

# CONSUMPTION INCREASES CAUSED BY HOUSING ASSISTANCE PROGRAMS

C. PETER RYDELL  
JOHN E. MULFORD

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APRIL 1982

HOUSING ASSISTANCE SUPPLY EXPERIMENT

Sponsored by

The Office of Policy Development and Research  
U.S. Department of Housing and Urban Development

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PREFACE

This report draws on research conducted by The Rand Corporation as part of the Housing Assistance Supply Experiment, which was sponsored and funded by the Office of Policy Development and Research, U.S. Department of Housing and Urban Development (HUD). The report is a product both of research on the market effects of housing allowances under HUD Contract H-1789 and of basic research on housing market behavior under HUD Grant H-5099RG.

Four information sources are crucial to the report's results:

- o G. Thomas Kingsley and Priscilla M. Schlegel, *Housing Allowances and Administrative Efficiency*, The Rand Corporation, forthcoming.
- o Stephen K. Mayo, Shirley Mansfield, David Warner, and Richard Zwetchkenbaum, *Housing Allowances and Other Rental Housing Assistance Programs--A Comparison Based on the Housing Assistance Demand Experiment; Part 1; Participation, Housing Consumption, Location, and Satisfaction; Part 2: Costs and Efficiency*, Abt Associates, Inc. (Part 1: AAI 79-111, Part 2: AAI 79-132), June 1980.
- o John E. Mulford, James L. McDowell, Lawrence Helbers, Michael Murray, and Orhan Yildiz, *Housing Consumption in a Housing Allowance Program*, The Rand Corporation, R-2779-HUD, forthcoming.
- o C. Peter Rydell, *Price Elasticities of Housing Supply*, The Rand Corporation, R-2846-HUD, forthcoming.

Readers interested in the housing allowance program as compared with public housing programs or unrestricted cash grants may also be interested in a parallel report, which compares the allowance program with the Section 8 Existing Housing Assistance Program:

- o C. Peter Rydell, John E. Mulford, and Lawrence Helbers, *Price Increases Caused by Housing Assistance Programs*, The Rand Corporation, R-2677-HUD, October 1980.

SUMMARY

This report compares and contrasts three methods of providing housing assistance to low-income renters: the public housing program, which actually constructs housing for eligible tenants; the housing allowance program, which supplements the income of eligible tenants on condition that they live in housing that meets minimum standards; and unrestricted cash grants, which unconditionally supplement the income of eligible tenants. All three provide not only housing benefits (increased housing consumption for program participants and, to a limited extent, for nonparticipants by means of market effects), but also nonhousing benefits (increased nonhousing consumption brought about by subsidy formulas that more than pay for increased housing consumption).

Each program entails costs that exceed its benefits. Total program costs equal the subsidies that pay for housing and nonhousing increases plus nonsubsidy expenses. Nonsubsidy expenses include the costs of conducting eligibility tests in all three programs and of enforcing the housing standards in the housing allowance and public housing programs; they also include above-market development costs in the public housing program.

Dividing housing and nonhousing consumption increases by total program cost yields the two ratios by which this report evaluates the alternate programs: (a) dollars of increased housing consumption per program dollar, and (b) dollars of increased nonhousing consumption per program dollar. Adding the measures gives total consumption increases per program dollar; the sum is always less than 1.0 because of nonsubsidy program costs.

The evaluation finds that if the alternative programs serve the same population, impose the same housing standards, and provide the same total subsidy to participants, the allowance program will perform unambiguously better than public housing and conditionally better than cash grants:

Type of Consumption	Consumption Increase per Program Dollar		
	Housing Allowances	Public Housing	Unrestricted Cash Grants
Housing	.15	.08	.07
Nonhousing	.68	.32	.81
Total	.83	.40	.88

Housing allowances are shown to deliver almost twice as much increase in housing consumption (per program dollar) as public housing, and more than twice the increase in nonhousing consumption. The poorer performance of the public housing program is due to the above-market development costs incurred in constructing public housing, and also to cutbacks in privately supplied housing that offset almost nine-tenths of the publicly supplied housing.

Compared with unrestricted cash grants, housing allowances are found to produce more than two times the housing consumption increase per program dollar but only about four-fifths the nonhousing increase. Total increases per program dollar are higher for unrestricted cash grants because the allowance program incurs the extra expense of enforcing the housing standards--which lead, however, to greater housing benefits. The choice between housing allowances and unrestricted cash grants depends on the relative importance given housing and nonhousing consumption increases. The allowance program is preferable to unrestricted cash grants if double the housing assistance is more important than a one-sixth cut in nonhousing assistance.



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## I. INTRODUCTION

There are two fundamentally different strategies for providing housing assistance to low-income households: (a) the supply strategy, which constructs housing that meets minimum standards and rents it to low-income households below cost; and (b) the demand strategy, which augments the income of low-income households, provided they live in housing that meets the minimum standards. Both strategies subsidize low-income households. They differ in that the first increases the supply of standard housing directly, while the second increases it indirectly through the private market's response to demand increases.

Before 1970, U.S. housing policy relied almost exclusively on the supply strategy. However, during the last decade the supply and demand strategies have assumed roughly equal importance.<sup>1</sup> In the future, if the new administration has its way, the demand strategy will become increasingly dominant.<sup>2</sup>

What is causing this revolution in U.S. housing policy? First, the supply strategy costs too much: government-built housing costs considerably more than privately built housing. Second, the demand strategy works: the private market does in fact supply additional standard housing, provided the government subsidizes demand and enforces the minimum standards.

Seven studies during the past dozen years have reported estimates of how much more government-built housing costs than privately built housing.<sup>3</sup> Smolensky (1968) found the ratio of public cost to private

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<sup>1</sup>Only 5 percent of the subsidized rental units in 1970, but 52 percent of the additional subsidized rental units from 1970 to 1977 were privately owned existing units. See *HUD Statistical Yearbook, 1971*, (1972, Table 149); and *1977*, (1978, Tables H85 and H125).

<sup>2</sup>Office of Management and Budget director David A. Stockman told the House banking committee on March 6, 1981, that he "would rather provide direct assistance to the families or individuals that need housing assistance than through the construction programs that we have today." See the *Housing and Development Reporter* (1981, p.849).

<sup>3</sup>In all these studies, "cost" comprises the annualized development cost, plus operating costs, plus governmental subsidies such as property tax reductions.



some former participants live in dwellings that are in better condition than they would have been without the demand program. (The upgrading caused by the program does not instantly decay when participants leave the program; see Mulford et al., forthcoming.)

So far we have followed the traditional method of housing program analysis in which the participant is the unit of account and which treats housing consumption increases per participant and program costs per participant. We depart from tradition, however, to combine the two measures into a single one: dollars of increased housing consumption per dollar of total program cost. That measure ignores the question whether program benefits are concentrated on a few households or spread out over many, focusing instead on a program's ability to convert assistance dollars to housing benefits.

Then, because no housing program provides only housing benefits, we also analyze a parallel ratio: dollars of nonhousing consumption increase per dollar of total program cost. Increases in nonhousing consumption arise whenever the income subsidy provided by an assistance program is larger than the housing consumption increase it causes.

The increases in nonhousing consumption caused by housing assistance programs are, in general, larger than the housing consumption increases. That is a surprising outcome for housing programs, but easily explained. Federal housing programs tend to require low-income families to pay only a fourth of their income for housing; that is what the average U.S. household pays for housing. However, in actuality, low-income households pay on the average over half their income for housing (see Mulford, 1979). Consequently, when low-income households join a housing assistance program, a substantial amount of the subsidy they receive goes to nonhousing consumption.

The large antipoverty component of housing assistance programs raises the question whether the programs contribute more to housing consumption than unrestricted cash grants would. After all, if low-income households receive an income supplement, at least some of it would be spent on increased housing consumption; and since an unrestricted cash grant program would not incur the costs of providing housing (as in the supply strategy) or of enforcing minimum housing

standards (as in the demand strategy), the dollars of increased housing consumption per program dollar could conceivably be even greater in an unrestricted cash grant program than in either the supply- or demand-strategy housing assistance programs.

Consequently, even though our report concerns housing assistance programs, it also analyzes an unrestricted cash grant program. We want to know not only which housing assistance strategy is best (supply or demand), but also whether either is better than unrestricted cash grants.

We cannot always unambiguously rank the alternate programs. Only if a program is better than another program on both measures (dollars of increased housing consumption per program dollar, and dollars of increased nonhousing consumption per program dollar) can it be deemed better without doubt. The sum of the two measures--total consumption increase per program--cannot be used to rank alternate programs because any housing program distorts consumption choices. Both the supply and demand housing assistance strategies deliberately force program participants to consume more housing than they would if provided unrestricted cash grants with an equivalent subsidy. Given that program design, housing policymakers obviously weight increased housing consumption more heavily than they do increased nonhousing consumption (see the discussion of housing as a merit good in De Salvo, 1976). On the other hand, since housing program participants overconsume housing (in terms of their own preferences), they give less weight to increased housing consumption than to increased nonhousing consumption (see the discussion of "consumption inefficiency" in Murray, 1980). Consequently, since neither the providers nor the recipients of housing assistance weight our two outcome measures equally, the sum of the two measures does not correctly measure program benefits.

Moreover, the two measures are not the only ones by which housing assistance programs are judged. For example, reduction in occupied substandard housing is a major goal of both supply- and demand-strategy housing assistance programs. Numerous other objectives are noted in the housing literature. Nevertheless, there is wide agreement that increases in housing and nonhousing consumption are important evaluation criteria.

To be concrete, we must analyze particular programs in particular places at particular times. For the supply strategy, we examine public housing programs in Pittsburgh, Pennsylvania, and Phoenix, Arizona, in 1975. For the demand strategy, we examine the housing allowance program (HASE) in Green Bay, Wisconsin, and South Bend, Indiana, from 1973 to 1977.

The choice of programs is dictated by the fact that public housing and housing allowances are the purest examples of the supply and demand strategies ever operated in the United States. Locations and dates are dictated by data availability. The Mayo et al. (1980) study of Pittsburgh and Phoenix provides the best data on benefits and costs in public housing programs; and HASE provides the only information about benefits and costs in a full-scale housing allowance program.<sup>6</sup>

The plan here is first to analyze changes in housing and non-housing consumption by participants in alternate assistance programs (Sec. II), then to consider changes in nonparticipant consumption caused by the programs (Sec. III). In both analyses, the focus systematically rests on the two fundamental performance measures: housing consumption increases per program dollar and nonhousing consumption increases per program dollar.

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<sup>6</sup>Benefit and cost data from the limited-scale, random assignment housing allowance program conducted by the Housing Allowance Demand Experiment in Pittsburgh and Phoenix, analyzed in Appendix A, are found consistent with the HASE data.

## II. CONSUMPTION CHANGES OF PARTICIPANTS

This section compares the housing and nonhousing consumption increases (per program dollar) enjoyed by participants in three housing assistance programs: (a) the public housing program, which uses the supply strategy; (b) the housing allowance program, which uses the demand strategy; and (c) an unrestricted cash grant program, which can be thought of as the demand strategy without the requirement that housing meet minimum standards.

The analysis first compares the performance of actual public housing and housing allowance programs. Second, it estimates what the public housing program's performance would be if it served the same population, imposed the same housing standards, and granted the same participant subsidies as the allowance program. Third, it estimates the performance of an unrestricted cash grant program that serves the same population and grants the same participant subsidies as the allowance program.

In all three programs, the total consumption increase of participants is the sum of a housing and a nonhousing consumption increase (see Fig. 2.1). The housing consumption increase consists of what the housing participants consume above what they would have consumed without the program. It equals the difference between the market rent of the average program unit and that of the average nonprogram unit. The nonhousing consumption increase is the amount of participant income freed for nonhousing consumption. It equals the difference between the market rent of the average nonprogram unit and the average contribution to rent made by program participants.

The subsidy to program participants equals the difference between the market rent of the average program unit and the average tenant contribution toward that rent. Given the above definitions of housing and nonhousing consumption increases, we see that the subsidy equals the total consumption increase participants experience.

Total program cost is the sum of the subsidy provided to participants and the nonsubsidy program costs. Nonsubsidy program costs in the housing allowance program include the expense of administering the

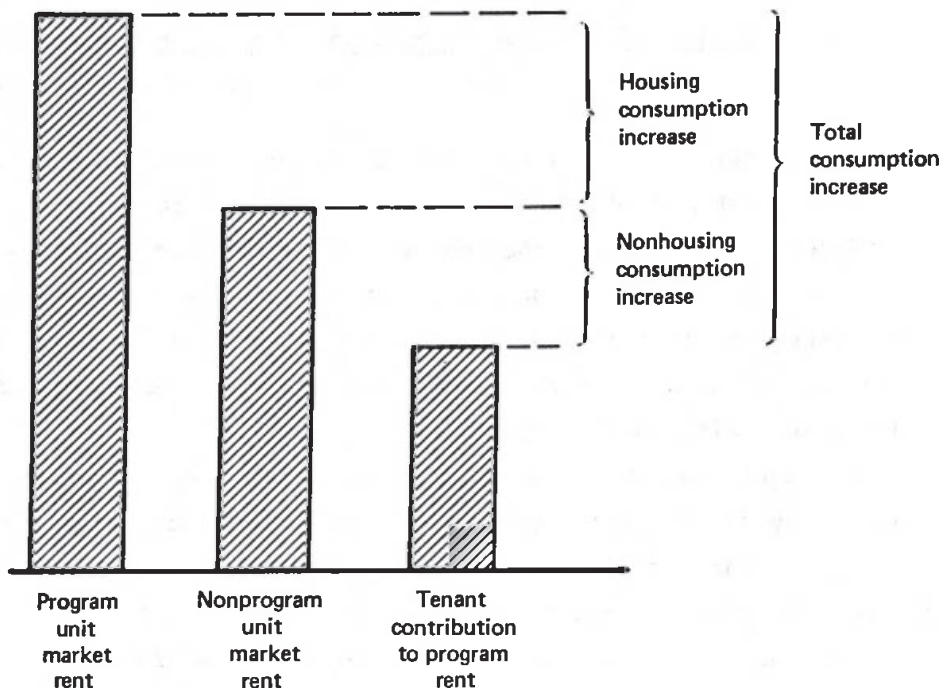


Fig. 2.1 – Components of participant consumption increases

means tests that establish participant eligibility and that of carrying out the housing inspections that enforce the program's housing standards. Nonsubsidy costs in the public housing program also include expenses for means tests and standards enforcement; but they also include the differential between the public and the private costs of constructing and operating housing. In an unrestricted cash grant program, the means test is the only nonsubsidy cost.

CONSUMPTION INCREASES PER PROGRAM DOLLAR

To estimate housing and nonhousing consumption increases per program dollar, we first assemble information on four program design characteristics. The first two consist of rents: the average rent of program units (i.e., average housing consumption of program participants) and the average rent of nonprogram units (i.e., the average amount of housing that participants would consume if they were not in a housing



assistance program). The third and fourth characteristics constitute program costs: participant subsidies and nonsubsidy costs.

Mayo et al. (1980) provide information about those characteristics for the public housing programs in Pittsburgh and Phoenix during 1975. Mulford et al. (forthcoming) and Kingsley and Schlegel (forthcoming) provide it for the housing allowance program conducted in Green Bay and South Bend during the period 1973-1977. The top panels in Tables 2.1 and 2.2 report the estimates from all three sources.

Next, we use the estimates for the four design characteristics to calculate the average housing and nonhousing consumption increases. A participant's housing consumption increase is the difference between his or her program and nonprogram unit market rents. A participant's nonhousing consumption increase is the difference between his or her subsidy and the nonhousing consumption increase. The middle panels of Table 2.1 and 2.2 report the results.

The bottom panel of the tables reports the consumption increases as proportions of total program cost (subsidy cost plus nonsubsidy cost). Dollars of increased housing consumption per program dollar are found to be 0.14 in the public housing program and 0.13 in the housing allowance program. Dollars of increased nonhousing consumption per program dollar come to 0.27 in the public housing program and 0.71 in the allowance program. The two programs thus perform about the same as regards housing consumption, but the allowance program performs two-and-a-half times better as far as nonhousing consumption is concerned.

#### PERFORMANCE OF COMPARABLE PROGRAMS

The public housing program is considerably less efficient than the housing allowance program. Nonsubsidy costs average \$142 a month in the public housing program but only \$14 a month in the allowance program. However, in spite of its greater nonsubsidy cost, as we have just seen, public housing induces approximately the same housing consumption increase, per program dollar, as does the allowance program. The explanation does not lie in the housing standards requirement, since unit market rent is slightly lower in the public housing program than in the

Table 2.1

CHARACTERISTICS OF PUBLIC HOUSING PROGRAM

Characteristic	Pittsburgh	Phoenix	Average
<i>Design Characteristics (Monthly Dollars per Participant)</i>			
Program unit market rent <sup>a</sup>	132.0	158.0	145.0
Nonprogram unit market rent <sup>b</sup>	107.0	117.0	112.0
Participant subsidy <sup>c</sup>	79.0	113.0	96.0
Nonsubsidy cost <sup>d</sup>	158.4	124.8	141.6
<i>Distribution of Program Cost (Monthly Dollars per Participant)</i>			
Housing consumption increase <sup>e</sup>	25.0	41.0	33.0
Nonhousing consumption increase <sup>f</sup>	54.0	72.0	63.0
Nonsubsidy cost	158.4	124.8	141.6
Total	237.4	237.8	237.6
<i>Distribution of Program Cost (Proportion of Total)</i>			
Housing consumption increase	.105	.172	.139
Nonhousing consumption increase	.228	.303	.265
Nonsubsidy cost	.667	.525	.596
Total	1.000	1.000	1.000

SOURCE: Stephen K. Mayo, Shirley Mansfield, David Warner, and Richard Zwetchkenbaum, *Housing Allowances and Other Rental Housing Assistance Programs--A Comparison Based on the Housing Allowance Demand Experiment*; Part 1: *Participation, Housing Consumption, Location, and Satisfaction*; Part 2: *Costs and Efficiency*, Abt Associates, Inc. (Part 1: AAI #79-111, Part 2: AAI #79-132), June 1980.

<sup>a</sup>The source, Part 1, p. 74, reports that the two-standard-deviation range about the mean monthly estimated market rent of public housing units is 100-164 in Pittsburgh and 126-190 in Phoenix. The mid-points of those ranges are the mean rents.

<sup>b</sup>The source, Part 1, p. 94, reports that public housing participants increase their housing consumption by \$25 per month in Pittsburgh and by \$41 per month in Phoenix. Non-program unit market rent equals program unit market rent less the increased housing consumption.

<sup>c</sup>Source, Part 1, p. 94.

<sup>d</sup>The source, Part 2, p. 136, reports that the ratio of resource cost to market rent is 2.20 in Pittsburgh and 1.79 in Phoenix. Multiplying program unit market rents by those ratios yields resource costs per unit; then subtracting the market rent yields nonsubsidy program cost (i.e., the part of program costs that does not go to the participant as benefits).

<sup>e</sup>Program unit market rent less nonprogram unit market rent.

<sup>f</sup>Participant subsidy less housing consumption increase.

Table 2.2

CHARACTERISTICS OF HOUSING ALLOWANCE PROGRAM

Characteristic	Green Bay	South Bend	Average
<i>Design Characteristics (Monthly Dollars per Participant)</i>			
Program unit market rent <sup>a</sup>	163.75	152.29	158.02
Nonprogram unit market rent <sup>b</sup>	151.95	140.72	146.34
Participant subsidy <sup>c</sup>	71.13	75.97	73.55
Nonsubsidy cost <sup>d</sup>	13.55	13.55	13.55
<i>Distribution of Program Cost (Monthly Dollars per Participant)</i>			
Housing consumption increase <sup>e</sup>	11.80	11.57	11.68
Nonhousing consumption increase <sup>f</sup>	59.33	64.40	61.87
Nonsubsidy cost	13.55	13.55	13.55
Total	84.68	89.52	87.10
<i>Distribution of Program Cost (Proportion of Total)</i>			
Housing consumption increase	.139	.129	.134
Nonhousing consumption increase	.701	.720	.710
Nonsubsidy cost	.160	.151	.156
Total	1.000	1.000	1.000

SOURCE: John E. Mulford, James L. McDowell, Lawrence Helbers, Michael Murray, and Orhan Yildiz, *Housing Consumption in a Housing Allowance Program*, The Rand Corporation. R-2779-HUD, forthcoming; and G. Thomas Kingsley and Priscilla M. Schlegel, *Housing Allowances and Administrative Efficiency*, The Rand Corporation, forthcoming.

<sup>a</sup>Mulford et al. (forthcoming, Table A.6). Gross rent for allowance recipients at end of program year 3 (184.36 in Green Bay and 178.08 in South Bend) deflated to mid-1975 dollars using the national consumer price index (i.e., multiplying by .8882 in Green Bay and by .8552 in South Bend).

<sup>b</sup>Mulford et al. (forthcoming, Table A.6). Gross rent allowance recipients would have spent without the allowance program (171.08 in Green Bay and 164.55 for South Bend) deflated to mid-1975 dollars in the same way as program rents.

<sup>c</sup>Mulford et al. (forthcoming, Table 3.2). Annual rate of housing allowance payment at end of program year 3 (961 in Green Bay and 1,066 in South Bend) divided by 12 to yield monthly payment and deflated to mid-1975 dollars in the same way as program rents.

<sup>d</sup>Kingsley and Schlegel (forthcoming, Table 6.2). Annual administrative costs for renter recipients in mid-1976 (172 in Green Bay, assumed to be the same in South Bend because the administrative costs for all recipients are the same in both locations) divided by 12 to yield monthly costs and deflated to mid-1975 dollars using the national consumer price index (i.e., multiplying by .9455).

<sup>e</sup>Program unit market rent less nonprogram unit market rent.

<sup>f</sup>Participant subsidy less housing consumption increase.

allowance program (\$145 as against \$158 per month). But nonprogram unit market rent in the public housing program is considerably lower than in the allowance program (\$112 as opposed to \$146 per month). We conclude that the public housing program serves households with lower incomes than the allowance program attracts, and hence raises housing consumption more than the housing allowance program does under approximately the same housing consumption requirements.

The population served by the public housing program is not an intrinsic characteristic of that program. In the past, in fact, the program served higher-income households than it now does. Its limited number of units (compared with the number of eligible households) has only recently been allocated to the poorest of low-income households. If the public housing program ever attempted to serve all eligible households (as the allowance program does), the average preprogram income of its participants, and hence the average nonprogram unit market rent, would be the same as in the allowance program.

To reveal the difference in program performance attributable to assistance strategy (as opposed to population served and subsidy given), we compare the programs for the same population, the same housing standards, and the same participant subsidies. In other words, the nonprogram unit market rent, the program unit market rent, and the participant subsidy must be the same to compare the performance of the supply and demand housing assistance strategies.

None of the program characteristics is intrinsic to the strategy; rather, each depends on choices that can be made identically, no matter which assistance strategy is used. Nonprogram unit market rent can be made identical by hypothesizing the same population. Program unit market rent can be made the same by establishing identical housing standards. The participant subsidy can be made the same by adjusting the tenant contribution to rent in the public housing program so that the average public housing subsidy equals the average housing allowance payment.

Any set of program characteristics could be used to make the comparison. Here we use those of the allowance program because it is open to all households eligible for housing assistance. Table 2.3 reports

Table 2.3

HOUSING ALLOWANCES COMPARED WITH PUBLIC HOUSING

Characteristic	Housing Allowances <sup>a</sup>	Public Housing
<i>Design Characteristics (Monthly Dollars per Participant)</i>		
Program unit market rent	158.02	158.02 <sup>b</sup>
Nonprogram unit market rent	146.34	146.34 <sup>b</sup>
Participant subsidy	73.55	73.55 <sup>b</sup>
Nonsubsidy cost	13.55	141.60 <sup>c</sup>
<i>Distribution of Program Cost (Monthly Dollars per Participant)</i>		
Housing consumption increase <sup>d</sup>	11.68	11.68
Nonhousing consumption increase <sup>e</sup>	61.87	61.87
Nonsubsidy cost	13.55	141.60
Total	87.10	215.15
<i>Distribution of Program Cost (Proportion of Total)</i>		
Housing consumption increase	.134	.054
Nonhousing consumption increase	.710	.288
Nonsubsidy cost	.151	.658
Total	1.000	1.000

SOURCE: Tables 2.1 and 2.2.

<sup>a</sup>From Table 2.2.

<sup>b</sup>Same as in housing allowance program for comparability.

<sup>c</sup>From Table 2.1.

<sup>d</sup>Program unit market rent less nonprogram unit market rent.

<sup>e</sup>Participant subsidy less housing consumption increase.

the result of making program unit market rent, nonprogram unit market rent, and participant subsidy the same in the public housing program as in the housing allowance program.<sup>1</sup> The dollars of increased parti-

<sup>1</sup>We assume that the public housing program's nonsubsidy cost per participant remains unchanged when the service characteristics are adjusted. If that assumption errs at all, it is in the direction of underestimating the cost, since the adjustment in service characteristics raises the program's housing standards (i.e., raises the program unit market rent).



participant housing consumption per program dollar become 0.05 (down from 0.14 in the actual program), and the dollars of increased participant nonhousing consumption per program dollar become 0.29 (up from 0.27 in the actual program).

#### EFFECT OF UNRESTRICTED CASH GRANTS

Even though the housing allowance program provides more housing benefits per program dollar than the public housing program yields, its housing benefits are not large; only 13 cents of an allowance program dollar go to increased housing consumption for participants. In contrast, 71 cents out of an allowance program dollar go to increased nonhousing consumption for participants (see Table 2.3). The nonhousing benefits are thus 5.5 times larger than the housing benefits.

Such large nonhousing benefits raise the question whether the housing allowance program accomplishes anything more than an unrestricted cash grant program would. In short, is the allowance program really a housing program, or just welfare under a new name?

Table 2.4 demonstrates that housing allowances indeed constitute a housing program. An unrestricted cash grant program that served tenants with the same nonprogram market rents and provided the same total subsidy would increase participant housing consumption only about half as much as the housing allowance program does (7.3 cents compared with 13.4 cents out of a program dollar).

The reason allowances provide more housing benefits per program dollar than unrestricted cash grants is that by imposing minimum housing standards, we increase the housing consumption effect by a greater proportion than we increase total program cost. Mulford et al. (forthcoming) show with HASE data that requiring participants to occupy standard housing changes the effect on their housing consumption from \$6.04 to \$11.68 a month--almost a 100 percent increase in housing benefits. Kingsley and Schlegel (forthcoming) use HASE data to show that implementing the standard housing requirement changes total program costs from \$82.77 to \$87.10 a month--an increase of only 5 percent.

Table 2.4

HOUSING ALLOWANCES COMPARED WITH UNRESTRICTED CASH GRANTS

Characteristic	Housing Allowances <sup>a</sup>	Unrestricted Cash Grants
<i>Design Characteristics (Monthly Dollars per Participant)</i>		
Program unit market rent	158.02	152.38 <sup>b</sup>
Nonprogram unit market rent	146.34	146.34 <sup>c</sup>
Participant subsidy	73.55	73.55 <sup>c</sup>
Nonsubsidy cost	13.55	9.22 <sup>d</sup>
<i>Distribution of Program Cost (Monthly Dollars per Participant)</i>		
Housing consumption increase	11.68	6.04 <sup>e</sup>
Nonhousing consumption increase	61.87	67.51 <sup>f</sup>
Nonsubsidy cost	13.55	9.22
Total	87.10	82.77
<i>Distribution of Program Cost (Proportion of Total)</i>		
Housing consumption increase	.134	.073
Nonhousing consumption increase	.710	.816
Nonsubsidy cost	.156	.111
Total	1.000	1.000

SOURCE: John E. Mulford, James L. McDowell, Lawrence Helbers, Michael Murray, and Orhan Yildiz, *Housing Consumption in a Housing Allowance Program*, The Rand Corporation, R-2779-HUD, forthcoming; and G. Thomas Kingsley and Priscilla M. Schlegel, *Housing Allowances and Administrative Efficiency*, The Rand Corporation, forthcoming.

<sup>a</sup>From Table 2.3.

<sup>b</sup>Mulford et al. (forthcoming, Table 3.3) shows that 51.7 percent of the increased housing consumption in the housing allowance program is caused by increased recipient income (the remaining 48.3 percent is from required housing standards). An unrestricted cash grant program would therefore cause recipients to consume only  $(.517)(11.69) = 6.04$  dollars per month more housing, making the average program unit market rent  $146.34 + 6.04 = 152.38$ .

<sup>c</sup>Same as for housing allowances (for comparability).

<sup>d</sup>Kingsley and Schlegel (forthcoming, Table 6.2) show that 68.0 percent of the administration costs in the housing allowance programs is caused by income transfers (the remaining 32.0 percent is caused by enforcing housing standards). An unrestricted cash grant program would therefore have administrative costs of  $(.680)(13.55) = 9.22$  dollars per month per recipient.

<sup>e</sup>Program unit market rent less nonprogram unit market rent.

<sup>f</sup>Participant subsidy less housing consumption increase.

The large effect of housing requirements found in HASE contrasts with the small effect noted in the Housing Allowance Demand Experiment (HADE). Friedman and Weinberg (1980, pp. 105 and 119) report no significant difference between the housing consumption increases caused by the allowance program and by an unrestricted cash grant program. However, HADE's samples for the unrestricted cash grant program were very small--only 59 households in Pittsburgh and 37 in Phoenix--which led to large statistical uncertainty. While the HADE estimate of the effect of housing standards on housing consumption is not significantly different from zero, neither is it statistically different from the HASE estimate.

In contrast, the HASE estimate of the effect of housing standards on housing consumption is based on samples of 1,848 households in Green Bay and 1,945 households in South Bend. True, HASE did not run an unrestricted cash grant program as HADE did. Rather, the HASE estimate of an unrestricted cash grant program's performance comes from analyses of the effect of housing standards on the allowance program. Because of its considerably larger samples, however, the HASE indirect analysis of the effect of housing standards yielded more information than the HADE direct analysis.

Of course, that housing allowances are better than unrestricted cash grants at increasing participant housing consumption does not necessarily define housing allowances as a better assistance program. Because the unrestricted cash grant program yields fewer housing benefits and does not pay for enforcing housing standards, it causes larger increases in nonhousing consumption for participants than does the housing allowance program (\$0.82 as against \$0.71 increased nonhousing consumption per program dollar). Whether the allowance program is better than the unrestricted cash grant program depends on the relative weight given the two types of consumption increase.

### III. CONSUMPTION CHANGES OF NONPARTICIPANTS

Having determined the effect of housing assistance programs on participant consumption, we now analyze their effect on nonparticipant consumption. First we review the known qualitative effects. Then we obtain quantitative estimates by applying the market-effects theory developed in Appendix B to the three programs.

The qualitative effect of the public housing program on nonparticipants is unambiguous: it increases both their housing and their nonhousing consumption. The dwellings vacated by households who move into public housing become excess supply in the private market; the price of housing services falls; and nonparticipants spend their housing savings to increase their housing and nonhousing consumption.

The qualitative effect of the housing allowance program on nonparticipants is unambiguous in the case of nonhousing consumption (it goes down). On the other hand, housing consumption can be either decreased or increased. The most common effect is the price effect, in which the increased demand for housing services caused by allowances drives up the price of those services, thereby reducing both housing and nonhousing consumption.

However, the price effect is not the only way the allowance program can influence nonparticipant consumption. One effect occurs when, in anticipation of future allowance support, nonparticipants who eventually join the program consume more housing services than they would have without the program (which we call the "anticipation effect"). Another occurs when former participants who only recently left the program consume more housing services than otherwise because the dwelling repairs they made to satisfy the program standards have not yet deteriorated (which we call the "inertia effect").

Both the anticipation and the inertia effects increase the housing consumption of nonparticipants. To pay for those increases, nonhousing consumption must decrease by an equal amount. Hence the two effects counteract the price effect on the housing consumption of nonparticipants, making the net effect ambiguous; and the anticipation and inertia

effects reenforce the price effect on the nonhousing consumption of nonparticipants, making the combined effect a clear decrease.

The qualitative effect of the unrestricted cash grant program on nonparticipant consumption is the same as that of the housing allowance program. The analysis differs only in that there are no housing standards in the unrestricted cash grant program, so there is no inertia effect. However, both the price effect and the anticipation effect occur, which is enough to produce the same qualitative effect as in the housing allowance program.

On balance, then, adding nonparticipant consumption changes to those of participants will improve the performance of the public housing program relative to the housing allowance and unrestricted cash grant programs. The question is, By how much? We find that the nonparticipant consumption changes are not very large compared with the participant consumption changes (see Table 3.1). Consequently, the results reported in Sec. II are not perceptibly altered by the analysis here.

The public housing and the housing allowance programs cause nonparticipants to increase their housing consumption, while the unrestricted cash grant program has essentially no effect on nonparticipant housing consumption. Only the public housing program causes nonparticipants to increase their nonhousing consumption. Total consumption by nonparticipants increases under the public housing program and decreases under the housing allowance and unrestricted cash grant programs.

Table 3.1

CONSUMPTION CHANGES OF NONPARTICIPANTS

Type of Consumption	Consumption Change per Assistance Program Dollar		
	Public Housing	Housing Allowances	Unrestricted Cash Grants
Housing	.029	.012	-.002
Nonhousing	.029	-.025	-.005
Total	.058	-.013	-.007

SOURCE: Appendix C, Tables C.1 and C.2.



#### IV. CONCLUSIONS

Combining the consumption increases of participants (Sec. II) with those of nonparticipants (Sec. III) yields the total housing and non-housing consumption increases caused by each housing assistance program. Table 4.1 shows that the consumption increases range from a high of \$0.146 per program dollar in the allowance program to a low of \$0.071 per program dollar in the unrestricted cash grant program. Nonhousing consumption increases range from a high of \$0.811 per dollar in the unrestricted cash grant program to a low of \$0.317 per program dollar in the public housing program.

The relation of the performances of the three assistance programs is illustrated in Fig. 4.1. Housing allowances deliver almost twice the housing consumption increases and more than twice the nonhousing consumption increases (per program dollar) of those public housing delivers. Compared with unrestricted cash grants, allowances produce more than two times the housing consumption increases but only about five-sixths the nonhousing consumption increases (per program dollar). Housing allowances are clearly better than public housing on both measures. However, whether they are better than unrestricted cash grants depends on the weights given housing and nonhousing assistance. The housing allowance program is better than unrestricted cash grants only if double the housing assistance is more important than a one-sixth cut in nonhousing assistance.

The poor performance of the public housing program relative to either housing allowances or unrestricted cash grants is due to its nonsubsidy program costs. Studies over the past decade have found that providing housing services publicly costs considerably more than providing them privately--according to Mayo et al. (1980), (the study used in this analysis), almost twice as much.

The relatively poor performance of unrestricted cash grants as regards housing consumption increases and their superior performance regarding nonhousing consumption increases have the same cause: the subsidy is not earmarked. Not requiring minimum housing standards



Table 4.1

CONSUMPTION CHANGES CAUSED BY ALTERNATE  
HOUSING ASSISTANCE PROGRAMS

Type of Consumption	Consumption Change per Assistance Program Dollar		
	Public Housing	Housing Allowances	Unrestricted Cash Grants
<i>Participants</i>			
Housing	.054	.134	.073
Nonhousing	.288	.710	.816
Total	.342	.844	.889
<i>Nonparticipants</i>			
Housing	.029	.012	-.002
Nonhousing	.029	-.025	-.005
Total	.058	-.013	-.007
<i>Total</i>			
Housing	.083	.146	.071
Nonhousing	.317	.685	.811
Total	.400	.831	.882

SOURCE: Tables 2.3, 2.4, and 3.3.

NOTE: Programs compared for the same population, the same total subsidy to participants, and the same housing standards (public housing and housing allowances).

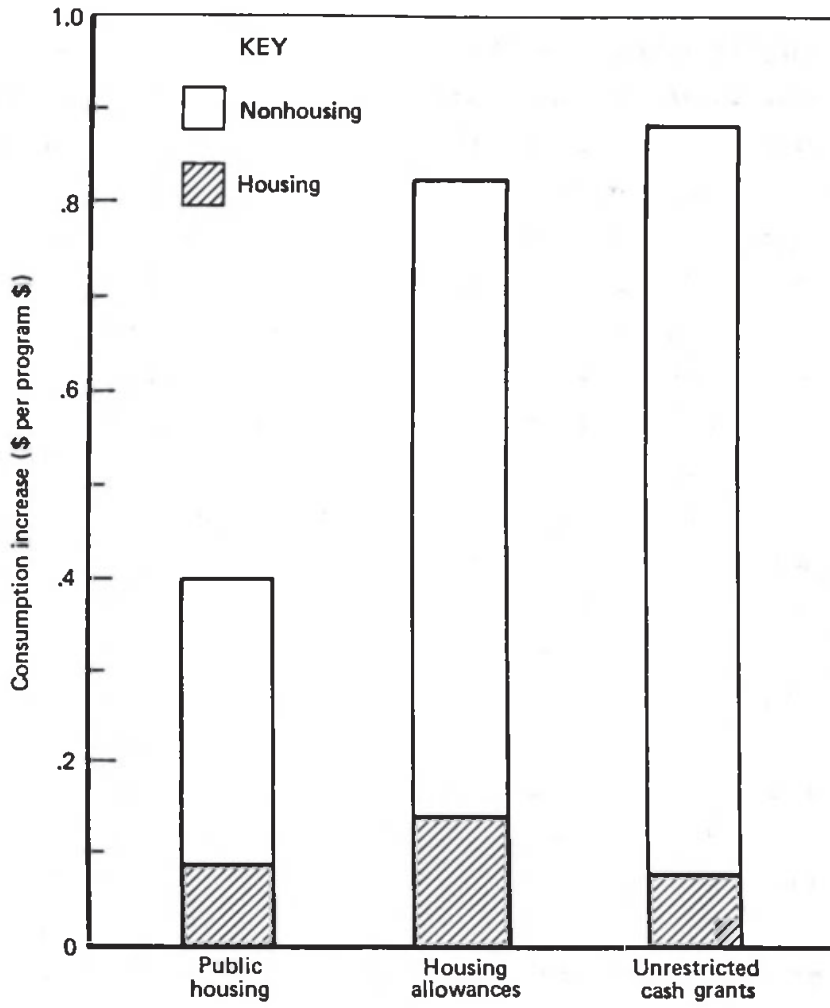


Fig. 4.1 – Housing and nonhousing consumption increases caused by alternate housing assistance programs

reduces program costs but also reduces the amount of assistance relative to the costs and amount of assistance in the housing allowance program. Both reductions cause nonhousing consumption to be higher in an unrestricted cash grant program than in the allowance program.

Focusing exclusively on the housing assistance provided by the three programs under consideration, we find that the housing allowance program does better than either the public housing program or the unrestricted cash grant program, even though we consider nonparticipant as well as participant benefits (see Fig. 4.2). The housing consumption changes of nonparticipants are largest for public housing, smaller but still positive for housing allowances, and virtually zero for unrestricted cash grants. However, the differential nonparticipant housing benefits are nowhere large enough to alter the program ranking established by the participant benefits.

Nonparticipant housing benefits are not large in the public housing program because, according to our estimates, the private market offsets 89 percent of public housing by reducing privately supplied housing.<sup>1</sup> Our estimate, based on the price elasticity of housing supply reported in Rydell (forthcoming), is higher than the 86 percent estimated by Swan (1976) and the 80 percent estimated by Murray (1980) because in addition to the decreased new construction in the private market considered by those two studies, we also implicitly include increased housing removal in the private market.

Nonparticipant housing benefits are not negative in the housing allowance program. That is because the anticipation and inertia effects cause increases in nonparticipant housing consumption that more than offset the decreases caused by the allowance program's effect on market prices. Mulford et al. (forthcoming) show that the allowance program causes nonparticipants to consume more housing than they would

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<sup>1</sup>The 89 percent offset estimate is calculated as follows: if there were no offset, the public housing program would cause 0.734 dollars of increased housing consumption per program dollar, the sum of preprogram unit market rent and the recipient housing consumption increase (see Table 2.3); but the program actually causes only 0.083 dollars of increased housing consumption per program dollar (see Table 4.1), making the offset ratio  $(0.734 - 0.083) / 0.734 = 0.89$ . See Appendix B for additional discussion of the offset percentage.

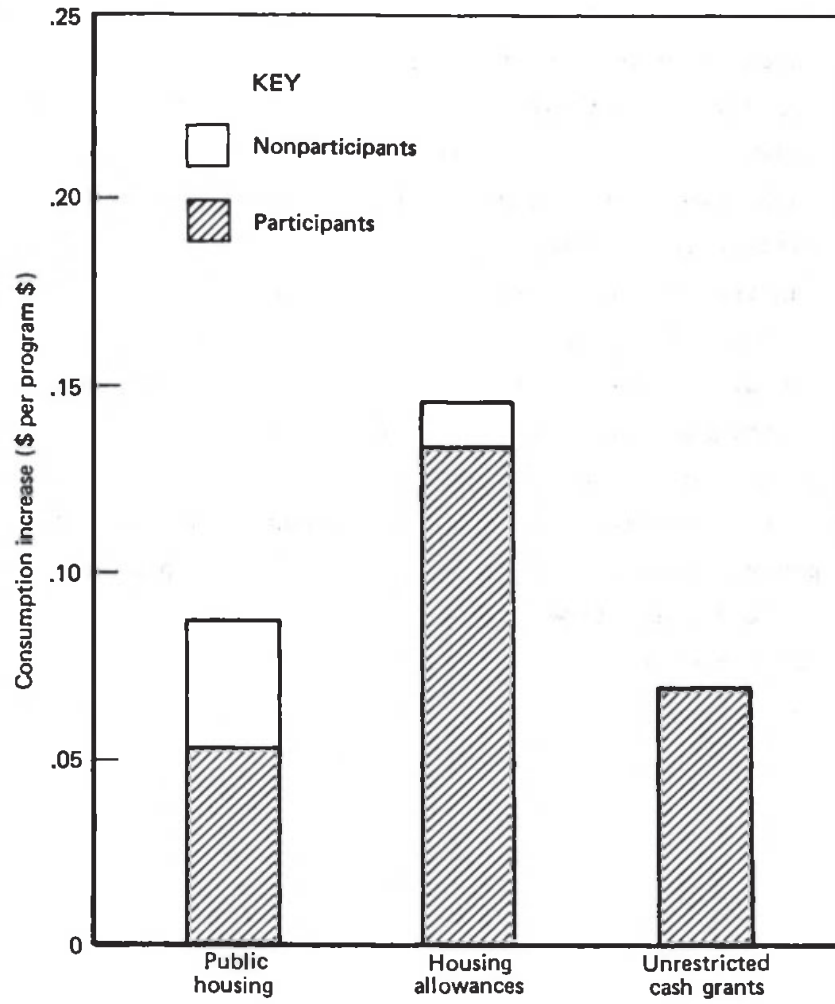


Fig. 4.2 – Participant and nonparticipant housing consumption increases caused by alternate housing assistance programs

without the program: those who expect to join the program anticipate the program subsidy, and those who have recently left the program benefit from the "inertia" of the program standards.

In short, the demand-subsidy strategy is better than the supply-subsidy strategy at providing housing assistance, provided the demand subsidy is conditional on participants meeting housing standards. (Housing consumption increases caused by the housing allowance program are twice those caused by the public housing program, per program dollar.) Without the housing standards, the demand-subsidy strategy is worse than the supply-subsidy strategy at providing housing assistance. (Housing consumption increases caused by an unrestricted cash grant program are slightly less than those caused by the public housing program, per program dollar.) Moreover, the demand-subsidy strategy is also better than the supply-subsidy strategy at providing nonhousing assistance. (Nonhousing consumption increases caused by the housing allowance program and by an unrestricted cash grant program are, respectively, 2.2 and 2.6 times those caused by the public housing program, per program dollar.)

Appendix A

COMPARISON OF HOUSING ALLOWANCE PROGRAMS IN HASE AND HADE

This report uses Housing Assistance Supply Experiment (HASE) data to evaluate the performance of the housing allowance program. Those data were chosen because HASE evaluated a full-entitlement housing allowance program committed for ten years to the metropolitan areas involved (Green Bay and South Bend).

A second source of data on the housing allowance program was provided by the Housing Allowance Demand Experiment (HADE). Those data result from a partial-entitlement housing allowance program run with a three-year commitment to the metropolitan areas involved (Pittsburgh and Phoenix). This appendix reviews the HADE data on the performance of the housing allowance program, finding them consistent with the HASE data.

Tables A.1 and A.2 report HADE data on the housing allowance program using the same format in which Table 2.2 reported HASE data. The two tables are necessary because two different HADE reports give somewhat different accounts of the allowance program's performance. Resolving the two accounts is beyond the scope of this report, but averaging them to arrive at a single HADE description, we find it is very close to that provided by HASE (see Table A.3).



Table A.1

HADE HOUSING ALLOWANCE PROGRAM CHARACTERISTICS  
ACCORDING TO MAYO ET AL.

Characteristic	Pittsburgh	Phoenix	Average
<i>Design Characteristics (Monthly Dollars per Participant)</i>			
Program unit market rent <sup>a</sup>	128.0	164.0	146.0
Nonprogram unit market rent <sup>b</sup>	112.0	137.0	124.5
Participant subsidy <sup>c</sup>	77.0	107.0	92.0
Nonsubsidy cost <sup>d</sup>	19.2	14.8	17.0
<i>Distribution of Program Cost (Monthly Dollars per Participant)</i>			
Housing consumption increase <sup>e</sup>	16.0	27.0	21.5
Nonhousing consumption increase <sup>f</sup>	61.0	80.0	70.5
Nonsubsidy cost	19.2	14.8	17.0
Total	96.2	121.8	109.0
<i>Distribution of Program Cost (Proportion of Total)</i>			
Housing consumption increase	.166	.222	.197
Nonhousing consumption	.634	.657	.647
Nonsubsidy cost	.200	.127	.156
Total	1.000	1.000	1.000

SOURCE: Stephen F. Mayo, Shirley Mansfield, David Warner, and Richard Zwetchkenbaum, *Housing Allowances and Other Related Housing Assistance Programs--A Comparison Based on the Housing Assistance Demand Experiment; Part 1: Participation, Housing Consumption, Location, and Satisfaction; Part 2: Costs and Efficiency*, Abt Associates, Inc., (Part 1: AAI #79-111, Part 2: AAI #79-132), June 1980.

<sup>a</sup>The source, Part 1, p. 76, reports that the mean estimated market rent of allowance program units differs from those of public housing (see Table 2.1) by -4 dollars per month in Pittsburgh and by +6 dollars per month in Phoenix.

<sup>b</sup>The source, Part 1, p. 94, reports that housing allowance participants increase their housing consumption by 16 dollars per month in Pittsburgh and by 27 dollars per month in Phoenix. Nonprogram unit market rent equals program unit market rent less the increased housing consumption.

<sup>c</sup>Source, Part 1, p. 94.

<sup>d</sup>The source, Part 2, p. 136, reports that the ratio of resource cost to market rent is 1.15 in Pittsburgh and 1.09 in Phoenix. Multiplying program unit market rents by those ratios yields the resource costs per unit, and then subtracting the market rent yields the nonsubsidy program costs (i.e., the part of program costs that do not go the participants as benefits).

<sup>e</sup>Program unit market rent less nonprogram unit market rent.

<sup>f</sup>Participant subsidy less housing consumption increase.

Table A.2

HADE HOUSING ALLOWANCE PROGRAM CHARACTERISTICS  
ACCORDING TO FRIEDMAN AND WEINBERG

Characteristic	Pittsburgh	Phoenix	Average
<i>Design Characteristics (Monthly Dollars per Participant)</i>			
Program unit market rent <sup>a</sup>	135.6	159.2	147.4
Nonprogram unit market rent <sup>b</sup>	130.0	137.0	133.5
Participant subsidy <sup>c</sup>	65.0	81.0	73.0
Nonsubsidy cost <sup>d</sup>	19.2	14.8	17.0
<i>Distribution of Program Cost (Monthly Dollars per Participant)</i>			
Housing consumption increase <sup>e</sup>	5.6	22.2	11.1
Nonhousing consumption increase <sup>f</sup>	59.4	58.8	59.1
Nonsubsidy cost	19.2	14.8	17.0
Total	84.2	95.8	87.2
<i>Distribution of Program Cost (Proportion of Total)</i>			
Housing consumption increase	.067	.232	.127
Nonhousing consumption increase	.705	.614	.678
Nonsubsidy cost	.228	.154	.195
Total	1.000	1.000	1.000

SOURCE: Joseph Friedman and Daniel H. Weinberg, *Housing Consumption Under a Constrained Income Transfer: Evidence From a Housing Gap Housing Allowance*, Abt Associates, Inc., AAI #79-41, June 1980, Table 5-21, p. 141; and Table A.1.

<sup>a</sup>Nonprogram unit market rent plus increased housing consumption caused by the program.

<sup>b</sup>Amount of housing services participants would have consumed without the program.

<sup>c</sup>Average allowance payment.

<sup>d</sup>From Table A.1 (only the Mayo study reported nonsubsidy costs).

<sup>e</sup>Program unit market rent less nonprogram unit market rent.

<sup>f</sup>Participant subsidy less housing consumption increase.

Table A.3

ALTERNATIVE ESTIMATES OF HOUSING  
ALLOWANCE PROGRAM CHARACTERISTICS

Characteristic	HADE Program			HASE Program
	Mayo et al.	Friedman-Weinberg	Average	
<i>Design Characteristics (Monthly Dollars per Participant)</i>				
Program unit market rent	146.0	147.4	146.7	158.02
Nonprogram unit market rent	124.5	133.5	129.0	146.34
Participant subsidy	92.0	73.0	82.5	73.55
Nonsubsidy cost	17.0	17.0	17.0	13.55
<i>Distribution of Program Cost (Monthly Dollars per Participant)</i>				
Housing consumption increase	21.5	11.1	17.7	11.68
Nonhousing consumption increase	70.5	59.1	64.8	61.87
Nonsubsidy cost	17.0	17.0	17.0	13.55
Total	109.0	87.2	99.5	87.10
<i>Distribution of Program Cost (Proportion of Total)</i>				
Housing consumption increase	.197	.127	.178	.134
Nonhousing consumption increase	.647	.678	.651	.710
Nonsubsidy cost	.156	.195	.171	.156
Total	1.000	1.000	1.000	1.000

SOURCE: Tables 2.1, A.1, and A.2.

Appendix B

ESTIMATION OF CONSUMPTION CHANGES OF NONPARTICIPANTS

The public housing program enables renter households who do not participate in the program to increase their housing consumption. The reason is that participants in the program leave the private market, which causes a reduction in the price of rental housing there, which therefore enables nonparticipants to enjoy consumption increases. Because the price elasticity of demand for rental housing services is 0.5, the total increase in consumption by nonparticipants is divided equally between housing and nonhousing consumption increases.

The housing allowance and unrestricted cash grant programs, on the other hand, both force nonparticipants to decrease their consumption. The explanation is that increased demand for housing by program participants causes an increase in the price of rental housing services, which then forces nonparticipants to accept consumption decreases. Because of anticipation and inertia effects on the housing consumption of nonparticipants, the total decrease in their consumption is not divided equally between housing and nonhousing. Rather, nonparticipants decrease their housing consumption less than their nonhousing consumption. (In fact, the anticipation and inertia effects in the housing allowance program are large enough to outweigh the price effect; the housing consumption of nonparticipants actually increases slightly under that program.)

Our numerical estimates of consumption changes of nonparticipants have already been given (see Table 3.1). This appendix presents the market theory behind those estimates. Specifically, it derives formulas for the changes in the housing and nonhousing consumption of nonparticipants and assembles the necessary parameter estimates. We derive the formulas by first estimating the total changes in housing and nonhousing consumption caused by housing assistance programs, then subtracting the consumption changes of participants.

Our analysis of market effects focuses on the "long run," where the supply of housing services has completely adjusted to the demand shifts

caused by housing assistance programs. That focus yields the policy-relevant information of how the programs perform over a long period. Deviations from the long-run performance in the initial years of a program are of interest when planning a new program, but they have little relevance when choosing among programs.

Although the analyses are very similar, there are sufficient differences between the supply-subsidy program (public housing) and the demand-subsidy programs (housing allowances and unrestricted cash grants) to warrant separate derivations. To highlight the similarities, the two derivations are given in parallel, and the conclusions are presented in identically formatted tables to facilitate comparison.

#### PUBLIC HOUSING

The public housing program constructs housing, drawing its consumers from the private market. The total change in housing consumption caused by public housing equals the consumption of public housing less the change in private market consumption due to the demand reduction there, which can be expressed as

$$H(x) = mx - [P_o Q_o - P_o Q(x)], \quad (\text{B.1})$$

where  $H(x)$  = change in rental housing consumption (dollars per month at preprogram prices) as a function of program size,

$x$  = size of the public housing program (measured in total program dollars per month),

$m$  = market rent of public housing (dollars per program dollar),

$Q(x)$  = consumption of rental housing services in the private market, as a function of program size,  $Q_o = Q(0)$ , and

$P_o$  = preprogram price of housing services.

Note that we evaluate the private market housing consumption,  $Q(x)$ , using the preprogram price of housing services,  $P_o$ . That makes  $H(x)$  indicate change in housing services purchased rather than change in rent paid for those services.

The total change in nonhousing consumption caused by the public housing program equals the increase in household income due to program subsidies less the increase in rent paid for housing consumption, or

$$N(x) = [mx - cx] - [mx + P(x)Q(x) - P_0Q_0], \quad (\text{B.2})$$

where  $N(x)$  = change in nonhousing consumption (dollars per month) as a function of program size,

$c$  = tenant contribution to rent (dollars per program dollar),

$P(x)$  = price of rental housing services in the private market as a function of program size,  $P_0 = P(0)$ .

The subsidy that increases household income equals the market rent of public housing,  $mx$ , less the tenant contribution to rent,  $cx$ . The increase in rent paid for housing consumption equals the market rent of the public housing<sup>1</sup> plus the increased expenditure on rental housing in the private market. Note that we evaluate the private market housing consumption,  $Q(x)$ , using the price of housing services under the program,  $P(x)$ , to make  $P(x)Q(x) - P_0Q_0$  indicate change in rent paid rather than change in services purchased.

The private market reaction to the public housing program is determined by the intersection of the demand and supply curves for rental housing services. The first curve relates the demand for rental housing services to the price of those services and to the size of the reduction in private market demand caused by the public housing program:

$$Q(x) = [Q_0 - \frac{vx}{P_0}] \left[ \frac{P(x)}{P_0} \right]^{-S}, \quad (\text{B.3})$$

---

<sup>1</sup>Public housing tenants do not pay full market rent, but neither do they ever explicitly receive the subsidy the program gives them. To simplify the algebra, our analysis assumes that they receive the subsidy and pay full rent. The assumption is for convenience only; it does not alter the conclusions.



where  $Q(x)$  = demand for rental housing services as a function of program size,  $Q_0 = Q(0)$ ,

$v$  = reduction in rental housing demand in the private market caused by the public housing program (dollars of market rent for the housing that program participants would have been occupying if they had not joined the program, per program dollar), and

$S$  = price elasticity of rental housing demand (percentage decrease in demand per one percent increase in the price of rental housing services).

The supply curve relates the supply of housing services (which, in long-run equilibrium, is the same as realized demand)<sup>2</sup> to the price of those services:

$$Q(x) = Q_0 \left[ \frac{P(x)}{P_0} \right]^Y, \quad (\text{B.4})$$

where  $Y$  = price elasticity of rental housing supply (percentage increase in supply per one percent increase in the price of rental housing services).

Solving Eqs. (B.3) and (B.4) for the equilibrium price and supply of housing services in the private market as a function of the size of the public housing program yields

$$P(x) = P_0 \left[ 1 - \frac{vx}{P_0 Q_0} \right]^{\frac{1}{Y+S}}, \quad (\text{B.5})$$

---

<sup>2</sup>Note that this analysis does not explicitly mention occupancy rates. The rates are important only in analyzing short-run market behavior. However, given that they never equal 1.0, supply exceeds demand even in long-run equilibrium, when occupancy rates are a constant (in a given housing market). To avoid carrying an extra constant throughout the analysis, we implicitly measure housing supply by total housing supply times the long-run equilibrium occupancy rate.

and

$$Q(x) = Q_o \left[ 1 - \frac{vx}{P_o Q_o} \right]^{\frac{1}{Y+S}} \quad (B.6)$$

Substituting those market results into Eqs. (B.1) and (B.2) then produces

$$H(x) = mx - \left[ P_o Q_o - P_o Q_o \left( 1 - \frac{vx}{P_o Q_o} \right)^{\frac{1}{Y+S}} \right], \quad (B.7)$$

and

$$N(x) = [mx - cx] - \left[ mx + P_o Q_o \left( 1 - \frac{vx}{P_o Q_o} \right)^{\frac{Y+1}{Y+S}} - P_o Q_o \right]. \quad (B.8)$$

Because public housing programs serve only a small fraction of the rental population,  $vx/P_o Q_o$  is much smaller than 1.0, so we can use the approximation

$$\left[ 1 - \frac{vx}{P_o Q_o} \right]^\alpha \approx 1 - \alpha \left[ \frac{vx}{P_o Q_o} \right] \quad (B.9)$$

and considerably simplify Eqs. (B.7) and (B.8). Using that approximation and dividing the result by program size,  $x$ , gives the final formulas for the total changes in housing and nonhousing consumption caused by the public housing program per program dollar:

$$\frac{H(x)}{x} = m - \left[ \frac{Y}{Y+S} \right] v, \quad (B.10)$$

and

$$\frac{N(x)}{x} = v - c + \left[ \frac{1-S}{Y+S} \right] v. \quad (B.11)$$

Readers who prefer calculus to algebra can obtain Eqs. (B.10) and (B.11) from Eqs. (B.7) and (B.8) by differentiating with respect to program size,  $x$ , and evaluating the result at  $x = 0$  to find the effect of a marginal program dollar when program size is small relative to market size.

The bottom line of Table B.1 reports our conclusions about the effect of the public housing program on total housing and nonhousing consumption. The top line of the table recognizes that the increase in housing consumption of participants equals the market rent of public housing units,  $m$ , less the market rent of the units the participants would have lived in if they had not joined the program,  $v$ ; and that the increase in nonhousing consumption of participants equals the nonprogram unit rent,  $v$ , less the tenant contribution to rent,  $c$ . (Figure 2.1 in Sec. II illustrates those relationships.)

The middle line of the table obtains the consumption increases of nonparticipants by subtracting the participant increases from the total increases. When evaluated using the parameter estimates presented at the end of this appendix, the formulas for nonparticipants yield the public housing effects reported in Table 3.1 (Sec. III).

Note that the formulas in Table B.1 highlight the role of supply elasticity in determining the effect of the public housing program on

Table B.1

FORMULAS FOR CONSUMPTION CHANGES CAUSED BY  
PUBLIC HOUSING PROGRAM

Consumer	Consumption Changes per Assistance Program Dollar	
	Housing	Nonhousing
Participants	$m - v$	$v - c$
Nonparticipants	$v - \left[ \frac{Y}{Y + S} \right] v$	$\left[ \frac{1 - S}{Y + S} \right] v$
Total	$m - \left[ \frac{Y}{Y + S} \right] v$	$v - c + \left[ \frac{1 - S}{Y + S} \right] v$

NOTE: Table B.3 presents summary definitions (and estimates) of the parameters in these formulas.

housing consumption. If supply were completely inelastic ( $Y \neq 0$ ), then  $Y/(Y + S) = 0.0$ , and the increase in housing consumption of nonparticipants would equal the market rent of the housing participants would have occupied if there had been no program,  $v$ ; and the total increase in housing consumption would equal the market rent of public housing,  $m$ . In other words, if supply is completely inflexible, there is no private market offset to the publicly supplied housing.

On the other hand, if supply is completely elastic ( $Y = \infty$ ), then  $Y/(Y + S) = 1.0$ , and there is no increase in the housing consumption of nonparticipants. In that case, the private-market offset equals the entire amount of housing participants would have lived in if there had been no program.

The supply elasticity estimate used in this analysis (judged by the authors to be the best now available) is  $Y = 11.3$ . Together with the demand elasticity estimate,  $S = 0.5$ , that supply elasticity makes  $Y/(Y + S) = 0.958$ , which is much closer to the 1.0 value of the completely elastic supply case than to the 0.0 value of the completely inelastic supply case. Consequently, our analysis indicates that the private-market offset to publicly supplied housing is very large. Specifically, we estimate that 89 percent of the publicly supplied housing is offset by decreases in privately supplied housing.<sup>3</sup>

#### HOUSING ALLOWANCES AND UNRESTRICTED CASH GRANTS

The housing allowance and unrestricted cash grant programs give participating households additional income and rely on the private market to expand supply to satisfy the new demand. They work entirely through the private market. Accordingly, the increased housing consumption caused by the program simply equals the changed consumption in market:

$$H(x) = P_0 Q(x) - P_0 Q_0, \quad (\text{B.12})$$

<sup>3</sup>The offset fraction is calculated by  $[Y/(Y + S)]v/m = 0.89$ , using the parameter estimates  $Y = 11.3$ ,  $S = 0.5$ ,  $m = 0.734$ , and  $v = 0.680$  from the last part of this appendix.

where  $H(x)$  = change in rental housing consumption (dollars per month at preprogram prices) as a function of program size,

$x$  = size of the demand-subsidy program (measured in total program dollars per month),

$Q(x)$  = consumption of rental housing services, as a function of program size,  $Q_0 = Q(0)$ , and

$P_0$  = preprogram price of housing services.

Note that we evaluate housing consumption,  $Q(x)$ , using the preprogram price of housing services,  $P_0$ . That makes  $H(x)$  indicate change in housing services purchased rather than change in rent paid for those services.

The total change in nonhousing consumption caused by a demand-subsidy program equals the increase in household income due to program subsidies less the increase in rent paid for housing consumption:

$$N(x) = [hx + nx] - [P(x)Q(x) - P_0Q_0] , \quad (\text{B.13})$$

where  $N(x)$  = change in nonhousing consumption (dollars per month) as a function of program size,

$h$  = increase in housing consumption for program participants (dollars per program dollar),

$n$  = increase in nonhousing consumption for program participants (dollars per program dollar), and

$P(x)$  = price of rental housing services as a function of program size,  $P_0 = P(0)$ .

The subsidy that increases household income equals the sum of the increases in the housing and nonhousing consumption of participants,  $hx + nx$ . The increase in rent paid equals the rent paid under the program,  $P(x)Q(x)$ , less the rent that would have been paid if there had been no program,  $P_0Q_0$ .

The market's reaction to a demand-subsidy program is determined by the intersection of the demand and supply curves for rental housing services. The demand curve relates the demand for rental housing

services to the price of those services and to the size of the demand increase caused by the program:

$$Q(x) = \left[ Q_0 + \frac{hx + ghx}{P_0} \right] \left[ \frac{P(x)}{P_0} \right]^{-S}, \quad (\text{B.14})$$

where  $Q(x)$  = demand for rental housing services as a function of program size,  $Q_0 = Q(0)$ ,

$g$  = increased housing consumption for nonparticipants due to anticipation and inertia effects (dollars per dollar of increased housing consumption for participants), and

$S$  = price elasticity of rental housing demand.

The shift in the demand curve caused by a demand-subsidy program is estimated in Eq. (B.14) by the sum of participant increases in housing consumption,  $hx$ , and the nonparticipant increases in housing consumption due to anticipation and inertia effects,  $ghx$ . Those expenditures are divided by the price of housing services,  $P_0$ , to convert them into measures of housing quantity.

The supply curve relates the supply of housing services to the price of those services:

$$Q(x) = Q_0 \left[ \frac{P(x)}{P_0} \right]^Y, \quad (\text{B.15})$$

where  $Y$  = price elasticity of rental housing supply.

Solving Eqs. (B.14) and (B.15) for the equilibrium price and supply of housing services as a function of program size yields

$$P(x) = P_0 \left[ 1 + \frac{hx + ghx}{P_0 Q_0} \right]^{\frac{1}{Y+S}}, \quad (\text{B.16})$$

and



$$Q(x) = Q_0 \left[ 1 + \frac{hx + ghx}{P_0 Q_0} \right]^{\frac{Y}{Y+S}} \quad (\text{B.17})$$

Substituting those market equilibrium results into Eqs. (B.12) and (B.13) produces

$$H(x) = P_0 Q_0 \left[ 1 + \frac{hx + ghx}{P_0 Q_0} \right]^{\frac{Y}{Y+S}} - P_0 Q_0, \quad (\text{B.18})$$

and

$$N(x) = [hx + nx] - \left[ P_0 Q_0 \left( 1 + \frac{hx + ghx}{P_0 Q_0} \right)^{\frac{Y+1}{Y+S}} + P_0 Q_0 \right]. \quad (\text{B.19})$$

Because even full-entitlement demand-subsidy programs serve only a small fraction of the renter population,  $[hx + ghx] / P_0 Q_0$  is much smaller than 1.0, so we can use the approximation

$$\left[ 1 + \frac{hx + ghx}{P_0 Q_0} \right]^{\alpha} \approx 1 + \alpha \left[ \frac{hx + ghx}{P_0 Q_0} \right] \quad (\text{B.20})$$

to simplify Eqs. (B.18) and (B.19). Using that approximation, and dividing by program size,  $x$ , gives the final formulas for the total changes in housing and nonhousing consumption caused by demand-subsidy programs per program dollar:

$$H(x) = h - \left[ \frac{S}{Y+S} \right] h + \left[ \frac{Y}{Y+S} \right] gh, \quad (\text{B.21})$$

and

$$N(x) = n - \left[ \frac{1-S}{Y+S} \right] h - \left[ \frac{Y+1}{Y+S} \right] gh. \quad (\text{B.22})$$

The bottom line of Table B.2 reports our conclusions about the effect of demand-subsidy programs on total housing and nonhousing consumption. The top line of the table recognizes the consumption

Table B.2

FORMULAS FOR CONSUMPTION CHANGES CAUSED BY HOUSING ALLOWANCE  
AND UNRESTRICTED CASH PROGRAMS

Consumer	Consumption Changes per Assistance Program Dollar	
	Housing	Nonhousing
Participants	$h$	$n$
Nonparticipants	$-\left[\frac{S}{Y+S}\right]h + \left[\frac{Y}{Y+S}\right]gh$	$-\left[\frac{1-S}{Y+S}\right]h - \left[\frac{Y+1}{Y+S}\right]gh$
Total	$h - \left[\frac{S}{Y+S}\right]h + \left[\frac{Y}{Y+S}\right]gh$	$n - \left[\frac{1-S}{Y+S}\right]h - \left[\frac{Y+1}{Y+S}\right]gh$

NOTE: Table B.3 presents summary definitions of the parameters in these formulas.

increases of participants. The middle line obtains the consumption changes of nonparticipants by subtracting the participant increases from the total increases. When evaluated by the parameter estimates given at the end of this appendix, the nonparticipant formulas yield the demand-subsidy program effects reported in Table 3.1.

Note that the nonparticipant consumption changes would be unambiguously negative if there were no anticipation or inertia effects (i.e., if  $g = 0$ ). The existence of those effects makes it possible for demand-subsidy programs to increase the housing consumption of nonparticipants. Note also the dependence of the nonparticipant consumption changes on the price elasticity of supply. If supply is completely inelastic ( $Y = 0$ ), then the housing consumption of nonparticipants decreases by an amount equal to the housing consumption increase of participants. In other words, if supply is completely inflexible, program participants gain housing only at the expense of nonparticipants. On the other hand, if supply is completely elastic ( $Y = \infty$ ), then the housing consumption of nonparticipants increases by the full amount of the anticipation and inertia effects, because under completely elastic supply there is no increase in the price of rental housing services to cause demand reductions.

PARAMETER ESTIMATES

Table B.3 presents estimates of the program parameters needed to solve the formulas in Tables B.1 and B.2. The first five parameters give program effects in dollars per total program cost, as estimated from the data in Tables 2.3 and 2.4. For example, the market rent of the average public-housing unit is \$158.02 per month, and the total cost of the public housing program per unit is \$215.15 per month (see Table 2.3); the ratio of the former to the latter is 0.734 (the estimate of parameter  $m$  for public housing in Table B.3).

The sixth parameter in Table B.3 gives the effects of anticipation and inertia in the housing assistance programs on the housing consumption of nonparticipants (in dollars per dollar of increased housing consumption by participants).

The final two parameters needed for the formulas in Tables B.1 and B.2 are the price elasticity of demand,  $S$ , and the price elasticity of housing supply,  $Y$ . Our estimates are  $S = 0.5$  and  $Y = 11.3$ , derived in a forthcoming report (C. Peter Rydell, *Price Elasticities of Housing Supply*, The Rand Corporation, R-2846-HUD). Appendix C of the present report analyzes the sensitivity of our conclusions to the estimates of those parameters.

Table B.3

PROGRAM PARAMETERS IN FORMULAS FOR CONSUMPTION CHANGES

Symbol	Description	Estimate		
		Public Housing	Housing Allowances	Unrestricted Cash Grants
<i>m</i>	Program unit market rent (per program dollar)	0.734	1.814	1.841
<i>v</i>	Nonprogram unit market rent (per program dollar)	0.680	1.680	1.768
<i>c</i>	Participant contribution to rent (per program dollar)	0.392	0.970	1.952
<i>h</i>	Increased housing consumption by participants (per program dollar)	0.054	0.134	0.073
<i>n</i>	Increased nonhousing consumption by participants (per program dollar)	0.288	0.710	0.816
<i>g</i>	Increased housing consumption by nonparticipants due to anticipation and inertia effects (per dollar of increased housing consumption by participants)	0	0.141	0.021

SOURCE: Parameters *m*, *v*, *c*, *h*, and *n* estimated from data in Tables 2.3 and 2.4 of the present report. Parameter *g* estimated from Table 4.1 in Mulford et al., *Housing Consumption in a Housing Allowance Program*, The Rand Corporation, R-2779-HUD, forthcoming.

NOTE: The first five parameters are related by  $h = m - v$  and  $n = v - c$ ; see Fig. 2.1.

Appendix C  
SENSITIVITY OF CONCLUSIONS TO PRICE ELASTICITIES  
OF SUPPLY AND DEMAND

This report's conclusions about program-induced changes in housing and nonhousing consumption depend on estimates of the price elasticity of rental housing demand,  $S$ , and the price elasticity of housing supply,  $Y$  (see the formulas in Tables B.1 and B.2). The estimates of those elasticities,  $S = 0.5$  and  $Y = 11.3$  come from a forthcoming report and will not be derived here, although we analyze the sensitivity of this report's conclusions to those estimates.

The estimated price elasticity of demand is the result of a literature review showing  $S = 0.5$  as the central tendency of many separate estimates. Almost all the studies report estimates lying between 0.2 and 0.8.

The estimated price elasticity of supply,  $Y = 11.3$ , is the result of an analysis of cross-sectional Annual Housing Survey (AHS) data from 59 metropolitan areas. The 95 percent confidence interval estimate of the supply elasticity is 7.0 to 23.0.

Table C.1 shows the result of varying the demand elasticity from 0.2 to 0.8 and the supply elasticity from 7.0 to 23.0. Each panel of the table was constructed using the formulas for total consumption changes given in Tables B.1 and B.2.

Comparing the bottom panels with the top panel, we find that varying the estimates of the demand and supply elasticities over the indicated ranges does not change this report's qualitative conclusions. In all five panels of the table, the housing allowance program yields more housing benefits (per assistance program dollar) than either the public housing or the unrestricted cash grant program. Also, in all five panels the unrestricted cash grant program does best on nonhousing benefits (per program dollar) and the housing allowance program does second best.

If we restrict attention to the housing benefits, the analysis becomes simple enough for an exhaustive sensitivity analysis in a single diagram. Using the formulas for total housing consumption changes in

Table C.1

CONSUMPTION CHANGES UNDER ALTERNATIVE  
SUPPLY AND DEMAND ELASTICITIES

Type of Consumption	Consumption Changes per Assistance Program Dollar		
	Public Housing	Housing Allowances	Unrestricted Cash Grants
<i>Actual Supply and Demand Elasticities<sup>a</sup></i>			
Housing	.083	.146	.071
Nonhousing	.317	.685	.811
Total	.400	.831	.882
<i>Low Supply Elasticity, Low Demand Elasticity<sup>b</sup></i>			
Housing	.073	.149	.072
Nonhousing	.354	.674	.806
Total	.427	.823	.878
<i>Low Supply Elasticity, High Demand Elasticity<sup>c</sup></i>			
Housing	.124	.137	.067
Nonhousing	.305	.687	.813
Total	.429	.824	.880
<i>High Supply Elasticity, Low Demand Elasticity<sup>d</sup></i>			
Housing	.060	.152	.074
Nonhousing	.311	.686	.812
Total	.371	.838	.886
<i>High Supply Elasticity, High Demand Elasticity<sup>e</sup></i>			
Housing	.077	.148	.072
Nonhousing	.294	.690	.814
Total	.371	.838	.886

SOURCE: Tables 2.3, 2.4, B.1, and B.2.

NOTE:  $S$  = price elasticity of rental housing demand,  
 $Y$  = price elasticity of rental housing supply.

$${}^a Y = 11.3, S = 0.5$$

$${}^b Y = 7.0, S = 0.2$$

$${}^c Y = 7.0, S = 0.8$$

$${}^d Y = 23.0, S = 0.2$$

$${}^e Y = 23.0, S = 0.8$$



Tables B.1 and B.2 (and using the parameter estimates in Table B.3), we find that the total housing consumption increases caused by the alternate assistance programs are functions of the ratio of the supply elasticity to the demand elasticity,  $Y/S$ . Figure C.1 shows how total housing consumption in the three housing assistance programs varies with that ratio.

The dots in the figure indicate program performance under our point estimate of the demand and supply elasticities ( $S = 0.5$ ,  $Y = 11.3$ , so that  $Y/S = 22.6$ ). There, the housing allowance program does the best job of producing housing benefits (per program dollar) and the public housing program does second best.

If the ratio of supply elasticity to demand elasticity were greater than 35.7, then the unrestricted cash grant program would yield more housing benefits than the public housing program. That result could be true because the highest ratio in our sensitivity analysis is  $Y/S = 76.7$  (the consequence of  $S = 0.3$  and  $Y = 23.0$ ).

If the ratio of supply elasticity to demand elasticity were lower than 7.4, then the public housing program would yield more housing benefits (per program dollar) than the housing allowance program. That result is not likely because the lowest ratio in our sensitivity analysis is  $Y/S = 10.0$  (the consequence of  $S = 0.7$  and  $Y = 7.0$ ).

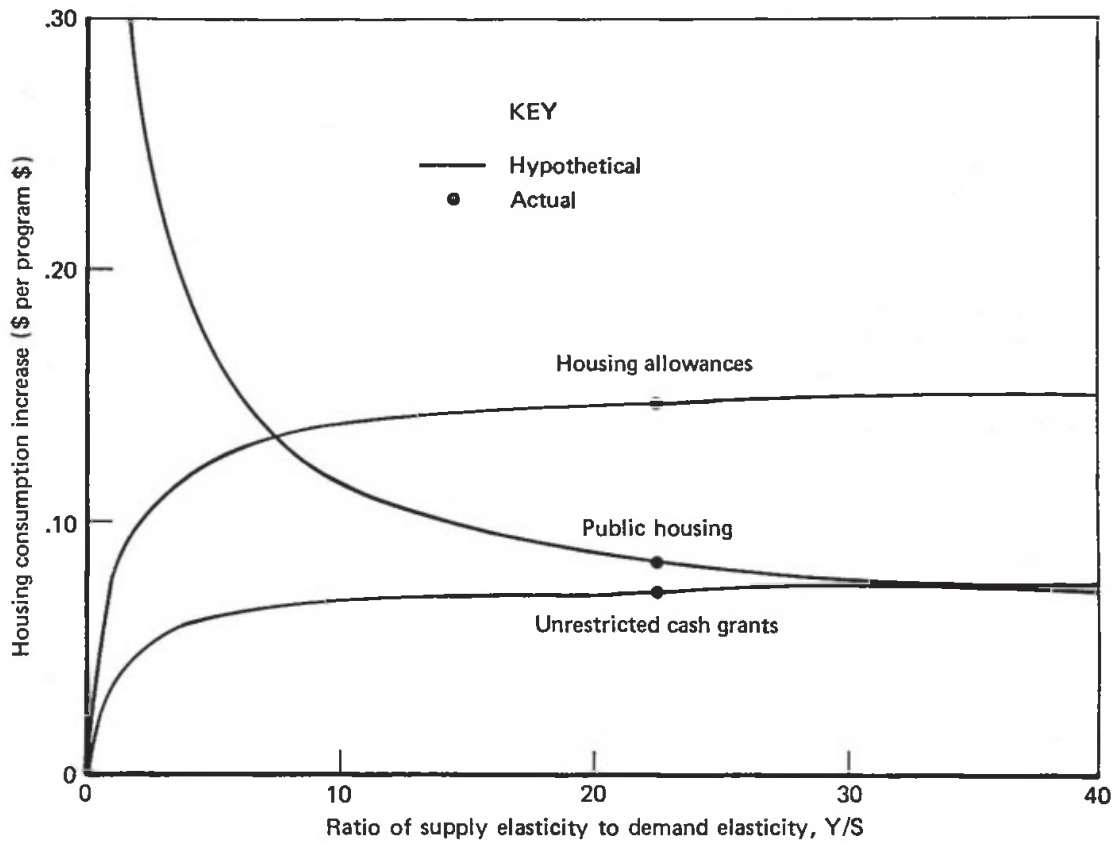


Fig. C.1 – Housing consumption increases caused by alternate housing assistance programs under varying ratios of supply elasticity to demand elasticity



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