "Effects of Housing Vouchers on Welfare Families: Final Report." Prepared for the U.S. Department of Housing and Urban Development, Office of Policy Development and Research.
- Chyn, Eric, Joshua Hyman, and Max Kapustin. 2017. "Predictors of Successful Housing Voucher Lease-Up and Implications for Estimated Labor Market Responses." University of Michigan working paper, July.
- Finkel, Meryl, Larry Buron, and Abt Associates Inc. 2001. "Study on Section 8 Voucher Success Rates: Volume I, Quantitative Study of Success Rates in Metropolitan Areas." Prepared for the U.S. Department of Housing and Urban Development, Office of Policy Development and Research.
- Shroder, Mark. 2002. "Locational Constraint, Housing Counseling, and Successful Lease-up in a Randomized Housing Voucher Experiment." *Journal of Urban Economics*, vol. 51, no. 2, pp. 315–338. Available at <https://doi.org/10.1006/juec.2001.2247>
- Tüzemen, Didem, and Jonathan L. Willis. 2013. "The Vanishing Middle: Job Polarization and Workers' Response to the Decline in Middle-Skill Jobs." Federal Reserve Bank of Kansas City, *Economic Review*, vol. 98, no. 1, pp. 5–32.