The Effect of Fundamental Housing Policy Reforms on Program Participation

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Abstract

This paper estimates the effects of alternative reforms of the current system of low-income housing assistance on the number of people of various types who would receive assistance. The reforms are designed to eliminate the system's substantial inefficiencies, inequities, and bias against homeownership. All would replace HUD's largest low-income housing programs with alternative tenure-neutral housing voucher programs that serve all eligible families that apply for assistance. Most cost less than the current system. The estimated effects on program participation are long-run effects after the transition to the new system has been completed. The estimates of participation in the reformed voucher programs are based primarily on the five-percent household sample from the 2000 Decennial Census and participation experience in the only similar housing assistance programs that have been operated in the United States. HUD's administrative records provide data on current recipients of low-income housing assistance. The paper explores the sensitivity of the results to the equations used to predict participation in the reformed voucher programs. The results indicate that even the reformed program that reduces public expenditure by more than 10 percent would serve 75 percent more people in total and many more in families of each type – white, black, and Hispanic; elderly and nonelderly; families living in metropolitan and nonmetropolitan areas; small, medium, and large families; and families in the first two real income deciles. The most underserved types experience the largest increases.

The Effect of Fundamental Housing Policy Reforms on Program Participation

Introduction

Low-income housing assistance is a major part of the U.S. welfare system. Unlike other major means-tested transfer programs, no low-income housing program serves all eligible families that apply for assistance. Nevertheless, federal, state, and local governments spend substantially more on housing subsidies to the poor than on other better-known parts of the welfare system such as Temporary Assistance to Needy Families (TANF). The U.S. Department of Housing and Urban Development (HUD) spent more than $36 billion in FY 2009, federal tax expenditures on the low-income housing tax credit, mortgage revenue bonds, and multi-family revenue bonds added more than $5 billion, the U.S. Department of Agriculture (USDA)'s low-income housing programs cost about $1 billion, and state and local governments spend some money from their own resources to provide such assistance.[1] For example, local governments provide substantial property tax abatements to all public housing projects and many privately owned projects.

Plausible assumptions about taxpayer preferences argue strongly for replacing the current patchwork of low-income housing programs with a housing assistance program that offers the same assistance to all eligible families in the same circumstances. Surely few favor offering some households large subsidies while denying assistance to other identical households. Instead they favor offering the same assistance to all households who are the same in their eyes. Inequities exist even among the fortunate minority who are offered assistance. The variation in the subsidy across identical households living in subsidized housing projects is enormous. The best housing projects offered by a particular program that has produced new units for many years are much more desirable than the worst, but tenants with the same characteristics pay the same rent for units in either.

These features of the current system of low-income housing assistance are a historical accident with no coherent rationale. Government involvement began during the Great Depression with a program that subsidized the construction of public housing projects. In part, this program was intended to increase employment. The number of households made eligible for public housing enormously exceeded the ability to build apartments for them anytime soon.

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[1] For HUD and USDA outlays, see housing assistance under the heading income security at http://www.gpoaccess.gov/usbudget/fy11/pdf/ap_cd_rom/26_14.pdf. For tax expenditures, see lines 55, 56, and 63 in Table 16-1 at http://www.gpoaccess.gov/usbudget/fy11/pdf/spec.pdf.

When projects were built, they were not equally desirable, especially with respect to location. As they aged, further divergences emerged.

Evidence on the excessive costs of all forms of housing assistance tied to the occupancy of specific dwelling units argues for exclusive reliance on tenant-based assistance.[2] It costs much more to provide equally good housing with unit-based housing assistance. Therefore, it would be possible to serve current recipients equally well (that is, provide them with equally good housing for the same rent) and serve many additional families without spending more money by shifting resources from unit-based to tenant-based assistance. The results of the best study of HUD's largest program that subsidized the construction of privately-owned projects imply that tenant-based vouchers could have provided all of the families who participated in the Section 8 New Construction Program with equally good housing for the same rent and served at least 72 percent more families with similar characteristics equally well without any additional public expenditure [Wallace et al., 1981]. Alternatively, the same households could have been served equally well at a much lower taxpayer cost. Mayo et al. (1980) finds similar results for public housing. Getting more for less is always desirable, but it is especially important in our current fiscal situation.

Tenant-based assistance has another major advantage over unit-based assistance. It greatly expands recipient choice. All low-income housing programs have minimum housing standards that reflect the interests of taxpayers in ensuring that low-income families live in adequate housing. Unit-based assistance forces each family to live in a particular unit in order to receive a subsidy. So it greatly restricts recipient choice among units meeting minimum housing standards. In contrast, each family offered tenant-based assistance has a choice among many units that meet the program's standards, and the family can retain its subsidy when it moves. Its landlord does not have a captive audience.

Finally, few argue that the government should actively discourage homeownership by low-income households. Low-income housing assistance should be at worst neutral in this regard. The flawed innovations in mortgage finance that sparked the recession of the late 2000s say more about how, rather than whether, to deliver homeownership assistance to low-income households.

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[2] Olsen (2003, pp. 394-399) provides a brief account of the evidence on the cost-effectiveness of low-income housing programs. Olsen (2009) provides a more detailed account.

The current situation differs greatly from a program of tenant-based housing assistance that offers the same assistance to all eligible families in the same circumstances. Less than 30 percent of eligible renters receive low-income housing assistance, and this percentage is much lower for eligible homeowners [Olsen, 2003, pp. 390-393]. This is not because they do not want it on the terms offered. There are long waiting lists to get into subsidized housing in almost all localities, and the length of the waiting list understates excess demand in many localities because housing authorities often close their waiting lists when they get sufficiently long. Furthermore, more than two thirds of low-income housing assistance is unit-based. Finally, the current system of low-income housing assistance is heavily biased against homeownership. After accounting for geographical price differences and adding an imputed return on home equity to the income of homeowners in calculating their real income, nearly 25 percent of renters but less than 5 percent of homeowners in the lowest real income decile receive housing assistance. The gap in the second real income decile is smaller, but still substantial [Olsen, 2007, Table 1]. The federal government does provide large subsidies through the federal income tax system that induce more households to be homeowners and all homeowners to occupy better housing. However, the bulk of these subsidies go to middle- and upper-income families.

Replacing the current system of low-income housing programs with a program of tenant-based assistance that serves all eligible families that apply for assistance has been espoused by housing policy analysts for many years [Lowry (1971), Aaron (1972), Khadduri and Struyk (1982), Olsen (1983), Weicher (1997), Quigley (2000), Green and Malpezzi (2003), Olsen (2008), Glaeser and Gyourko (2008)]. The Clinton Administration proposed comprehensive legislation for phasing out project-based assistance [HUD, 1995], and in his campaign against President Clinton, Robert Dole also proposed vouchering out public housing. Although the Clinton proposals were not adopted, the 1998 Housing Act mandated the demolition of public housing projects and the provision of tenant-based assistance to their residents under certain circumstances and allowed it under other circumstances.

Although many advantages of reforms of this type have documented, their effects on participation rates of families of different types have not been studied. This is an important omission because the proposed reforms might reduce participation among some groups whose housing is of particular interest to taxpayers.

This paper studies the effect on participation rates of families of various types of replacing most of HUD's current low-income housing programs with alternative tenure-neutral housing voucher programs that serve all eligible families that apply for assistance. Most have a taxpayer cost almost identical to my best estimate of the cost of the current system, others cost 10 percent more, and still others 10 percent less. Since I omit certain taxpayer costs that are difficult to quantify, my best estimate understates the cost of the current system and my results understate the increase in program participation that would result from replacing it with equally costly alternative programs. Feasible reforms would gradually phase out existing programs. The estimated effects on program participation are long-run effects after the transition to the new system has been completed.

Reformed Housing Voucher Programs

The reformed voucher programs analyzed would offer a cash grant to each eligible family on the condition that it occupy housing meeting certain standards. This type of housing voucher was used in HUD's open-enrollment Housing Assistance Supply Experiment (HASE) operated in two metropolitan areas in the 1970s and in a limited-enrollment national voucher program administered by HUD from 1983 through 1999. The minimum housing standards are similar to those in HASE and HUD's current voucher program. The subsidy to a household under each reformed housing voucher program analyzed is equal to a constant called the payment standard minus a percentage of the household's adjusted income. All reforms adjust the payment standard for differences in family size and composition and geographical price differences, all mimic the income adjustments in current programs, and all involve different subsidy levels than the current voucher program in order to achieve specified taxpayer costs. Unlike the current voucher program, the proposed programs are neutral with respect to homeownership, that is, a household receives the same subsidy with the same restrictions whether it owns or rents its dwelling unit.

Like the current Section 8 Housing Choice Voucher Program, the payment standard within a locality is tied to a particular number of bedrooms that is considered to be appropriate for households with a particular size and composition. Unlike the current Section 8 Housing Choice Voucher Program, the reforms analyzed involve a nationally uniform relationship between the payment standards for units with different numbers of bedrooms. Two alternative nationally uniform relationships are considered.

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Under most reformed housing voucher programs analyzed, payment standards across areas are adjusted fully for differences in housing prices. This enables households entitled to the same number of bedrooms and living in units renting for the local payment standard to occupy equally good housing in all localities. Olsen, Davis, and Carrillo (2005, pp. 103-104) describe the derivation of the housing price index. It is based on data on the gross rent and numerous housing, neighborhood, and location characteristics of about 173,000 units occupied by current voucher recipients throughout the United States. Information on the census tract of each dwelling unit makes it possible to append detailed information on its immediate neighborhood from the Decennial Census to each observation.[3] Using this housing price index and the nationally uniform bedroom adjustment factors, the payment standards for all numbers of bedrooms and all locations can be computed from the two-bedroom payment standard in any location.

To incentivize recipients to choose less expensive locations, some argue that subsidies should not be fully adjusted for geographic price differences. For this reason, I also consider several partial adjustments. One adjusts payment standards across areas for differences in the Olsen, Davis, and Carrillo's overall consumer price index rather than their housing price index. The overall index varies less than the housing index across areas. Another adjusts payment standards across areas for 90 percent of the difference from the national mean rental housing price index.

I use the current standard benefit reduction rate in HUD's low-income housing programs in most simulations, namely, 30 percent. This has been the HUD norm since the 1980s. However, I also produce estimates based on 25 and 35 percent. The former was the HUD norm at the time of HASE. A higher benefit reduction rate requires higher payment standards in order to maintain the same taxpayer cost. This leads to higher subsidies to families with the lowest incomes and lower subsidies to families with the highest incomes.

Because homeowners are richer than renters with the same ordinary income, I add an estimated return on their home equity to their ordinary income to determine their adjusted incomes and hence their housing subsidy, as was done in HASE [Katagiri and Kingsley, 1980,

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[3] This is the genesis of the somewhat more refined housing price index in Carrillo, Early, and Olsen (2013). Since the correlation between these housing price indices was .983, I did not redo our calculations with the new index.

2.03(3)]. Online appendix B describes how I calculated the estimated return for each homeowner.

As in HASE, voucher recipients would not be allowed to live in subsidized housing projects. The rationale for this restriction is that each voucher recipient that lives in a subsidized project reduces the number of subsidized households by one and receives a subsidy greater than similar voucher recipients living in otherwise unsubsidized units.

In all, I analyze the effects of ten different reformed voucher programs. I consider three benefit reduction rates in the subsidy formula (25, 30, and 35 percent), two alternative adjustments of the subsidy for family size and composition, three alternative adjustments of the subsidy for geographical price differences, two alternative minimum subsidies, and higher subsidies for households with an elderly or disabled head. The results indicate that the qualitative results of the analysis apply to a wide range of reforms and illustrate how the quantitative effects of a voucher program can be altered by changing its parameters. Online appendix A provides more details about HASE and the reformed housing voucher programs.

Current Programs Phased Out

Due to the absence of relevant data on the characteristics of the majority of households served by the low-income housing tax credit projects, USDA's housing programs, and HUD's HOME and community development block grants and its programs for the homeless, the analysis will be limited to replacing HUD's other programs with reformed voucher programs. That is, this paper analyzes effects of phasing out public housing, the tenant-based and project-based Section 8 programs, and HUD's older programs that subsidize privately owned projects. Since HUD provides project-based or tenant-based Section 8 subsidies on behalf of a substantial minority of the tenants of tax credit projects and HUD routinely collects data on these households, they are included in the analysis. The overwhelming majority of other households in tax credit projects have incomes too high to be eligible for the reformed voucher programs analyzed. I assume that these households and households served by other programs excluded from the analysis will continue to be served by their current programs. Since tax credit projects would continue to serve the same number of households and voucher recipients would not be allowed to live in them, the poorest households in such projects would be gradually replaced by eligible households with higher incomes.

Methodology for Predicting Participation in Reformed Voucher Programs

The primary purpose of this paper is to estimate the effect of fundamental reforms of the current system of low-income housing assistance on the number of recipients of various types. In order to estimate the number of households that would participate in a particular reformed housing voucher program and its cost, it is necessary to predict the participation rate in the program of households with different combinations of characteristics. This section discusses the alternative methods that could have been used to make these predictions and describes the method chosen in more detail.

There are two possible broad approaches to the prediction of participation rates under a reformed housing voucher program that offers assistance to all eligible families that apply for it. One possibility is to use information on outcomes under the current system of housing assistance that offers assistance to selected households from waiting lists to estimate a model that could be used to simulate the effects of replacing this system with a reformed housing voucher program. The other approach is to base predictions of participation rates under the proposed program on outcomes under a previous program that offered tenant-based housing assistance to all eligible households that applied for it.

Implementing the first approach would be extremely difficult. It would involve specifying and estimating a model that explains outcomes for a random sample of households under the current system of housing assistance. This model must explain which households are on waiting lists for existing programs, which are offered assistance, and which accepted the offer. Each public housing authority maintains a separate waiting list for its public housing and housing voucher programs, and each privately owned subsidized housing project maintains a separate list. An eligible household can put its name on any waiting list that is open, and most surely have their names on multiple lists. Each public housing authority and each privately owned subsidized housing project has a preference system for determining the order in which households on its waiting list are offered assistance. Estimation of the model requires information about these preference systems. Public housing authorities submit annual plans to HUD that contain information about their waiting lists.[4] However, similar information about the waiting lists of privately owned subsidized housing projects is not available. Estimation of the

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[4] See http://portal.hud.gov/hudportal/HUD?src=/program_offices/public_indian_housing/pha.

model also requires data on how receipt of assistance from each program and indeed each subsidized housing project would affect the consumption bundles available to each eligible household. These factors affect the efforts that households will make to get on waiting lists, whether a household is offered housing assistance during any period of time, and whether the household will accept the assistance offered. Many offers are declined. Assembling the information necessary to estimate the model would be a massive undertaking.

To avoid the preceding difficulties, I opted for the second approach. I estimate the participation rates of households of various types in the five-percent household sample from the 2000 Decennial Census using a previously estimated logit equation explaining participation in the Housing Assistance Supply Experiment at its two sites. These are the only low-income housing programs in the United States that have offered tenant-based housing assistance to all eligible households.[5] An advantage of using the HASE experience is that it accounts for general equilibrium effects of an entitlement housing program on program participation.[6]

Table 1 describes the logit equation that reflects the HASE participation experience. It was estimated using data for 1977 because the participation rate seemed to have reached its steady state by then. Because few single non-elderly households were eligible for housing assistance at the time, HASE researchers excluded such households from the sample used to estimate the logit equation [Lowry, 1983, p. 89]. Because I did not have a good basis for predicting their participation rates in the reformed programs, I exclude them from my analysis. Because the estimated coefficients of the logit model's explanatory variables were very similar in the two sites in preliminary work, the HASE researchers settled on a final specification of the logit model in which only the constant term differed across sites [Carter and Wendt, 1982, p. 88]. Since HASE data were inadvertently discarded by an organization entrusted by HUD with its safekeeping, estimating alternative specifications of the prediction equations are not possible at this stage.

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[5] EHAP's Housing Assistance Demand Experiment (HADE) studied participation in housing voucher programs with the same structure as HASE (as well as other structures), and HADE researchers did estimate equations explaining participation in these programs in its two sites Phoenix and Pittsburgh. For reasons explained in online appendix C, the HASE evidence is much better for predicting participation in the reformed voucher programs considered in this paper.

[6] HASE researchers found little effect of the entitlement housing allowance program on market rents of units of any type in its two sites [Rydell, Neels, and Barnett, 1982]. Eriksen and Ross (2013) find small increases in the rents of units of average quality and decreases in the rents of the worse units in the average metro area. The estimated effects are somewhat larger in areas with the lowest price elasticity of supply.

The remainder of this section describes (1) how I used the logit equation to predict participation in the reformed housing voucher programs in 1999 throughout the U.S. based on information from the 2000 Decennial Census and (2) my analyses to determine the sensitivity of the results to reasonable alternative methods for predicting participation.

I first created prediction equations based on the experience in each site in 1977 by substituting the appropriate values for the dummy variable *St. Joseph County, Indiana* (South Bend) into the equation. The two HASE sites were chosen to differ greatly with respect to variables that were expected to affect program participation and other outcomes, namely, their vacancy rate and racial composition. The rental vacancy rate was 5.1 percent in Green Bay in 1973 and 10.6 percent in South Bend in 1974 [Lowry, 1983, Table 2-6]. In 1980, the rental vacancy rate was 3.4 percent in Green Bay and 9.1 percent in South Bend. Because the average vacancy rate in the two sites was very close to the national average in 2000 (6.8 percent), most of my predictions are based on the mean predicted participation rates across the two sites.[7]

To test the sensitivity of the results to the prediction equation used, I also produce results based on the equations for the individual sites. These prediction equations provide a substantial difference in predicted participation rates. At the sample mean values of the variables, the predicted probability of participation is 10 percentage points lower in South Bend than Green Bay. To put this magnitude in perspective, the predicted participation rate in the programs analyzed ranged from 35 to 58 percent. Although it is very unlikely that the national average participation rate among households that are the same with respect to the characteristics included in the logit equation is outside the range of these predictions, I also report results based on predicted participation rates 10 percent lower than the prediction based on the experience in the site with the lower participation rates and 10 percent higher than in the site with the higher rates.

The logit equation contains two variables *Duration of Eligibility* and *Fraction Previous Year Eligible* that are not available in the PUMS. I substituted HASE sample mean values of these variables into the prediction equation. The logit equation also contained a dummy variable *Previous Interview* that significantly affected participation and requires some explanation. Each year during HASE, the occupants of a random sample of dwelling units chosen at the outset of the experiment were surveyed. New units were added to the survey sample each year to account

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[7] For vacancy rates in the U.S. in 2000, see http://factfinder.census.gov/home/saff/main.html. For the HASE sites in 1980, see www.socialexplorer.com.

for new construction. The logit equation was estimated with data from this survey and administrative records from the fourth year of the experiment. Due to household mobility and the addition of newly built units to the sample, some households surveyed in the fourth year were interviewed for the first time and many others had been interviewed earlier. Each year's survey asked a number of questions concerning the respondent's knowledge about HASE, thereby increasing their awareness of the program. The variable *Previous Interview* takes a value of 1 if the respondent had been interviewed previously and 0 otherwise. Unsurprisingly, it was found that respondents who had been interviewed previously were more likely to be receiving a housing allowance. Because no similar survey will accompany the reforms considered, I set the value of this variable equal to zero in almost all simulations. However, to test the sensitivity of the results to this decision, I report results based on setting its value equal to 1.

Obviously, the generosity of the subsidy (the variable *Allowance*) is an important determinant of participation. However, a subsidy of $3000 a year in South Bend in 1977 is considerably more generous than a subsidy of the same nominal magnitude in New York City in 1999. For each reformed voucher program considered, I use Olsen, Davis, and Carrillo's cross-sectional consumer price index to express each household's subsidy in 1999 in terms of the prices that prevailed in each of HASE sites in 1999 and then use the CPI for the Midwest (specifically, the CPI-U price index for all items) to deflate these amounts to 1977.[8]

In estimating the logit equation, the variable *Minority* was defined to be 0 if the household head was a non-Hispanic white and 1 otherwise. It is tempting to apply this definition to households in the PUMS and use the logit equation in a straightforward manner to predict the participation rates of otherwise similar households in different racial and ethnic groups, and I report the results of a sensitivity analysis that uses this approach. However, the racial and ethnic mixes of the populations in HASE sites in 1977 and the U.S. in 2000 lead us to choose a more nuanced approach for most simulations. Table 2 reports the percentage of the U.S. population in broad racial and ethnic groups in 2000 and the percentages in HASE sites in 1980. It documents the substantial difference in the racial composition of the two HASE sites that reflected a conscious choice in site selection. More importantly for present purposes, it reveals the very small Hispanic population in the two sites compared with their percentage of the U.S. population

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[8] The BLS does not report time-series price indices for Green Bay or South Bend or for the Midwest in their size class prior to 1996. However, the percentage increase in the CPI from 1977 to 1999 is about the same for the Midwest as a whole and the Midwest size categories reported, ranging from 155 to 173 percent.

in 2000. The households classified as minority in the sample underlying the logit equation were overwhelmingly black. Very few were Hispanic.

Clearly, HASE logit equations are most informative about the participation rates of non-Hispanic whites and blacks, and I use them without modification for these groups. Non-Hispanic whites and blacks accounted for about 82 percent of HUD-assisted households in the lowest two real income deciles in 1999.[9] Since almost all households eligible for the reformed housing programs are in these income deciles, the logit equation provides a good basis for predicting participation for the bulk of likely participants. Based on participation rates in HUD's Section 8 Housing Choice Voucher Program, I use the participation prediction equation for non-Hispanic whites to predict participation for Hispanics and non-Hispanics of other races for most simulations. Online appendix D provides the rationale and evidence for this decision.

Unlike the proposed reformed voucher programs, HASE did not replace the low-income housing programs that existed at the time. Instead it offered an alternative form of housing assistance to all households with sufficiently low income, roughly the poorest 15 to 20 percent of households. Most families served by existing programs were eligible for HASE, but few switched to the allowance program [Lowry, 1983, p. 89].[10] The logit equation was estimated with data on HASE-eligible households who were not served by other programs. Therefore, it surely understates what the participation rates would have been in the absence of the existing programs. Many households that continued to participate in the existing programs would have participated in HASE if the existing programs had been terminated. I assume that all households that were poor enough to be eligible for HASE but continued to participate in an existing program would have participated in HASE in the absence of the existing programs. Lowry (1983, pp. 96-99) provides aggregate results for renters and homeowners in each site that allow us to predict participation in the reformed housing voucher programs in the absence of the existing programs under this assumption. Consistent with these results, I increase the predicted

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[9] Our method for calculating real income is described later. Briefly, it accounts for geographic differences in consumer prices and differences in family size and composition

[10] This is not surprising. First, the low-income housing projects at these locations at the time of the experiment probably provided a larger subsidy than HASE. All were quite new. HUD's Section 236 Program accounted for the overwhelming majority of privately-owned, HUD-subsidized projects at the time, and none of these projects were built before 1970. All of the public housing projects in the Green Bay and South Bend were built after 1960. The overwhelming majority were built after 1970. Second, in order to receive HASE assistance, the family must incur search and moving costs. Third, housing allowance payments were limited to at most the ten years of the experiment, with no guarantee of any housing assistance after the experiment ended.

participation rates based on the logit regression by 17.8 percent for renters and 32.1 percent for homeowners in Green Bay and 44.7 percent for renters and 14.8 percent for homeowners in South Bend.[11]

To summarize, the preferred method for predicting participation in the reformed housing voucher programs attempts to account for important differences between the HASE sites in 1977 and other locations in 1999, and I conduct sensitivity analyses to try to insure that the true effects of the reforms on program participation are within the range of the estimated effects.

Estimating Participation Rates in Existing Housing Programs

The number of households of various types who received assistance from the HUD programs that would be gradually replaced by the reformed housing voucher programs is based primarily on HUD's Longitudinal Occupancy, Demography, and Income (LODI) file that contains data from HUD's Multifamily Tenant Characteristics System (MTCS) and Tenant Rental Assistance Certification System (TRACS) for 1995 through 2002. This database provides information that is reported by local housing authorities and owners of privately-owned HUD-subsidized housing projects on the characteristics of assisted families collected when they are admitted to a housing program or recertified for continued participation. It also identifies the primary program providing the housing assistance.[12] Due to incomplete reporting by housing agencies and owners of private projects, the LODI data file does not contain information on all households that received HUD assistance under the set of programs considered. Furthermore, in making calculations, I deleted observations for households that did not report values of the variables used in the analysis or reported clearly erroneous values.[13] So using unadjusted counts of the households in the LODI data file with reasonable values of the variables of interest would understate the number of HUD-assisted households.

I used data on the total number of households that received assistance under the specified programs in 1998 and 2000 reported in HUD's Picture of Subsidized Households (PSH) to adjust upward the total number of households of each type in the LODI data file in 1999 with

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[11] These are percentages rather than percentage points. The same percentage is applied to the predicted participation rate for all renters in Green Bay no matter what their other characteristics and similarly for the other three groups.
[12] Selected researchers were granted access to this file under confidentiality agreements to protect the privacy of the households involved. An issue of Cityscape (Volume 8, Number 2, 2005) contains many articles based on it.
[13] With billions of entries, some errors are inevitable.

reasonable values of the variables used in the analysis.[14] Specifically, with two exceptions explained in online appendix E, I calculated the number of HUD-assisted households in each state in 1999 by first multiplying the number of HUD units (or vouchers) in each state by the occupancy rate (or voucher utilization rate) and then calculating the mean of these numbers for the two years. The ratio of this estimated total number of HUD-assisted households in the state to the number of households in the LODI file was used to adjust the participation totals for all household types in the state.

Independent evidence indicates that these methods led to estimates of the total number of HUD-assisted households at the national level in 1999 very close to the truth. My estimate is about 4.15 million. HUD's Recent Research Results (October 2000) reported 4.19 million households at the end of 1999, excluding Indian housing but including HUD-assisted housing in U.S. possessions.[15] Since there were about 70,000 households served by IHA and 110,000 HUD-assisted households in U.S. possessions, the comparable HUD number is also about 4.15 million. This does not preclude errors in a particular direction for some types of households, but it implies errors of equal magnitude in the opposite direction for other types.

Overall, the preceding analysis led us to conclude that the LODI file contained about 87 percent of HUD-assisted households, and I adjusted total participation in current programs upward by that magnitude. However, I did not adjust participation rates upwards by the same percentage for families of all types. I used the same percentage adjustment for all families in the same state. Because families of a given type accounted for different fractions of the population in different states, the percentage adjustment was different for families of different types.

Taxpayer Cost of Existing Housing Programs

The primary purpose of this paper is to estimate an important effect of replacing the bulk of HUD's low-income housing programs for most potential recipients with alternative housing voucher programs with the same taxpayer cost as the current system and with taxpayer costs 10 percent more and less than this amount. This section describes how I estimated the cost of serving all households except single non-elderly under the HUD programs replaced.[16] For the

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[14] The source is http://www.huduser.org/portal/datasets/assthsg.html. HUD did not produce a PSH for 1999.
[15] See http://www.huduser.org/periodicals/rrr/rrr_10_2000/1000_6.html.
[16] Recall that I exclude single non-elderly individuals from the analysis because I did not have a good basis for predicting their participation rates in the proposed voucher programs.

reasons mentioned below, this estimate understates taxpayer cost. As a result, my estimates of the increase in the number of households served that would result from the intended reform is understated on this account. Alternatively, the results reported can be viewed as estimates of the effect on the number of households served of replacing the current system with alternatives that are somewhat less costly.

The HUD programs that would be replaced with the reformed voucher programs served about 4.0 million households in 1999. The full taxpayer cost of serving these households is not available. To get a lower bound estimate of this cost, I begin with the reported outlays of the HUD programs that served them. According to the U.S. House of Representatives (2000, Table 15-32), this amount was about $25 billion. However, a part of it was used to serve non-elderly one-person households that are excluded from the analysis. In adjusting the total taxpayer cost for the exclusion of these households, I account for their share of total assisted households (about 20 percent) and the ratio of their cost per household to the cost per household of other household types. In the Section 8 Housing Choice Voucher Program, the latter ratio is about .77.[17] Since I have not found data for other programs, I assume that this ratio applies to all current HUD programs. This leads to the conclusions that the excluded households account for 16.7 percent of the aforementioned budget and hence about $20.8 billion is spent on the households included in the analysis. This figure includes almost $500 million spent to assist households in U.S. possessions, mainly Puerto Rico.[18] Assuming that 16.7 percent is devoted to single non-elderly, about $400 million is devoted to other households. This suggests that the total taxpayer cost of the programs replaced in the United States for serving all households except the single non-elderly was about $20.4 billion.

The taxpayer cost of providing housing assistance to the specified households is clearly much greater than this amount. For example, about 40 percent of the households that live in tax credit projects receive tenant-based or project-based Section 8 assistance [GAO, 1997, p. 40]. HUD assistance under these programs is included in my total. However, the tax credit subsidy that pays most of the development cost of these projects is not included. Furthermore, tax credit projects usually receive additional subsidies from several other sources that are not included in the outlays of the specified HUD programs. For example, many receive subsidies funded by the

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[17] The source of these numbers is the LODI file.
[18] This is based on data from the 1998 and 2000 PSH.

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HOME Program that provides housing block grants to state and local governments [Cummings and DiPasquale, 1999, p. 299]. Public housing provides another example. Housing authorities receive substantial property tax abatements on their projects. This is a cost to local taxpayers. A less obvious example is the opportunity cost of continuing to use public housing projects to serve assisted households. These projects could be sold to the highest bidders and the proceeds put into a trust fund whose interest is used to fund housing vouchers. Since some of these funds would be difficult to tap to support the reformed housing voucher programs, I ignore them and limit the budget for most reformed voucher programs to $20.4 billion.

Because the reformed voucher programs would have administrative costs, the entire $20.4 billion would not be available to distribute to recipients. I assume that the per-recipient administrative cost of the reformed voucher programs would be the same as the per-recipient administrative fees in the Section 8 Housing Choice Voucher Program. Budget documents do not contain this information for the year of the data used in the analysis, and HUD's Office of Public and Indian Housing was unable to provide it. I estimate it based on the formula for calculating the per-recipient fee received by individual housing authorities and publicly available data. My estimate of the per-recipient annual administrative fee in HUD's voucher program in 1999 is $625. Online appendix F provides the details.

The per-recipient administrative cost of a reformed housing voucher program is likely to be less than the per-recipient administrative cost in the Section 8 Housing Choice Voucher Program because housing authorities will have to deal with fewer households per recipient. In the Section 8 Program, households offered a voucher have 60 to 120 days to find a unit meeting the program's standards. This surely deters some who are offered a voucher from participating in the program. The voucher offer may come at a time that is very inconvenient for searching for a new unit and moving to it. The reformed voucher programs would not impose this restriction. In HASE, 79 and 84 percent of the families who enrolled in the two sites ultimately received subsidies. Success rates in the Section 8 Program have usually been lower [Finkel and Buron, 2000, Exhibit 2-1, Exhibit C-1]. Furthermore, HASE administered their program in a simpler manner than the current voucher program. If these procedures were used, it would be possible to distribute more to recipients with no increase in the budget.

Results

This section presents estimates of the effect on participation rates of families of various types of replacing HUD's largest current low-income housing programs with alternative tenure-neutral housing voucher programs that serve all eligible families that apply for assistance. First, I report the effects of one alternative reform (called the basic reform) on the number of households of various types served based on my preferred method for predicting participation in it. This follows the conventional practice in describing participation in low-income housing programs in terms of the number of households rather than people served. Second, I report its effect on the number of people in households of various types served. This is arguably a better way of talking about who is served. Third, I show the sensitivity of the estimates of the effects of the basic policy reform to a number of reasonable alternative methods for predicting participation in the reformed voucher program. These analyses reveal that the qualitative conclusions are not affected by the alternative prediction methods considered. Finally, I report the effects on the number of people in households of various types served for alternative policy reforms using my preferred prediction methods.

I report results for families whose members are in the first and second decile of the distribution of real income. This requires a measure of the real income of the members of a household. In all simulations, I add an imputed return on home equity to the income of homeowners and account for geographical price differences in calculating real household income. To measure the level of material well-being attained by the individuals in the household, I divide real household income by an equivalence scale for family size and composition recommended by a committee of the National Research Council, namely, the number of adults plus .7 times the number of children all raised to the .7 power, [Citro and Michael, 1995, p. 162].

Basic Policy Reform with Preferred Participation Prediction Method

Table 3 reports results for the basic policy reform and the preferred participation prediction method. The basic policy reform is designed to have the same taxpayer cost as the (understated) estimate of the current budget of the programs replaced. It adjusts the payment standards in each locality for differences in the number of bedrooms to which the family is entitled in a manner consistent with the national average in HUD's Section 8 Housing Choice Voucher Program, and

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it adjusts them fully across areas for differences in housing prices. It uses the current HUD standard benefit reduction of 30 percent to calculate the subsidy and provides no subsidy if the formula yields less than $30 a month. The third section describes in detail my preferred method for predicting participation in the proposed program. Among other things, it predicts participation as the mean of the predicted probabilities from the two HASE sites for families of each type.

Table 3 indicates that the basic reformed housing voucher program would serve more than 1.8 million additional households, a 55 percent increase, without spending any more money. Indeed, it would cost less than the current system because it costs slightly less than the estimate of the taxpayer cost of the programs replaced ($20.4 billion) and this estimate understates the cost of the current system for the reasons explained in the fifth section.[19] All major groups would experience increases in participation from the reform, ranging from 5 percent for black households to 175 percent for households with 5 or more members.

In interpreting the results in this table, it is important to distinguish between the amount of money spent on behalf of a recipient and how much the recipient is helped. Because the same total amount is spent on a larger number of households, the amount spent per household is less under the reformed housing voucher program than with the continuation of the current system. Because they will be grandfathered, current recipients will not be hurt by the reforms. However, many future recipients will have less money spent on their behalf than they would have received with the continuation of the current system. This does not imply that they will be served less well. As mentioned earlier, the best previous studies show that housing vouchers could be used to provide occupants of subsidized housing projects with equally good housing for the same rent at a much lower taxpayer cost. The amount spent on behalf of recipients under different types of low-income housing assistance is a poor measure of how much they are helped by it. The 55 percent increase in the number of households served due to the basic reform results to a considerable extent from replacing programs of project-based assistance with much more cost-effective housing vouchers.

This is not to say that all future recipients of low-income housing assistance would be better served by this reformed housing voucher program than the continuation of the current system. For example, the reformed program's payment standards are less than FMRs in HUD's

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[19] Tables 9 and 10 report the estimated cost of each alternative considered.

Section 8 Voucher Program in almost all cases. The average difference varied somewhat for households entitled to a different number of bedrooms. The median and mean payment standards across all metropolitan areas ranged from 20 to 30 percent less than the median and mean FMRs. This reduction in subsidies to future voucher recipients serves the interest of equity. Instead of providing larger subsidies to two identical households and none to a third, the proposed reform provides smaller subsidies to all three.

Some believe that these reduced payment standards will preclude participation by the poorest households. The evidence is inconsistent with this belief. Cutts and Olsen (2002) estimated that the FMR exceeded the minimum rent necessary to occupy a unit meeting the Section 8 Voucher Program's minimum housing standards for households of all types in all locations studied.[20] In 2001, the median difference was about 68 percent across all combinations of location and household type. Their results for 1985, 1989, and 1993 and Olsen and Reeder's results for 1975 indicate that this has always been a feature of the program. These differences are large for almost all locations studied. Contrary to the view that reduced payment standards will preclude participation by the poorest households, the results in this paper indicate that the poorest families will experience larger than average increases in participation due to the reforms.

Table 4 shows that the wide range of percentage increases for different groups is due to large differences in the participation rates under the current system of households of different types whose economic circumstances are similar. It reports participation rates in the current system and under the reformed voucher program separately for households in the first and second real income deciles. About 93 percent of current recipient households and 99 percent of households who would participate in the reformed housing voucher are in these real income deciles. Under the current system, the participation rate of blacks in the first income decile is more than twice the participation rate of whites or Hispanics. Under the reformed voucher program, the black participation rate is only slightly greater than the white rate. Because blacks in the lowest real income decile participate at such a high rate in the current system, they would experience a smaller increase in participation than other groups due to the reform (about 5 percent). The pattern is similar in the second real income decile. The data in table 4 support the conventional wisdom that current low-income housing programs serve large families at a much

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[20] In these calculations, households of the same type are households entitled to a subsidy based on the same number of bedrooms.

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lower rate than smaller families. Large families would be served at a much higher rate under the reformed voucher program and hence experience the greatest percentage increase in participation from the reform.

Since the proposed reforms would require congressional approval and members represent states or parts of states, I report the overall results for each state and the District of Columbia (D.C.). Table 5 indicates very large increases in the overwhelming majority of states. In seven states, more than twice as many households would be served. Only seven states would experience decreases in the number of assisted households. These range from 0.6 percent in Nebraska to 21.8 percent in North Dakota with a median of 6.5 percent. These are small states that had unusually high participation rates under the current system ranging from 23.9 percent in the bottom two real income deciles in South Dakota to 44.9 percent in D.C. Throughout the country, only 17.8 percent of all households in these deciles participated in the current programs. Because the states involved account for such a small fraction of current recipient households (about 6 percent), it would be possible to insure that no state experiences a reduction in the number of households that receive housing assistance at a very small cost by providing higher subsidies to the households in these states than would result from the strict application of the formulas underlying the proposed reformed housing voucher program. I defer further consideration of this possibility until I present results on the number of people rather than households served.

Since we are presumably concerned about the well-being of individuals, the remainder of the paper reports the effect of the proposed reforms on the number of people served. Because the largest households experience the largest increase in participation from each of the reforms considered, the reforms all have a larger percentage effect on the number of people than the number of households served.

Table 6 reports the results for the basic reform. This reform increases the number of people served by 89 percent compared with a 55 percent increase in the number of households served. For the group that experiences the smallest increase, namely, households with black heads, it leads to a 15 percent increase in the number of people served compared with a 5 percent increase in the number of households served. Table 7 tells the same qualitative story as table 4. The groups that have the highest participation rates under the current system experience the smallest increases from the reform. Table 8 reports the increase in the number of people served

in each state and D.C. Only D.C. and North Dakota are estimated to experience a decrease from the reform. These states have unusually high participation rates under the current system. D.C. has the highest rate among households in the bottom two real income deciles 44.9 percent and North Dakota the fifth highest 25.6 percent. Throughout the country, only 17.8 percent of all households in these deciles participated in the current programs. Allowing housing authorities in these areas to offer sufficiently generous subsidies so that the number of assisted people in each would increase by 5 percent would cost less than $27 million each year. Achieving a 10 percent increase would cost about $40 million. Neither would lead to total spending in excess of the amount spent on the current system.

Sensitivity of Results to Alternative Methods for Predicting Participation
Before presenting estimates of the effects of alternative policies based on the preferred participation prediction method, I consider the sensitivity of estimates of the effects of the basic reform to a range of alternative methods for predicting participation in it. Table 9 reports the results. The results show that the qualitative conclusions of the analysis are the same for a wide range of reasonable alternative methods for predicting participation in the reformed housing program. Readers who are not interested in the details can skip to the next subsection.

The first column repeats the results for the preferred method. These results are based on the average participation experience in the two HASE sites. The second and third columns report results based on using the individual equations for South Bend and Green Bay (as adjusted for differences over time and space) to predict participation. In the third section, I argued that most localities would experience participation rates between those in the two sites and that the national average participation experience in reformed housing voucher programs in 1999 almost surely would have been between the predicted probabilities based on the experience in these two sites. The predicted participation rate in South Bend was 10 percentage points lower than in Green Bay at the sample mean values of the variables. When these prediction equations are used and payment standards are adjusted so that the basic reform costs about $20.4 billion, its estimated effects do not differ from the results based on my preferred method in any important respect. I go further to test the sensitivity of the results in this regard. Columns 4 and 5 report results for simulations using voucher participation rates 10 percent less than those in the site with the lower participation rates (South Bend) and 10 percent more than those in the site with the

higher participation rates (Green Bay). This too has no effect on the qualitative conclusions of the analysis.

Table 9 also reports results based on alternative values of two variables in the logit equation that could reasonably be assigned to households in the PUMS data. First, the logit equation only distinguishes between non-Hispanic whites and others in terms of race and ethnicity. Table 2 documents that the two sites had very few Hispanics or non-Hispanics other than whites and blacks. Based on evidence on participation in HUD's current Section 8 Housing Voucher Program, I concluded that members of these groups are likely to have participation rates in the reformed voucher programs similar to otherwise similar non-Hispanic whites. My preferred prediction method is based on this assumption. Column 6 reports results of an analysis that deviates from the preferred method only in treating Hispanics and other-race non-Hispanics as minorities in the prediction equations. Because the logit equation predicts small differences in participation rates between non-Hispanic whites and others, this alternative treatment has very little effect the results. Second, the logit equation contains a categorical variable that distinguishes households who were exceptionally well informed about the HASE housing program from other households. My preferred method assumes that households eligible for the reformed housing programs would not have this extra information. Column 7 reports results based on the alternative assumption. This does not affect the qualitative conclusions of the analysis in any important respect.

The preceding analyses indicate the sensitivity of the estimated effects of replacing the current system with a reformed housing voucher program to alternative ways of predicting participation in the reformed program, when the program's payment standards are adjusted to spend the current budget. The final sensitivity analyses consider how the outcomes of a reformed voucher program with fixed parameters would vary with differences in participation propensities. In these simulations, payment standards are not adjusted to achieve the same taxpayer cost. These simulations attempt to place upper and lower limits on the taxpayer cost and other outcomes of a given reformed program, specifically, the basic reform. Column 8 reports the outcomes for a reformed housing voucher program with the same parameters as the basic program but based on the participation experience in South Bend. The result would be smaller, but still substantial, increases for all groups and spending $1.64 billion less. Column 9 reports the outcomes for the same voucher program based on the Green Bay participation

experience. In this case, the increases would be larger for all groups and the cost would be $1.65 billion more.

It is rarely, if ever, possible to predict exactly the cost of changes in government policy, and the inability to do it in this case is a very weak argument against the proposed reform because it will be phased in over many years. If participation experience deviates from the expected in the early years, the payment standards can be adjusted to account for these deviations. Some adjustments in payment standards will occur every year to account for inflation. In the early years of the reform, this could be decided each year rather than by formula. If participation rates and hence taxpayer cost are higher than expected, these adjustments could be more modest. If they are lower than expected, the adjustments could be more generous.

Alternative Policy Reforms with Preferred Participation Prediction Method

Table 10 reports the effects of a range of alternative voucher programs based on the preferred prediction method. With two exceptions (columns 2 and 3), the program's payment standards are adjusted so as to spend the current budget when other parameters of the voucher program are changed. As before, I report the results for the basic policy reform in the first column so that the results of alternative policies can be easily compared with them. The results indicate that all of the reforms considered would lead to large increases in participation by people in all types of households. They also illustrate how the quantitative effects of a voucher program can be changed by altering its parameters.

Some favor greater spending on low-income housing assistance; others favor less spending for this purpose. Columns 2 and 3 report the results of spending about 10 percent more and 10 percent less than the current system, respectively. The most important result is that the proposed reform would serve 75 percent more people in total and substantially more households of every type while spending 10 percent less money.

Column 4 reports results for an alternative set of payment standards. Specifically, differences in payment standards for units with different numbers of bedrooms are based on a hedonic regression rather than HUD's Fair Market Rents (see online appendix table 1). These lead to differences in the payment standards and hence subsidies for households of different sizes and compositions. For most groups, the effect is modest. Although the smallest households gain

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the most from these alternative payment standards, their percentage gain in participation from replacing current programs with the reformed voucher program is still much smaller than for larger households.

Some argue that higher payment standards are desirable for households with an elderly or disabled household head to pay for additional features that are important for these households. Higher payment standards might also be justified to offset their lower participation propensities in a reformed voucher program. Table 7 indicates that 37.2 percent of the people in households with an elderly head in the first real income decile would participate in the basic reformed program compared with 49.0 percent of people in other types of households in this decile. Column 5 in table 10 reports the results of a reformed program that provides 10 percent higher payment standards than the basic reform for households with an elderly or disabled household head. To maintain the same budget, payment standards for other households must be lowered. This modification of program parameters has little effect on the participation rates of any group except the elderly. Their participation rate would increase by over 40 percent. These results illustrate the flexibility of the voucher program in achieving desired results. By offering larger subsidies to households with elderly heads, participation rates of the two groups can be equalized.

The basic reform is based on a subsidy formula that reduces the voucher subsidy by 30 cents for each additional dollar of income, the standard benefit reduction rate in HUD's low-income housing programs. There is no compelling rationale for this rate. Prior to 1982, the HUD standard was 25 percent. It could be raised to 35 percent. Columns 6 and 7 present results for these alternative benefit reduction rates. When payment standards are adjusted to spend the current budget, these alternatives increase the subsidy at some income levels and decrease it at others. Increasing the benefit reduction to 35 percent without adjusting payment standards would decrease the subsidy at each positive income level and hence reduce taxpayer cost. To maintain the same taxpayer cost, the payment standard would have to be increased. This results in higher subsidies for the poorest households and lower subsidies for households with higher incomes. The opposite is true for a decrease in the benefit reduction rate. The results indicate that a 25 percent benefit reduction rate would lead to a larger number of people served for every group than the basic reform and the opposite is true for a 35 percent benefit reduction rate. The

results reported obscure one difference in outcomes. Within the first decile, the number of the very poorest people served is greater when the benefit reduction rate is higher.

One possible concern about the analysis is that it assumes that a change in the benefit reduction rate would have no effect on earnings. Recent research provides compelling evidence that this effect would be very small. Jacob and Ludwig (2012) estimate that non-disabled working-age recipients of housing vouchers reduce their earnings by 10 percent, on average, in response to this subsidy. Abt Associates et al. (2006) and Carlson et al.(2012) find an even smaller effect. This is the result of a 30 percentage point change in the recipient's marginal tax rate on labor earnings as opposed to my 5 percentage point change. The best available evidence also suggests changing the mix of housing programs away from subsidized housing projects towards housing vouchers will have a modest effect on labor earnings (Carlson et al. 2012; Olsen et al. 2005; Sanbonmatsu et al. 2011; Susin 2005).

To avoid incurring substantial administrative cost to provide small subsidies, the basic reform provides no subsidy to households whose incomes are so high that they would be entitled to a subsidy of less than $30 a month according to the strict application of the subsidy formula. Column 8 reports the results for a program that raises this amount to $60 a month. Even though payment standards are adjusted to achieve the same taxpayer cost, this alteration in the basic reform results in fewer people in households of each type served.

Under the basic reform, payment standards across areas are adjusted fully for differences in housing prices. This would enable households entitled to the same number of bedrooms and living in units renting for the local payment standard to occupy equally good housing in all localities. Some argue for a partial or no adjustment in order to incentivize low-income families to live in less expensive locations. The final simulations estimate the effects of two partial adjustments. These results do not take account of how people will alter their locational choices in response to the alternative policies. Such responses would affect both participation in the voucher program and its taxpayer cost.

Column 9 presents results for a policy reform that adjusts payment standards across areas for differences in the overall consumer price index rather than the housing price index. The consumer price index varies significantly less across areas than the housing price index [Carrillo, Early, and Olsen, 2013]. Except for a large increase for people living in non-metro areas, the effects of this alternative are similar to the effects of the basic reform.   The final reform

considered adjusts payment standards across areas for 90 percent of the difference from the national mean rental housing price. This degree of partial adjustment causes a very modest deviation from the outcomes of the basic reform.

Conclusion

The major defects of the current system of low-income housing assistance are the cost-ineffectiveness of the programs that account for the majority of households served, the inequities associated with its failure to offer the same housing assistance to all eligible families in the same circumstances, and its bias against homeownership. This paper analyzes an important effect of replacing HUD's largest low-income housing programs with ten alternative housing voucher programs that would eliminate these deficiencies, namely, the effect on the number of people in households of various types who would receive housing assistance. With one exception, these programs cost at least somewhat less than the current system.

The results indicate that replacing HUD's largest low-income housing programs with many different housing voucher programs that would offer assistance to all of the poorest families and would have a somewhat lower taxpayer cost than the programs replaced would significantly increase the number of people in families of all types who receive housing assistance. For most types of families, the increase would be enormous. Indeed, this is true even for a reformed voucher program costing more than 10 percent less than the programs replaced. Sensitivity analyses reveal that these results hold for a wide range of reasonable methods that could be used to predict participation in a reformed voucher program.

Replacing the current system of low-income housing assistance with a tenure-neutral housing voucher program that offers the same assistance to all eligible families in the same circumstances would serve the interests of many low-income households and the taxpayers who want to help them with their housing. With due attention to the transition to the new system, the benefits of the proposed reforms can be achieved without hurting current recipients. Indeed, a transition can be designed to benefit many of these households. For example, public housing tenants could be offered a choice between housing vouchers and staying in their current units on the same terms. Current recipients of Section 8 vouchers could be allowed to receive the generous subsidies that are now offered by the program while new recipients receive less generous subsidies so that more households can be served. Reform must also honor legal

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commitments. For example, payments on current terms will be provided to owners of private subsidized projects until the end of their use agreements.

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Table 1

Logit Equation for the Probability of Participation in Proposed Program

Variable	Coefficient	t-statistic	Sample Mean
Constant	-3.281	3.70	1.00
St. Joseph County	-0.456	2.88	0.47
Duration of eligibility (yrs)	0.036	5.18	10.56
Fraction previous year eligible[+]	1.143	3.01	-0.26
Previous interview	0.571	3.35	0.62
Allowance[*]	0.396	3.31	6.64
Minority	0.164	0.65	0.11
Household size	-0.206	3.27	2.71
Household type			
Children in household	1.359	3.68	0.56
Single parent	-0.388	1.70	0.34
Elderly	0.089	0.24	0.36
Elderly couple	-0.196	0.70	0.10
Owner	0.067	0.35	0.19

Source: Carter & Wendt, 1982, p. 57.

Notes: -- * Natural logarithm of annual dollars, + Natural logarithm
Household types listed are not mutually exclusive. For example, the coefficient for
a non-elderly married couple with children is 1.359, but the coefficient for a single
non-elderly parent with children is .987 (=1.359-.388).

Table2

Racial and Ethnic Percentages

Group	United States (2000)	St. Joseph (1980)	Brown (1980)
White	75.1	89.4	97.7
Black	12.3	8.9	0.3
Other	12.6	1.7	2.0
Non-Hispanic	87.5	98.5	99.5
Hispanic	12.5	1.5	0.5

Sources: For the U.S. in 2000, http://factfinder.census.gov/home/saff/main.html.
For the HASE sites in 1980, www.socialexplorer.com.

Table 3

Summary of Effects of Basic Proposed Reform on Number of Households Served

Number of Households

Group	Current System	Proposed Program	Absolute Increase	Percentage Increase
All	3,339,409	5,186,888	1,847,479	55%
White	1,846,794	2,955,666	1,108,872	60%
Black	1,360,794	1,430,366	69,572	5%
Hispanic	461,222	1,080,702	619,480	134%
Elderly	1,202,217	1,269,977	67,760	6%
Non-Elderly	2,137,192	3,916,910	1,779,718	83%
Metro	2,728,184	4,229,808	1,501,624	55%
Non-Metro	611,225	957,079	345,854	57%
First Real Income Decile	2,239,993	3,864,270	1,624,277	73%
Second Real Income Decile	852,240	1,287,250	435,010	51%
1-2 person	1888015	2196347	308,332	16%
3-4 person	1102278	2031811	929,533	84%
5+ person	349116	958729	609,613	175%

Table 4

Household Participation Rates in Lowest Real Income Deciles for Current System and Basic Reform

Group	Current System	Proposed Program
First Real Income Decile		
White	23.1%	44.1%
Black	48.1%	52.4%
Hispanic	20.5%	47.9%
Elderly	29.7%	37.4%
Non-Elderly	26.3%	49.6%
Metro	28.2%	47.6%
Non-Metro	23.0%	43.7%
1-2 person	30.3%	40.7%
3-4 person	29.0%	53.9%
5+ person	17.7%	46.8%
Second Real Income Decile		
White	8.9%	13.1%
Black	16.5%	18.8%
Hispanic	4.7%	13.0%
Elderly	16.3%	18.3%
Non-Elderly	6.1%	12.1%
Metro	9.9%	15.7%
Non-Metro	7.5%	9.1%
1-2 person	15.0%	18.1%
3-4 person	6.2%	12.7%
5+ person	1.9%	7.5%

Table 5

Effects of Basic Reform on Number of Households Served by State

State Name	Current Programs	Proposed Program	Absolute Increase	Percentage Increase
AL	66,681	88,835	22,154	33.2%
AK	8,521	10,113	1,592	18.7%
AZ	38,019	92,711	54,692	143.9%
AR	38,777	45,481	6,704	17.3%
CA	330,172	774,819	444,647	134.7%
CO	36,499	59,703	23,204	63.6%
CT	59,401	58,355	(1,046)	-1.8%
DE	8,442	11,564	3,122	37.0%
DC	22,467	19,813	(2,654)	-11.8%
FL	134,595	324,134	189,539	140.8%
GA	97,760	154,958	57,197	58.5%
HI	15,982	22,220	6,239	39.0%
ID	8,948	28,097	19,149	214.0%
IL	138,683	204,157	65,473	47.2%
IN	66,508	77,759	11,251	16.9%
IA	28,051	30,485	2,434	8.7%
KS	22,904	29,801	6,897	30.1%
KY	61,064	80,048	18,984	31.1%
LA	61,424	102,327	40,903	66.6%
ME	17,597	23,455	5,858	33.3%
MD	67,795	79,757	11,962	17.6%
MA	112,294	135,296	23,002	20.5%
MI	100,341	142,515	42,174	42.0%
MN	59,219	56,755	(2,463)	-4.2%
MS	39,887	62,919	23,032	57.7%
MO	65,553	71,508	5,955	9.1%
MT	12,927	15,206	2,279	17.6%
NE	19,618	19,481	(137)	-0.7%
NV	14,480	32,359	17,879	123.5%
NH	14,289	16,447	2,158	15.1%
NJ	120,955	161,425	40,471	33.5%
NM	19,802	36,955	17,153	86.6%
NY	392,438	557,772	165,334	42.1%
NC	85,823	131,399	45,576	53.1%
ND	10,343	8,090	(2,253)	-21.8%
OH	143,893	166,275	22,382	15.6%
OK	44,128	59,670	15,541	35.2%
OR	30,374	54,243	23,869	78.6%
PA	148,884	208,901	60,017	40.3%
RI	25,764	24,097	(1,667)	-6.5%
SC	44,136	74,709	30,573	69.3%
SD	12,448	10,742	(1,706)	-13.7%
TN	74,119	97,545	23,426	31.6%
TX	193,108	394,893	201,784	104.5%
UT	11,036	24,268	13,232	119.9%
VT	7,541	11,116	3,574	47.4%
VA	74,473	98,899	24,426	32.8%
WA	48,054	90,701	42,647	88.7%
WV	23,935	39,075	15,140	63.3%
WI	54,878	59,738	4,861	8.9%
WY	4,378	5,299	921	21.0%
US	3,339,409	5,186,888	1,847,479	55.3%

Table 6

Summary of Effects of Basic Proposed Reform on Number of Persons Served

Number of Persons

Group	Current System	Proposed Program	Absolute Increase	Percentage Increase
All	8,461,480	15,968,956	7,507,476	89%
White	4,119,662	8,287,525	4,167,863	101%
Black	3,950,550	4,526,122	575,571	15%
Hispanic	1,376,886	4,283,038	2,906,151	211%
Elderly	1,411,611	1,808,316	396,704	28%
Non-Elderly	7,049,869	14,160,640	7,110,771	101%
Metro	6,971,298	13,208,453	6,237,155	89%
Non-Metro	1,490,182	2,760,503	1,270,321	85%
First Real Income Decile	6,400,320	12,718,434	6,318,114	99%
Second Real Income Decile	1,664,891	3,203,096	1,538,205	92%
1-2 person	2738302	3437361.1	699,059	26%
3-4 person	3738784	6984442.3	3,245,658	87%
5+ person	1984394	5547152.3	3,562,758	180%

Table 7

Person Participation Rates in Lowest Real Income Deciles for Current System and Basic Reform

Group	Current System	Proposed Program
First Real Income Decile		
White	20.6%	45.7%
Black	44.8%	52.3%
Hispanic	15.4%	47.2%
Elderly	23.5%	37.2%
Non-Elderly	24.1%	49.0%
Metro	24.7%	48.4%
Non-Metro	21.3%	44.9%
1-2 person	28.6%	41.0%
3-4 person	28.6%	53.8%
5+ person	16.9%	45.3%
Second Real Income Decile		
White	5.3%	10.0%
Black	12.5%	15.7%
Hispanic	2.9%	11.1%
Elderly	11.4%	14.3%
Non-Elderly	4.8%	10.7%
Metro	6.2%	12.7%
Non-Metro	4.8%	6.4%
1-2 person	12.5%	16.0%
3-4 person	5.9%	12.4%
5+ person	1.7%	7.3%

Table 8

Effects of Basic Reform on Number of Persons Served by State

State Name	Current Programs	Proposed Program	Absolute Increase	Percentage Increase
AL	173,828	254,085	80,257	46.2%
AK	24,747	34,237	9,491	38.4%
AZ	106,839	315,184	208,345	195.0%
AR	99,438	132,235	32,797	33.0%
CA	901,311	2,783,285	1,881,974	208.8%
CO	92,653	179,337	86,684	93.6%
CT	138,722	161,971	23,249	16.8%
DE	21,411	33,669	12,258	57.3%
DC	61,357	57,719	(3,638)	-5.9%
FL	349,711	948,353	598,642	171.2%
GA	267,001	471,069	204,067	76.4%
HI	49,145	71,651	22,506	45.8%
ID	22,579	87,323	64,744	286.7%
IL	346,975	646,512	299,537	86.3%
IN	158,779	219,760	60,982	38.4%
IA	61,945	80,974	19,029	30.7%
KS	50,219	83,969	33,750	67.2%
KY	152,274	227,944	75,670	49.7%
LA	177,806	318,730	140,924	79.3%
ME	40,292	58,647	18,355	45.6%
MD	165,904	233,570	67,666	40.8%
MA	267,003	363,447	96,444	36.1%
MI	216,438	419,086	202,648	93.6%
MN	138,125	160,288	22,163	16.0%
MS	114,303	193,213	78,910	69.0%
MO	163,100	202,903	39,803	24.4%
MT	31,716	44,313	12,597	39.7%
NE	44,472	54,288	9,816	22.1%
NV	38,494	102,908	64,414	167.3%
NH	28,989	42,233	13,244	45.7%
NJ	271,912	475,076	203,165	74.7%
NM	55,846	121,098	65,252	116.8%
NY	1,000,798	1,727,114	726,316	72.6%
NC	220,760	374,435	153,675	69.6%
ND	23,600	21,004	(2,596)	-11.0%
OH	352,444	470,996	118,553	33.6%
OK	115,208	174,144	58,936	51.2%
OR	80,025	160,101	80,076	100.1%
PA	340,043	579,917	239,874	70.5%
RI	51,272	64,778	13,507	26.3%
SC	118,643	216,301	97,658	82.3%
SD	27,305	31,291	3,986	14.6%
TN	185,115	277,354	92,240	49.8%
TX	558,789	1,323,235	764,446	136.8%
UT	30,018	82,688	52,671	175.5%
VT	16,235	28,811	12,576	77.5%
VA	198,316	285,771	87,455	44.1%
WA	123,415	273,696	150,281	121.8%
WV	57,635	112,357	54,722	94.9%
WI	118,511	171,009	52,498	44.3%
WY	10,015	14,877	4,862	48.5%
US	8,461,480	15,968,956	7,507,476	88.7%

Table 9

Percentage Increases in Persons Served Based on Alternative Prediction Equations

Prediction Equations

Group	1	2	3	4	5	6	7	8	9
All	89%	82%	95%	75%	101%	91%	109%	71%	106%
White	101%	92%	109%	87%	114%	101%	119%	80%	123%
Black	15%	11%	18%	6%	23%	13%	30%	6%	23%
Hispanic	211%	202%	219%	191%	228%	236%	245%	185%	237%
Elderly	28%	18%	37%	15%	38%	27%	43%	10%	46%
Non-Elderly	101%	94%	107%	87%	113%	104%	122%	84%	118%
Metro	89%	83%	95%	76%	101%	93%	110%	73%	106%
Non-Metro	85%	74%	95%	69%	100%	84%	103%	64%	107%
First Decile	99%	86%	111%	71%	126%	104%	145%	82%	116%
Second Decile	92%	104%	79%	123%	53%	86%	20%	69%	116%
1-2 person	26%	19%	31%	15%	35%	25%	43%	13%	39%
3-4 person	87%	82%	91%	75%	97%	88%	103%	72%	102%
5+ person	180%	167%	191%	158%	199%	188%	211%	151%	208%
Cost (in billions)	$ 20.39	$ 20.40	$ 20.39	$20.29	$20.39	$20.39	$20.39	$ 18.75	$ 22.04

The cost of the current system for the programs and households involved is at least $20.4 billion.
Alternative Prediction Equations (see text for details)
1. FMR bedroom adjustments, current budget, mean prediction equations, ES real income measure
2. Same as 1 except South Bend equation used to predict participation
3. Same as 1 except Green Bay equation used to predict participation
4. Same as 1 except predicted participation rate 10 percent less than in site with lowest participation
5. Same as 1 except predicted participation rate 10 percent greater than in site with highest participation
6. Same as 1 except alternative minority classification of Hispanics and other-race non-Hispanics
7. Same as 1 except predicted participation rate based on people with extra information about program
8. Same program parameters as 1 but taxpayer cost based on South Bend participation equation
9. Same program parameters as 1 but taxpayer cost based on Green Bay participation equation

Table 10

Percentage Increases in Persons Served under Alternative Policies

Alternative Policies

Group	1	2	3	4	5	6	7	8	9	10
All	89%	102%	75%	86%	87%	105%	75%	81%	92%	90%
White	101%	117%	85%	101%	99%	122%	85%	90%	109%	103%
Black	15%	21%	8%	13%	14%	22%	9%	11%	17%	15%
Hispanic	211%	232%	189%	198%	206%	238%	188%	202%	199%	209%
Elderly	28%	39%	17%	31%	40%	41%	17%	18%	34%	30%
Non-Elderly	101%	114%	87%	97%	96%	118%	87%	94%	104%	102%
Metro	89%	102%	76%	86%	87%	106%	76%	83%	85%	89%
Non-Metro	85%	99%	71%	85%	84%	102%	72%	73%	124%	94%
First Decile	99%	103%	93%	97%	97%	99%	96%	97%	101%	100%
Second Decile	92%	137%	48%	83%	86%	168%	36%	60%	101%	95%
1-2 person	26%	34%	17%	34%	29%	36%	17%	17%	30%	27%
3-4 person	87%	99%	74%	88%	83%	103%	74%	79%	91%	88%
5+ person	180%	200%	159%	155%	174%	206%	158%	172%	180%	180%
Cost (in billions)	$20.39	$22.43	$18.35	$20.39	$20.39	$20.38	$20.38	$20.39	$20.39	$20.39

The cost of the current system for the programs and households involved is at least $20.4 billion.
Alternative Policies (see text for details)
1. FMR bedroom adjustments, current budget, mean prediction equations, ES real income measure
2. Same as 1 except 10 percent larger taxpayer cost
3. Same as 1 except 10 percent smaller taxpayer cost
4. Same as 1 except for hedonic bedroom adjustments
5. Same as 1 except payment standards are 10 percent higher for elderly or disabled household
6. Same as 1 except benefit-reduction rate is .25 rather than .30
7. Same as 1 except benefit-reduction rate is .35 rather than .30
8. Same as 1 except that smallest subsidy paid is $60 a month
9. Same as 1 except payment standards are adjusted for differences in CPI rather than housing prices
10. Same as 1 except payment standards are adjusted for 90% of difference from mean housing price

The Effect of Fundamental Housing Policy Reforms on Program Participation

Online Appendices

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Appendix A

Reformed Housing Voucher Programs

This appendix provides details about the structure and parameters of the reformed housing voucher programs analyzed. Because participation in any government program depends in part on its structure and parameters and I predict participation rates based on HASE experience, I provide some additional information about the Supply Experiment.

Congress authorized the Experimental Housing Allowance Program in 1970, planning for the experiment occurred in the early 1970s, data were collected during the mid-1970s, and the final reports were completed in the late 1970s and early 1980s. The Rand Corporation conducted the Housing Assistance Supply Experiment.[1] This experiment involved operating housing allowance programs in the Green Bay and the South Bend metropolitan areas that provided assistance to all eligible families that asked for it. At the beginning of the experiment, Green Bay had few minorities and a rental vacancy rate of about 5 percent. South Bend had a large minority population and a rental vacancy rate of about 10 percent [Lowry, 1983, pp. 31 and 53]. The rental vacancy rate in the U.S. at the time of the data used in my analysis was 6.8 percent. About 16.5 percent of the households in Green Bay and 21.4 percent in South Bend were eligible for the program [Lowry, 1983, p. 90]. For the reformed voucher programs considered in this paper, the fraction eligible ranges from 11.2 to 15.5 percent. Unlike established housing programs, both renters and homeowners could participate. These households were offered a cash grant on the condition that they occupy housing meeting certain standards. These payments could continue for up to ten years provided that the household's income remained sufficiently low. Unlike the Section 8 Housing Choice Voucher Program, the payments were made directly to the households. Empirical evidence indicates that the cost-effectiveness of the voucher program does not depend to any significant extent on this feature [Mayo et al., 1980; Wallace et al., 1981; Weinberg, 1982; Leger and Kennedy, 1990; ORC/Macro, 2001, Chapter V].

Figure 1 depicts the budget space of a household offered this type of housing assistance under standard simplifying assumptions. The quantity of housing services Q_H is measured along the horizontal axis, the quantity of other goods Q_X along the vertical axis. The quantity of

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[1] Lowry (1983) describes the Supply Experiment and its main findings.

housing services is an index of the overall desirability of the dwelling unit and its neighborhood. If the household were to decline the offer of housing assistance, it could consume any bundle of goods that costs no more than its income Y at market prices P_H and P_X. These are the points on or below the line segment AB. Under the voucher program in the Supply Experiment, the household receives a subsidy S on the condition it occupies a unit meeting the program's minimum housing standards (in the diagram, a unit that provides at least Q_H^{MIN} units of housing service). The shaded area in Figure 1 is the budget space of a household that is offered this type of voucher. The subsidy in the Supply Experiment was equal to a payment standard minus 25 percent of the family's adjusted income. Larger families were entitled to subsidies based on larger payment standards to enable them to occupy units with more bedrooms.

Because participation in the reformed housing programs depends in part on the program's minimum housing standards and the participation predictions are based on participation in HASE, the proposed programs adopt the minimum housing standards that were used in the Supply Experiment. These minimum housing standards are very similar to the standards in the current Section 8 Housing Choice Voucher Program [Lowry, 1983, Appendix C; 24CFR982.401].

The subsidy to a household under each reformed housing voucher program analyzed is equal to a payment standard minus percentage of the household's adjusted income provided that this amount exceeds a certain minimum.[2] Like other welfare programs, I set a lower bound on the subsidy to avoid the administrative cost of distributing a small amount of money. Like payment standards in the Section 8 Housing Choice Voucher Program, the payment standards within an area for each program analyzed are different for households of different sizes and compositions, and they are different across areas for households of a given size and composition. However, they are not the payment standards in the Section 8 Housing Choice Voucher Program. Payment standards in each reformed voucher program analyzed are designed to achieve a specified taxpayer cost. Under most, they insure that households with the same characteristics

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[2] This subsidy formula differs from that in the current voucher program in several respects. Under the proposed programs, the subsidy does not depend on the rent of the unit occupied. Under the current voucher program, occupying a unit renting for less than the program's payment standard reduces the subsidy dollar for dollar and (on new leases) occupying one renting for more than the payment standard plus 10 percent of adjusted income reduces the subsidy to zero [Olsen, 2003, pp. 401-404].

are able to occupy equally good housing in all localities. In some, they are less generous in the most expensive and more generous in the least expensive locations.

Like the current Section 8 Housing Choice Voucher Program, households of a particular size and composition within an area under the reformed voucher programs are entitled to a subsidy based on a particular number of bedrooms.[3] Although federal rules do not mandate a particular number of bedrooms for households of a given size and composition, the norm under the current system is two people to a bedroom with certain exceptions [HUD, 2001, Section 5.9; HUD, 2003, Chapter 5]. For example, virtually all housing authorities establish a relationship that depends on the mix of age and gender of the children. My payment standards assume two persons to a bedroom except to avoid the sharing of a bedroom by children of the opposite sex who are over six years old and adults who are not married or partners. Boys and girls under seven of different sexes can share a bedroom. Two children of the same sex can share a bedroom no matter what their ages. Census data do not indicate the relationship between adults except their relationship to the household head who filled out the Census questionnaire. Therefore, I allocate a separate bedroom to each other adult who was neither the spouse nor unmarried partner of the respondent. Although some households surely contain more than one couple, this is rare. Less than 5 percent of all households have more than three adults, and some of these households surely have only one couple.

Unlike the current Section 8 Housing Choice Voucher Program, I establish a nationally uniform relationship between the payment standards for units with different numbers of bedrooms across all areas. In the current program, each local housing authority can choose a payment standard for units with a particular number of bedrooms within 10 percent of HUD's Fair Market Rent (FMR) that applies throughout its metropolitan area or non-metro county. The standard FMR for two-bedroom units is HUD's estimate of the fortieth percentile of the gross rents of unsubsidized units that meet certain rudimentary minimum standards, are more than two years old, and were occupied within the past 15 months.[4] However, there are many exceptions. For example, FMRs in some localities are set at the fiftieth percentile, and in others, they are increased to a state minimum. Even when the standard formula is applied to two-bedroom units, relative FMRs for units with different numbers of bedrooms are not the same across all areas.

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[3] Recipients do not have to occupy units with the number of bedrooms specified on their vouchers.
[4] HUD (2007) provides the details.

Current ratios in a locality are based on local differences in median rents of units with different numbers of bedrooms, with some fairly arbitrary upward adjustments for units with more than two bedrooms. The methods used to produce FMRs and housing authority discretion in setting payment standards based on them lead to deviations in the relative payment standards for units with different numbers of bedrooms across housing authorities.

I analyze two alternative nationally uniform relationships between the payment standards for units with different numbers of bedrooms. One is based on the percentage difference in 2006 national average FMR for units with each number of bedrooms up to 4, with a 15 percent increment for each additional bedroom beyond 4.[5] The other is based on the coefficients of a hedonic equation explaining the natural logarithm of the market rents of dwelling units as a function of many housing and neighborhood characteristics, dummy variables for the location of the unit in one of 331 metropolitan areas or the non-metropolitan part of a particular state, and dummy variables for the number of bedrooms [Carrillo, Early, and Olsen, 2012, Table A-1 (1)]. Appendix Table 1 reports the ratio of the payment standard for units with each number of bedrooms to the two-bedroom payment standard.

Under most reformed housing voucher programs analyzed, payment standards across areas are adjusted fully for differences in housing prices. This enables households entitled to the same number of bedrooms and living in units renting for the local payment standard to occupy equally good housing in all localities. Olsen, Davis, and Carrillo (2005, pp. 103-104) describe the derivation of the housing price index. It is based on data on the gross rent and numerous housing, neighborhood, and location characteristics of about 173,000 units throughout the United States. Information on the census tract of each dwelling unit makes it possible to append detailed information on its immediate neighborhood from the Decennial Census to each observation.[6] Using this housing price index and the nationally uniform bedroom adjustment factors, the payment standards for all numbers of bedrooms and all locations can be computed from the two-bedroom payment standard in any location.

To incentivize recipients to choose less expensive locations, some argue that subsidies should not be fully adjusted for geographic price differences. For this reason, I also consider

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[5] See http://www.huduser.org/portal/datasets/fmr.html for the underlying data. Because less than one percent of all households would be entitled to more than 4 bedrooms based on my algorithm, any reasonable treatment of units with more bedrooms would yield about the same results.

[6] This is the genesis of the somewhat more refined housing price index in Carrillo, Early, and Olsen (2012). Since the correlation between these housing price indices was .983, I did not redo the calculations with the new index.

several partial adjustments. One adjusts payment standards across areas for differences in the Olsen, Davis, and Carrillo's overall consumer price index rather than their housing price index. Another adjusts payment standards across areas for 90 percent of the difference from the national mean rental housing price index.

I use the current standard benefit reduction rate in HUD's low-income housing programs in most simulations, namely, 30 percent. This has been the HUD norm since the 1980s. However, I also produce estimates based on 25 and 35 percent. The former was the HUD norm at the time of HASE. A higher benefit reduction rate requires higher payment standards in order to maintain the same taxpayer cost. This leads to higher subsidies to families with the lowest incomes and lower subsidies to families with the highest incomes.

The adjusted income used to determine a household's subsidy is the household's cash income from all sources plus an estimated return on home equity for homeowners minus allowed deductions from income. If this yields a negative number, adjusted income is zero. Because homeowners are richer than renters with the same ordinary income, I add an estimated return on their home equity to their ordinary income to determine their gross incomes and hence their housing subsidy, as was done in HASE [Katagiri and Kingsley, 1980, 2.03(3)]. Appendix B describes how I calculated the estimated return for each homeowner. The allowed deductions from gross income mimic those in the HUD programs replaced at the time of the data to the extent possible with the Decennial Census's Public Use Microdata Sample (PUMS), namely, $480 a year per child, $400 a year if the head or co-head of the household was elderly or disabled, and the mean of other deductions ($628 a year) based on HUD's administrative data. Unlike many welfare programs, the allowed deductions from gross income in low-income housing programs are modest. Their nominal amounts have not been changed for many years.

Appendix B

Calculating the Return on Home Equity

This appendix describes how I calculated the return on home equity of each homeowner in the 2000 Decennial Census PUMS. Home equity is equal to the market value of the house minus the outstanding balance on all home loans. The PUMS reports the owner's estimate of market value but does not report the outstanding balance on home loans. I combine information from the PUMS, the American Housing Survey, Freddie Mac's Primary Mortgage Market Survey, and research on the relationship between the owner's estimate of market value and actual sales price to approximate each household's home equity and the return on it.

PUMS reports the owner's estimate of market value (VALUE) in 24 categories. I use the midpoint of the category reported by a household as its estimate of the market value of its house. Based on research on the relationship between the owner's estimate of market value and actual sales price [Kiel and Zabel, 1999], I multiply the owner's estimate by .95 to get a better estimate of market value.

PUMS does not report outstanding balances on mortgage and home equity loans. However, it does report monthly payments on first and second mortgages (MRT1AMT and MRT2AMT) and the year that the household occupied the unit (YRMOVED). To approximate the outstanding balance, I assumed that (1) the owner's only loans are first and second mortgages taken out at the time that the household moved into its house, (2) the loans have not been refinanced, (3) both loans are for some standard duration, and (4) the interest rate on these loans is the national average interest rate for loans of similar durations at the time that the mortgage was originated. Under these assumptions, the appropriate formula to calculate outstanding balance on each mortgage is:

$$OB = MP \cdot \left(\frac{1 - (1/(1+r))^T}{r} \right).$$

In this formula, OB is the outstanding balance on the loan, MP is the monthly payment (MRT1AMT or MRT2AMT), T is the number of remaining monthly payments, and r is the

monthly interest rate. Adding the estimated outstanding balances on the first and second mortgages yields the overall outstanding balance.

To approximate the outstanding balance on a mortgage based on the preceding formula requires estimates of its interest rate r and number of remaining mortgage payments T. The PUMS reports neither. To estimate the interest rate on first and second mortgages, I combine data on the average durations of mortgages of each type with data on mortgage interest rates for mortgages of similar durations. Specifically, the 1999 National American Housing Survey reports that the mean term of first mortgages was 25 years (300 months) and the mean term of second mortgages was 17 years (204 months). I assume that all first and second mortgages were of these durations. To approximate the interest rates on them, I use the interest rates at the time that the household moved into its house from Freddie Mac's Primary Mortgage Market Survey for 30-Year Fixed Rate Mortgages and Conventional Conforming 15-Year Fixed Rate Mortgages.[7] The PUMS does not report the exact date that the household moved into its house. Instead, it reports the date in one of six categories: 1999-2000, 1995-1998, 1990-1994, 1980-1989, 1970-1978, and 1969 or earlier. I assume that the move occurred in the middle of each period except for the last. I assume that households in the last category moved into their house in January 1969. Very few people in this category had a mortgage. The first period was assumed to end on April 1, 2000, the approximate time of the census survey. The calculations use the interest rates on 30-year and 15-year mortgages at these times for first and second mortgages, respectively. The PUMS data together with the preceding assumptions about when mortgages were originated leads to an estimate of the number of mortgage payments that had already been made. This combined with the assumption about the duration of first and second mortgages leads to an estimate of number of remaining mortgage payments.

Due to the various approximations involved in the calculations, the predicted number of remaining mortgage payments was negative in some cases. In these cases, I assumed that the outstanding balance on the mortgage was zero. In part for the same reason, the estimated outstanding balance on all mortgages exceeded the estimate market value of the house in some cases. In these cases, I assumed that home equity was zero.

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[7] The sources are http://www.freddiemac.com/pmms/pmms30.htm and
http://www.freddiemac.com/pmms/docs/15yr_pmmsmnth.xls

Finally, I must apply a rate of return to home equity to get a dollar return that is added to the homeowner's income. Such returns differ from property to property and time to time. For the calculations, I assume a rate of return of 7.2 percent. This was the average mortgage interest rate on 30-year fixed rate mortgages between 1998 and 2002. The assumed rate of return overstates the average return on home equity for at least one important reason and understates it for another. Since the return on home equity is untaxed, the relevant rate of return is the expected *after-tax* return on a taxed investment of the same risk. Recipients of mortgage interest payments must pay taxes on this income. Therefore, the after-tax return on mortgages was less than 7.2 percent during this period. An offsetting bias is that mortgagors assume more risk than mortgagees. Mortgagees do not incur losses unless the market value of the house falls below the outstanding balance of the loan. Index funds based on the S&P 500 and the Wilshire 4500 arguably are more risky than mortgages but less risky than equity in a house. The returns on both indices vary greatly from year to year. Between 1996 and 2005, the return on the S&P index fund varied from a high of 33.17 percent in 1997 to a low of negative 22.05 percent in 2002. In 2000, the rates of return on these index funds were –9.14 and –9.74 percent, respectively. The *before-tax* rate of return on the stocks in the S&P 500 averaged about 9.01 percent over this period and the rate of return on the stocks in the Wilshire 4500 averaged about 9.75 percent. *After-tax* returns would be around 6 percent. The risk associated with the equity in a single asset is surely greater than the risk associated with an index fund of stocks.

Appendix C

Housing Assistance Demand Experiment

EHAP's Housing Assistance Demand Experiment (HADE) studied participation in housing voucher programs with the same structure as HASE (as well as other structures), and HADE researchers did estimate equations explaining participation in these programs in its two sites Phoenix and Pittsburgh. However, the HASE evidence is much better for predicting participation in the reformed voucher programs considered in this paper.

Unlike HASE, HADE did not operate programs that offered housing assistance to all eligible households. Instead it conducted random-assignment experiments involving a small number of households. Some of disadvantages of using the HADE equations relate to this difference. First, HADE solicited individuals to participate in the experiment and indeed encouraged them to do it. Participation in HADE was surely higher than in an entitlement housing voucher program on that account. HASE did not encourage particular individuals to participate and an operational open-enrollment housing voucher program would not do it. In an open-enrollment housing voucher program, some eligible people will be unaware of their eligibility. Despite an unusual amount of publicity [Lowry, 1983, Chapter VII], HASE research revealed that about 18 percent of eligible families were not aware of their eligibility after three years of program operation [Lowry, 1983, Table 4.5]. Second, a program that offered assistance to all eligible families might have general equilibrium effects that affect participation. Because HADE subsidized so few households, its experience would not capture any effects of the reforms on program participation that result from changes in market prices. This, however, is a minor consideration. Mills and Sullivan (1981) and Rydell, Neels, and Barnett (1982) find that the HASE entitlement housing allowance programs had very small effects on market rental prices in their sites; Eriksen and Ross (2013) obtain similar results for most of the 135 larger metropolitan areas identified in the American Housing Survey.

Other disadvantages are unrelated to HADE's non-entitlement nature. First, unlike the reformed housing voucher programs, HADE did not offer assistance to homeowners. HASE evidence indicates some differences in participation rates between homeowners and renters. Second, the HADE subsidy was limited to 3 years as opposed to HASE's 10 years. For this

reason, the HASE experience is more relevant for predicting the effect of a permanent housing voucher program. Finally, HADE had unusually severe minimum housing standards, especially with respect to light and ventilation, which would have required costly renovations of many units to enable them to qualify for occupancy by voucher recipients [Valenza, 1977]. Since the HASE housing standards are closer to those in the current Section 8 Housing Choice Voucher Program, I opted to analyze the effects of a voucher program with HASE's minimum housing standards.

Appendix D

Predicting Participation for Non-Black Minorities

My decisions about how to predict participation rates of households other than non-Hispanic whites and blacks are based on evidence on participation in HUD's current housing voucher program in 1999 by people in the first real income decile. About 80 percent of participants in the proposed programs are in this decile. Because the current voucher program allocated funds to different localities in proportions that surely differed from the expenditure proportions under the reformed programs, and the current program did not affect the consumption possibilities of households offered assistance in exactly the same way as any reformed housing voucher program analyzed, the relative participation rates of different groups will not be exactly the same under the existing and proposed voucher programs. Nevertheless, I believe that the relative participation rates of different groups in the current voucher program provide useful guidance for predicting the participation rates of groups other than non-Hispanic whites and blacks.

Because the nature of the question about racial identity in the 2000 Decennial Census does not permit the identification of the race of a significant minority of Hispanics, I use a single equation to predict participation for all Hispanics. In the 2000 Decennial Census, 47.9 percent of Hispanics classified themselves as white only, 2.0 percent as black only, 1.2 percent as American Indian or Alaska native, 42.2 percent as some other unspecified single race, and 6.3 percent multiple races [Grieco and Cassidy, 2001, Table 10]. In other data sets where respondents are forced to choose a specific racial category, the overwhelming majority of Hispanics classify themselves as white only. In the 2007 Current Population Survey, 90 percent of Hispanics were in this racial category. Unlike the 2000 Decennial Census, HUD's administrative data on current participants in low-income housing programs requires each recipient to choose a standard racial category. Almost all Hispanics classify themselves as white. Since I cannot identify the race of a substantial minority of Hispanics in the 2000 Decennial Census, I use a single equation to predict participation for all Hispanics.[8]

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[8] In the previous draft of the paper, I used separate prediction equations for white, black, and other-race Hispanics that are flawed due to their failure to recognize this important difference between Census and HUD race questions. This flaw did not affect the qualitative conclusions of the analysis, but the quantitative magnitudes of the effects are very different for a few groups.

Based on participation rates in HUD's Section 8 Housing Choice Voucher Program, I use the participation prediction equation for non-Hispanic whites to predict participation for Hispanics and non-Hispanics of other races for most simulations. The Housing Choice Voucher Program serves 8.8 percent of all white non-Hispanic households in the first real income decile and 19.4 percent of all black non-Hispanic households. The participation rate of Hispanic households (8.9 percent) is almost identical to the non-Hispanic white rate, and the participation rate of non-Hispanic households of other races (7.4 percent) is very similar to it. Since the last group accounts for less than 4 percent of current recipients and less than 6 percent of recipients of the reformed voucher programs, reasonable alternative prediction equations for this group will have little effect on the overall results.

Appendix E

Adjusting LODI File on Assisted Households for Underreporting

I used data on the total number of households that received assistance under the specified programs in 1998 and 2000 reported in HUD's Picture of Subsidized Households (PSH) to adjust upward the total number of households of each type in the LODI data file in 1999 with reasonable values of the variables used in the analysis. Specifically, with two exceptions explained in this appendix, I calculated the number of HUD-assisted households in each state in 1999 by first multiplying the number of HUD units (or vouchers) in each state by the occupancy rate (or voucher utilization rate) and then calculating the mean of these numbers for the two years. The ratio of this estimated total number of HUD-assisted households in the state to the number of households in the LODI file was used to adjust the participation totals for all household types in the state.

One problem with the PSH numbers is that they understate the number of units and households served in 2000 due to the exclusion of households served by Indian Housing Agencies (IHA). After 1998, IHA were no longer required to submit to HUD the information used to construct the PSH.[9] Since the money spent to serve these households is included in the taxpayer cost of the existing system and residents of these areas would be eligible for the reformed housing voucher programs, households served by IHA should be included among current recipients. The 1998 PSH reports the number of units and occupancy rates for IHA in each state, and I use this information to calculate the number of households served in that year. To estimate the number of households served by these housing authorities in 2000 in each state, I multiply the 1998 number of units by the mean of the 1998 and 2000 public housing occupancy rates in the state.

Although the total number of households served by IHA is a very small fraction of the national HUD total, their exclusion would greatly affect the results in the states with the largest Native American populations. In Alaska, IHA accounted for almost half of total HUD units; in South Dakota about a third. Since the proposed reforms would require congressional approval

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[9] See http://www.hud.gov/offices/pih/ih/codetalk/nahasda/1998/1998-09.pdf.

and members represent states or parts of states, producing credible results at the state level is important.

With this adjustment to the PSH numbers, my estimate of the HUD total in each state in 1999 was the mean of the 1998 and 2000 totals with one exception. Even if the 1998 and 2000 totals were correct, this estimate for 1999 will surely be too high in some states and too low in others. Furthermore, there are always some inaccuracies in any data file. I can deal with these measurement errors to some extent. Under the assumption that housing authorities do not submit forms for fictional households, the number of households served in each state in 1999 must be at least as large as the number in the 1999 LODI file. In seven states, the estimated HUD total was less than the number of households in the 1999 LODI. In these cases, I increased the estimate of the HUD total to the LODI total. This added only about 20,000 households to the total.

Appendix F

Estimated Per-Recipient Administrative Cost of Current Voucher Program

Budget documents do not contain the per-recipient administrative cost of the Section 8 Housing Choice Voucher Program for the year of the data used in the analysis, and HUD's Office of Public and Indian Housing was unable to provide it. I estimate it based on the formula for calculating the per-recipient fee received by individual housing authorities and publicly available data. The formula is in the Federal Register (64FR12686). Under the formula, the housing authority's FY 1993 two-bedroom FMR is multiplied first by the BLS's ES-202 price index to produce the relevant number for FY 1999 and then by .0765 for the authority's first 600 units and .07 for additional units. In order to use national average data for the calculation, I assume that .0765 applies to all recipients. This leads to an overstatement of the national average per-recipient administrative fee of the Section 8 Housing Choice Voucher Program and hence an understatement of the amount of money available to distribute to recipients of the reformed housing voucher programs and the number of additional households served by these programs. My estimate of the per-recipient annual administrative fee in HUD's voucher program in 1999 is $625 [=$6,660 x 1.227 x .0765].[10]

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[10] See http://www.huduser.org/portal/datasets/fmr.html for average annual 2-bedroom FMR.

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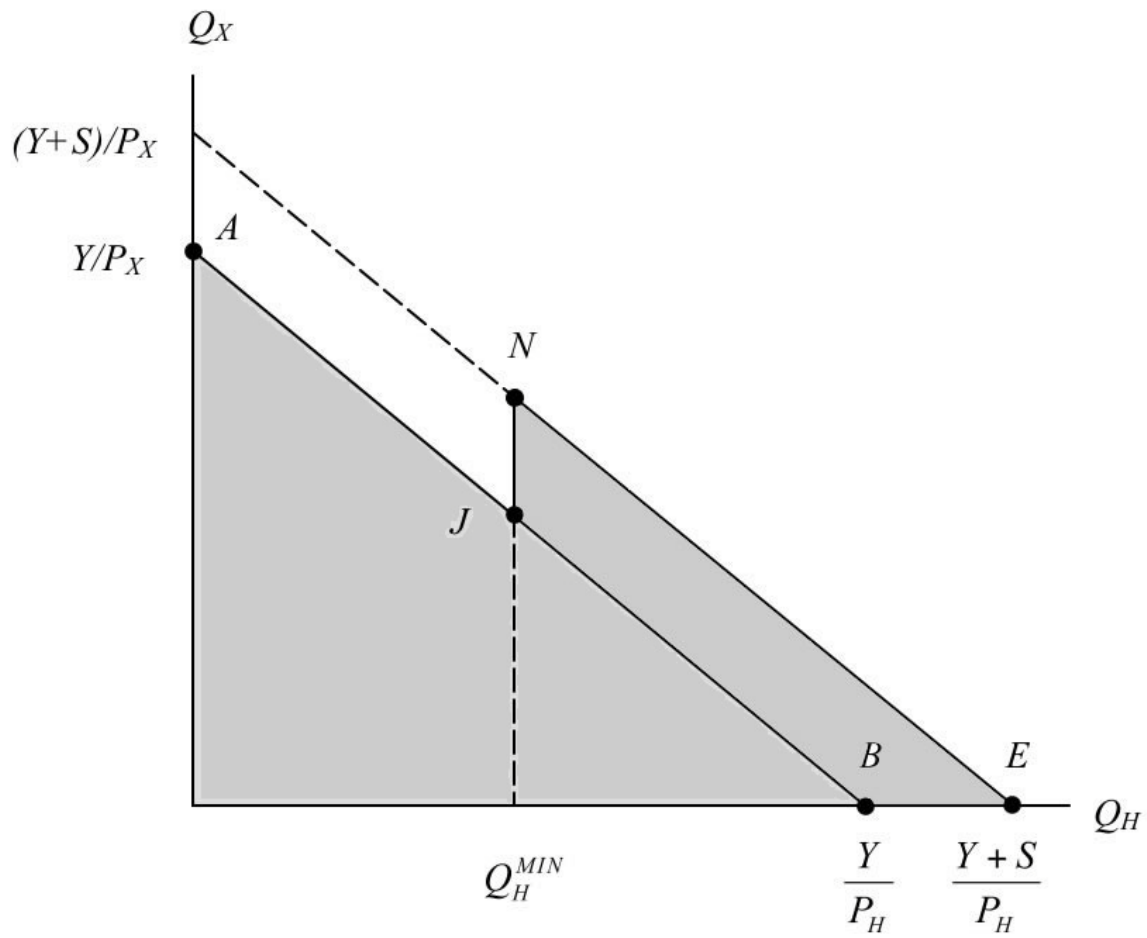Weinberg, Daniel H. 1982. "Housing Benefits from the Section 8 Program." *Evaluation Review* 6: 5-24.

Figure 1 – Budget space with proposed voucher program

Appendix Table 1

**Ratios of Payment Standard for Units with Each Number of Bedrooms
to Two-Bedroom Payment Standard**

Number of Bedrooms	FMR Based	Hedonic Based
0	0.736	0.706
1	0.826	0.857
2	1.000	1.000
3	1.296	1.204
4	1.467	1.334
5	1.687	1.477
6	1.940	1.637
7	2.231	1.814
8	2.566	2.009