Targeting Transfers Through Priority Rules: Evidence from the Housing Choice Voucher Program

Sasha Ruby

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Abstract

Housing choice vouchers are rationed through local Public Housing Authority (PHA) waiting lists. Limited funding forces PHAs to employ priority rules to determine which households receive a voucher. The voucher amount increases in household rent and decreases in household income such that the cost to the government of providing a voucher tends to be greater for households that benefit most from the voucher. This creates a fundamental trade-off. PHAs must choose between targeting high value but high cost households or targeting low cost but low value households. Using data from a randomized experiment, I quantify this trade-off and discuss the implications for the optimal choice of priority rule as a function of social welfare weights. I find that under a broad, common class of social welfare functions, priority rules that favor higher-value households deliver more welfare per dollar of government cost than priority rules that favor lower-cost households. The value-cost trade-off remains quantitatively similar even under counterfactual program changes that significantly increase program participation.

Sasha Ruby: nathaniel.ruby@email.virginia.edu

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1 Introduction

The Housing Choice Voucher program, the largest tenant-based rental assistance program in the United States, annually provides an average of $10,000 in rental assistance to over 2 million households. However, as evidenced by long and often closed waiting lists, voucher assistance falls far short of meeting overwhelming demand. Local Public Housing Authorities (PHAs), which implement the program, employ priority rules to determine which households receive assistance. The design of the voucher, which is increasing in rent and decreasing in household income, creates a fundamental trade-off: households that value the voucher more highly likely cost the government more to assist, while households that cost the government less to assist likely value the voucher less. PHAs, in their choice of priority rule, must weigh targeting higher-value, higher-cost households against targeting lower-value, lower-cost households. The magnitude of this trade-off is a crucial determinant of the optimal choice of priority rule.

In this paper, I quantify this trade-off using data from a multi-PHA experiment that randomly allocated housing choice vouchers to waiting list households. I develop a sufficient-statistics formula linking household outcomes and responses to voucher receipt with the welfare effects of different PHA priority rules. The analysis reveals that households rent similar units but exhibit substantial heterogeneity in their total income. Using this sufficient-statistics approach, I show that households who most highly value the voucher also impose the highest costs while households who impose the lowest costs also value the voucher least. Each priority rule targets a distinct subset of households but the ratio of voucher value to government cost is the same across these subsets. Under a broad set of social welfare functions, priority rules that target higher-value households deliver more welfare per dollar of government cost than priority rules that target lower-cost households.

This analysis uses data from the Welfare to Work Voucher Experiment, part of the larger Welfare to Work Housing Choice Voucher demonstration initiated in 1999. The experiment, sponsored by the Department of Housing and Urban Development (HUD) and carried out between 2000 and 2001, involved over 8,000 households from seven PHA housing choice voucher waiting lists. Participants in the experiment were randomly assigned to either remain on their voucher waiting list or receive a voucher offer. All participating households were linked to administrative records including on voucher receipt, state unemployment insurance wages, and state or local welfare participation and benefits.

I establish a model of the marginal value of public funds (MVPF) of different priority rules, defined as the ratio of household value for a housing choice voucher to the cost to the government of providing the voucher (Hendren (2016)). I use a sufficient-statistics type approach to recover household value for a voucher. Only two outcomes are necessary to recover household value for a voucher: "counterfactual" rent and total income when not receiving a voucher. Similarly, only two outcomes are necessary to recover the direct cost of voucher provision to the government: "counterfactual" rent and total income when receiving a voucher. The total cost to the government

also includes any changes in welfare income or tax revenues due to voucher receipt. When evaluating PHA priority rules that determine which households receive assistance, I show that the behavioral responses and potential outcomes of experimental compliers, households who participate in the Housing Choice Voucher program when offered a voucher but do not participate otherwise, are policy-relevant.

Because each priority rule targets a different subset of households, the relevant subset of experimental compliers varies by priority rule. This necessitates accounting for potential heterogeneity in household outcomes and behavioral responses to housing choice voucher receipt. I consider three PHA priority rules: (1) "equal priority" where households are offered a voucher in a random order; (2) "no-earnings priority" where households with no wage earnings are first offered a voucher; and (3) "earnings priority" where households with positive wage earnings are first offered a voucher.

I use two-stage least squares (2SLS) to estimate both behavioral responses to housing choice voucher receipt and without- and with-voucher outcomes. I find that voucher receipt increases rent by about $300 per quarter, with no heterogeneity in this effect across households.[1] Consistent with the literature, I also find that voucher receipt reduces total income by about $100 per quarter. While the impact of voucher receipt on total income does not vary across households, I do find heterogeneity in the impact of voucher receipt on wage earnings and welfare income. This heterogeneity affects the impact of Housing Choice Voucher program participation on total government costs: decreases in wage earnings may decrease government costs through decreased Earned Income Tax Credit (EITC) payments, while increases in welfare income increase government costs.

I decompose treatment effects into without- and with-voucher outcomes to determine household value for a housing choice voucher and the direct cost of voucher provision. I find little heterogeneity in rent outcomes but substantial heterogeneity in total income outcomes. Households maintain their relative income positions: households that exhibit low without-voucher total income also exhibit low with-voucher total income and households that exhibit high without-voucher total income also exhibit high with-voucher total income. These patterns imply that households who value vouchers most also impose the highest costs on the government, while households who value vouchers least impose the lowest costs on the government.

I use these estimates with the model to evaluate the welfare effects of different priority rules. The rules I consider illustrate the fundamental value-cost trade-off that PHAs face: the "no-earnings priority" rule targets households who highly value vouchers but exhibit higher costs, while the "earnings priority" rule targets households who exhibit lower costs but value the voucher less. I find that in all cases households value the voucher at approximately three-fourths the net cost to the government, leading to quantitatively similar marginal value of public funds (MVPF) across the

[1] Jacob and Ludwig (2012) estimate that voucher receipt increases rent by $1000 per quarter relative to baseline rent, but this likely overstates the true effect. Their estimate assumes that without-voucher rent equals baseline rent and that voucher recipients pay Fair Market Rent. The latter assumption likely inflates their estimate, as many voucher recipients live in units where landlords charge below the payment standard and therefore below the Fair Market Rent.

priority rules. However, because these rules target different households, their welfare implications differ. Under a broad class of social welfare functions – any where the marginal social welfare weights are higher for relatively lower-income households – the "no-earnings priority" rule delivers more welfare per dollar of government cost than either the "equal priority" rule or the "earnings priority" rule.[2]

In the Welfare to Work Voucher Experiment, nearly one-third of households offered a housing choice voucher did not ultimately participate in the Housing Choice Voucher program. This pattern is not unique to the experiment; nationwide over one-third of households offered a voucher do not participate in the program (Ellen et al. (2024)). This substantial non-participation has captured the attention of HUD; increasing participation is an ongoing priority.[3] PHAs can already employ a variety of policies to increase program participation, such as extending the time allotted to voucher offer recipients to secure housing or simplifying property inspection procedures to induce more landlords to participate in the program.

A key question is whether and how participation-increasing policies alter the welfare effects of PHA priority rules. The challenge is that the experiment only identifies the behavior of current program participants while participation-increasing policies would induce participation from households who currently don't participate.[4] These households might exhibit different behavioral responses and outcomes. Therefore, to evaluate the welfare effects of participation-increasing policies it is necessary to go beyond the experiment to identify the behavioral responses and outcomes of households who don't currently participate but would participate under participation-increasing policies.

To quantify the welfare effects of participation-increasing policies, I employ an econometric selection model that relates both observed and unobserved characteristics to the Housing Choice Voucher program participation decision. I use a two-step control function estimator that leverages variation in the response to a housing choice voucher offer across household characteristics and PHAs to recover the relationship between observed and unobserved characteristics and potential outcomes.[5] I show that the model accurately reproduces the patterns of heterogeneity found in the experimental results. The model estimates indicate that households with unobserved characteristics that make them less likely to participate in the program exhibit similar rents but experience smaller changes

[2]There may still be a rationale for PHA priority rules that target working households. Priority rules favoring non-earning households could dis-incentivize labor supply among waiting list households, though research in this area is limited. Furthermore, PHAs might view working households as more deserving of assistance. While quantitative evidence on these attitudes is scarce, the generalized social marginal welfare weights framework proposed by Saez and Stantcheva (2016) offers a means to assess how strong these preferences would need to be to justify priority rules that target working households.

[3]See new proposals in the 2024 President's Budget (US Department of Housing and Urban Development (2024)).

[4]Consider a household that receives a voucher offer under current policy but ultimately does not participate in the program because they are unable to find, within the restrictive lease-up period, a landlord to accept the voucher. A participation-increasing policy that extends this lease-up period could enable this household to successfully participate in the program.

[5]The selection model and two-step control function estimator used here is similar to the selection model and two-step control function estimator used by Kline and Walters (2016) to quantify the cost-effectiveness of the Head Start Program.

in total income due to voucher receipt.

I conclude with an assessment of the welfare effects of priority rules under participation-increasing policies. I assume perfect compliance – all households extended a housing choice voucher offer subsequently participate in the Housing Choice Voucher program. I find that the behavioral responses and outcomes of households who participate when offered a voucher under participation-increasing policy but do not participate otherwise are similar to households who participate when offered a voucher under current policy. Consequently, the welfare effects of priority rules under participation-increasing policies are similar to the welfare effects of priority rules under current policy. The fundamental value-cost trade-off that PHAs face under current policy persists under participation-increasing policies.

This paper contributes to three main strands of literature. First, this paper estimates the effects of housing choice voucher receipt on household outcomes. Prior work shows that voucher receipt reduces household total income, despite increasing welfare income (Mills et al. (2004); Mills et al. (2006); Jacob and Ludwig (2012)), and generally improves neighborhood quality (Mills et al. (2004); Mills et al. (2006)). I identify which treatment effects are welfare-relevant and precisely define the welfare-relevant estimands. While I find little heterogeneity in how households respond to voucher receipt, decomposing these effects reveals substantial heterogeneity in both without- and with-voucher outcomes.

Public finance economists have recently adopted sufficient-statistics type approaches to quantify the value of government transfer programs.[6] I use a similar approach with experimental data from the Welfare to Work Voucher Experiment to quantify the welfare effects of PHA priority rules. This analysis demonstrates that PHAs face a fundamental value-cost trade-off: they must choose between priority rules that target high value but high cost households and rules that target low cost but low value households. I quantify this trade-off and show that the optimal choice of PHA priority rule depends on social preferences for redistribution across households.

Finally, this paper contributes to a larger literature on the incomplete take-up of government transfer programs.[7] This literature centers around the question of whether incomplete program participation reflects efficient screening (Nichols and Zeckhauser (1982)). This question is particularly relevant in the context of the Housing Choice Voucher program, where substantial non-participation among households offered a housing choice voucher has prompted HUD and PHAs to pursue participation-increasing policies. I address how households induced to participate because of these policies may differ from current participants. I use methods from the literature on selection models (Heckman and Vytlacil (1999); Kline and Walters (2016); Brinch et al. (2017); Mogstad et al. (2018)) to account for potential heterogeneity between these groups.

[6] See Kline and Walters (2016) on Head Start; Finkelstein and Notowidigdo (2019) on food stamps; Finkelstein et al. (2019); Lieber and Lockwood (2019); and Shepard and Wagner (2024) on subsidized health insurance; and Deshpande and Lockwood (2022) and Haller and Staubli (2023) on disability insurance.

[7] See Deshpande and Li (2019); Finkelstein and Notowidigdo (2019); Homonoff and Somerville (2021); Wu and Meyer (2023); Shepard and Wagner (2024); Giannella et al. (2024).

2 Institutional Background

2.1 The Housing Choice Voucher Program

The Housing Choice Voucher program, commonly known as Section 8, is managed by the Department of Housing and Urban Development (HUD) and provides housing assistance to 2.3 million households through the issuance of tenant-based housing choice vouchers. HUD establishes voucher income eligibility criteria then issues these vouchers to over 2,100 local PHAs which are responsible for household selection and program administration. Income eligibility is primarily determined by local area median income (AMI) – families must generally earn no more than 50% of the AMI for their chosen location, and by law, 75% of a PHA's vouchers must go to applicants whose incomes do not exceed 30% of AMI. To be considered for a voucher, eligible households must first join a PHA waiting list; voucher offers are restricted to households on the waiting list. Offered households must find a landlord willing to accept the voucher within at least 60 days, though PHAs have discretion to provide additional search time. Voucher recipient households pay approximately 30% of adjusted pre-tax income, including both wage earnings and welfare income, towards rent and utilities and the PHA pays the remainder up to a payment standard established by the PHA. The payment standard is usually between 90% and 110% of the HUD established 40^{th} percentile Fair Market Rent (FMR).[8] The program is especially generous; in 2022, voucher-recipient households received an average annual subsidy of over $10,000 (US Department of Housing and Urban Development (2024)).

The limited number of housing choice vouchers and the generous per-household subsidy creates excess demand for vouchers. HUD allocates a specific number of vouchers to each PHA, effectively capping the local supply. In many localities there is only one available voucher for every four or five eligible households (US Department of Housing and Urban Development (2024)). In 2012, there were nearly 3 million households on Housing Choice Voucher program waiting lists (Public and Affordable Housing Research Corporation (2015)). This likely underestimates the demand for vouchers since many waiting lists are closed to new applicants. PHAs exercise considerable discretion in determining which eligible households receive vouchers through their implementation of priority rules. PHAs can establish local priority rules such as giving preference to working families (where the head, spouse, co-head, or sole member is employed) or to severely rent-burdened households (those paying more than 50 percent of gross income towards rent and utilities). When multiple households qualify for the same priority, PHAs have additional discretion in how they select among these households - they may use random selection among priority-qualified households or implement more complex ordering systems. Alternatively, PHAs can opt to forgo priority rules entirely and select households from their waiting lists purely at random (U.S. Department of Housing and Urban Development (2023)). To the best of my knowledge, there is no comprehensive

[8] HUD determines FMRs annually for each metropolitan area and non-metropolitan county in the United States. The FMR is typically set at the 40^{th} percentile of rents for standard rental units occupied by recent movers in a local housing market.

resource that systematically documents priority rules employed by the over 2,100 PHAs.

2.2 The Welfare to Work Voucher Experiment

In Fiscal Year 1999, the federal government introduced the Welfare to Work Voucher Program which allocated an additional 50,000 housing choice vouchers to 129 different PHAs to help promote the self-sufficiency of welfare families. To qualify for a Welfare to Work voucher, households were required to meet the standard Housing Choice Voucher income eligibility criteria and be either current or former Temporary Assistance for Needy Families (TANF) recipients or be eligible for TANF benefits. To assess the Welfare to Work Voucher Program, HUD sponsored an evaluation in which households on voucher waiting lists across seven different PHAs were randomly selected to either receive a voucher offer or remain on the voucher waiting list.[9] The randomization process began in April 2000 (in Fresno and Houston) and concluded in May 2001 (Los Angeles), with each site conducting random assignment over a period of 3 to 8 months. Although PHAs participating in the Welfare to Work Voucher program intended to provide additional employment-related services, in practice, most households receiving these vouchers did not receive specialized services beyond those typically available to TANF or TANF-eligible households using standard vouchers.[10]

2.3 Data

This paper uses data collected for two reports: "The Evaluation of the Welfare to Work Voucher Program" (Mills et al. (2004)) and "Effects of Housing Vouchers on Welfare Families" (Mills et al. (2006)). These reports comprehensively document the impacts of housing choice voucher receipt on Welfare to Work Voucher Experiment participant households. The data include a baseline survey conducted with household heads prior to randomization. This survey provides valuable demographic and household information, including baseline rent. The data also include administrative data from three separate linkages. Participating household heads were linked to their respective state unemployment insurance agencies which enables observation of quarterly household head wage earnings. Household heads were also linked to their respective state or local welfare agencies which enables observation of quarterly household head welfare income. Finally, households were linked to the Public Housing Information Center (PIC) System which provides a binary indicator for voucher receipt. The indicator is equal to one once a household reports voucher receipt even if the household leaves the Housing Choice Voucher program. A notable limitation is the absence of post-randomization rent. However, household census tract data is available both before and after

[9] The seven PHAs were Atlanta Housing Authority (Georgia); Augusta (Georgia); Fresno City (California); Fresno County (California); Housing Authority of the City of Los Angeles (California); Houston Housing Authority (Texas); and Spokane (Washington). Note that the data do not differentiate between households from Fresno City and Fresno County, so throughout, "Fresno" refers to both PHAs collectively.

[10] Due to the lack of additional services provided by participating PHAs, the evaluation authors renamed their final report from "The Evaluation of the Welfare to Work Voucher Program" to "Effects of Housing Vouchers on Welfare Families." This change reflects the fact that the study primarily assessed the impact of receiving a standard voucher (Mills et al. (2006)).

randomization. To address this limitation, I impute rent using Census tract level public-use data on rent.

The primary analysis sample includes 6442 households from six PHAs. I exclude households from Los Angeles, California because household head welfare income is not available from this site. I restrict the dataset to households that meet the following criteria: non-missing baseline characteristics, non-missing quarterly wage earnings and welfare income, and a reported Census tract that corresponds to the state of the experimental site. Additionally, I exclude households that report receiving any form of housing assistance at baseline.[11] Because housing assistance tends to be persistent over time, this exclusion helps ensure that without-voucher households in my sample are not receiving other form of housing assistance (McClure (2018)). Households switching between different forms of housing assistance would likely value the voucher differently than households switching from no housing assistance to voucher receipt.

2.4 Descriptive Statistics

Table 1 shows summary statistics for the primary analysis sample. Columns (1) and (2) report the average characteristics of households offered a housing choice voucher and households not offered a voucher, respectively. Column (3) reports the average characteristics of households offered a voucher and households not offered a voucher are similar. Columns (4) and (5) report the average characteristics of households that receive a voucher and households that do not receive a voucher. Households that receive a voucher have lower average quarterly baseline wage earnings, welfare income, and rent compared to households that do not receive a voucher.

Table 2 examines whether housing choice voucher recipient households in the analysis sample are representative of the broader voucher recipient population. The analysis sample draws from the Welfare to Work Voucher Experiment, which restricted eligibility to households that were either current or former Temporary Assistance for Needy Families (TANF) recipients or TANF-eligible. This additional eligibility requirement might limit the external validity of any welfare analysis of priority rules. Columns (2) and (3) report characteristics of all voucher recipient households from HUD's Picture of Subsidized Households 2000, for the experimental sites and nationally, respectively. Welfare to Work Voucher Experiment households differ from the wider population of voucher recipients in several ways – household heads are, on average, younger, more likely to be female, and more likely to be Black or Hispanic. Welfare to Work Voucher Experiment households also have lower incomes and pay slightly less for units with lower rents.[12] Importantly, the average direct cost of a voucher to the government, a key ingredient for analyzing the welfare effects of PHA priority rules, is quantitatively similar across the different samples.

[11] See Appendix A for additional details on sample construction.

[12] Income differences between Welfare to Work Voucher Experiment households and the broader voucher population are partly due to experimental data limitations. The Welfare to Work Voucher Experiment data only includes household head wage earnings and welfare income, while data from the Picture of Subsidized Households captures all income sources (e.g., Social Security) and income from all household members.

3 Model of Housing Choice Voucher Receipt

I develop a model that links Housing Choice Voucher program participation to household behavioral responses and outcomes, focusing on changes to the household budget constraint, to recover the welfare effects of different PHA priority rules.

3.1 Participation

The model of Housing Choice Voucher program participation follows closely from Kline and Walters (2016).[13] Consider a population of program eligible households. PHAs ration vouchers via voucher offers, Z, that arrive at random via lottery with probability δ_X, where δ_X may vary across households based on household or household head characteristics, reflecting different PHA priority rules. Upon receiving a voucher offer, households choose whether to participate in the program.[14]

I denote Housing Choice Voucher program participation as $D \in \{0, 1\}$ and the voucher offer as $Z \in \{0, 1\}$. Program participation depends on observable household characteristics X and an unobservable characteristic ν

$$D(Z) = \mathbb{1}\{\psi(X, Z) + \nu > 0\}$$

where I assume that $D(1) \geq D(0)$.

3.2 Value

The model of housing choice voucher value follows closely from Finkelstein et al. (2019). I assume that households optimize and that Housing Choice Voucher program participation affects households only through the household budget constraint. I assume that program participation affects the price of housing, $p(b)$, and income taxation, $\tau(b)$, where $b = 1$ denotes program participation and $b = 0$ denotes non-participation. Households optimally choose non-housing consumption, c, housing consumption, h, labor supply, l, and welfare receipt, r subject to their budget constraint. These outcomes depend on program participation. The household optimization assumption is non-trivial; behavioral frictions and the involvement of multiple agents with differing objectives (Cunningham et al. (2018)) may lead to sub-optimal household outcomes (Bergman et al. (2024)).

I show in Appendix B that a first-order approximation of household value for a housing choice voucher, by the envelope theorem, can be expressed as

$$WTP = (p(0) - p(1))h(0) + (\tau(0) - \tau(1))(wl(0) + r(0)) \tag{1}$$

where housing consumption ($h(0)$) and total income – the sum of wage earnings ($wl(0)$) and welfare

[13] Kline and Walters (2016) model Head Start participation and consider close program substitutes, while I focus solely on Housing Choice Voucher participation and abstract away from potential program substitutes.

[14] There are households who participate in the program without a recorded voucher offer, likely due to voucher offer receipt through alternate channels.

income ($r(0)$) – are evaluated using without-voucher outcomes. Intuitively, household value for a housing choice voucher is the amount by which it loosens the household's budget constraint. This approach obviates the need to consider behavioral responses when evaluating household value for a voucher (Hendren (2016)). Because household's optimize, behavioral responses to voucher receipt have no first-order impact on household welfare. This formulation for the household value for a voucher does not account for stigma or hassle costs. Moreover, this formulation abstracts from potential benefits to landlords (Eriksen and Ross (2015); Collinson and Ganong (2018)).[15]

The expected value for a housing choice voucher is

$$E[WTP] = \sum_X P_X E[WTP_X]$$

where $E[WTP_X] \equiv E[WTP|X]$ and X represents household characteristics. This approach is particularly relevant because PHAs may distribute voucher offers on the basis of household characteristics. The consideration of $E[WTP_X]$ accounts for heterogeneity in household value for a voucher across different types of households.

The cost to the government of providing a housing choice voucher is the direct expenditure required to fund the voucher plus any changes in government transfers due to voucher receipt. This can be expressed as

$$C = (p(0) - p(1))h(1) + (\tau(0) - \tau(1))(wl(1) + r(1)) + T(1) - T(0). \tag{2}$$

where housing consumption ($h(1)$) and total income – the sum of wage earnings ($wl(1)$) and welfare income ($r(1)$) – are evaluated using with-voucher outcomes and $T(1) - T(0)$ represents with-voucher transfers less without-voucher transfers. The expected cost of the Housing Choice Voucher program to the government is

$$E[C] = \sum_X P_X E[C_X]$$

where $E[C_X] \equiv E[C|X]$ and X represents household characteristics. In the formulations for benefits and costs, $(p(0) - p(1))$ denotes the housing price reduction from housing choice voucher receipt and $(\tau(0) - \tau(1))$ denotes the income tax increase from housing choice voucher receipt. I assume that $p(0) - p(1) = 1$ and, because voucher receipt results in a 30% marginal tax rate, $\tau(0) - \tau(1) = -0.3$. Therefore, $WTP = h(0) - 0.3(wl(0) + r(0))$ and $C = h(1) - 0.3(wl(1) + r(1))$.

Equations (1) and (2) illustrate that housing demand and labor supply enter value for a voucher and cost in the same way, suggesting that households who highly value vouchers will also tend to impose high costs on the government, while households who impose low costs on the government will tend

[15] In Appendix B, I recover household value for a voucher using an alternative sufficient-statistics type approach that incorporates the welfare effects of behavioral responses.

to value vouchers less. Because value and cost are functions of the same underlying household outcomes, behavioral responses to voucher receipt drive a wedge between household value for a voucher and cost to the government. Increases in rent directly increase the cost to the government while decreases in total income directly increase the direct cost of voucher provision. The impact of income changes on total government cost depends on composition: decreases in wage earnings decrease government costs through decreased EITC payments, while increases in welfare income raise government costs.

4 PHA Priority Rules

I evaluate the welfare effects of different PHA priority rules. These rules determine which households receive housing choice voucher offers. The overall change in expected household value due to an increase in the probability of receiving a voucher offer is

$$\Delta E[WTP] = \sum_X P(X) \frac{\partial E[WTP_X]}{\partial \delta_X} \Delta \delta_X.$$

The change in voucher offer probabilities ($\Delta \delta_X$) varies with household characteristics, X, because PHAs employ different priority rules that target specific types of households. Similarly, the overall change in cost due to an increase in the probability of a housing choice voucher offer is

$$\Delta E[C] = \sum_X P(X) \frac{\partial E[C_X]}{\partial \delta_X} \Delta \delta_X.$$

The overall change in expected government cost depends on how priority rules affect the distribution of voucher offers across different household types. I measure the welfare effect of priority rules using the marginal value of public funds, which measures the value of an additional dollar spent per dollar of government cost

$$MVPF_X \equiv \frac{\Delta E[WTP]}{\Delta E[C]} = \frac{\sum_X P(X) \frac{\partial E[WTP_X]}{\partial \delta_X} \Delta \delta_X}{\sum_X P(X) \frac{\partial E[C_X]}{\partial \delta_X} \Delta \delta_X}.$$

To evaluate the welfare effects of different priority rules, it is necessary to estimate both the change in expected household value, $\frac{\partial E[WTP_X]}{\partial \delta_X}$, and the change in expected government cost, $\frac{\partial E[C_X]}{\partial \delta_X}$, associated with changes in voucher offer probabilities. I estimate these changes both under the experimental voucher and under participation-increasing policies that alter the composition of participating households.

4.1 Experimental Voucher

Consider an increase in the probability that households with characteristics X experience an increase in the probability of receiving a housing choice voucher offer In Appendix B, I show that the

expected marginal benefit of a change in voucher offer probability for households with characteristics X is

$$\frac{\partial E[WTP_X]}{\partial \delta_X} = \underbrace{E[WTP | -\psi(X_i,1) < \nu_i < -\psi(X_i,0), X]}_{\text{Complier WTP}} \underbrace{P(-\psi(Xi,1) < \nu_i < -\psi(X_i,0)|X)}_{\text{Complier Density}}. \quad (3)$$

The impact of changes in voucher offer probabilities on expected household value is the product of expected complier value of voucher receipt and the probability of compliance. In Appendix B, I show that the expected marginal cost of a change in voucher offer probability for households with characteristics X is

$$\frac{\partial E[C_X]}{\partial \delta_X} = \underbrace{E[C | -\psi(X_i,1) < \nu_i < -\psi(X_i,0), X]}_{\text{Complier Costs}} \underbrace{P(-\psi(X_i,1) < \nu_i < -\psi(X_i,0)|X)}_{\text{Complier Density}}. \quad (4)$$

The impact of changes in voucher offer probabilities on expected government cost is the product of expected complier cost of voucher receipt and the probability of compliance. The MVPF of the experimental voucher is therefore

$$MVPF_{E,X} \equiv \frac{\Delta E[WTP]}{\Delta E[C]} =$$

$$\frac{\sum_X P(X) \frac{\partial E[WTP_X]}{\partial \delta_X} \Delta \delta_X}{\sum_X P(X) \frac{\partial E[C_X]}{\partial \delta_X} \Delta \delta_X} =$$

$$\frac{\sum_X P(X) E[WTP | -\psi(X_i,1) < \nu_i < -\psi(X_i,0), X] P(-\psi(X_i,1) < \nu_i < -\psi(X_i,0)|X) \Delta \delta_X}{\sum_X P(X) E[C | -\psi(X_i,1) < \nu_i < -\psi(X_i,0), X] P(-\psi(X_i,1) < \nu_i < -\psi(X_i,0)|X) \Delta \delta_X}$$

where $MVPF_{E,X}$ represents the marginal value of public funds estimated using experimental data under different priority rules that target households based on characteristics X. The moments of $MVPF_{E,X}$ – the probability of compliance, without- and with-voucher mean complier outcomes, and behavioral responses to voucher receipt conditional on household characteristics – are all empirically identifiable from a randomized experiment.

4.2 Participation-Increasing Voucher

What are the welfare effects of PHA priority rules under policies that increase Housing Choice Voucher program participation? This question is particularly relevant as HUD and PHAs actively pursue such policies, including extending voucher search periods and simplifying administrative processes to encourage landlord participation.[16] Because these policies likely alter the composition of voucher recipients, I extend the welfare analysis framework to evaluate priority rules under these

[16] The Choice in Affordable Housing Act of 2023 exemplifies these efforts to increase participation. This bill authorizes HUD to provide incentive payments to landlords who accept housing choice vouchers for the first time and permits PHAs to reimburse landlords for damages exceeding security deposits, with the aim of expanding the pool of landlords willing to participate in the program.

participation-increasing policies.

I now assume

$$D(Z) = \mathbb{1}\{\psi(X, Z; f) + \nu > 0\}$$

where the function $\psi(X_i, Z_i; f)$ is equivalent to $\psi(X, 0)$ when $Z_i = 0$ and $\psi(X, 1; f)$ when $Z_i = 1$. The parameter f only impacts the probability of participation when households receive a housing choice voucher offer. In this context, a program complier household is one for which $-\psi(X_i, 1; f) < \nu_i < -\psi(X_i, 0)$. This formulation ensures that all households that complied with the experimental voucher also comply under participation-increasing policies. These policies enable additional households to participate - those for which $-\psi(X_i, 1; f) < \nu_i \leq -\psi(X_i, 1)$. This inequality captures households that would not have participated with the experimental voucher offer but will participate under policies that facilitate voucher use.

Similar to the experimental voucher analysis, the welfare effects of different priority rules under participation-increasing policies can be expressed as

$$MVPF_{H,X} \equiv \frac{\Delta E[WTP]}{\Delta E[C]} =$$

$$\frac{\sum_X P(X) \frac{\partial E[WTP_X]}{\partial \delta_X} \Delta\delta_X}{\sum_X P(X) \frac{\partial E[C_X]}{\partial \delta_X} \Delta\delta_X} =$$

$$\frac{\sum_X P(X) E[WTP | -\psi(X_i, 1; f) < \nu_i < -\psi(X_i, 0; f), X] P(-\psi(X_i, 1; f) < \nu_i < -\psi(X_i, 0); f | X) \Delta\delta_X}{\sum_X P(X) E[C | -\psi(X_i, 1; f) < \nu_i < -\psi(X_i, 0; f), X] P(-\psi(X_i, 1; f) < \nu_i < -\psi(X_i, 0); f | X) \Delta\delta_X}.$$

where $MVPF_{H,X}$ represents the marginal value of public funds under participation-increasing policies for priority rules that target households based on characteristics X. To evaluate these welfare effects, it is necessary to estimate these parameters for the expanded set of complier households. This set is weakly larger than the experimental complier group, as it includes all households that would comply with the experimental voucher as well as those households that only participate under policies that facilitate voucher use. The question of whether $MVPF_{H,X}$ differs from $MVPF_{E,X}$ is fundamentally a question of whether participation-increasing policies screen in households who value the voucher relative to their cost to the government more or less than the original set of compliers (Nichols and Zeckhauser (1982)).

5 Experimental Estimates

In this section, I estimate the impacts of housing choice voucher receipt and then estimate without- and with-voucher outcomes. I use 2SLS to estimate the impacts of voucher receipt one year after

randomization.[17] To increase precision, I incorporate covariates, specifically the baseline characteristics reported in Table 1.[18] Table 3 Panel A reports the resulting estimates. I find that across the considered priority rules voucher receipt increases rent by $330 and reduces household head total income by $90.[19] However, there are notable differences in the composition of the change in household head total income. For households targeted by the "no earnings priority" rule, voucher receipt leads to a substantial decrease in wage earnings partially offset by an increase welfare income. In contrast, for households targeted by the "earnings priority" rule, voucher receipt primarily reduces welfare income with minimal impact on wage earnings. These compositional differences have important fiscal implications: increases in welfare income represent increases in government transfers, while decreases in wage earnings may represent decreases in government transfers through lower Earned Income Tax Credit (EITC) payments.

Table 3 Panel B reports the decomposition of these treatment effects into without- and with-voucher outcomes. I find that without-voucher rents are approximately $1480 and with-voucher rent are approximately $1810 across the three priority rules. However, there is substantial heterogeneity in without- and with-voucher household total income across the three priority rules. Households targeted by the "no earnings priority" rule exhibit the lowest without- and with-voucher household head total income ($1523 and $1437, respectively), while households targeted by the "earnings priority" rule exhibit the highest without- and with-voucher household head total income ($2522 and $2426, respectively). In the next section, I integrate these household outcomes and behavioral responses with the model to quantify the welfare effects of different PHA priority rules.

6 Value of Experimental Voucher

In this section, I use the behavioral responses to housing choice voucher receipt and welfare-relevant outcomes to quantify the welfare effects of different PHA priority rules. The without-voucher outcomes determine voucher value to recipient households, while the with-voucher outcomes and behavioral responses determine government costs. I use the MVPF metric for this welfare analysis,

[17] Using a one-year timeframe supports the plausibility of the "experimental compliers only" assumption (Rose and Shem-Tov (2024)). In the Welfare to Work Voucher Experiment data, voucher receipt is coded as an absorbing state – once a household reports receiving a voucher, the indicator remains equal to one even if the household later exits the program. Therefore, the endogenous variable is an indicator for ever-received a voucher rather than quarters of receipt. This is appropriate if the voucher offer only impacts voucher receipt along the extensive margin, i.e., it causes households to switch from non-receipt to receipt, but does not affect the duration of receipt for those households that would have received a voucher anyway. See Appendix C for additional details.

[18] The 2SLS estimator in this context recovers the Local Average Treatment Effect (LATE). Blandhol et al. (2022) caution that the 2SLS estimator does not always recover the LATE and that it is necessary for the linear projection of the instrument Z on covariates X to equal $E[Z|X]$ in order for the 2SLS estimator to recover the LATE. This condition is likely satisfied because of the randomized nature of the Welfare to Work Voucher Experiment, which ensures independence between the voucher offer (Z) and covariates (X).

[19] The local average treatment effect of voucher receipt on household head total income is consistent with Mills et al. (2004) and Mills et al. (2006) who estimate the treatment on the treated and intent to treat effects using data from the Welfare to Work Voucher Experiment and Jacob and Ludwig (2012) who estimate treatment effects using data from a natural experiment in the Chicago PHA. To the best of my knowledge, there are no estimates of the direct impact of voucher receipt on rent.

noting that MVPFs below one are expected given that redistribution, in general, involves net resource costs that exceed recipient value (Okun, 1975).

Table 4 reports the welfare effects of different PHA priority rules. Because without-voucher rent is quantitatively similar across the three priority rules, differences in value for the voucher stem from differences in without-voucher household head total income. Households targeted by the "no earnings priority" rule have the lowest without-voucher total income and therefore the highest value for the voucher, while households targeted by the "earnings priority" rule have the highest without-voucher total income and therefore the lowest value for the voucher. Similarly, because with-voucher rent is quantitatively similar across the three priority rules, differences in cost stem from differences in with-voucher household head total income and behavioral responses. Households targeted by the "no earnings priority" rule have the lowest with-voucher total income and exhibit the largest increases in welfare income due to voucher receipt, while households targeted by the "earnings priority" rule have the highest with-voucher total income and exhibit decreases in welfare income due to voucher receipt. After accounting for these behavioral responses and changes in EITC payments, the total cost to the government is highest for households targeted by the "no earnings priority" rule and lowest for households targeted by the "earnings priority" rule.[20] These results highlight the fundamental trade-off that PHAs face in their choice of priority rule. The households targeted by the "no earnings priority" rule both most highly value the voucher and impose the highest government costs, while the households targeted by the "earnings priority" rule have the lowest value for the voucher but also impose the lowest government costs. PHAs must choose between providing assistance to high value but high cost households or low cost but low value households.

Despite the stark differences in household value for the voucher and government cost, I find that the MVPF (0.73) is quantitatively similar across the three priority rules. However, this does not imply equivalent welfare effects across rules, as each priority rule targets a distinct subset of households. Given that households targeted by the "no earnings priority" rule have substantially lower incomes than households targeted by either the "equal priority" rule or the "earnings priority" rule, any welfare weights that place higher value on lower-income households would favor this rule over the "equal priority" or "earnings priority" rules.[21]

7 Beyond the Experimental Voucher

The previous results illustrate that PHAs face a fundamental value-cost trade-off in their choice of priority rule, with welfare effects highest for rules targeting high value but high cost households under a broad, common class of social welfare functions. However, this analysis relies only on

[20] I compute changes in EITC payments using the NBER TAXSIM model (Feenberg and Coutts, 1993).

[21] I also conduct this analysis using the alternative household valuation approach detailed in Appendix B. As shown in Appendix Table A6, the fundamental value-cost trade-off persists: the "no earnings priority" rule continues to target high value but high cost households while the "earnings priority" rule continues to target low cost but low value households.

households who comply with the experimental voucher offer, which represents only about one-half of households, while over one-third of households never participate even when offered a voucher.

This pattern of participation is not unique to the Welfare to Work Voucher Experiment. In a study of over 2,500 households across 48 PHAs, Finkel and Buron (2001) documented that only 70% of households participated after receiving a voucher offer. More recently, Ellen et al. (2024) found even lower participation, with only 60% of over 85,000 households successfully using their vouchers across 433 PHAs between 2015-2019. These rates are particularly striking given that they reflect only households who had already been deemed eligible, formally accepted their voucher offers, and agreed to search for participating landlords.

In response, HUD and PHAs have implemented participation-increasing policies, such as extending search periods and streamlining landlord administrative requirements. A key question is how these policies affect the magnitude of the value-cost trade-off that PHAs face in their choice of priority rule. While the experimental data identifies the outcomes needed to recover the value and cost of voucher receipt for various poissible priority rules holding fixed the set of households who actually participate, evaluating participation-increasing policies requires the estimation of value and cost for a different group: households who would participate because of participation-increasing policies but not otherwise.

The experimental data provide a starting point for understanding the welfare effects of participation-increasing policies. Because household value for the voucher depends only on without-voucher outcomes, I recover voucher value for potential compliers – households who would participate under participation-increasing policies but would not participate otherwise. However, estimating welfare effects requires requires both value and cost. To overcome this challenge, I use an econometric selection model that parametrizes the relationship between potential outcomes and both observable and unobservable characteristics.

7.1 Potential Compliers

I estimate the without-voucher outcomes of potential complier households – households who would participate in the Housing Choice Voucher program under participation-increasing policies but would not participate otherwise. Table 5 shows that potential compliers constitute approximately 35% of households across all three priority rules, suggesting substantial scope for participation-increasing policies. The outcomes of potential compliers vary systematically across priority rules. Compared to current compliers, potential compliers targeted by the "equal priority" and "earnings priority" rules exhibit higher without-voucher rents but potential compliers targeted by the "no earnings priority" rule exhibit lower without-voucher rents. Similarly, potential compliers targeted by the "equal priority" and "no earnings priority" rules exhibit lower without-voucher household head total income but potential compliers targeted by the "earnings priority" rule exhibit higher without-voucher household head total income. These outcomes suggest that participation-increasing policies target households with higher value for the voucher.

However, while the experiment does identify potential compliers' without-voucher outcomes and therefore their value for vouchers, the experiment does not identify potential compliers' with-voucher outcomes or behavioral responses to voucher receipt and therefore their cost to the government. To overcome this limitation, I employ an econometric selection model that leverages the household participation decision to recover the relationship between potential outcomes and observable and unobservable characteristics.

7.2 Selection Model

The econometric selection model employed in this analysis draws heavily from Kline and Walters (2016). I parameterize the housing choice voucher receipt decision and potential outcomes. Households receive a housing choice voucher if

$$D_i(Z_i) = \mathbb{1}\{X_i'\psi_X + \psi_Z Z_i + \nu_i > 0\} \tag{5}$$

where X_i denotes an intercept and a vector of baseline household head and household characteristics, listed in Table 1, and Z_i denotes the housing choice voucher offer. The stochastic component of the receipt decision, ν_i, captures unobservable preference heterogeneity and unobserved constraints. I assume ν_i obeys a probit specification

$$\nu_i | X_i, Z_i \sim N(0,1).$$

Following Heckman (1979), I model mean potential outcomes as a linear function of the observable and unobservable characteristics that influence housing choice voucher receipt

$$E[Y_i | X_i, Z_i, \nu_i] = X_i'\theta + \gamma_d \nu_i \tag{6}$$

where the coefficient γ_d describes the nature of selection on unobservables. Importantly, this specification does not dictate the pattern of selection into the Housing Choice Voucher program. The specification allows households that are more likely to participate in the Housing Choice Voucher program to exhibit higher ($\gamma_d > 0$) or lower ($\gamma_d < 0$) without and with-voucher rent and household head total income By iterated expectations, I write equation (6) as

$$E[Y_i | X_i, Z_i, D_i = d] = X_i'\theta + \gamma_d \lambda(X_i, Z_i, d) \tag{7}$$

where $\lambda(X_i, Z_i, d) \equiv E[\nu_i | X_i, Z_i, D_i = d]$ is the inverse Mills ratio used in the two-step Heckman correction.

7.3 Estimation

I fit the model in two stages. In each stage the model incorporates household and household head covariates and experimental site fixed effects. I recover the probit model parameters using

maximum likelihood estimation. I use these parameters to form the control function estimates $\lambda(X_i, Z_i, D_i)$. I use ordinary least squares (OLS) to separately estimate the potential outcomes parameters for voucher recipient and non-recipient households

$$\begin{aligned} Y_i &= \theta_{00} + X'\theta_{0x} + \gamma_0\lambda(X_i, Z_i, 0) + \epsilon_i \text{ for } D_i = 0 \\ Y_i &= \theta_{10} + X'\theta_{1x} + \gamma_1\lambda(X_i, Z_i, 1) + \epsilon_i \text{ for } D_i = 1. \end{aligned} \tag{8}$$

I conduct estimation separately for four potential outcomes: rent, household head total income, household head wage earnings, and household head welfare income. I conduct inference via non-parameteric block bootstrap, clustered by experimental site.

7.4 Parameter Estimates

Table 6 presents the estimates of the parameters in equation (5). The housing choice voucher offer increases the probability of Housing Choice Voucher program participation. Table 6 Panel B, Column (2) demonstrates that there is substantial variation in the effect of the voucher offer on program participation across experimental sites, likely reflecting unobserved market characteristics. These site-specific differences may be attributable to factors such as varying local housing market conditions that affect households' ability to secure voucher-eligible housing units.[22] The heterogeneity in the impact of voucher offers on program participation yields substantial variation in predicted program participation shares. Appendix Figure A1 illustrates that the variation in predicted program participation aligns closely with the variation in observed program participation.

Table 7 presents the second-step estimates of the parameters in equation (8). I show estimates for two outcome variables: rent and household head total income earnings. Columns (1) and (2) report impacts on without-voucher rent and without-voucher household head total income, respectively. Columns (3) and (4) report the impacts for with-voucher rent and with-voucher household head total income, respectively. Unobservable characteristics that increase the likelihood of Housing Choice Voucher program participation are not systematically related to rent – neither without-voucher rent ($\gamma_0 = 0$) nor the change in rent due to voucher receipt ($\gamma_1 - \gamma_0 = 0$) is affected by these characteristics, conditional on observable characteristics. In contrast, unobservable characteristics do affect household head total income. Conditional on observable characteristics, households that are more likely to participate in the program exhibit higher without-voucher household total income ($\gamma_0 > 0$) and experience larger decreases in household head total income due to voucher receipt ($\gamma_1 - \gamma_0 < 0$).

To better understand the relationship between unobservable characteristics and household head

[22] Local housing market conditions, particularly rental vacancy rates, are widely recognized as a key determinant of program participation. Markets with lower vacancy rates typically present greater challenges for voucher offer recipients due to limited rental unit availability and potentially reduced landlord willingness to participate. The experimental sites exhibit substantial variation in rental vacancy rates, ranging from 5.4% in Fresno to 10.4% in Augusta (Mills et al. (2006)) The estimated site-specific coefficients on voucher offers align with this pattern: Fresno shows the smallest effect (0.983) while Augusta shows one of the largest (1.213).

total income, I explore the relationship between unobservable characteristics and household head wage earnings and welfare income, respectively in Appendix Table A8. The households that are more likely to participate in the Housing Choice Voucher program experience large decreases in household head wage earnings ($\gamma_1 - \gamma_0 < 0$) due to voucher receipt, conditional on observable characteristics. These same households also experience large increases in welfare income ($\gamma_1 - \gamma_0 > 0$) due voucher receipt, conditional on observable characteristics. This pattern suggests that participation-increasing policies, by inducing the participation of households that are currently less likely to participate, would result in more modest behavioral responses – specifically, smaller decreases in wage earnings and smaller increases in welfare income.

8 Policy Counterfactuals

I use the control function estimator to recover the behavioral responses and outcomes of households that comply with participation-increasing policies. I quantify the welfare effects of different PHA priority rules under participation-increasing policies and assess whether – and to what extent – the fundamental trade-off between the choice of priority rule that targets high value but high cost households versus one that targets low cost but low value households persists.

8.1 Participation-Increasing Outcomes

Table 8 Panel A reports how households respond to housing choice voucher receipt under participation-increasing policies.[23] I find that across the considered priority rules voucher receipt increases rent by $350 but does not impact household head total income; point estimates of the impact of voucher receipt on household head total income vary substantially across priority rules but none are statistically distinguishable from zero. Decomposing total income into its components reveals a consistent pattern: while point estimates suggest positive effects on wage earnings and negative effects on welfare income across all priority rules, none of these estimates are statistically significant.

Table 8 Panel B reports the decomposition of these treatment effects into without- and with-voucher outcomes. I find that without-voucher rents are approximately $1850 and with-voucher rents are approximately $1840 across the three priority rules. However, there is substantial heterogeneity in without- and with-voucher household head total income across the three priorty rules. Households targeted by the "no earnings priority" rule exhibit the lowest without- and with-voucher household head total income ($1373 and $1458, respectively), while households targeted by the "earnings priority" rule exhibit the highest without- and with-voucher household head total income ($2555 and $2510, respectively). I integrate these household behavioral responses and outcomes with the

[23] These estimates cover a broader set of compliers than the non-parametrically identified LATEs from the Welfare to Work Voucher Experiment. While Kline and Walters (2019) show that control function estimators can exactly reproduce non-parametric estimates under certain conditions, several methodological choices – including the additive separability assumption on exogenous covariates and the use of multiple instruments – create differences here. Appendix Figure A2 demonstrates the model's ability to match observed without- and with-voucher outcomes.

model to quantify the welfare effects of participation-increasing policies across the different PHA priority rules.

8.2 Value of Participation-Increasing Voucher

Table 9 reports the welfare effects of participation-increasing policies across the different PHA priority rules. Because without-voucher rent is quantitatively similar across the three priority rules, differences in value for the voucher stem from differences in without-voucher household head total income. Households targeted by the "no earnings priority" rule have the lowest without-voucher household head total income and therefore the highest value for the voucher, while households targeted by the "earnings priority rule" have the highest without-voucher household head total income and therefore the lowest value for the voucher. Because with-voucher rent and behavioral responses to voucher receipt are quantitatively similar across the three priority rules, differences in cost stem from differences in with-voucher household head total income. Households targeted by the "no earnings priority" rule have the lowest with-voucher household head total income and therefore impose the highest cost to the government, while households targeted by the "earnings priority" rule have the highest with-voucher household head total income and therefore impose the lowest cost to the government.[24] These results highlight that the value-cost trade-off that PHAs face in their choice of priority rule persists under participation-increasing policies.

I find that while the MVPF of the "no earnings priority" rule is highest (0.75) and the MVPF of the "earnings priority" rule is lowest (0.72) under participation-increasing policies, these differences are not statistically significant. However, because the households targeted by the "no earnings priority" rule exhibit substantially lower incomes than the households targeted by both the "equal priority" and "earnings priority" rules, any welfare weights that place higher value on lower-income households would favor this rule.

9 Conclusion

This paper evaluates the welfare effects of PHA priority rules for housing choice voucher allocation. I find that PHAs face a fundamental trade-off: rules that target households with higher value for the voucher also impose high costs on the government, while rules that impose low costs on the government costs target households with low value for the voucher. I show that priority rules that target high-value households ultimately yield larger welfare gains, even after accounting for their higher costs. This trade-off – and its magnitude – persists even under policies that increase program participation, as households who currently do not participate after receiving a voucher offer appear similar to current participants in both their potential value for vouchers and the costs they would impose.

[24] The total cost to the government accounts for both the direct cost of voucher provision and changes in welfare income and EITC payments due to voucher receipt.

The invariance of the welfare effects to participation-increasing policies has important implications for ongoing efforts by HUD and PHAs to increase program participation. While the literature on participation barriers in transfer programs shows mixed welfare effects – with Deshpande and Li (2019) finding that increased participation can increase welfare and Finkelstein and Notowidigdo (2019) finding that increased participation can reduce it – my results suggest a different conclusion for housing vouchers: policies that increase participation do not impact the welfare effects of PHA priority rules. Future research might explore the relationship between barriers to program participation and household net value for the voucher.

This analysis has important limitations. First, housing choice vouchers represent just one form of housing assistance. Without data on alternative assistance programs, I cannot account for how access to these alternatives might affect the welfare implications of PHA priority rules. Second, the analysis abstracts from strategic responses to priority rules – for instance, households might adjust their wage earnings to improve their selection chances under an earnings-based priority rule. Quantifying behavioral responses to priority rule design remains an important area for future research.

Despite these caveats, this analysis yields broader insights for transfer program design. Priority rules meaningfully shape welfare effects, a finding likely to extend beyond housing vouchers to other non-entitlement programs where administrators influence participant selection. Moreover, evaluating policy counterfactuals requires careful consideration of how new participants might differ from current ones in both their value for the program and cost to the government.

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Tables and Figures

Table 1: Summary Statistics of Baseline Characteristics

	Assignment			Selection		
	No Lottery (1)	Lottery (2)	Lottery Effect (3)	No Voucher (4)	Voucher (5)	Voucher Effect (6)
Panel A: Household Head Characteristics						
Age	30.67	30.70	0.03 (0.22)	30.96	30.26	-0.70 (0.22)
Share Female	92.42	92.16	-0.27 (0.66)	92.17	92.48	0.31 (0.68)
Share Black	46.22	46.90	0.68 (1.24)	46.29	46.98	0.69 (1.27)
Baseline Wage Earnings	1006.79	1044.38	37.59 (38.51)	1071.16	955.56	-115.60 (39.38)
Share Baseline Employed	50.38	51.40	1.02 (1.25)	51.52	49.92	-1.60 (1.27)
Baseline Welfare Income	802.10	787.99	-14.10 (19.22)	732.89	890.56	157.67 (19.57)
Share Baseline Welfare Receipt	73.90	73.26	-0.64 (1.10)	71.11	77.38	6.27 (1.12)
Panel B: Household Characteristics						
Household Size	3.93	3.93	-0.00 (0.04)	3.88	4.00	0.13 (0.04)
Baseline Rent	1065.45	1065.02	-0.43 (13.30)	1058.54	1075.43	16.89 (13.59)
N	2997	3445		3773	2669	

Note: This table reports baseline household head and household characteristics. Columns (1) and (2) report baseline characteristics by housing choice voucher offer receipt. Columns (4) and (5) report baseline characteristics by housing choice voucher receipt. All statistics are weighted by survey weights. Standard errors are clustered at the site level. Baseline rent is missing for 20 percent of observations. Missing values are excluded in the statistics for baseline rent.

Table 2: Comparing Welfare to Work Voucher Experiment Households

	Experiment (1)	PSH Experiment (2)	PSH All (3)	Diff (Exp) (4)	Diff (All) (5)
Panel A: Household Head Characteristics					
Age:					
<25	33.65	6.81	8.23	26.84 (1.78)	25.43 (0.91)
25–50	64.20	74.23	62.56	-10.03 (1.89)	1.65 (1.05)
51–61	2.03	10.18	12.02	-8.15 (0.65)	-9.99 (0.33)
62+	0.12	9.21	16.78	-9.09 (1.07)	-16.66 (0.54)
Share Female	92.48	89.60	83.62	2.88 (3.30)	8.86 (0.63)
Share Black	46.98	69.83	40.86	-22.85 (15.78)	6.12 (1.87)
Share Hispanic	25.14	11.07	16.17	14.07 (8.31)	8.97 (1.85)
Panel B: Household Outcomes					
Household Income	1963.03	2575.79	2631.16	-612.77 (163.16)	-668.14 (42.84)
Household Rent	588.91	586.03	674.44	2.88 (56.82)	-85.53 (13.87)
Landlord Rent	1820.76	1930.32	1953.27	-109.56 (104.08)	-132.51 (36.55)
Cost	1231.85	1344.29	1278.83	-112.44 (126.54)	-46.98 (36.89)

Note: This table reports voucher household head characteristics and household outcomes. 'Experiment' refers to Welfare to Work Voucher Experiment households with a housing choice voucher. 'PSH Experiment' refers to Housing Choice Voucher program households from the Picture of Subsidized Housing (2000), using data from the six Public Housing Authorities that correspond to the six Public Housing Authorities represented in the experimental sample. 'PSH All' refers to Housing Choice Voucher program households from all Public Housing Authorities in the Picture of Subsidized Housing (2000). 'Diff (Exp)' shows the difference between the 'Experiment' and 'PSH Experiment' columns. 'Diff (All)' shows the difference between the 'Experiment' and 'PSH All' columns. Dollar amounts are quarterly. The 'Experiment' column statistics are weighted by survey weights.

Table 3: Experimental Estimates

	Equal Priority (1)	No Earnings Priority (2)	Earnings Priority (3)
Panel A: Treatment Effects			
Rent	334.05 (12.60)	333.70 (19.80)	334.38 (24.22)
Income:			
Total Income	-91.18 (42.35)	-86.76 (60.26)	-95.42 (95.53)
Wage Earnings	-92.49 (52.92)	-176.20 (70.52)	-12.01 (98.82)
Welfare Income	1.31 (31.95)	89.44 (35.23)	-83.41 (46.15)
Panel B: Household Outcomes			
Counterfactual: Without Voucher			
Rent	1483.22	1471.80	1494.21
Income:			
Total Income	2032.89	1523.87	2522.21
Wage Earnings	1386.22	783.16	1965.95
Welfare Income	646.66	740.71	556.26
Counterfactual: With Voucher			
Rent	1817.27	1805.50	1828.59
Income:			
Total Income	1941.71	1437.10	2426.79
Wage Earnings	1293.73	606.96	1953.94
Welfare Income	647.97	830.15	472.85
Panel C: Baseline Characteristics			
Age	29.16	29.66	28.68
Share Female	95.68	95.68	95.68
Share Black	50.83	46.31	55.18
Household Size	3.98	4.08	3.89
Prob. Complier	0.52	0.52	0.52

Note: This table reports experimental estimates using data from the Welfare to Work Voucher Experiment. This table reports results for the considered Public Housing Authority priority rules: Equal Priority, No Earnings Priority, and Earnings Priority. Panel A reports local average treatment effects for key outcomes. Panel B decomposes the treatment effects into expected without-voucher complier outcomes and expected with-voucher complier outcomes. Panel C provides baseline characteristics of households compliers. Dollar amounts are quarterly. All statistics are weighted by survey weights.

Table 4: Experimental Housing Choice Voucher – Welfare Estimates

	Equal Priority (1)	No Earnings Priority (2)	Earnings Priority (3)
WTP	873.36	1014.64	737.55
	(19.55)	(14.24)	(35.67)
Cost	1198.70	1393.05	1011.86
	(21.79)	(19.54)	(40.95)
MVPF	0.73	0.73	0.73
	(0.01)	(0.02)	(0.04)

Note: This table reports the willingness-to-pay, cost to the government, and marginal value of public funds (MVPF) of different Public Housing Authority priority rules under the experimental voucher. The 'Cost' category includes changes in welfare income and adjustments to the Earned Income Tax Credit, calculated using TAXSIM. No standard error is computed for the changes in the Earned Income Tax Credit. Dollar amounts are quarterly. All statistics are weighted by survey weights.

Table 5: Actual and Potential Complier Households

	Equal Priority		No Earnings Priority		Earnings Priority	
	Actual	Potential	Actual	Potential	Actual	Potential
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Welfare						
WTP	873.36	933.98	1014.64	1121.83	737.55	765.71
	(19.55)	(23.21)	(14.24)	(18.20)	(35.67)	(40.59)
Panel B: Household Outcomes						
Counterfactual: Without Voucher						
Rent	1483.22	1505.04	1471.80	1463.24	1494.21	1542.49
Earnings:						
Total Earnings	2032.89	1903.55	1523.87	1138.03	2522.21	2589.27
Wage Earnings	1386.22	1437.76	783.16	553.68	1965.95	2229.67
Welfare Income	646.66	465.79	740.71	584.35	556.26	359.59
Panel C: Household Characteristics						
Share Female	95.68	90.76	95.68	91.14	95.68	90.42
Share Black	50.83	45.67	46.31	43.33	55.18	47.76
Age	29.16	31.46	29.66	32.32	28.68	30.69
Household Size	3.98	3.83	4.08	3.99	3.89	3.69
Share	0.52	0.35	0.52	0.34	0.52	0.36

Note: This table reports statistics for 'Actual' complier households, households that receive a voucher if they receive a voucher offer and do not receive a voucher if they do not receive a voucher offer, and 'Potential' complier households, households that receive a voucher if they receive a participation-increasing voucher offer and do not receive a voucher if they do not receive a participation-increasing voucher offer. 'Actual' complier households are complier households under the experimental voucher offer. 'Potential' complier households are never-taker households under the experimental voucher offer. Dollar amounts are quarterly. All statistics are weighted by survey weights.

Table 6: Probit Estimates

	Main Effect (1)	Offer Interaction (2)
Panel A: Covariates		
Age	-0.011	0.000
	(0.004)	(0.004)
Female	-0.127	0.302
	(0.110)	(0.110)
Black	0.246	0.126
	(0.080)	(0.080)
Baseline Wage Earnings	-0.000	-0.000
	(0.000)	(0.000)
Baseline Employed	-0.021	0.064
	(0.081)	(0.081)
Baseline Welfare Earnings	0.000	-0.000
	(0.000)	(0.000)
Baseline Welfare Receipt	-0.058	0.184
	(0.099)	(0.099)
Household Size	-0.011	0.003
	(0.018)	(0.018)
Baseline Rent	0.000	0.000
	(0.000)	(0.000)
Panel B: Experimental Sites		
Atlanta	-1.436	1.214
(747)	(0.237)	(0.299)
Augusta	-0.588	1.213
(731)	(0.226)	(0.295)
Fresno	-0.436	0.983
(2342)	(0.214)	(0.275)
Houston	-1.040	1.074
(1546)	(0.234)	(0.297)
Spokane	-1.250	1.404
(1076)	(0.216)	(0.274)

Note: This table reports maximum likelihood estimates of a binomal probit model of Housing Choice Voucher program participation. The numbers in parentheses beneath each experimental site indicate the total number of households participating from that site. All statistics are weighted by survey weights.

Table 7: Selection Corrected Estimates: Rent and Total Income

	Without Voucher		With Voucher	
	Rent	Total Income	Rent	Total Income
	(1)	(2)	(3)	(4)
Age	-2.298	-7.320	-0.174	-2.192
	(0.553)	(2.737)	(0.539)	(3.378)
Female	-21.150	-22.778	4.850	-196.564
	(16.792)	(107.530)	(13.041)	(104.799)
Black	-79.739	130.833	-5.392	10.456
	(12.676)	(66.464)	(10.777)	(86.112)
Baseline Wage Earnings	0.018	0.604	0.007	0.633
	(0.005)	(0.078)	(0.004)	(0.046)
Baseline Employed	-19.887	50.750	-5.651	-88.494
	(12.924)	(143.431)	(12.104)	(90.155)
Baseline Welfare Income	-0.010	0.487	0.020	0.546
	(0.010)	(0.064)	(0.009)	(0.058)
Baseline Welfare Receipt	6.028	-68.461	-16.705	-105.888
	(19.213)	(97.913)	(16.263)	(98.697)
Household Size	-0.265	20.350	12.136	48.792
	(2.799)	(14.789)	(2.551)	(18.991)
Baseline Rent	0.118	0.225	0.011	0.023
	(0.013)	(0.071)	(0.012)	(0.084)
Voucher Preference	6.232	120.529	0.623	-94.917
	(13.548)	(69.477)	(14.432)	(69.915)

Note: This table reports selection-corrected estimates for the impact of housing choice voucher receipt on rents and household head total income. Columns (1) and (2) report estimates for households without a voucher, while Columns (3) and (4) report estimates for households with a voucher. The 'Voucher Preference' row reports the coefficient estimates on the expected unobserved component. All standard errors are bootstrapped and clustered at the site level. All statistics are weighted by survey weights.

Table 8: Participation-Increasing Estimates

	Equal Priority (1)	No Earnings Priority (2)	Earnings Priority (3)
Panel A: Treatment Effects			
Rent	351.38 (15.00)	359.04 (14.38)	344.15 (18.26)
Income:			
Total Income	18.06 (83.79)	85.12 (87.20)	-45.23 (95.55)
Wage Earnings	49.52 (89.62)	88.35 (92.29)	12.88 (101.71)
Welfare Income	-31.46 (33.43)	-3.23 (35.71)	-58.11 (36.49)
Panel B: Household Outcomes			
Counterfactual: Without Voucher			
Rent	1495.80	1477.64	1512.93
Income:			
Total Income	1981.61	1373.15	2555.76
Wage Earnings	1413.49	672.26	2112.93
Welfare Income	568.12	700.89	442.83
Counterfactual: With Voucher			
Rent	1847.18	1836.68	1857.08
Income:			
Total Income	1999.66	1458.27	2510.53
Wage Earnings	1463.01	760.61	2125.81
Welfare Income	536.65	697.66	384.72
Panel C: Baseline Characteristics			
Age	30.78	31.69	29.93
Share Female	92.57	92.52	92.62
Share Black	46.86	43.58	49.96
Household Size	3.89	4.01	3.78
Prob. Complier	0.86	0.85	0.87

Note: This table reports model estimates under participation-increasing policies using the econometric selection model and data from the Welfare to Work Voucher Experiment. This table reports results for the considered PHA priority rules: Equal Priority, No Earnings Priority, and Earnings Priority. Panel A reports treatment effects on key outcomes. Panel B decomposes the treatment effects into expected without-voucher complier outcomes and expected with-voucher complier outcomes. Panel C provides baseline characteristics of households compliers. Dollar amounts are quarterly. All statistics are weighted by survey weights.

Table 9: Participation-Increasing Housing Choice Voucher – Welfare Estimates

	Equal Priority (1)	No Earnings Priority (2)	Earnings Priority (3)
WTP	901.31	1065.69	746.20
	(11.52)	(13.83)	(13.05)
Cost	1230.77	1429.80	1042.97
	(41.61)	(47.57)	(45.59)
MVPF	0.73	0.75	0.72
	(0.02)	(0.03)	(0.03)

Note: This table reports the willingness-to-pay, cost to the government, and marginal value of public funds (MVPF) of different Public Housing Authority priority rules under the participation-increasing voucher. The 'Cost' category includes changes in welfare income and adjustments to the Earned Income Tax Credit, calculated using TAXSIM. No standard error is computed for the changes in the Earned Income Tax Credit. Dollar amounts are quarterly. All statistics are weighted by survey weights.

Appendices for Online Publication

A: Data Appendix

B: Housing Choice Voucher Model Appendix

C: Econometric Model Appendix

D: Additional Tables and Figures

A Data Appendix

A.1 Welfare to Work Voucher Experiment

The primary analysis sample is drawn from the "Effects of Housing Choice Vouchers on Welfare Families" dataset which includes information on 8,732 households from housing choice voucher waiting lists across six PHAs. The data include information on household demographics, household housing choice voucher receipt, and household head earnings. The analysis sample comprises 6,442 households with non-missing values for key variables.

A.1.1 Demographics

Baseline demographic information is derived from the "Covariates" data file, which collects responses from household heads via a survey conducted prior to randomization. This survey captures data on household and household head characteristics and includes data on baseline household head quarterly earnings and monthly housing unit spending. I augment this data with the "Quarterly Administrative Outcomes" data file, which provides administrative records of quarterly earnings. In cases where there is a discrepancy between the quarterly earnings reported in the "Covariates" file and the "Quarterly Administrative Outcomes" file, the value from the "Quarterly Administrative Outcomes" file is used. I multiply the monthly baseline housing unit spending value by three to convert it to quarterly baseline housing unit spending.

A.1.2 Housing Choice Voucher Receipt

Housing choice voucher receipt is measured from the "Lease-Up" data file which provides a quarterly indicator lease-up variable equal to one if the household ever-received a housing choice voucher. If a household receives a housing choice voucher then the variable equals one for that quarter and for all subsequent quarters. The variable value is derived from the Department of Housing and Urban Development's Public Housing Information Center (PIC) System.

A.1.3 Outcomes

Rent

Household rent is only recorded during the baseline survey conducted before randomization – there are no further observations of household rent – regardless of whether the household participates in the Housing Choice Voucher program. I consider three approaches to impute without-voucher household rent and two approaches to impute with-voucher household rent.

In the first two without-voucher household rent imputation approaches, I match non-recipient households to U.S. Census Bureau, 2000 Census of Population and Housing, Summary File 3 by census tract. The Summary File 3 Table HCT18 provides data on the distribution of renters across each Census tract, detailing the joint number of households in each of seven household income bins and one of fifteen gross household rent bins. I drop all those joint bins where household income is

greater than $50,000 because any household with an income above $50,000 is unlikely to participate in the Housing Choice Voucher program.

The preferred approach makes the following assumption: within each household income × household rent bin, rents are uniformly distributed. Under this assumption, the average rent in each bin equals the midpoint of that bin.[25] I multiply this midpoint by the number of households within that bin. I do this for every household income × household rent bin and then take the weighted average. I then assign that weighted average rent to the households in the experiment in that census tract.

In the second approach, I aggregate the data to the share of households in each of the fifteen housing unit spending bins, considering only those households with household income below $50,000. I assume that within each Census tract housing unit spending is distributed log-normal with a point mass at zero. Let y_i denote the observed proportion of renters in the i^{th} bucket. Then $F(r; \mu, \sigma)$ denotes the cumulative distribution function of the log-normal distribution with a point mass at zero with parameters μ and σ, where L_i and U_i denote the lower and upper bounds of the i^{th} bin. The log-likelihood function for the parameters μ, σ, and π is:

$$\begin{aligned}\ell(\mu, \sigma, \pi) = y_1 \log(\pi) + \sum_{i=2}^{14} y_i \log\left((1-\pi)\left[F(\log(U_i); \mu, \sigma) - F(\log(L_i); \mu, \sigma)\right]\right) \\ + y_{15} \log\left((1-\pi)\left[1 - F(\log(U_{14}); \mu, \sigma)\right]\right)\end{aligned}$$

After estimating the parameters for the log-normal distribution with a point mass at zero, each household in their respective census tract is assigned the mean rent based on the recovered distribution. Specifically, the mean rent $\bar{R}$ for a log-normal distribution with parameters μ and σ is

$$\bar{R} = \exp\left(\mu + \frac{\sigma^2}{2}\right).$$

In the third approach, I use the household rent reported in the baseline survey. Since not all households reported rent in the baseline survey, this approach restricts the analysis to only those households that did report baseline rent.

For households that receive housing vouchers, I consider two approaches to impute household rent. In the preferred approach, I match voucher recipients to the Picture of Subsidized Housing 2000 by census tract. For each household, I sum two variables: "rent per month" (average gross household contribution towards rent per month) and "spending per month" (average federal spending per unit per month). When these variables are missing, I impute their values using data from nearby Census tracts.

In the second approach for voucher recipients, I assume each household rents a unit at Fair Market Rent, using the Department of Housing and Urban Development's "2001 Fair Market Rents by

[25] For the final bin of household rent $2000+, I assume the rent is $2000.

State." Within each state, Fair Market Rents vary by Metropolitan Fair Market Rent Area and number of bedrooms. I match households to their Metropolitan Fair Market Rent Area and assign Fair Market Rents based on household size from the baseline survey: households with 1-3 people are assigned 1-bedroom Fair Market Rent, 4-5 people are assigned 2-bedroom Fair Market Rent, 6-7 people are assigned 3-bedroom Fair Market Rent, and 8+ people are assigned 4-bedroom Fair Market Rent.

Income

Quarterly administrative household head TANF income (welfare income) and household head wage earnings are sourced from the "Administrative (Quarterly) Outcomes" data file. The file includes the quarterly wage earnings and welfare income for the household heads who were successfully matched to administrative records using their Social Security Number. This file does not include quarterly welfare income for households in Los Angeles, California.

B Housing Choice Voucher Model Appendix

B.1 Willingness to Pay

I assume housing choice voucher receipt impacts recipient households solely through housing unit price, $p(b)$, and through income taxes, $\tau(b)$. I assume that households optimally choose non-housing unit consumption, c, housing unit spending, h; household head labor supply, l, and household head welfare receipt, r, subject to their budget constraint. Households solve

$$\max_{c,h,l,r} u(c,h,l,r) \ \textit{subject to} \ c + p(b)h = (1-\tau(b))(wl+r).$$

The household's indirect utility is

$$V(b) = u(c(p(b),\tau(b),w), h(p(b),\tau(b),w), l(p(b),\tau(b),w), r(l(p(b),\tau(b),w))).$$

The envelope theorem implies

$$\frac{\partial V}{\partial b} = -\lambda[\frac{dp}{db}h + \frac{d\tau}{db}(wl+r)] \tag{9}$$

where $\frac{dp}{db}$ and $\frac{d\tau}{db}$ are the change in housing unit price and income taxes due to housing choice voucher receipt, respectively. Following Finkelstein et al. (2019), I consider a "marginal" program expansion such that $b \in [0,1]$. Let b index a linear term between housing choice voucher non-receipt, $(b=0)$, and housing choice voucher receipt, $(b=1)$. Then housing unit price and income taxes are

$$p(b) = bp(1) + (1-b)p(0)$$
$$\tau(b) = b\tau(1) + (1-b)\tau(0)$$

and the change in the housing unit price and income taxes due to marginal expansion are

$$\frac{dp}{db} = p(1) - p(0)$$
$$\frac{d\tau}{db} = \tau(1) - \tau(0)$$

Therefore, the willingness to pay for a housing choice voucher, in dollars, is

$$WTP \equiv \frac{\frac{\partial V}{\partial b}}{\lambda} = (p(0)-p(1))h(0) + (\tau(0)-\tau(1))(wl(0)+r(0))$$

where I evaluate housing consumption, labor supply, and welfare receipt without a housing choice voucher. I assume $p(1)=1$, $p(1)=0$, $\tau(0)=0$, and $\tau(1)=0.3$. This simplifies to

$$WTP \equiv \frac{\frac{\partial V}{\partial b}}{\lambda} = h(0) - 0.3(wl(0)+r(0)).$$

An alternative approach accounts for behavioral responses to housing choice voucher receipt in the willingness to pay calculation. By the "trapezoidal approach" (Finkelstein et al. (2019); Kleven (2021)), willingness to pay is:

$$WTP \equiv \frac{1}{2}\left[\frac{\frac{\partial V}{\partial b}\big|_{\theta=1}}{\lambda} + \frac{\frac{dV}{db}\big|_{\theta=0}}{\lambda}\right] = \frac{1}{2}\left[h(1) - 0.3(wl(1) + r(1)) + h(0) - 0.3(wl(0) + r(0))\right].$$

This approach incorporates both without- and with-voucher housing consumption and labor supply. Unlike the preferred approach, the "trapezoidal approach" makes additional assumptions about households' housing demand and labor supply curves.

B.2 Housing Choice Voucher Program Voucher Offer

Expected willingness to pay is

$$E[WTP] = \sum_X E[WTP_X]P(X)$$

where $E[WTP_X] \equiv E[WTP|X]$. Then

$$\begin{aligned} E[WTP_X] &= E[WTP(D(1))Z + WTP(D(0))(1-Z)|X] \\ &= E[WTP(D(1))|X]E[Z|X] + E[WTP(D(0))|X](1 - E[Z|X]) \\ &= E[WTP(D(1))|X]\delta_X + E[WTP(D(0))|X](1-\delta_X), \end{aligned}$$

The second line follows from the assumption that the housing choice voucher offer conditional on characteristics $E[Z|X]$ is not correlated with potential outcomes. The term $\delta_X \equiv E[Z|X]$ is the probability of receiving the instrument given characteristics X. Then,

$$\frac{\partial E[WTP_X]}{\partial \delta_X} = E[WTP(D(1)) - WTP(D(0))|X].$$

The monotonicity assumption implies

$$\frac{\partial E[WTP_X]}{\partial \delta_X} = E[WTP(D(1)) - WTP(D(0))|D(1) \neq D(0), X]P(D(1) \neq D(0)|X).$$

The condition $D(1) \neq D(0)$ implies $D(1) = 1$ and $D(0) = 0$. In addition, $WTP_X(0) = 0$. Therefore,

$$\begin{aligned} \frac{\partial E[WTP_X]}{\partial \delta_X} &= E[WTP(1)|D(1) = 1, D(0) = 0, X]P(D(1) = 1, D(0) = 0|X) \\ &= E[WTP|D(1) = 1, D(0) = 0, X]P(D(1) = 1, D(0) = 0|X). \end{aligned}$$

Expected cost is

$$E[C] = \sum_X E[C_X]P(X)$$

where $E[C_X] \equiv E[C|X]$. Then

$$\begin{aligned} E[C_X] &= E[C(D(1))Z + C(D(0))(1-Z)|X] \\ &= E[C(D(1))|X]E[Z|X] + EC(D(0))|X \\ &= E[C(D(1))|X]\delta_X + EC(D(0))|X](1-\delta_X) \end{aligned}$$

The second line follows from the assumption that the housing choice voucher offer conditional on characteristics $E[Z|X]$ is not correlated with potential outcomes. The term $\delta_X \equiv E[Z|X]$ is the

probability of receiving the instrument given characteristics X. Then,

$$\frac{\partial E[C_X]}{\partial \delta_X} = E[C(D(1)) - C(D(0))|X].$$

The monotonicity assumption implies

$$\frac{\partial E[C_X]}{\partial \delta_X} = E[C(D(1)) - C(D(0))|D(1) \neq D(0), X]P(D(1) \neq D(0)|X).$$

The condition $D(1) \neq D(0)$ implies $D(1) = 1$ and $D(0) = 0$. The net cost of the voucher is

$$\begin{aligned} C &= (p(0) - p(1))h(1) + (\tau(0) - \tau(1))(wl(1) + r(1)) + T(1) - T(0) \\ \text{where } C(1) &= (p(0) - p(1))h(1) + (\tau(0) - \tau(1))(wl(1) + r(1)) + T(1) \\ \text{and } C(0) &= T(0) \end{aligned}$$

Therefore,

$$\frac{\partial E[C_X]}{\partial \delta_X} = E[C|D(1) = 1, D(0) = 0, X]P(D(1) = 1, D(0) = 0|X)$$

A household complies with the housing choice voucher offer if

$$\psi(X, 1) + \nu > 0,\ \psi(X, 0) + \nu < 0.$$

Therefore

$$\begin{aligned} &E[WTP|D(1) = 1, D(0) = 0, X]P(D(1) = 1, D(0) = 0|X) \equiv \\ &E[WTP|\psi(X, 0) < -\nu < \psi(X, 1), X]P(\psi(X, 0) < -\nu < \psi(X, 1)|X) \end{aligned}$$

and, similarly,

$$\begin{aligned} &E[C|D(1) = 1, D(0) = 0, X]P(D(1) = 1, D(0) = 0|X) \equiv \\ &E[C|\psi(X, 0) < -\nu < \psi(X, 1), X]P(\psi(X, 0) < -\nu < \psi(X, 1)|X) \end{aligned}$$

. The marginal value of public funds is

$$MVPF_{E,X} \equiv \frac{\Delta E[WTP]}{\Delta E[C]} =$$

$$\frac{\sum_X P(X) \frac{\partial E[WTP_X]}{\partial \delta_X} \Delta \delta_X}{\sum_X P(X) \frac{\partial E[C_X]}{\partial \delta_X} \Delta \delta_X} =$$

$$\frac{\sum_X P(X) E[WTP | \psi(X_i, 0) < -\nu_i < \psi(X_i, 1), X] P(\psi(X_i, 0) < -\nu_i < \psi(X_i, 1) | X) \Delta \delta_X}{\sum_X P(X) E[C | \psi(X_i, 0) < -\nu_i < \psi(X_i, 1), X] P(\psi(X_i, 0) < -\nu_i < \psi(X_i, 1) | X) \Delta \delta_X}.$$

The process for recovering the $MVPF_{H,X}$, is identical.

C Econometric Model Appendix

C.1 Extensive Margin Compliers Only

I define the treatment as housing choice voucher receipt, specifically whether the household has ever received a housing choice voucher. I denote the treatment as $D \in \{0, 1\}$. This definition represents a simplification of the actual voucher receipt process. Households do not simply receive or not receive a voucher; rather, households receive vouchers for varying duration. An alternative definition is $D \in \{0, 1, 2, ..., \bar{D}\}$, where each integer represents the time a household receives a voucher. However, the binary definition is appropriate if I assume, following Rose and Shem-Tov (2024), "extensive margin compliers only":

$$D(1) > D(0) \implies D(0) = 0.$$

This restriction requires that housing choice voucher offers induce households to shift from no housing choice voucher receipt to some positive quantity of housing voucher receipt, but does not induce shifts from some positive quantity of time to an even greater positive quantity of time.

Potentially, this is a strong restriction in the context of the Welfare to Work Voucher Experiment. The experiment involves households already on a housing choice voucher waiting list. The randomization process determines whether households are selected to receive a voucher offer immediately or must wait longer on the waiting list for a voucher offer. Many of the households that do not receive the voucher offer through the experiment are likely to receive a voucher offer in the future. Consequently, their counterfactual outcome may actually be receiving a housing choice voucher for a shorter duration rather than not receiving one at all. To mitigate this issue, I focus on outcomes one year post-randomization. Due to data limitations, I am unable to empirically test whether the data are consistent with this restriction.

A significant methodological advantage of the "extensive margin compliers only" assumption is that it allows for the use of a simple "two-step" selection model

$$\mathbb{1}(D = d) = \begin{cases} \mathbb{1}\{\psi_0(X, Z) + \nu^{ext} < 0\} \text{ if } d = 0 \\ \mathbb{1}\{\psi_0(X, Z) + \nu^{ext} > 0\}\mathbb{1}\{\psi_d(X) + \nu^{int} < \psi_{d+1}(X)\} \text{ if } d > 0 \end{cases}$$

in which ν^{ext} governs the decision to participate and ν^{int} governs the level of participation. I assume that mean potential outcomes are not governed by ν^{int}

$$E[Y|\nu^{ext}, \nu^{int}, X] = E[Y|\nu^{ext}, X].$$

This assumption implies that if households do differ in the amount of time receiving a housing choice voucher, in ways not captured by household characteristics and the unobservable extensive margin characteristic, then those differences do not impact mean potential outcomes. I define $\nu^{ext} \equiv \nu$.

C.2 Estimating Mean Potential Outcomes

A household complies with the housing choice voucher offer if

$$\psi(X_i, 1) + \nu_i > 0, \psi(X_i, 0) + \nu_i < 0.$$

This implies that the mean potential outcomes for compliers are

$$E[Y_i(d)| - \psi(X_i, 1) < \nu_i < -\psi(X_i, 0), X_i] = X_i'\theta_{dX} + \gamma_d E[\nu_i| - \psi(X_i, 1) < \nu_i < -\psi(X_i, 0), X_i]$$

where

$$E[\nu| - \psi(X_i, 1) < \nu_i < -\psi(X_i, 0), X_i] = \frac{\phi(\psi(X, 1)) - \phi(\psi(X, 0))}{\Phi(\psi(X, 0)) - \Phi(\psi(X, 1))}.$$

I define $\xi(\psi(X, 0), \psi(X, 1)) \equiv E[\nu|X_i, -\psi(X_i, 1) < \nu_i < -\psi(X_i, 0)]$. An estimate of mean $Y_i(d)$ for compliers with characteristics X is therefore

$$\hat{\mu}_d(X) = \hat{\theta}_d 0 + X'\hat{\theta}_{dX} + \hat{\gamma}_d \xi(\hat{\psi}(X, 0), \hat{\psi}(X, 1))$$

where $\hat{\psi}(X, Z)$ come from the first-stage binomial probit model and $\hat{\theta}_{d0}$ and $\hat{\theta}_{dX}$ come from the second-step least squares regression. An estimate of the mean $Y_i(d)$ for compliers is

$$\hat{\mu}(d) = \sum_i (\frac{\omega_i}{\sum_j \omega_j}) \hat{\mu}_d(X)$$

where

$$\omega_i = [\Phi(\psi(X, 0)) - \Phi(\psi(X, 1))] w_i$$

is an estimate of the probability that household i is a complier multiplied by the Welfare to Work Voucher Experiment survey weight w_i.

C.3 Decomposition

I decompose the differences in expected complier outcomes between the participation-increasing voucher and the experimental voucher into two components: differences attributable to observable characteristics and differences attributable to unobservable characteristics. The decomposition is

$$\mathbb{E}[Y(d)|\text{Complier}_H] - \mathbb{E}[Y(d)|\text{Complier}_E] =$$

$$\sum_{X_i}(\theta_{d0} + X_i'\theta_{dx} + \gamma\lambda_H(X_i)) \cdot P(X_i|\text{Complier}_H) - \sum_{X_i}(\theta_{d0} + X_i'\theta_{dx} + \gamma\lambda_E(X_i)) \cdot P(X_i|\text{Complier}_E) =$$

$$\underbrace{\sum_{X_i}(\theta_{d0} + X_i'\theta_{dx}) \cdot (P(X_i|\text{Complier}_H) - P(X_i|\text{Complier}_E)) +}_{\text{Observed}}$$

$$\underbrace{\sum_{X_i}\gamma(\lambda_H(X_i) \cdot P(X_i|\text{Complier}_H) - \lambda_E(X_i) \cdot P(X_i|\text{Complier}_E))}_{\text{Unobserved}}$$

where the $\mathbb{E}[Y(d)|\text{Complier}_H]$ represents the expected outcome for households that comply with the participation-increasing housing choice voucher and $\mathbb{E}[Y(d)|\text{Complier}_E]$ represents the expected outcome for households that comply with the experimental housing choice voucher. I present the results of the decomposition for rent, total income, wage earnings, and welfare income across the considered PHA priority rules in Table A1.

C.4 Model Fit

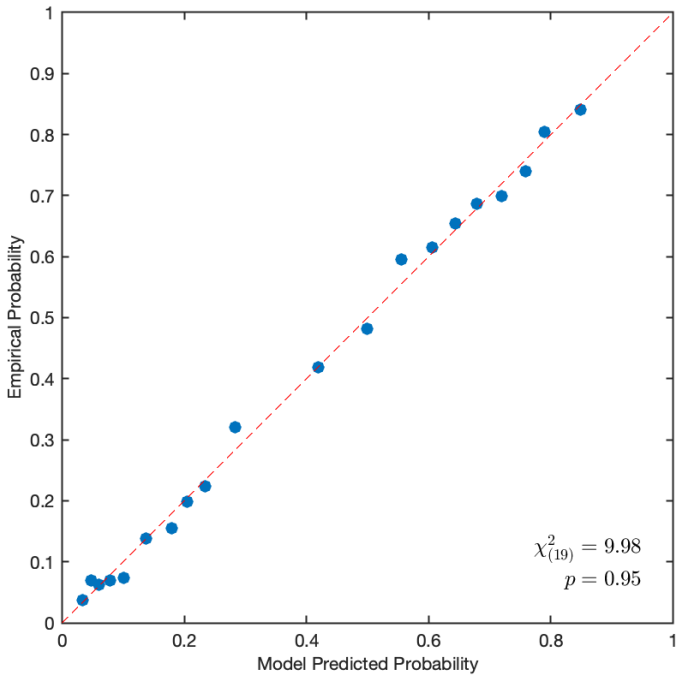
The reliability of the control function approach depends on the model's ability to accurately predict both program participation decisions and potential outcomes that can be validated against local average treatment effects (LATEs) estimated via two-stage least squares.

I assess the choice model's performance by comparing predicted and empirical participation probabilities. Using probit estimates, I first calculate predicted probabilities of Housing Choice Voucher program participation ($\hat{\pi}(X, Z)$) for each household. I then sort households into vigintile based on these predicted probabilities and compare them to actual participation rates within each decile. Appendix Figure A1 shows close agreement between predicted and empirical probabilities across all vigintiles.

To validate the potential outcomes models, I examine four key variables: housing unit rent and total household earnings, each measured with and without voucher receipt. For each outcome, I first generate individual-level predictions using the control function approach. I then sort these predictions into vigintiles and estimate local average treatment effects within each vigintile using two-stage least squares. This 2SLS estimation interacts the endogenous voucher receipt variable with indicators for each vigintile, using the original instruments interacted with these same vigintile indicators. Appendix Figure A2 demonstrates that the control function predictions closely track these independently estimated treatment effects across the distribution of predicted outcomes.

D Additional Tables and Figures

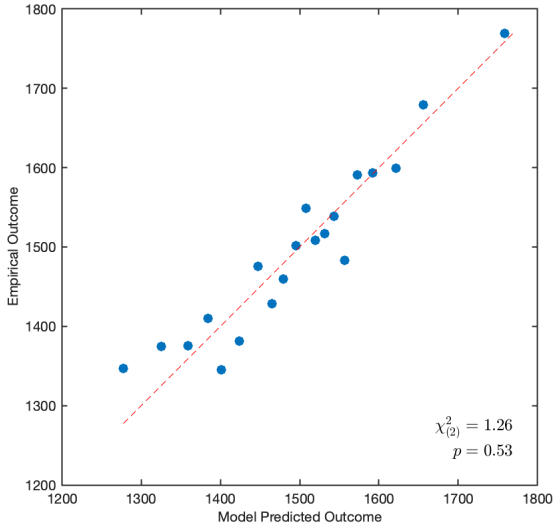
Figure A1: Probit Model Fit



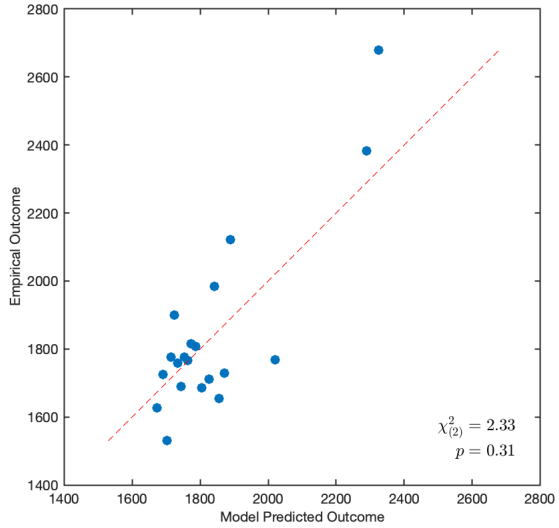
Note: This figure plots empirical probabilities of Housing Choice Voucher program participation against model predictions of participation. Cells are defined by vigintiles of model predicted probabilities of participation. The figure shows the results of a test that the empirical and model-predicted probabilities are equal.

Figure A2: Empirical and Model Mean Potential Outcome Estimates

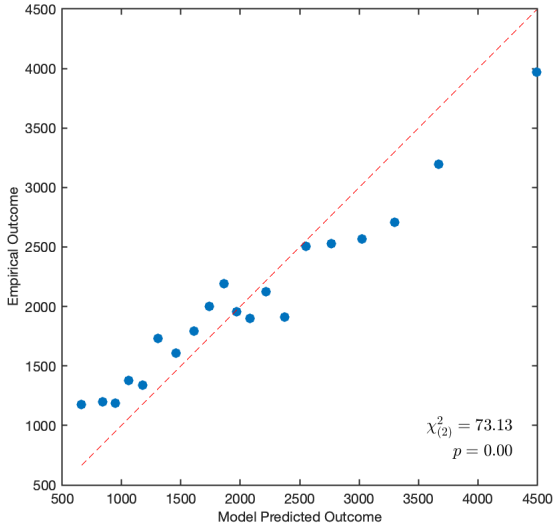
Panel A: Without Voucher Rent



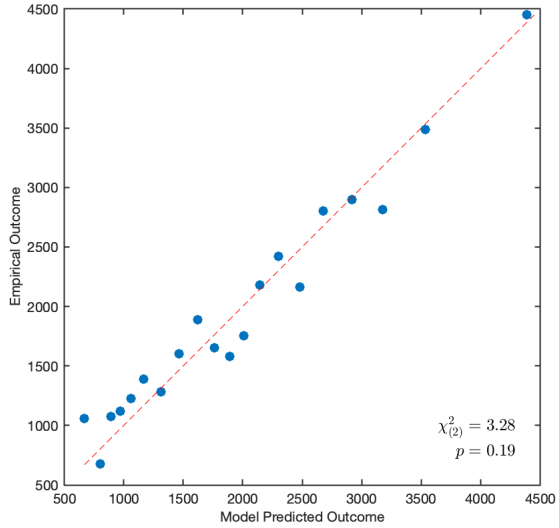
Panel B: With Voucher Rent



Panel C: Without Voucher Total Earnings



Panel D: With Voucher Total Earnings



Note: This figure compares model-predicted and empirically-estimated potential outcomes across groups. Households are sorted into vigintiles based on their model-predicted outcomes. For each vigintile, we estimate empirical potential outcomes using two-stage least squares with vigintile interactions. The dashed line represents the 45-degree line. The figure shows the result of a test that the relationship between the predicted and empirical outcomes follows a 45-degree line. See Appendix C for additional details.

Table A1: Decomposition: Observables and Unobservables

	Equal Priority			No Earnings Priority			Earnings Priority		
	Observable	Unobservable	Total	Observable	Unobservable	Total	Observable	Unobservable	Total
Counterfactual: Without Voucher									
Rent	10.068	-3.191	6.877	5.540	-3.136	2.404	14.115	-3.246	10.869
Income:									
Total Income	-5.072	-61.717	-66.789	-57.113	-60.650	-117.763	34.809	-62.769	-27.960
Wage Earnings	-51.616	-13.619	-65.235	-56.493	-13.384	-69.876	-44.719	-13.851	-58.571
Welfare Income	46.544	-48.098	-1.554	-0.620	-47.266	-47.886	79.528	-48.918	30.610
Counterfactual: With Voucher									
Rent	18.444	-0.319	18.125	13.935	-0.313	13.622	22.600	-0.324	22.276
Income:									
Total Income	-4.501	48.602	44.101	-54.513	47.762	-6.751	34.499	49.431	83.930
Wage Earnings	-60.415	-43.013	-103.428	-63.288	-42.270	-105.558	-54.959	-43.747	-98.706
Welfare Income	55.914	91.616	147.529	8.775	90.031	98.806	89.458	93.177	182.636

Note: Note: This table presents the decomposition of differences in complier outcomes between participation-increasing and experimental housing choice vouchers. The decomposition is divided into two main components: the portion explained by observable characteristics and the portion explained by the unobservable characteristic. Results are shown for the considered Public Housing Authority priority rules: Equal Priority, No Earnings Priority, and Earnings Priority. The "Observable" column represents the difference attributable to observed characteristics, while the "Unobservable" column shows the difference due to the unobserved characteristic. The "Total" column is the sum of these two components. Dollar amounts are quarterly. All statistics are weighted by survey weights.

Table A2: Mover Estimates

	Equal Priority (1)	No Earnings Priority (2)	Earnings Priority (3)
Panel A: Treatment Effects			
Move	0.07 (0.02)	0.10 (0.03)	0.04 (0.03)
Panel B: Potential Outcomes			
Counterfactual: Without Voucher			
Move	0.23	0.22	0.24
Counterfactual: With Voucher			
Move	0.30	0.32	0.28
Prob. Complier	0.52	0.52	0.52

Note: This table reports experimental estimates for the considered Public Housing Authority priority rules: Equal Priority, No Earnings Priority, and Earnings Priority. Panel A reports local average treatment effects on the the likelihood of moving to a different census tract between the pre-randomization period and one year later. Panel B decomposes the treatment effects into expected without-voucher complier outcomes and expected with-voucher complier outcomes. All statistics are weighted by survey weights.

Table A3: Neighborhood Estimates

	Equal Priority (1)	No Earnings Priority (2)	Earnings Priority (3)
Panel A: Treatment Effects			
Employed	0.36 (0.29)	0.15 (0.41)	0.56 (0.38)
Public Assistance	-0.37 (0.31)	0.03 (0.44)	-0.75 (0.40)
Poverty	-0.97 (0.61)	-0.18 (0.85)	-1.74 (0.83)
Panel B: Neighborhood Outcomes			
Counterfactual: Without Voucher			
Employed	87.22	86.32	88.09
Public Assistance	10.18	10.15	10.22
Poverty	27.81	27.90	27.72
Counterfactual: With Voucher			
Employed	87.59	86.48	88.65
Public Assistance	9.81	10.18	9.46
Poverty	26.83	27.72	25.98
Prob. Complier	0.52	0.52	0.52

Note: This table reports experimental estimates for the considered Public Housing Authority priority rules: Equal Priority, No Earnings Priority, and Earnings Priority. Panel A reports local average treatment effects on neighborhood outcomes. Panel B decomposes the treatment effects into expected without-voucher complier outcomes and expected with-voucher complier outcomes. All statistics are weighted by survey weights.

Table A4: Primary and Alternative Rent Imputation

Without Voucher Method	With Voucher Method	Equal Priority			No Earnings Priority			Earnings Priority		
		Without	With	Treatment	Without	With	Treatment	Without	With	Treatment
Uniform	**PSH**	**1483.2**	**1816.9**	**333.7**	**1471.8**	**1805.2**	**333.4**	**1494.2**	**1828.1**	**333.9**
Uniform	FMR	1483.2	1748.3	265.1	1471.8	1756.3	284.5	1494.2	1740.6	284.5
Log-Normal	PSH	1409.9	1816.9	407.0	1399.9	1805.2	405.4	1419.5	1828.1	405.4
Log-Normal	FMR	1409.9	1748.3	338.5	1399.9	1756.3	356.5	1419.5	1740.6	356.5
Baseline	PSH	1055.7	1802.7	747.0	1012.3	1781.5	769.2	1094.1	1821.5	769.2
Baseline	FMR	1055.7	1706.0	650.4	1012.3	1710.2	697.8	1094.1	1702.3	697.8

Note: This table evaluates complier means and treatment effects under different rent imputation methods. For without-voucher rents, I use three approaches: Uniform, Log-Normal, and Baseline. For with-voucher rents, I use two approaches: PSH and FMR. The first row (in bold) shows results from the preferred specification, while subsequent rows shows results for each alternative combination of these methods all of which are detailed in Appendix A. For each combination, I report the without-voucher complier mean (without), the with-voucher complier mean (with), and their difference (treatment). for the considered Public Housing Authority priority rules: Equal Priority, No Earnings Priority, and Earnings Priority. Dollar amounts are quarterly. All statistics are weighted by survey weights.

Table A5: Experimental Housing Choice Voucher – Alternative Rent Welfare Estimates

Without Voucher Method	With Voucher Method	Equal Priority			No Earnings Priority			Earnings Priority		
		WTP	Cost	MVPF	WTP	Cost	MVPF	WTP	Cost	MVPF
Weighted	FMR	873.36	1130.13	0.77	1014.64	1344.16	0.75	737.55	924.38	0.80
		(18.86)	(25.00)	(0.01)	(20.53)	(16.79)	(0.01)	(15.77)	(20.16)	(0.03)
Log-Normal	PSH	800.00	1198.70	0.67	942.70	1393.05	0.68	662.81	1011.86	0.66
		(47.45)	(54.37)	(0.03)	(62.76)	(60.27)	(0.03)	(21.89)	(18.86)	(0.02)
Log-Normal	FMR	800.00	1130.13	0.71	942.70	1344.16	0.70	662.81	924.38	0.72
		(14.24)	(22.07)	(0.02)	(19.31)	(18.54)	(0.02)	(16.37)	(26.52)	(0.03)
Baseline	PSH	445.79	1184.48	0.38	555.15	1369.35	0.41	337.48	1005.22	0.34
		(15.14)	(53.54)	(0.02)	(30.34)	(26.43)	(0.02)	(52.02)	(19.70)	(0.06)
Baseline	FMR	445.79	1087.82	0.41	555.15	1297.98	0.43	337.48	886.08	0.38
		(66.86)	(29.91)	(0.06)	(35.08)	(74.65)	(0.03)	(36.27)	(61.33)	(0.04)

Note: This table reports welfare estimates under different rent imputation methods. The first two columns indicate the method used to calculate without-voucher rents (Weighted, Log-Normal, or Baseline) and with-voucher rents (PSH or FMR). For each combination of methods, I report willingness-to-pay, cost to the government, and marginal value of public funds (MVPF) across three different Public Housing Authority priority rules: Equal Priority, No Earnings Priority, and Earnings Priority. The 'Cost' category includes changes in welfare income and adjustments to the Earned Income Tax Credit, calculated using TAXSIM. No standard error is computed for the changes in the Earned Income Tax Credit. Dollar amounts are quarterly. All statistics are weighted by survey weights.

Table A6: Experimental Housing Choice Voucher – Trapezoidal Welfare Estimates

	Equal Priority (1)	No Earnings Priority (2)	Earnings Priority (3)
WTP	1053.87	1194.37	918.81
	(18.22)	(14.30)	(33.03)
Cost	1198.70	1393.05	1011.86
	(21.79)	(19.54)	(40.95)
MVPF	0.88	0.86	0.91
	(0.01)	(0.02)	(0.04)

Note: This table reports the willingness-to-pay under the "trapezoidal approach" which is described in Appendix B, cost to the government, and marginal value of public funds (MVPF) of different Public Housing Authority priority rules under the experimental voucher. The 'Cost' category includes changes in welfare income and adjustments to the Earned Income Tax Credit, calculated using TAXSIM. No standard error is computed for the changes in the Earned Income Tax Credit. Dollar amounts are quarterly. All statistics are weighted by survey weights.

Table A7: Experimental Housing Choice Voucher – Alternative Rent Trapezoidal Welfare Estimates

Without Voucher Method	With Voucher Method	Equal Priority			No Earnings Priority			Earnings Priority		
		WTP	Cost	MVPF	WTP	Cost	MVPF	WTP	Cost	MVPF
Weighted	FMR	1019.59	1130.13	0.90	1169.92	1344.16	0.87	875.07	924.38	0.95
		(19.54)	(25.00)	(0.01)	(16.98)	(16.79)	(0.00)	(12.47)	(20.16)	(0.03)
Log-Normal	PSH	1017.19	1198.70	0.85	1158.40	1393.05	0.83	881.44	1011.86	0.87
		(47.16)	(54.37)	(0.03)	(58.29)	(60.27)	(0.03)	(17.63)	(18.86)	(0.02)
Log-Normal	FMR	982.91	1130.13	0.87	1133.95	1344.16	0.84	837.70	924.38	0.91
		(15.28)	(22.07)	(0.02)	(16.09)	(18.54)	(0.02)	(15.61)	(26.52)	(0.03)
Baseline	PSH	832.98	1184.48	0.70	952.77	1369.35	0.70	715.45	1005.22	0.71
		(27.41)	(53.54)	(0.04)	(24.82)	(26.43)	(0.01)	(22.46)	(19.70)	(0.04)
Baseline	FMR	784.64	1087.82	0.72	917.09	1297.98	0.71	655.89	886.08	0.74
		(38.77)	(29.91)	(0.03)	(47.25)	(74.65)	(0.04)	(40.29)	(61.33)	(0.05)

Note: This table reports welfare estimates under different rent imputation methods. The first two columns indicate the method used to calculate without-voucher rents (Weighted, Log-Normal, or Baseline) and with-voucher rents (PSH or FMR). For each combination of methods, I report willingness-to-pay under the "trapezoidal approach" which is described in Appendix B, cost to the government, and marginal value of public funds (MVPF) across three different Public Housing Authority priority rules: Equal Priority, No Earnings Priority, and Earnings Priority. The 'Cost' category includes changes in welfare income and adjustments to the Earned Income Tax Credit, calculated using TAXSIM. No standard error is computed for the changes in the Earned Income Tax Credit. Dollar amounts are quarterly. All statistics are weighted by survey weights.

Table A8: Selection Corrected Estimates: Wage Earnings and Welfare Income

	Without Voucher		With Voucher	
	Wage Earnings (1)	Welfare Income (2)	Wage Earnings (3)	Welfare Income (4)
Age	-5.831	-1.488	-2.885	0.693
	(2.681)	(1.029)	(2.345)	(1.593)
Female	2.128	-24.907	-116.391	-80.173
	(95.223)	(35.778)	(106.663)	(40.010)
Black	117.885	12.948	-54.086	64.541
	(62.935)	(30.402)	(79.930)	(27.957)
Baseline Wage Earnings	102.654	-51.904	-21.102	-67.391
	(147.653)	(28.741)	(68.768)	(22.964)
Baseline Employed	0.618	-0.014	0.658	-0.025
	(0.077)	(0.007)	(0.047)	(0.009)
Baseline Welfare Income	-0.084	0.571	-0.034	0.580
	(0.063)	(0.029)	(0.062)	(0.037)
Baseline Welfare Receipt	49.262	-117.724	-91.965	-13.923
	(109.997)	(17.597)	(117.238)	(27.137)
Household Size	-8.645	28.995	22.517	26.275
	(10.233)	(5.288)	(24.509)	(7.754)
Baseline Rent	0.236	-0.011	-0.009	0.032
	(0.065)	(0.025)	(0.101)	(0.028)
Voucher Preference	93.932	26.597	-178.919	84.002
	(94.245)	(30.897)	(67.889)	(24.759)

Note: This table reports selection-corrected estimates for the impact of housing choice voucher receipt on household head wage eanrings and welfare income. Columns (1) and (2) report estimates for households without a voucher, while Columns (3) and (4) report estimates for households with a voucher. The 'Voucher Preference' row reports the coefficient estimates on the expected unobserved component. All standard errors are bootstrapped and clustered at the site level. All statistics are weighted by survey weights.