Chapter 7

HOUSING SUBSIDIES

Effects on Housing Decisions, Efficiency, and Equity

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1. Introduction

1.1. The U.S. housing stock

From virtually every point of view, housing is an important commodity. In 1981, the value of the net stock of residential capital in the United States was over a trillion dollars, measured in 1972 dollars. (See Table 1.1.) Although it is difficult to summarize in a single measure the quality of this stock, most experts agree that in general it is very high.[1] In 1980, for example, only 2.7 of the housing units lacked some or all of their plumbing facilities. Similarly, overcrowded housing which is characteristic of many countries does not appear to be a widespread problem in the U.S. In 1978, the median number of persons per owner-occupied unit was 2.6; for renter-occupied units of the figure was 2.0.[2] In 1980, only 4.5 of housing units had more than 1.01 persons per room.[3]

The flow of resources into housing continues to be large. In 1983, about 43% of expenditures on fixed total investment went into the residential capital stock. (See Table 1.2.) For the past two decades, the total value of housing output has been between nine and ten percent of gross national product.[4] For purpose of comparison, Table 1.3 shows the ratio of residential investment to total fixed investment in a number of countries. The U.S. does not appear to be an outlier.

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[1] See, for example, Aaron (1972, p. 30).
[2] U.S. Bureau of the Census (1982, p. 751).
[3] U.S. Bureau of the Census (1982, p. 754).
[4] U.S. Bureau of the Census (1982, p. 750).

Handbook of Public Economics, vol. I, edited by A.J. Auerbach and M. Feldstein

Table 1.1
U.S. net private residential capital stock (selected years, measured in 1972 billions of dollars).[a]

1960	1965	1970	1975	1981
593	711	818	964	1107

[a]*Source*: U.S. Department of Commerce, Bureau of the Census, *Statistical Abstract of the United States 1982–83*, 1982, p. 750.

Table 1.2
U.S. net fixed total investment and residential investment (selected years, measured in 1972 billions of dollars).[a]

	1960	1965	1970	1975	1980	1983[b]
Net fixed total investment	37.9	65.4	58.7	40.8	63.1	51.7
Residential investment	20.3	26.0	21.0	17.8	18.7	22.2

[a]*Source*: *Economic Report of the President*, February 1984, p. 239.
[b]Preliminary.

Table 1.3
Ratio of residential investment to fixed total investment (selected countries, 1980).[a]

Australia	0.33
Canada	0.17
France	0.25
Sweden	0.24
United Kingdom	0.15
United States	0.26

[a]*Source*: Computed from figures in Organization for Economic Cooperation and Development, *Quarterly Accounts Bulletin, 1967–81*, 1981.

1.2. Government and housing

The American housing market is subject to a mind-boggling array of government interventions by various levels of government.[5] These include: housing codes,

[5]The best source for an overall view of government housing policy remains Aaron's (1972) classic work.

which set quality standards that must be met by builders; licensure of real estate brokers and sales people; exclusionary zoning, which stipulates that land in a given area can be used only for certain purposes; open housing laws, which prohibit discrimination in the selling of housing; rent control; interest rate and other regulations on mortgage lending institutions; urban renewal programs, under which communities use their powers of eminent domain to acquire urban land, destroy "slums", and sell the land to private developers; real estate taxation; and interventions in the credit market to increase the flow of credit to housing (e.g., the Federal Home Loan Bank Board).[6]

This essay focuses on what are probably the two most important federal policies toward housing, at least in terms of costs to the government.[7] The first is not even explicitly a housing program. It consists of certain provisions of the federal income tax code which have the effect of lowering the costs of owner-occupied housing.[8] The second is the provision of housing for low-income families at rents below cost. Both programs subsidize the consumption of housing, the first mostly for middle- and upper-income groups, the second mostly for the poor. We will examine how each affects economic behavior, efficiency, and the distribution of real income.

As will be seen below, a number of countries have similar policies. Although most of our attention will be devoted to the American experience, some international comparisons will also be made.

1.3. Rationalizations for government intervention

Despite the fact that housing markets tend to be fairly competitive [see Mills (undated)], it has been suggested that government action is required for reasons of efficiency as well as equity. Each of these is discussed in turn.

1.3.1. Efficiency arguments

The most frequently encountered efficiency argument concerns externalities in housing consumption. When an individual improves his property, it increases the value of this investment. Simultaneously, the improvement may increase neighbors' property values. However, an individual's calculation of whether or not to undertake an improvement takes into account only the effect on his investments,

[6]See Congressional Budget Office (1981) for a concise description of these mortgage programs.
[7]See Aaron (1972, p. 162).
[8]As noted below, there are also favorable provisions for owners of rental housing, but these are not very large in comparison to those of owner-occupiers.

not those of his neighbors. Thus, the marginal social benefits of the improvement exceed the private marginal costs, and the "rational" property owner is likely to invest less than a socially efficient amount.

As a theoretical matter, it is hard to doubt that within a neighborhood, some kind of property value interdependence exists. But it is equally doubtful that all housing investments generate such externalities. Presumably, some such as painting outside walls create spillover effects. Others, such as painting interior walls, do not. The usual Pigouvian analysis requires that subsidies be targeted specifically at those activities that produce the externalities. It is pretty certain that the federal subsidies for owner-occupied housing, which in effect lower the cost of housing in general, are inefficient.

The empirical evidence for the existence of quantitatively significant spillovers is weak. One would expect, for example, that if externalities were important anywhere, it would be in the slums, where housing density is very high. Mills (undated, p. 15) notes that the presence of substantial externalities should provide a strong incentive for single ownership of neighboring dwellings in such neighborhoods. No such tendency appears to exist. Similarly, the literature reviewed by Muth (1973, p. 35) indicates that the removal of slums and their replacement by public housing does not have much of an impact upon the values of surrounding properties. To the extent such effects are present, they are probably due to the community facilities associated with the public housing (e.g., playgrounds), rather than the removal of slum dwellings *per se*.

Another externality sometimes mentioned is the "social cost of slums". The notion is that poor housing does more than merely lower neighborhood property values. It breeds crime, delinquency, fires, disease, mental illness, etc. [Weicher (1979, p. 491)]. It seems reasonable to believe, however, that it is the poverty associated with poor housing, rather than the housing *per se*, that causes these costly social problems. [See Mills (undated) or Aaron (1972, p. 22).]

A quite different efficiency argument is that federal subsidies for housing merely offset biases against housing consumption which are induced by local property taxes. The soundness of this view depends upon one's view of the role of the property tax. To the extent that it is an excise tax on housing, the view has some merit. However, if the property tax is just a fee for services provided by the community, then it is really not a distortion. Such a notion is consistent with the "Tiebout model", in which households shop around for the community whose bundle of public services best suits their needs, and property taxes finance these services.

The Tiebout benefit-tax result holds exactly only under very restrictive assumptions. Mills (undated) has argued that suburbs are more likely to satisfy the conditions required for a Tiebout equilibrium than inner cities, in part because suburbanites have more mobility than their urban counterparts. Thus, the notion

of a federal housing subsidy as an offset to a pre-existing distortion is probably more relevant to inner cities than suburbs. Again, it is hard to justify subsidies for owner-occupied housing on this basis.

1.3.2. Equity arguments

Housing subsidies can also be rationalized in terms of redistributional goals. By providing subsidized housing for the poor, a more egalitarian income distribution can perhaps be achieved. It is hard to see the relevance of this point for subsidization of owner-occupied housing, because the incidence of owner-occupation increases with income. (See Section 3 below.) Egalitarian arguments cannot so easily be dismissed in the case of subsidized housing for low-income individuals. But here a puzzle arises. It is well-known that if the government's sole objective is redistribution, and the recipients' preferences are paramount, then using cash to redistribute income is more efficient than a subsidy, in the sense that the same utility level for the recipient can be reached with a smaller cash outlay.[9]

If this is the case, how can one account for the prevalence of subsidies and in-kind transfers? If the donor cares not only about the beneficiary's utility level, but the composition of the latter's consumption bundles as well, then inducements for the beneficiary to consume certain commodities may be efficient. Alternatively, attitudes toward housing may be influenced by "commodity egalitarianism", the notion that "society" cares not only about the distribution of income *per se*, but also about the distribution of certain "necessary" commodities [see Tobin (1970)]. In 1949 the U.S. Congress set as a national goal "... a decent home and a suitable living environment for every American family" [Weicher (1979, p. 470)].

Nichols and Zeckhauser (1981) have suggested another possible rationalization for in-kind transfers. Suppose that it is difficult for the welfare authorities to determine who is qualified for a program and who is not. In other words, "welfare fraud" is a possibility. In the Nichols–Zeckhauser model, in-kind transfers of inferior goods may discourage some impostors from applying for welfare. By forcing the "truly needy" to consume a certain bundle, consumption efficiency is reduced. But program efficiency increases, because the money is better targeted. The optimal design of transfer packages requires taking both kinds of efficiency into account.

It is hard to know how important any of these considerations are in determining policy. Perhaps it is the high visibility of housing that leads people to view it

[9] This argument is discussed more formally in Section 4.2. As usual it applies strictly only in the absence of other distortions of competitive market price.

as a "problem" that must be dealt with publicly. In any event, many economists find public policies based upon such paternalistic principles to be quite unattractive from a philosophical viewpoint. Indeed, Mills (undated) has suggested that in the U.S., official paternalism toward low-income groups may be tinged with racism – the poor are disproportionately black, and there is an underlying expectation that they cannot be expected to manage their lives without help.

Another explanation for the existence of low-income housing subsidies is political. An in-kind subsidy tends to help not only the beneficiary, but also the producers of the favored commodity. Thus, a transfer program that increases the demand for housing will tend to benefit the building industry, which will then lend its support to a coalition in favor of the program. As indicated in Section 4.1 below, housing programs for the poor have focused on the construction of new units, thus benefitting the housing industry rather directly.

It is also important to note that unlike cash transfers, the administration of a public housing program requires substantial amounts of resources. (Contracts must be arranged, standards set and enforced, etc.) According to most theories of bureaucratic behavior [see, e.g., Niskanen (1971)], one would therefore expect public employees to put their political support behind low-income housing programs. In 1977, when welfare reformers proposed that subsidized housing be phased out and replaced with cash grants, the Department of Housing and Urban Development (H.U.D.) was in vigorous opposition [Weicher (1980, p. 51)].

1.3.3. Summary and evaluation[10]

The main efficiency argument for subsidizing housing is the existence of externalities. However, the mechanisms through which these externalities work are not well understood and there is little evidence that they are quantitatively important. The redistributive rationalization is equally weak. To the extent that society seeks to distribute income to the poor, the subsidies to owner-occupation are perverse, because as will be seen below, they benefit mainly the middle- and upper-income classes. The in-kind subsidies involved in low-income public housing are inefficient in the sense that the poor could be made better off if the transfers were made directly in cash. Paternalism and political considerations seem to be the sources of this policy.

[10] We have discussed housing policies in terms of the traditional goals of equity and efficiency. It has been argued that public housing can be an effective means of alleviating racial discrimination in housing. [See, e.g., Sumka and Stegman (1978, pp. 409–410).] Even if it does have some efficacy, however, the question is whether or not there are more efficient ways of achieving this end.

2. Methodological issues

The theoretical considerations of the last section left unanswered many important *empirical* questions that surround housing policy. It may be, for example, that even if the policy is inefficient on *a priori* grounds, the actual magnitude of the distortions is small. Similarly, without examination of the data, one cannot assess the distributional effects of the policy.

In order to investigate such issues, one must first understand how the consumers and producers of housing make their decisions. Some special aspects of housing as a commodity make it difficult to use the standard theoretical and econometric tools. Because these difficulties crop up in virtually every empirical study of housing, we discuss them now all together, rather than later on a piecemeal basis.

2.1. Specifying a model

In general, the effect of a housing policy is to change the price of housing services facing a household, and perhaps its disposal income as well. [For example, a subsidy at rate s would change the effective price of housing services from its initial value, say p_h^0, to $(1-s)p_h^0$).] Therefore, given price and income elasticities, one can predict individuals' responses to given policies. These considerations suggest the following strategy: Employ appropriate econometric techniques to estimate the demand and supply for housing services, using either cross-sectional or time series data. This yields a set of the relevant elasticities. Then, assuming that people would react to the price and income differences generated by the policy in the same way as those generated "naturally", use the elasticities to estimate the program's impact on behavior. We discuss problems in estimating demand and supply functions, and then turn to the influence of the market environment upon the results.

2.1.1. Demand[11]

Empirical investigators typically begin by specifying a model that relates the quantity of housing services demanded for the ith observation (Q_{hi}^{D}), to some function $f(\cdot)$ of price (p_{hi}), income (Y_i) and a vector of demographic variables Z_i that theoretical considerations suggest might be relevant,

$$Q_{hi}^{D} = f(p_{hi}, Y_i, Z_i). \tag{2.1}$$

[11] For a useful survey of the results of housing demand studies, see Mayo (1981).

In some cases $f(\cdot)$ is specified in an *ad hoc* but convenient form such as log linear [Polinsky and Ellwood (1979)], while other times it is derived from maximization of an explicit utility function [Abbot and Ashenfelter (1976)], which is also chosen on the basis of convenience.

Equation (2.1) is deterministic, so the next step is to posit some stochastic specification. Usually, an error term is appended additively. Given a set of observations on Q_{hi}, p_{hi}, Y_i and Z_i and the stochastic specification, the model's parameters can be estimated using a variety of econometric techniques. The behavioral elasticities implied by the parameter estimates can then be used to predict the effects of policy changes. Alternatively, one can obtain such predictions by substituting the new values for price and income directly into equation (2.1).

There are several problems with this standard approach:

(1) Economic theory puts very few constraints on the form of $f(\cdot)$, so the investigator must make an essentially *ad hoc* choice with respect to the specification of either the demand or utility function.

(2) It must be assumed that $f(\cdot)$ is identical across individuals.[12] [When time series data are used, the analogous assumption is that $f(\cdot)$ does not change over time.]

(3) Demand functions like (2.1) ignore the dynamic nature of housing decisions. Because these decisions are made in a life cycle context, expected future prices and incomes as well as those of the current period are relevant. [See Henderson and Ionnides (1983) or Weiss (1978).]

(4) Observations on p_{hi} are never directly observed. Only $p_{hi} \times Q_{hi}$ – the value of the dwelling – is observable.

(5) For many owner-occupiers, housing is not only a consumption item, but an investment as well. To the extent this is the case, the theory of portfolio behavior suggests that the demand for housing depends upon the joint distribution of the returns from housing and other assets. Even those econometric studies discussed below which explicitly recognize the investment nature of housing decisions have failed to take into account this consideration.

(6) It must be assumed that the fitted relationship will continue to apply when a right-hand side variable for a given observation changes. For example, if an investigator using cross-sectional data finds that $(\partial Q^{D}/\partial Y_{hi})(Y_{hi}/Q_{hi}^{D})$ is less than one, it does not imply that increasing a particular family's income ten percent will increase its housing consumption by a smaller percentage. All that one really

[12] Note that this need *not* imply that the elasticities be identical across individuals; such will be the case only for the very simple Cobb–Douglas specification. One can also specify a random coefficients model, which allows for a distribution of elasticities across people. See King (1980).

learns is that in the data, poorer families devote a larger fraction of their income to housing than richer families, *ceteris paribus*. Only by *assuming* that poorer families would act like the richer ones if their incomes were increased, and *vice versa*, can one give any behavioral significance to elasticity estimates from regressions.

Moreover, most of the studies using cross-sectional data to examine housing demand implicitly or explicitly assume that all agents are in equilibrium.[13] Were not this the case, then a regression of housing services on price, income, and demographic variables could not be interpreted as a demand equation. On the other hand, analyses of longitudinal and time series data often allow for the possibility that at a given point in time, households may not be at their long-run equilibrium positions, because adjustment costs make it prohibitively expensive to respond immediately to changes in economic environment.

It is usually assumed that such a disequilibrium is eliminated over time as households move gradually to their equilibrium positions [e.g., Rosen and Rosen (1980)]. Such models lack a strong choice theoretic foundation, but tractable alternatives are lacking. Venti and Wise (1982) measure transactions costs by including them as a random parameter in a model of moving decisions. Their results confirm earlier conjectures that these costs are large relative to income ($60 per month in a sample of low-income households whose median monthly income was $320.)

2.1.2. Supply

A popular approach for studying the supply of housing is to assume some housing production function, estimate its parameters, and use them to infer the shape of the supply function.[14] For example, Ingram and Oron (1977, p. 284) assume that housing services are a constant elasticity of substitution (C.E.S.) function of "quality capital" and "operation inputs". Polinsky and Ellwood (1979) also posit a C.E.S. production function, but assume that its arguments are land and capital. Follain (1979) and Poterba (1980) eschew selection of a specific form for the production function, and instead start by postulating supply functions that include the price of housing input costs as arguments. (Of course, duality considerations suggest that one can work backward from the supply curve to the underlying production function.)

The specification of the underlying technology can sometimes predetermine substantive results. For example, since Polinsky and Ellwood (1979, p. 210)

[13]An important exception is King (1980), which is discussed below.

[14]Given the production function and input prices, one can derive the marginal cost schedule which, under competition, is the supply curve.

assume constant returns to scale, the implied long-run supply curve of housing services is perfectly elastic, regardless of parameter estimates.[15] Postulating such a technology, then, guarantees the result that policies that affect housing demand will have no effect on the long-run producer's price of housing services, at least as long as input prices remain unchanged. The interesting questions then become how high do prices rise in the short run, and how much time is required to reach long-run equilibrium?

Various approaches have been used to model the process of adjustment to the new equilibrium. Ingram and Oron (1977, p. 292) assume that the most a landlord can invest each period is limited to the amount of cash generated by the existing investment, even if this is insufficient to close the gap between the desired and actual housing stock. Poterba (1980) argues that the supply of housing may be affected by conditions in the credit market, and summarizes these by the flow of savings deposits received by savings and loan associations. He also assumes a delayed supply response to changes in all right-hand side variables, which are entered in polynomial distributed lags [Poterba (1980, p. 10)].

2.1.3. Market environment

In microeconometric studies of demand or supply, the key question is how individual units react to exogenous changes in their budget constraints. No explicit consideration of the market environment is usually taken. To understand overall effects, however, the question of market structure is crucial – the impact of a given housing policy will depend upon its effect upon the market price of housing, which will in turn depend *mutatis mutandis* upon the degree of competitiveness in the market, the amount of slack existing when the program is initiated, the extent of housing market segmentation, etc.

The standard assumption is that competition prevails. As de Leeuw and Struyk (1975) and Poterba (1980) note, however, even given competition, complications arise because *two* markets have to be equilibrated by the price of housing services: the market for existing houses and the market for new construction. The situation increases in complexity when one takes into account the multiplicity of tenure modes. Each type of housing is traded in its own submarket, and each of these (interrelated) markets has its own clearing price. If the housing market is

[15] The assumption of a horizontal supply curve is quite common, e.g., see DeLeeuw and Struyk (1975, p. 15). Of course, to the extent that input prices change with the size of the housing industry, the long-run supply curve will have a non-zero slope.

non-competitive, the question of supply effects is even more difficult because of the absence of a generally accepted theory of price determination.[16]

In practice, most econometric investigations of the issues discussed in this essay ignore such considerations. As will be seen below, attention tends to be focused upon the estimation of demand curves. It is usually assumed that the housing market is perfectly competitive, and that the long supply curve of housing services is infinitely elastic.[17]

2.2. Measuring quantity and price

Our discussion of model specification suggests that accurate measurement of the quantity and price of housing services is crucial. This is a very difficult task, because housing is intrinsically a multi-dimensional commodity – a dwelling is characterized by its number of rooms, their size, the quality of construction and plumbing, etc. It is therefore not obvious how to summarize in a single number the quantity of housing services generated by a given dwelling. Usually it is assumed that the amount of housing services is proportional to the rent paid, or, in the case of an owner-occupied dwelling, to the value of the house. [See, e.g., Polinsky and Ellwood (1979).] A problem here is that the rental value of a dwelling at a given time may reflect characteristics of the market that have nothing to do with the quantity of housing services actually generated. As King (1980) points out, for example, the special income tax treatment of rental income will generally influence market values.[18]

An alternative tack would be to abandon the possibility of summarizing housing services in a single variable, and instead to estimate a series of demand functions for various housing attributes. An immediate problem is the absence of observable market prices for attributes. Recently, Witte et al. (1979) have implemented the suggestion of Rosen (1974) that attribute demand equations be estimated in a two-step process: (1) estimate the implicit attribute prices from an

[16]An example of the use of a non-competitive framework is Rydell (1979), who attempts to explain the insensitivity of housing prices to apparent variations in market tightness by recourse to a theory of monopolistic competition.

[17]An exception is Englund and Persson (1982). In their simulation model of the Swedish housing market, they assume that the supply of housing services is perfectly inelastic.

[18]Other problems with the concept of housing services are discussed by Diamond and Smith (1981).

hedonic price equation[19] for housing; and (2) use these prices as explanatory variables in regressions with attribute quantities as the dependent variables. However, Brown and Rosen (1982) have shown that major statistical pitfalls are present in this procedure, and that the validity of Witte et al.'s results is therefore in question. Although some progress is being made in dealing with these problems [see Quigley (1982)], the approach that continues to predominate is to measure the quantity of a dwelling's housing services by its market value (if it is owner-occupied) or otherwise by its rental value.

Because the price of housing services is housing expenditures divided by the quantity of housing services, the above noted difficulties in measuring the latter are bound to create problems in measuring price. Several possible solutions are found in the literature. A popular approach is to estimate hedonic price equations for different cities, and use them as the bases for a housing price index. However, Alexander (1975) has pointed out several problems with this approach. One of the most important is that the selection of a set of attributes to be included in the hedonic price index must be decided on *ad hoc* grounds, but the substantive implications of the estimates often depend upon the choice made.

Further difficulties in measuring price are caused by the fact that even within a given housing market, the price per unit of housing services may not be a constant. Struyk et al. (1978) have argued that one of the key characteristics of urban housing markets is the existence of submarkets, each of which has different prices per unit of housing services. (Such differences might exist because of residential segregation.) Most empirical studies, however, continue to assume that any given city is characterized by a single (pre-tax) price of housing.

2.3. Measuring "shift" variables

In order to obtain unbiased estimates of demand and supply parameters, one must also take into account variables other than price that might be affecting decisions. On the demand side, probably the most obvious candidate is income. Standard theoretical considerations suggest that for income a permanent rather than annual measure should be used. It is not obvious how to compute permanent income, and investigators have dealt with the problem in various ways. Carliner (1972) and Rosen (1979), analyzing longitudinal data, take an average of several year's worth of annual income. Struyk (1976) uses the fitted value of a regression

[19]A regression of the price of a commodity R on its characteristics (a vector X) is the basis of an hedonic price index for the commodity. The implicit price of the ith characteristic is $\partial R/\partial X_i$. See Rosen (1974).

of income on a set of personal characteristics as his permanent income measure.[20] In time series analyses, a distributed lag on income is often used. [See, e.g., Hendershott and Shilling (1980).]

With respect to the selection of other shift variables, investigators have to make arbitrary decisions with respect to which ones to chose, their measurement, and how they interact with the other variables. Typical candidates for inclusion are race, sex and head of household, age, number of children, etc.

On the supply side, theory suggests that input prices are important variables. There are serious problems involved in obtaining operational measures of housing input costs. For example, Poterba (1980) uses the Boeckh index of the price of inputs for a new one-family structure to measure construction costs. Although this is a commonly used index, it is well-known that it is deficient because fixed weights are used in its computation. Ingram and Oron (1977) use the fuel component of the consumer's price index to account for the price of all operating inputs, but as Rothenberg (1977) points out, it is not clear that this index captures all the needed information.

2.4. Summary

The quandries facing students of housing are similar to those who seek to explain other kinds of complicated economic behavior (e.g., the determinants of business investment). Although it is easy to carp about the simplifications made by econometric investigators, compromises are required in order to obtain tractable models. On the other hand, in light of the serious methodological problems, one must regard substantive conclusions regarding policy with a very critical eye.

3. Housing behavior and the federal income tax

In this section we discuss: (1) the key provisions of the income tax code that pertain to housing; (2) how the provisions change the effective cost of housing; (3) the impact of these cost changes upon individuals' housing decisions; (4) the implications of these changes for economic efficiency and equity; and (5) some proposals that have been made for reform.

[20] Neither the necessity of using a permanent income measure nor the types of solutions just mentioned are unique to the study of housing; they appear throughout the literature on the estimation of demand functions.

3.1. Housing related tax provisions

Exclusion of net imputed rental. The U.S. federal tax code does not require that the net value of the services received by owner-occupants from their homes be included as taxable income. If these same units were rented out, the income obtained *would* be taxed, after deductions for taxes, interest, maintenance, etc. In other words, because an investment in owner-occupied housing produces in-kind income rather than cash, that income is untaxed.[21]

Deduction of mortgage interest. Tax payers can deduct from taxable income the full value of all interest payments, including the interest on home mortgage loans.[22] The deduction of interest has been a part of the tax law since its inception. At that time (1913), however, consumer interest payments were minimal.

Deduction of local property taxes. Homeowners are allowed to deduct all state, local and foreign taxes paid on real property. This provision, which also dates from the beginning of the code, was based on the idea that such taxes represent a reduction in disposable income. To the extent that local taxes are user fees for locally provided services, this rationalization lacks validity.

Deferral of capital gains on home sales. Excluded from taxable income are any capital gains from the sale of a principal residence when another residence costing at least as much is purchased within two years of the sale of the former one. This provision, introduced in 1951, was a consequence of the view that individuals' decisions to change houses were due to personal reasons or uncontrollable circumstances, as opposed to a profit motive. Therefore, taxation of the capital gain would cause undue hardship.

One-time exclusion of $125,000 capital gains in home sales for taxpayers 55 years of age and older. Provisions to shield elderly taxpayers from potentially heavy tax burdens when they decide to become renters or move to less costly residences were first introduced in 1964. The cut-off age at that time was 65 years and the exemption was available only under special circumstances. In light of this provision and the one concerning deferral just discussed, most investigators have found it safe to assume that for all practical purposes, the tax rate on capital gains from owner-occupied housing is zero.

Exclusion of income from tax exempt mortgage bonds. In 1978 states and localities began to sell tax exempt bonds to private mortgage funds for owner-occupied and rental units at below market interest rates. However, in 1980,

[21] For more detail, see Congressional Budget Office (1981), upon which most of this section is based.

[22] There are certain limitations for interest payments on property held for investment income, but these are not important in the current context. For certain homeowners, it may be more advantageous to take the standard deduction than to itemize. See Hendershott and Slemrod (1983).

Table 3.1

Approximate revenue losses from the special tax treatment of owner-occupied housing (fiscal year 1981, millions of dollars).[a]

Exemption of net imputed rent	16,413
Deductibility of mortgage interest	19,805
Deductibility of property taxes	8.915
Deferral of capital gains	1,110
Exclusion of capital gain for "elderly"	590
Tax exempt bond finance	840

[a]*Source*: Except for the exemption of net imputed rent, the figures are from Congressional Budget Office (1981, p. 7). A study for the Department of Housing and Urban Development estimated that in fiscal year 1979 revenue loss due to the non-taxation of net imputed rent was between $14 and $17 billion. [See Congressional Budget Office (1981, p. 20).] The figure in the table is found by taking $15 billion, and multiplying by 177/163, the ratio of the implicit GNP price deflators for 1980 and 1979.

significant limits were imposed on the issuance of new tax exempt bonds, and issues to finance new single-family housing are now banned beginning in 1983.

Table 3.1 shows some estimates of the foregone tax revenues associated with the various exclusions discussed above. Note that these estimates are based on the assumption that even if the provisions were eliminated, people would continue to make the same housing decisions. As both common sense and the empirical evidence reported below indicate, this is an unrealistic assumption. Nevertheless, the figures in the table at least indicate the orders of magnitude involved. The Congressional Budget Office estimated that if all the tax preferences associated with housing (except exclusion of imputed rent) were eliminated, it would be possible to lower all personal marginal tax rates by 10% without sustaining any revenue loss [Congressional Budget Office (1981, p. 40)].

The main federal tax item concerning rental housing is accelerated depreciation. Owners of rental property may claim accelerated depreciation on their buildings, and amortize construction period interest and real estate taxes over a ten-year period, rather than the full economic life.[23] The Congressional Budget Office (1981, p. 33) estimated that the foregone tax revenues due to the tax treatment of rental housing were about $1.9 billion in 1981, considerably less than those associated with owner-occupation.

[23]For a discussion of other features of the tax treatment of rental housing – recapture provisions, capital gains rules and minimum tax rules – see Hendershott and Shilling (1982).

With respect to tax concessions for housing interest payments, the United Sates is roughly comparable to Western Europe. Fainstein (1980) estimates that the revenue loss as a percentage of gross domestic product in the early 1970's was about 0.3% for Germany, 0.9% for the Netherlands, 1.1% for Sweden, 0.7% for the United Kingdom, and 0.6% for the United States. England, like the United States, levies no tax on imputed rental income (since 1963). On the other hand, some form of imputed net rental is taxed in Belgium, Denmark, Luxembourg, Netherlands, Portugal, Spain, Sweden and West Germany.

3.2. Effects on the cost of housing

Following Aaron (1972),[24] denote R^G = gross imputed rent, R^N = net imputed rent, MA = maintenance, D = depreciation, T = state and local taxes, and MI = mortgage interest. Assume that no changes are expected in either house prices or the general price level. Then by definition

$$R^N = R^G - MA - D - T - MI. \tag{3.1}$$

If net imputed rental were subject to income taxation and a homeowner's marginal tax rate were τ_y, then the tax liability associated with homeownership would be $\tau_y \times R^N$. Under the current regime, the main tax consequences of homeownership are to reduce taxable income by the sum of MI and T, or alternatively, to reduce tax liability by $\tau_y \times (MI + T)$. To find the difference between tax liabilities under the status quo and those which would occur if net imputed rent were taxed, we simply compute

$$\tau_y \times R^N - \left(-\tau_y \times (MI + T)\right) = \tau_y (R^N + MI + T). \tag{3.2}$$

To get a sense for the numerical values involved, assume for simplicity that the mortgage rate and the individual's opportunity cost of capital are the same rate, i; property taxes are a proportion τ_p of house value; and depreciation plus maintenance are a proportion of house value d. Then (3.2) can be written as $\tau_y(i + \tau_p)V$, where V is the value of the house. When the homeowner spends $(i + \tau_p + d)V$ on housing services, he therefore derives tax savings of $\tau_y(i + \tau_p)V$, so the after-tax imputed rent is

$$(i + \tau_p + d)V - \tau_y(i + \tau_p)V = \left[(1 - \tau_y)i + (1 - \tau_y)\tau_p + d\right]V. \tag{3.3}$$

Alternatively, the difference between the pre- and post-income tax costs of

[24] See also Laidler (1969).

housing, expressed as a proportion of the pre-tax cost, is

$$\left(\tau_y\left(i+\tau_p\right)\right)/\left(i+\tau_p+d\right). \tag{3.4}$$

Suppose that $\tau_p = 0.025$, $i = 0.06$, $d = 0.03$, and the individual's marginal tax rate is 0.2. The substitution into (3.4) indicates that the federal income tax lowers the cost of owning by about 15%. For an individual with the same circumstances but a marginal income tax rate of 0.4, the difference would be about 30%. The amounts involved are substantial, and increase with the marginal tax rate, *ceteris paribus*.

Hendershott and Shilling (1982) provide a more detailed analysis of the costs of owner-occupation which is based on the analogy between the cost of housing services and the "user cost of capital" from the literature on the neoclassical theory of investment.[25] Their derivation makes clear exactly what assumptions are required to obtain a simple expression like (3.3). It begins with the notion that in equilibrium, one expects that the present value of the net cash flows from a house will equal the initial equity investment. The positive cash flows consist of the net imputed rent from the house, and a lump sum received at the selling date. The negative cash flows include the after-tax costs of mortgage and property taxes, the selling costs at the date of sale, and the outstanding mortgage debt due at the time of the sale. Hendershott and Shilling assume that

(i) inflation is expected to generate increases in net revenues at rate p, and in housing prices at rate q;
(ii) physical depreciation of the house occurs at rate d;
(iii) the proportion, α, of the purchase price is financed with a mortgage at rate i;
(iv) the house is expected to be sold after N periods, at which time a percentage realtor's fee, ρ, is paid.

Then the equilibrium condition is

$$(1-\alpha)V = \sum_{t=1}^{N} \frac{(1+p-\gamma d)^{t-1}R}{(1+e)^t} - \sum_{t=1}^{N} \frac{(1-\tau_y)\tau_p(1+q-\gamma d)^{t-1}V}{(1+e)^t}$$

$$- \sum_{t=1}^{N} \frac{\zeta_t}{(1+e)^t} + \sum_{t=1}^{N} \frac{\tau_y i L_{t-1}}{(1+e)^t} + \frac{(1-\rho)(1+q-\gamma_s d)^N V - L_N}{(1+e)^N}, \tag{3.5}$$

[25] See, e.g., Jorgenson (1971).

where

V = purchase price of the house, including land,
e = after-tax rate of return available on other investments,
γ = ratio of the value of the structure to the value of the structure plus land,
R = implicit rent during the first period,
τ_y = marginal income tax rate,
τ_p = property tax rate,
ζ_t = mortgage payment in period t,
L_t = mortgage loan outstanding at the end of period t.

Because α is the loan to value ratio, $(1-\alpha)V$ is the equity investment in the house. The sums on the right-hand side are the present values of the stream of imputed rents, the after-tax cost of property taxes, the mortgage payments, the tax savings from interest reductions, and the net "profit" from selling the house. Note that the income tax rate is not included in the last term. This reflects the realistic approximation that the rate on housing capital gains is zero.

Hendershott and Shilling go on to show that if: (i) the mortgage is a standard fixed rate, fixed payment mortgage or if the variable rate is expected to remain at the constant value i through period N; (ii) the holding period is "large" (N approaches infinity); (iii) there are no selling costs ($\rho = 0$); (iv) the net mortgage rate equals the net rate of return available on other investments $[e = (1-\tau_y)i]$; (v) the expected rate of increase in implicit rents equals the expected rate of increase in housing prices ($p = q$); and (vi) the structure to value ratio is 1.0; then

$$R/P = \left[(1-\tau_y)i - q + d + (1-\tau_y)\tau_p\right]V/P. \tag{3.6}$$

where P is the general price level.

The crucial difference between (3.6) and (3.3) is the presence of q, the expected rate of increase in housing prices. When homeowners expect capital gains, it lowers their effective cost of housing. This fact is often ignored in popular discussions of housing markets. The expectation of rising prices is an incentive to buy a house provided that households are not constrained in their ability to borrow in the capital markets.

The fact that housing capital gains are untaxed is reflected by the fact that q is not multiplied by $(1-\tau_y)$. As a result, the decrease in the cost of housing as inflation rises is greater for individuals with high values of τ_y. To see this, assume for simplicity that increases in the inflation rate are matched by increases in the nominal interest rate, i.e., $\partial i/\partial q = 1$. Then taking the derivative of (3.6) with

Table 3.2
User cost of housing (1955–1979).[a]

Year	Owner-occupied		Rental
	$\tau_y = 0.30$	$\tau_y = 0.45$	
1955	0.0563	0.0478	0.0873
56	0.0500	0.0410	0.0803
57	0.0539	0.0446	0.0827
58	0.0591	0.0502	0.0878
59	0.0627	0.0536	0.0921
1960	0.0666	0.0572	0.0989
61	0.0680	0.0589	0.1010
62	0.0666	0.0576	0.0992
63	0.0671	0.0584	0.0988
64	0.0650	0.0563	0.0975
65	0.0596	0.0508	0.0936
66	0.0552	0.0460	0.0907
67	0.0514	0.0418	0.0859
68	0.0455	0.0355	0.0801
69	0.0402	0.0291	0.0786
1970	0.0492	0.0378	0.0927
71	0.0419	0.0313	0.0809
72	0.0407	0.0299	0.0818
73	0.0369	0.0250	0.0866
74	0.0350	0.0223	0.0866
75	0.0241	0.0117	0.0681
76	0.0292	0.0165	0.0801
77	0.0227	0.0093	0.0807
78	0.0177	0.0040	0.0847
79	0.0231	0.0059	0.0867

[a]*Source*: Averages of quarterly figures presented by Hendershott and Shilling (1982).

respect to q yields

$$\partial R/\partial q = -\tau_y.$$

Clearly, even if nominal interest rates increase on less than a one-for-one basis with inflation, the tax advantages associated with the deduction of nominal interest payments will still be greater the higher the tax rate, though the magnitude will be less.

Hendershott and Shilling evaluate (3.5) on a quarterly basis from 1955 through 1979. As usual, some arbitrary decisions have to be made to estimate expected inflation rates. They compute the general expected inflation rate as a 16-quarter distributed lag on current and past rates of change in prices. In Table 3.2 we present annual averages of Hendershott and Shilling's quarterly figures. The first

column is based upon a marginal income tax rate of 0.30; the second of 0.45. The figures make clear that the cost of owner-occupation fell dramatically in the 1970s, a phenomenon due largely to increases in the inflation rate.[26] Note also that the higher marginal tax rate is associated with a low user cost, as expected.

As Hendershott and Shilling note, even this relatively elaborate estimate of the user cost of capital suffers from inadequacies. For example, it does not take into account people's expectations on the future course of tax policy. Neither does it allow for the holding period or depreciation rate to vary with the tax structure. Similar problems, of course, have been encountered in attempts to estimate the after-tax costs of business capital.

Hendershott and Shilling use a similar framework to derive the user cost of rental occupation. (The equilibrium condition takes into account the federal tax provisions for rental housing.) Their calculations are reported in the third column of Table 3.2. Over time, renting has become expensive relative to owning. The implications of this phenomenon are discussed below.

It is common to refer to the tax induced lowering of the relative cost of owner-occupation as an "implicit subsidy" of owner-occupied housing. Alternatively, housing related deductions are viewed as "tax expenditures", items that are exempt from tax but which would be included under a comprehensive tax base. Although we follow this practice, it should be noted that some object to it strenuously. First of all, in order to characterize an item as being "exempt", one must first have some kind of criterion for deciding what "ought" to be included. As is well known, there exists no rigorous set of principles for determining what belongs in income [Musgrave (1959)].

In addition, the tax expenditure concept has been attacked on more philosophical grounds [Jones (1978, p. 53)]:

> "... The tax expenditure concept implies that all income belongs of right to the government, and that what government decides, by exemption on qualification, not to collect in taxes constitutes a subsidy. This... violates a widely held conviction, basic to the American polity... that the income earned by the people belongs to them, not the government."

Characterizing the tax provision discussed herein as a "subsidy" is not meant to carry these ideological implications, but merely to describe their impact on the cost of owner-occupation.

[26] Presumably, if Hendershott and Shilling had used each year's average value of τ_y, rather than keeping it constant over time, an even greater decline would have been evident, given that inflation was pushing people into higher personal income tax brackets. See Hendershott and Slemrod (1983) for a discussion of the problems involved in computing the marginal tax rate relevant for homeownership decisions.

3.3. Effects on behavior

3.3.1. Housing decisions

Laidler's (1969) early attempt to assess the impact of the federal tax treatment of housing upon housing decisions begins with an estimate of its effect upon the cost of housing for each of several income groups. This is done by evaluating expression (3.4) with reasonable values of the appropriate parameters. (All parameters except the marginal tax rate are constant across income goups.) To find the amount of housing demand generated by these tax induced price changes, Laidler assumes a price elasticity of demand of -1.5, a figure consistent with much of the econometric literature completed at the time of his study. He finds that in 1960, the housing stock of \$355,369 million dollars would have been \$60,699 million smaller had imputed rent been taxed.[27] This calculation assumes that the long-run supply of housing services is perfectly elastic, an assumption that is in line with some econometric evidence.

One problem with the Laidler estimates is that the price elasticity used is based upon econometric studies which ignore the impact of taxes upon the relative price of housing. In addition, attention is focused only upon the quantity of housing consumed by owner-occupiers, with no attempt made to incorporate the effect of taxes upon the tenure choice. Subsequent work has attempted to remedy these problems.

Rosen (1979) uses cross-sectional U.S. data from 1970 to estimate jointly equations for the quantity of housing services demanded and the tenure choice. He assumes that the demand for housing services by owners (conditional upon owning) is a translog function in the relative prices of owner-occupied housing and permanent income, with an intercept which depends upon the indiviual's personal characteristics.[28] The price of owner-occupied housing is based upon equation (3.3). A probit equation is used to model the choice between renting and owning. The choice depends upon the relative prices of both owner- and renter-occupied housing, permanent income, and the same set of demographic variables as in the demand function. The two equations are estimated using a statistical procedure which corrects for possible biases associated with the fact that the assortment of people into tenure modes is not random. [See Heckman (1979).]

The results indicate that the price elasticity of demand for owner-occupied housing services evaluated at the mean is -1.0; the income elasticity, about

[27] Laidler (1969, p. 60).

[28] These include age of head of household, number of dependents under age 17 in the family unit, and age and sex of head of household. Permanent income is a four-year average of annual income.

Table 3.3
The effects of taxing net imputed income upon housing decisions (1970).[a]

Gross income group	Status quo house value	Change in house value	Change in % owning
0– 4,000	10,991	−1,254	−2.6
4– 8,000	14,022	−2,549	−3.9
8–12,000	17,856	−3,107	−4.7
12–16,000	21,134	−3,756	−4.9
16–20,000	26,665	−4,343	−5.0
20–24,000	29,893	−4,879	−5.4
24–28,000	36,477	−4,379	−5.1
> 28000	48,031	−4,250	−4.8

[a]*Source*: Rosen (1979).

0.76.[29] The sign of the price–income interaction term is positive, implying that the price elasticity of demand falls with income. The effective price of owner-occupied housing also enters the tenure choice equation with a negative sign, while income affects the probability of owning positively.

The parameter estimates are used to predict how housing decisions would change if net imputed rent were taxable. Such a change would generate a new value of the price owning for each family.[30] (Assuming that the long-run supply curve of housing services is perfectly elastic, the possibility of changes in the pre-tax price of housing services can be ignored.) By substituting these new values into the probit equation, the expected proportion of homeowners under the new regime can be calculated. Similarly, by substituting into the demand equation, the expected amount of housing demanded conditional on owning can be predicted.

The results are shown in Table 3.3. Taxation of net imputed rent produces substantial reductions in the expected amount of owner-occupied housing demanded. Although families in the highest income brackets face greater increases in the price of housing, their demand is sufficiently less price-elastic that their demands actually fall by smaller amounts. The third column shows how the expected percentage of homeowners decreases due to the removal of the tax advantages. The average change in the incidence of owner-occupied housing for the entire sample is 4.4%. In another simulation, Rosen assumes that the removal of the housing tax subsidy is accompanied by a proportional reduction in marginal tax rates so as to keep tax revenues constant. Despite the income effects

[29] McRae and Turner (1981) argue that allowing for the impact of taxes upon factor input ratios in the production of owner-occupied housing would lead to a lower estimates of the income elasticity of demand. Unfortunately, they study only purchasers of homes with mortgages from the Federal Housing Administration (FHA), a rather unrepresentative sample.

[30] Specifically, the price of a unit of housing services would rise from $\$1 - (\tau_y(i + \tau_p))/(i + \tau_p + d)$ to \$1. See equation (3.4).

so generated, there are still sizeable decreases in the quantity of housing demanded and in the percentage of homeowners in each income bracket.

King (1980) studies the impact of taxes on housing decision in the United Kingdom, where, as noted in Section 3.1, the tax treatment of housing is similar to that of the United States. Like Rosen (1979), he examines both the tenure choice and the quantity of services demanded conditional on that choice. In Rosen's analysis the two decisions are modelled in an *ad hoc* fashion, so that there is no guarantee that the estimates are consistent with a single underlying utility function. In contrast, King derives both equations from the same structure of preferences.

Another important feature of King's model is that it allows for the possibility that there is rationing in the choice of tenure modes. In the United Kingdom, essentially three types of dwellings are available: owner-occupied, government-subsidized rental, and unsubsidized furnished rental. Mortgages are not freely available in the U.K., and are rationed among applicants. In addition, admission to the subsidized rental sector is also rationed. King assumes that the household chooses the unsubsidized rental sector only if it is rationed out of the other two.

In King's model, preferences are represented by a homothetic translog indirect utility function,

$$\ln v_i = \ln\left(\frac{y}{p_{gi}}\right) - \beta_1 \ln\left(\frac{p_{hi}}{p_{gi}}\right) - \beta_2 \left(\ln\left(\frac{p_{hi}}{p_{gi}}\right)\right)^2, \tag{3.7}$$

where v_i is the ith individual's utility, y_i is income, p_{hi} is the price of housing services [which is defined using an expression like (3.4)], p_{gi} is a price index for all other goods, and the β's are the utility function parameters. On the basis of a suitable stochastic specification, King computes the probability that each individual will be observed in a given tenure mode as a function of the utility function parameters, and hence is able to deduce the likelihood function. The β's are then estimated by maximum likelihood.

An unusual aspect of King's model is that he does not include any controls for the demographic situation of the family, as is common in most housing demand studies. Income and the relative price of housing are the only explanatory variables. King does assume a "random coefficients" model, i.e., that β_1 and β_2 are to be regarded as means of the relevant distributions.

King estimates the model with the cross-sectional data from 1973–74 for England and Wales. He finds $\beta_1 = 0.1022$ ($s.e. = 0.0008$) and $\beta_2 = 0.0238$ ($s.e. = 0.0009$). Perhaps more useful are the implied price elasticities of demand for housing. Evaluated at the means, the price elasticity of demand for owner-occupied housing is -0.532; for subsidized rental -0.498; and for furnished rental -0.645 [King (1980, p. 156)]. This elasticity for owner-occupation is somewhat less than Rosen's (1979) figure of about -1.0 for U.S. data. King's

analysis does not provide an estimate of the income elasticity, because a value of 1 is imposed by the utility function (3.7).

A disturbing aspect of King's results is that a statistical test of the hypothesis that the utility functions for the discrete and continuous choices are identical is rejected at conventional significance levels. He suggests two explanations for this finding. One is that different spouses are responsible for different parts of the decision, and the two spouses may have different utility functions. The second is that the assumption that rationing probabilities are exogenous results in a serious model misspecification. Presumably, this latter deficiency could be corrected by making the rationing probability a function of some observable demographic characteristics. But it is hard to imagine how to specify a set of characteristics that would affect the probability of rationing but *not* affect the decisions themselves.

In another paper, King (1981) uses his estimates to predict the consequences of taxing the imputed income from owner-occupation.[31] Under the assumption that the increased tax revenues are distributed as a flat rate lump-sum amount to each family, he finds that the taxation of net imputed rent leads to an overall decline in the long-run consumption of housing services of 13.7%. This is not too different from Rosen's results for the U.S.

In the exercise just described, King makes the "standard" assumption of an infinitely elastic supply of housing services. He also does the simulation assuming a price elasticity of supply of 2.0, a value found by Poterba (1980) in U.S. data. In this case, the overall average percentage decrease in housing consumption is 12.2%. This is less than the result obtained in the perfectly elastic case, because part of the removal of the subsidy is offset by a lower pre-tax price. It is interesting to note that departing from the assumption of perfectly elastic supply does not have a dramatic impact on the substantive results.

The studies discussed so far have ignored the impact of (non-taxable) expected capital gains upon housing decisions. This omission is probably a consequence of the fact that cross-sectional data are not well-suited for dealing with such a phenomenon. Rosen and Rosen (1980) use U.S. time series data to study the determinants of the choice between renting and homeownership. In their model, it is assumed that the overall proportion of families who desire to be owners in a given year depends upon relative price of homeowning to renting, per capita permanent income, and a vector of shift variables. They posit a simple partial adjustment model to account for the fact that in a given year, the actual number of homeowners will not necessarily equal the number who desire to own.

The expression for the price of owner-occupied housing used by Rosen and Rosen is essentially expression (3.6). The expected capital gains component of the expression is calculated as the difference between the one-year forward prediction of house value, $\tilde{V}_{t+1}$, and the current value, $\dot{V}_t = \tilde{V}_{t+1} - V_t$. An ARIMA model with one autoregressive and one moving average parameter is used to generate

[31] In these calculations, the tenure choice is assumed to be exogenous to the model.

$\tilde{V}_{t+1}$. The price of renting is simply the rental component of the consumer price index.

The relative price of owning to renting is entered as a polynomial distributed lag, and permanent income is "proxied" by consumption. To take account of the possibility that credit rationing may affect people's abilities to become homeowners, a variable measuring the availability of deposits at thrift institutions is also included.

The model is estimated using annual U.S. data for the period 1949–74. The price term is negative and significant at conventional levels. The coefficient on income is positive and also significant. There is no strong theoretical presumption for a positive effect of real per capita permanent income on the incidence of homeownership, but it crops up in virtually every study. The availability of funds at credit institutions exerts a positive effect on the proportion of homeowners, but this coefficient is not estimated precisely.

To assess the quantitate implications of their results, Rosen and Rosen use them to predict the long-run consequences of changing the tax treatment of housing. More specifically, the price of owner-occupied housing that would prevail in the absence of tax preferences is substituted into the regression and the long-run proportion of homeowners calculated. The model predicts a change in the incidence of owning from 64% to 60% of all households in 1974. Because the income tax provisions related to homeownership only became important with the rise in marginal tax rates associated with World War II, this implies that about one-fourth of the 16% increase in homeownership between 1945 and 1974 can be attributed to these tax factors.

In another time series analysis of the tenure choice in the U.S., Hendershott and Shilling (1982) study quarterly changes in an "adjusted homeownership rate", i.e., an ownership rate adjusted for changes in the demographic structure of the population. The relative cost of owning to renting and real disposable income per capita are the key explanatory variables. The costs of the two housing modes are computed as discussed in Section 3.2 (see the text surrounding Table 3.2). Both variables are entered in third-degree polynomial lags.

Estimating the model with quarterly data for the period 1960.2 to 1978.4, Hendershott and Shilling find a statistically significant response to changes in the relative costs of owning and renting. Long lags appear to be present; the peak response takes place after 12 to 15 quarters. Income has a positive and statistically significant effect on homeownership only when the user cost is based upon a tax rate of 0.30.

The regression coefficients are used to predict what the long-run homeownership rate would have been in 1974 if property taxes and interest payments had not been deductible. Hendershott and Shilling estimate that the incidence of homeownership would have been 59% conditional on the average marginal income tax rate being 15%, and 57.5% conditional on a value of 30%. It is striking

to note the similarity to the result of Rosen and Rosen, despite the differences in model specification and definition of the price of housing services.

3.3.2. Investment decisions

The models discussed above view housing primarily as a consumption good, albeit one whose analysis is particularly complicated because of its durable nature. In addition, housing is a form of investment, and as such, it competes with other assets for a place in people's portfolios. [See, e.g., Henderson and Ioannides (1983).] This aspect of housing has recently received considerable attention in discussions of whether investment in housing has crowded out investment in business capital, and hence contributed to the "productivity crisis".

Empirical resolution of this issue would require joint specification and estimation of housing and physical plant and equipment equations. Unfortunately, even after several decades of careful research on the determinants of business investment, not much consensus with respect to how the process should be modelled has developed. [See, e.g., Sunley (1981).] We discuss, then, a few theoretical and empirical studies whose results are indicative of what might be happening, but are certainly not demonstrative.

To begin, it is important to note the asymmetry in the tax treatment of owner-occupied housing and business investments during inflationary periods. It is sometimes argued that the key to the difference is the fact that owner-occupiers are allowed to deduct nominal rather than real mortgage interest. However, as Summers (1980) points out, this is somewhat misleading reasoning, because nominal interest payments are also deductible on loans taken out to finance other types of investment. Thus, deductibility *per se* does not increase the attractiveness of owner-occupied housing vis-a-vis other forms of investment.[32] The important sources of asymetry are that: (1) in the presence of inflation, depreciation of business investment based on historical costs lowers the real value of depreciation allowances,[33] and (2) owners of physical capital pay tax on nominal rather than real capital gains. Other things being the same, then, increases in inflation increase the effective tax rate on business capital. Thus, inflation raises the relative cost of an investment in business capital to one in owner-occupied housing. When this fact is built into theoretical models which determine the amounts of residential and business investment, the result is predictable – with reasonable parameter values, when inflation increases, the amount of owner-occupied housing relative to business investment goes up. [See Hendershott and Hu (1981), Feldstein (1981), or Muth (1982).]

Summers (1980) notes that an implication of such theories is that, in the short run, an increase in the permanent expected rate of inflation should increase the

[32]A possible exception occurs if ownership of housing relaxes capital market constraints that would otherwise be binding [Summers (1980, p. 2)].

[33]Note that the distorting effect of a *given* level of inflation can be offset by a suitable rate of accelerated depreciation.

market price of housing and reduce the value of the stock market. He regresses the "excess returns" of both the stock market and owner-occupied housing on changes in the permanent expected rate of inflation. The excess return on the stock market during a given period is defined as the ratio of capital gains plus dividends to the beginning of period market valuation, all minus the beginning of period treasury bill rate. The analogous measure for housing is the appreciation in the price deflator for one-family structures less the beginning of period treasury bill rate. (Imputed rent is ignored.) Finally, the expected inflation rate is estimated by assuming that expectations are formed on the basis of an autoregressive moving average process applied to the preceding 10 years of data on inflation.

Summers estimates the regressions with quarterly U.S. data from 1958–78. The results suggest a strong negative relationship of excess stock returns to increases in the expected inflation rate. A 1% increase in the expected inflation rate reduces the value of the stock market by 7.6%. In contrast, a similar increase in inflation increases the value of a house by 1.68%. As Summers (1980, p. 11) emphasizes, these results do not prove that the inflation–taxation interaction has increased residential capital at the expense of business capital. First of all, inflation rates and housing prices generally have moved together over time, while the stock market has moved in the opposite direction. It is therefore dangerous to ascribe a structural interpretation to such regressions. More importantly, the regressions do not even attempt to establish a link between the price changes induced by the inflation–taxation interaction and individuals' investment decisions.

3.3.3. Summary and evaluation

The federal income tax treatment of owner-occupied housing lowers the cost of owner-occupation relative to renting. Studies of housing demand and tenure choice in the United States as well as the United Kingdom (where the relevant tax provisions are similar) suggest that these provisions have had a substantial impact on housing decisions. They induce people to become homeowners and to consume more housing conditional on owning. The interaction of inflation with the tax system has exaggerated these effects. Although there is speculation that the expansion of the housing stock has come at the expense of business capital, not much in the way of econometric evidence is available.

Although considerable progress has been made in explaining housing behavior, much remains to be done. Consider the figures in Table 3.4.[34] Even without any elaborate calculation of the user cost of housing, it is clear from columns 2 and 3 that owner-occupied housing was a good deal in the middle 1970s. The nominal capital gains rates tended to exceed mortgage rates. As a very rough approximation, one could say that owner-occupiers were consuming "free housing" over this

[34] This discussion is based on Rosen (1981).

Table 3.4
Some data on housing for 1973–78.

Year	Median value of owner-occupied housing units (1)	Nominal capital gain rate (2)	New home mortgage yields (3)	Owner-occupancy rate (4)
1973	$24,100	—%	7.95%	0.645
1974	27,200	12.8	8.92	0.646
1975	29,500	8.4	9.01	0.646
1976	32,300	9.4	8.99	0.647
1977	36,900	14.2	9.01	0.648
1978	41,500	12.5	9.54	0.652

[a]*Source:* For years prior to 1977, figures are from Rosen (1981, p. 325). For 1978, columns 1 and 4 are from *Statistical Abstract of the United States, 1981* (pp. 794 and 793, respectively), and column 3 is from *Economic Report of the President 1981* (p. 308). Column 2 is calculated from column 1.

period. Yet column 4 indicates that there was hardly a rush into owner-occupation. The proportion of owner-occupiers moved from just under 0.65 to just above it.

It is not hard to come with explanations for this phenomenon. Transactions costs may inhibit the switch from renting to owning. Rationing in the credit market may prevent individuals from obtaining loans.[35] Jaffee and Rosen (1979) have emphasized the fact that households with different demographic characteristics have quite different homeownership rates, and the proportion of the population of those groups with low rates has been increasing.

Finally, the price figures in the table are *ex post*. *Ex ante*, individuals do not know for sure how much and in what direction prices will move. Presumably, housing decisions depend upon the subjective uncertainty concerning the future course of prices. [See Rosen, Rosen and Holtz-Eakin (1984).] The point is that such potentially important phenomena as these have either been ignored or treated peripherally in most empirical studies of the impact of taxes on housing. As progress on the theoretical and econometric issues in dealing with these problems is made, one can expect more reliable estimates to be produced.

3.4. Efficiency and equity implications

For purposes of estimating efficiency effects, the basic problem is to model the tax law in such a way that the usual techniques for measuring excess burden can be

[35]This possibility is discussed by Kearl (1979).

used. Laidler (1969) recognizes that the tax provisions related to housing introduce a wedge between the effective price of housing services and their marginal cost. Therefore, it can be analyzed like any other distortion. In particular, assuming there are no other imperfections in the system, and given estimates of: (a) individual i's marginal tax rate, τ_{yi}, (b) the proportion of his housing costs which are not subject to tax, δ_i, and (c) the compensated price elasticity of demand, η_i, then the size of the welfare loss 'triangle' is[36]

$$0.5(\tau_{yi}\delta_i)^2 V_i \eta_i. \tag{3.8}$$

Laidler assumes a value of -1.5 for η, and 0.68 for δ. He computes a value of τ_{yi} for each of ten income groups on the basis of Internal Revenue Service statistics. Substituting into equation (3.8), he calculates the excess burden for each group, and then aggregates to find a figure of \$500 million dollars for the year 1960.[37] This is equivalent to about \$50 per household in 1980 dollars.

Rosen (1979) uses the same basic framework for calculating the excess burden on the basis of his estimates, with a few differences: The excess burden is computed on a household basis; a different price elasticity of demand[38] is used for each household (the translog functional form does not constrain the elasticity to be constant); and the behavioral response includes tax-induced changes in the tenure choice. The average annual excess burden for the entire sample for the year 1970 is \$107. In terms of 1980 dollars, this is about \$192.

It is difficult to decide whether or not excess burden of this magnitude should be characterized as "large". Ultimately, the decision to eliminate the excess burden depends upon the social and political costs of doing so.

To assess the distributional effects of taxing imputed rent, Rosen estimates how the disposable income of each household in his sample would change, assuming that each would modify its housing behavior as predicted by his model. In Table 3.5, the first column shows average disposable income for each income group under the *status quo*. Column 2 shows disposable income if net imputed rent is taxed, and the government makes no other adjustments in the tax schedule. Column 3 is based on the assumption that marginal tax rates are adjusted proportionately so as to keep tax revenues the same as they were under the *status quo*. As is well-known, it is impossible to summarize the degree of inequality in any "objective" distributional measure [Atkinson (1970)]. In any case, it appears that the taxation of net imputed rent would tend to distribute income away from

[36] See Harberger (1964).

[37] Laidler (1969, p. 64). This is about \$1.3 billion in terms of 1980 dollars.

[38] The uncompensated price elasticity is converted to the theoretically required compensated version by using the Slutsky equation.

Table 3.5
Disposable income under alternative tax treatment of net imputed rent (1970).[a]

Income group	Status quo (1)	Tax net imputed rent (2)	Tax net imputed rent and maintain constant tax revenues (3)
$ 0–4,000	$ 2,686	$ 2,666	$ 2,675
4–8,000	6,024	5,953	6,018
8–12,000	9,452	9,317	9,478
12–16,000	12,715	12,465	12,736
16–20,000	15,829	15,396	15,795
20–24,000	19,088	18,521	19,086
24–28,000	22,248	21,482	22,208
> 28,000	30,306	28,800	30,186

[a]*Source:* Rosen (1979, p. 20).

high-income groups, although at the very bottom end of the scale disposable incomes would fall by small amounts.

King (1981) uses his estimates of housing demand parameters in the United Kingdom to assess the efficiency and distributional consequences of the tax treatment of housing in that country. Instead of relying upon the usual second-order approximation, he estimates the welfare effects directly using the utility function (3.7). Specifically, King (1981, pp. 8–9) computes each household's "equivalent gain" (EG), the sum of money which it would have accepted under the *status quo* as equivalent to the impact of taxing the imputed rental from owner-occupation. The equivalent gain for the ith individual can be defined algebraically in terms of the indirect utility function,

$$v_i\left(y_i^0 + EG_i, p_{h+i}^0, p_g\right) = v_i\left(y_i^1, p_{h+i}^1, p_g\right),$$

where the superscripts 0 and 1 denote values under the *status quo* and the new regime, respectively, and the other variables are as defined above. King observes that for a tax reform that holds tax revenues constant, the sum of the equivalent gains provides a measure of the efficiency gain to the economy. Given constant revenues, a positive average EG "... is equivalent to a Pareto-improvement combined with a set of lump-sum redistribution among households" [King (1981, p. 9)].

For the sake of contrast, King (1981, p. 7) also computes for each household a "cash gain" (CG), which is just the effect of the reform on the household's cash flow on the assumption that its behavior is exogenous. A comparison of EG and

Table 3.6
Gains and losses from taxing imputed rent in the United Kingdom (£ per week, 1973 prices).[a]

Decile	Mean income	Mean *CG*	Mean *EG*
1	10.77	0.52	0.76
2	17.13	0.34	0.67
3	24.34	0.28	0.58
4	31.39	0.24	0.48
5	37.64	0.13	0.36
6	43.65	0.05	0.24
7	49.43	−0.05	0.14
8	57.07	−0.24	−0.09
9	67.64	−0.40	−0.32
10	103.20	−0.87	−1.15
Overall	44.23	0	0.17

[a]*Source:* King (1981, p. 41).

CG indicates whether or not allowing for endogenous housing decisions has important substantive consequences.

Table 3.6 shows the distribution of gains and losses by income decile for both measures. The reduction in excess burden, which is given by the overall mean value of the equivalent gain, is £0.17 per week, about 0.4 of one percent of mean income. The overall value of the cash gain has to be zero given that it is computed under the assumptions of exogenous behavior and constant tax revenues. The figures indicate that just as in the U.S., non-taxation of net imputed rent has substantial distributional implications.[39] Those with higher incomes would tend to be made worse off by the taxation of net imputed rent, and vice versa.

Of course, the estimates of efficiency and equity effects described in this section can be only as good as the underlying behavioral estimates, so all the *caveats* of Section 2 should be recalled. In addition, several other qualifications deserve attention:

(1) The results all involve comparison of long-run equilibria. The short-run capital gains and losses in housing which might occur between equilibrium positions could have important distributional consequences.

(2) The studies focus on housing as a *use* of income. Presumably, if there were major decreases in the demand for housing, it would have a large effect on the *sources* side of the account as well. The owners of those factors used intensively in the production of housing services would suffer reductions in income. As of yet, such effects have not been integrated into studies of the distributive aspects of the tax treatment of housing.

[39]Patric Hendershott has pointed out to me that comparison of King's results with those of Rosen for the U.S. (Table 3.5) must take into account the fact that Rosen assumes tax revenues are held constant via proportional changes in marginal tax rates, while King assumes a lump-sum rebate.

3.5. *Proposals for reform*

In the absence of clearly articulated goals for U.S. housing policy, it is bound to be difficult to determine how the tax treatment of housing should be changed. If we discount the externality arguments of Section 2, then it would appear that subsidizing owner-occupation is inefficient. Moreover, if we take the evidence on the distributional implications from Section 3.4 seriously, this inefficiency cannot be viewed as "buying" society more equality. Such considerations have lead a number of investigators to suggest that net imputed income should be taxed at the same rate as other sources of income. Thus, for example, Hughes (1980, p. 74) argues that "... the inclusion of imputed housing income in taxable income would be justified under almost any consistent income tax system". From this point of view, the only valid reason for not taxing imputed rent would be administrative difficulties involved in computing it.

This argument is in line with the famous Haig–Simons principle of tax design, which states that an individual should pay tax on his total income regardless of the source. It is often suggested that departures from the Haig–Simons criterion necessarily induce inefficiencies. Clearly, the excess burdens reported in the last section are non-trivial. But the excess burden computation is implicitly based upon a comparison with a lump-sum tax. In practice, such taxes are infeasible. The theory of optimal taxation shows that if lump-sum taxes are excluded, the efficiency maximizing set of tax rates is in general a complicated function of the elasticities of demand and supply for all commodities. [See Sandmo (1976).] It is only in very special cases that one would expect efficiency to require equal rates for all sources of income. On the other hand, it is also highly improbable that the efficient tax rate on imputed rental income is zero. Determination of the appropriate rate has received some attention [e.g., Atkinson (1977)], but remains an important topic for future research.

A number of reform suggestions have been made which maintain the basic structure of the *status quo*, but seek to ameliorate its inegalitarian income distributional consequences. Such a view might be consistent with the notion that there is some merit to the externality argument, but that the subsidy goes too far in helping high-income groups. Alternatively, one might believe that there is no valid externality argument, but that it is politically and administratively impossible to include imputed rent in the tax base. In any case, these reforms focus upon reducing the value of mortgage interest and property tax deductions to upper-income individuals. One possibility would be to put ceilings on the amounts of mortgage interest and property tax deductions, and/or capital gains exclusions. Other proposals would convert the deductions into credits – every homeowner would be allowed to subtract some proportion of interest and property tax payments from his tax liability. In this way, those with higher marginal tax rates would not enjoy an advantage, *ceteris paribus*.

Questions of administrative feasibility lessen the attractiveness of deduction limitations. Unless limitations in the deductibility of mortgage interest were accompanied by a ceiling on all interest deductions, taxpayers could simply secure mortgage loans to other assets. More generally, it is difficult to evaluate such proposals because it is not clear what their objectives are, and what other policy instruments are assumed to be available. If increased efficiency is the goal, why not tax imputed rent at the appropriate rate? If more income redistribution is sought, why not increase marginal tax rates at upper income levels?

So far, our discussion of the equity implications of the tax treatment of housing has focused on distribution of income between upper- and lower-income groups. A number of observers have urged reform because the *status quo* violates horizontal equity, the injunction that equals be treated equally for purposes of tax policy. If there are two identical people, but one owns and one rents, the renter does not obtain the tax advantages of owning.[40] A possible solution to this disparity would be to allow renters either a tax credit or a deduction for part or all of their rent payments.

Evaluation of this suggestion is complicated by the considerable controversy over the question of what horizontal equity really means. [See Feldstein (1976) or King (1983).] Feldstein, for example, has argued that given a fairly reasonable definition of horizontal equity, under certain conditions the tax treatment of owner-occupation is equitable. Specifically, define a horizontally equitable tax system as one that preserves the utility ordering: If two individuals would have the same utility level in the absence of taxation, they should also have the same utility level if there is a tax [Feldstein (1976, p. 94)]. Suppose that individuals' tastes are the same, and they are free to choose between renting and owning. Despite the fact that homeowners are not taxed on the net imputed income from their housing capital, there is no horizontal inequity in Feldstein's sense. As long as tastes are identical, everyone would choose ownership unless the price of houses adjusted to capitalize the tax advantage. Some individuals might choose to rent because (for example) the nature of their employment required a variety of temporary locations. In this case, however, one would expect their earnings to adjust enough to compensate them. Indeed, the surprising conclusion is that any attempts to change the *status quo* would probably *induce* horizontal inequities.

The fact that the opportunity to be a homeowner may be more available to those with high incomes is not *per se* a violation of horizontal equity. "If the opportunity is open to everyone with the high income, it is in effect a reduction in rate progressivity but not a source of horizontal inequity" [Feldstein (1976, p. 95)].

[40] Indeed, if increases in the demand for housing generated by the subsidy to owner-occupiers increases the price of rental housing, renters will be worse off. See White and White (1977).

This analysis relies heavily upon the assumption that tastes are identical. If this is not the case, then *any* tax treatment of housing will create horizontal inequities. It is therefore not clear *a priori* that moving to a system of credits for renters would result in less horizontal inequity.[41]

4. Housing assistance

As we have seen, housing subsidies for the middle- and upper-income groups are implicit in the federal income tax. In contrast, housing subsidies for the poor have tended to be more explicit, often taking the form of public housing provided at below market rents. In this section, we begin by describing briefly the structure of U.S. housing assistance programs, with most of the emphasis on public housing. This is followed by discussions of the program's equity and efficiency implications, and some possibilities for reform.

4.1. Provisions

In the United States, subsidies for the provision of housing to the poor began in 1937. Until very recently, the largest was public housing. Public housing units are developed, owned, and run by local authorities which operate within a municipality, county, or several counties as a group. Up to 1969, the federal government covered the capital cost of the housing, but did not subsidize operating costs, which were paid by the tenants. Since that time, a portion of the operating costs has been subsidized. To obtain finance, the authority sells its own tax exempt and federally guaranteed bonds; the interest and principal are paid by the federal government. By the end of fiscal year 1978, there were 1,173,000 public housing units [Straszheim (1980, p. 170)].[42]

The low-income housing program has been extended and modified many times. We discuss just a few of the key developments in its history.[43]

Section 235, authorized in 1968, provides subsidies for the annual mortgage payments made by low- and moderate-income persons who live in newly built or substantially rehabilitated homes. No new funds have been provided since fiscal year 1981 to finance additional Section 235 commitments.

[41] The difficult problems involved in quantifying the amounts of horizontal equity associated with various tax reforms are discussed by King (1983).

[42] As Murray (undated) has noted, it should not be assumed that this figure represents net additions to the housing stock. It may be the case that to some extent, subsidized housing displaces unsubsidized.

[43] More details can be found in Aaron (1972) or Congressional Budget Office (1982).

In 1969, Congress mandated an important change in the administration of public housing. The rent that could be paid by an eligible family in public housing was limited to 25% of its income, if this was less than the operating cost of the dwelling. This represented a fundamental change in the nature of the federal subsidy, making it income-conditioned as well as cost-conditioned. By 1976, 40% of operating costs were met by subsidies [Weicher (1979, p. 474)].

The turnkey program, also introduced in the 1960's, permitted the local authorities to purchase new, privately built projects. The idea was that by permitting the participation of more developers, construction costs could be reduced. Another attempt to reduce the authorities' participation in building itself was Section 23, the leased housing program (1968), under which local authorities could sign leases with private landlords for existing apartments, with the federal government making available the same subsidy it would for new units.

Section 8 of the Housing Act of 1974 included an important "existing housing and moderate rehabilitation program".[44] Under this program, which involved expenditures of about $1.9 billion in 1982,[45] eligible households search on the private market for housing units. If the dwelling meets certain quality standards and the rent is deemed to be "fair" by the government, then it subsidizes the rent with payments directly to the landlord. (The tenant's rent payment is a fixed proportion of his income, currently set at 25%, but due to rise to 30 percent by fiscal year 1986.) By the end of fiscal year 1978, there were 666,603 housing units covered under Section 8. [See Straszheim (1980, p. 170).]

European programs for low-income housing are qualitatively similar to those of the U.S. Great Britain, Sweden, Germany and the Netherlands also have rent subsidies, management of public housing by special authorities, etc. [Fainstein (1980, p. 216)]. The major difference between the United States and Western Europe concerns the extent of the subsidies. Table 4.1 shows estimates of direct public expenditure on housing and community development as a percentage of gross national product for a group of selected countries in the mid-1970s. Table 4.2 shows the percentage of dwellings completed by private persons. Both tables indicate that the U.S. has relied more heavily on the private market than its European counterparts.

On the other hand, while the amounts spent in the U.S. are relatively small, they are certainly not trivial. The Congressional Budget Office (1982, p. 17) estimated that in 1982 the federal government would spend nearly $10 billion on a variety of housing assistance programs for low- and moderate-income households. The various programs, and particularly public housing, have generated considerable political and academic controversy. The economic literature has

[44] Section 8 also includes a "new construction and substantial rehabilitation" section, which gives financial incentives for developers to house low income families. From the point of view of the inhabitants, this is the same as traditional low-income housing programs.

[45] Congressional Budget Office (1982, p. 17).

Table 4.1
Direct public expenditures on housing and community development as percent of GNP (selected countries, mid-1970s).[a]

United Kingdom (central government, local authorities, public corporations, 1976)	4.1%
Netherlands (central government, 1975)	2.5
Sweden (central government, 1976)	2.3
Germany, Fed. Republic (all governments, 1975)	1.9
United States (all governments, 1976)	0.5

[a]*Source:* Fainstein (1980, p. 218).

Table 4.2
Percent of dwellings completed by private persons (selected countries, 1979).[a]

Austria	45.9%
Denmark	81.5
France	50.4
Sweden	66.2
Switzerland	88.8
United Kingdom	54.0
United States[b]	99.9

[a]*Source:* Economic Commission for Europe, *Annual Bulletin of Housing and Building Statistics for Europe*, United Nations, New York, 1980, pp. 38–41.
[b]Figure for U.S. is for the year 1978.

focused on three allegations: Public housing is produced inefficiently; it is an inefficient method for distributing income to the poor; and it has anomalous distributional implications. Each of these is discussed in turn.

4.2. Production inefficiency

As noted above, for a considerable portion of its history, the federal government paid for the capital costs of public housing, but did not subsidize operating costs. To assess the efficiency implications of this practice, Muth (1973) assumes that

housing services are produced with two inputs, "real estate inputs", which are used to build a structure, and "current inputs", which are used to maintain it. Presumably, there is some scope for substitution between them. For example, one can use relatively expensive aluminum siding which requires little maintenance, or wood siding, which is cheaper but needs more maintenance. The necessary condition for cost minimization is that the marginal rate of substitution between the inputs to be equal to the ratio of their marginal social costs. Because capital costs are paid by the federal government, local authorities in effect face a price of capital below its social marginal cost. This gives them an incentive to produce housing which uses too much capital and too little maintenance.

Muth's formal analysis focuses on the costs of this distortion in input ratios.[46] He postulates a constant elasticity of substitution unit cost function for housing services,

$$p_h = \left[\psi^{\xi} r^{(1-\xi)} + c^{(1-\xi)}\right]^{1/1-\xi}, \tag{4.1}$$

where p_h is the price per unit of housing services; r is the price per unit of real estate inputs; c is the price per unit of current inputs; ξ is the elasticity of substitution between real estate inputs and current inputs; and ψ is a parameter of the production function.

On the basis of earlier studies on production in housing, Muth assumes that $\xi = 0.2$ and $\psi = 0.243$. He normalizes prices such that in the private sector $r = 1$ and $c = 1$. To the extent the public housing authority pays for its operating expenses, it also faces a price of c equal to one. On the other hand, due to the federal subsidy, the authority's effective value of r is only about 0.05.

Substituting these figures into equations for input ratios derived from (4.1), Muth shows how the subsidy lowers the per unit price of housing produced by the housing authority, and induces it to use relatively less in the way of current inputs than the private sector. But the key question is what the resource cost of public housing is. This is found by pricing the inputs used by the local housing authorities at their *market* prices. Muth finds that the ratio of the market value of public housing to its resource cost is 0.82. Other studies using methodologies somewhat different than Muth's have found estimates of production inefficiencies similar in magnitude.[47] [See Weicher (1979, p. 497).]

[46] Muth (1973, p. 7) notes two other reasons why public housing tends to be more expensive than comparable private housing: (1) The Davis–Bacon Act forces contractors to use wage scales set by the Department of Labor. These tend to be higher than those prevailing in the labor market. (2) Cleared slum land is often used, and such land tends to be expensive due to proximity to downtown areas. Demolishing existing structures is also expensive.

[47] Of course, the validity of such estimates must be viewed in light of the methodological difficulties in studying housing supply discussed in Section 2.

In 1970, it was decided to reimburse local housing authorities for the excess of operating costs over revenues. As Olsen (forthcoming, p. 9) notes, in effect this reduces the price of marginal maintenance and rehabilitation facing the authorities to zero. Operating costs increased dramatically, and by 1976 federal operating subsidies mounted to 40 percent of the operating costs of public housing units. However, in many programs today, there are still mortgage subsidies which generate a bias toward capital intensive production techniques. There is also a persistent belief that publicly constructed housing is excessively expensive because public sector managers, unlike their counterparts in the private sector, have no incentive to give much weight to efficiency. Unfortunately, no systematic estimates of the importance of this effect are available. Similarly, despite the widespread publicity given to occurrences of outright corruption in the administration of public housing,[48] it is not clear what the impact of this has been on its cost.

4.3. Consumption inefficiency

An important motivation behind public housing appears to be income redistribution. Given the theoretical presumption that redistributing income via a price subsidy is inefficient relative to cash, the key empirical question is whether the inefficiency is large in dollar terms.

An early examination of this issue is due to Aaron and von Furstenberg (1971). They assume that a representative individual's utility, U, depends only upon his consumption of housing services, Q_h (which are defined so that the price of a unit equals one dollar), and all other goods, G,

$$U = U(Q_h, G).$$

Facing private market prices, the individual chooses some bundle (Q_h^0, G^0), with associated utility level U^0. Now suppose the government makes available to the individual the opportunity to purchase housing services at a price of $(1 - s)$, where s is the subsidy rate. Geometrically this is equivalent to pivoting out the budget line. In general, the individual will change his consumption bundle to (Q_h^1, G^1), which gives utility $U^1 > U^0$.[49] The cost to the government of the program is sQ_h^1.

[48] In 1982, one member of the Chicago Housing Authority (CHA) opined that "the CHA is a political slop bucket, and everybody's drinking from it" (*Newsweek Magazine*, April 19, 1982).

[49] If the individual is not allowed to choose freely the quantity of subsidized housing he consumes, his utility may be less than U^1. In the extreme case where the housing authority offers a specific quantity–price bundle, the budget line does not pivot. The program simply adds one point to the family's budget set.

The problem is to find the amount of income that would be required for the recipient to attain, at market prices, the level of utility U^1 reached under the subsidy program. This is found simply by holding the price of housing at its original value, and giving the individual lump-sum income until his utility reaches U^1. (The geometrical analogue is a parallel shift outward of the budget line until it is just tangent to the indifference curve associated with U^1.) Call the amount of lump-sum income so required M. Then Aaron and von Furstenberg define the relative consumption inefficiency of the subsidy as

$$(sQ_h^1 - M)/sQ_h^1.$$

To implement this theoretical framework, one needs to choose a utility function and specific values for its parameters. Aaron and von Furstenberg assume a constant elasticity of substitution utility function. Parameters are selected so that they are consistent with a price elasticity of demand for housing of -1.0 and an income elasticity of 1.0. Assuming that the public housing subsidy rate is 50% (i.e., $s = 0.5$), they find that the relative consumption inefficiency is about 10%.

The price and income elasticities used by Aaron and von Furstenberg to compute the utility function parameters are from studies of the housing behavior of the general population. It might very well be the case, however, that the behavioral responses of the poor differ from those of the population at large. Moreover focusing on a representative individual does not allow one to address the important question of how benefits vary across individuals. Subsequent to the Aaron and von Furstenberg study, a number of others have been done which estimate utility function parameters with cross-sectional data on public housing recipients. This allows a more accurate depiction of the behavioral and distributional effects of the subsidy. We discuss here the analysis by Murray (1980), which is one of the most recent and careful.[50]

Murray assumes that preferences can be represented by the generalized constant elasticity of substitution form,

$$U = (\varepsilon_1 Q_h^{\varepsilon_2} + G^{\varepsilon_3})^{\varepsilon_4}, \tag{4.2}$$

where the ε's are parameters to be estimated, and the other variables are defined above.[51] The first-order conditions for utility maximization imply that

$$\ln \frac{p_h G}{p_g Q_h} = \ln \frac{\varepsilon_1 \varepsilon_2}{\varepsilon_3} + (\varepsilon_2 - 2)\ln Q_h + (2 - \varepsilon_3)\ln G. \tag{4.3}$$

[50] See also Kraft and Kraft (1979), Kraft and Olsen (1977), Sumka and Stegman (1978), and Olsen and Barton (1982).

[51] The version of this equation appearing in Murray (1980, p. 27) has a typographical error.

Murray partitions his sample into groups based on family size, and for each group estimates (4.3) using an instrumental variables technique.

The variable p_h is based upon the Bureau of Labor Statistics (BLS) estimate of the price of a "standard" unit in each city. The quantity of housing services provided by a given dwelling is its rent divided by the rental on the BLS standard unit. (Inter-city price indices are formed by taking the ratio of the prices of the BLS units in the different cities.)

Because market rents are unavailable for public housing units, it is not clear how to measure the quantity of housing services they provide. (Recall the discussion of Section 2 concerning the difficulties of measuring housing services in general.) To estimate the market value of each public housing unit, Murray uses an hedonic price equation produced by another study. By substituting into the hedonic equation the characteristics of a given public housing dwelling, he can obtain an estimate of what its rent would be in the private market.[52]

Equation (4.3) is estimated with 1971 data on nearly 1,400 successful public housing applicants across seven cities. The parameters imply that on average, the subsidy increased housing consumption by about 95% over what it would have been otherwise [Murray (1980, p. 33)]. If each household would have received instead an equivalent cash grant, housing consumption would have increased only 20% above the unsubsidized level.

To assess the efficiency of the program, Murray computes the subsidy cost associated with each public housing unit, defined as the resource cost of the unit[53] plus administrative costs minus the rent paid. He finds that in his sample, the average subsidy cost is \$1,530, while the average nominal benefit is \$948.[54] Thus, a shift to an equivalent cash grant would lower costs by 34%. Other studies have reached similar conclusions. [See Weicher (1979, p. 497).]

Although the results of such analyses have contributed considerably to our understanding of public housing, they suffer from several potentially important problems. The fact that the utility function parameters are estimated using only public housing inhabitants means that the estimates may be inconsistent due to selectivity bias.[55] The use of hedonic indices to value public housing units is also problematic because, as Aaron (1977, p. 69) has noted, public housing tenants may not value housing characteristics the same way that the market would.

Even if the parameter estimates were perfect, errors in measuring consumption inefficiency might arise due to the implicit assumption that the only distortion in the system is the subsidy on housing. For example, it is well-known that the welfare system tends to place high implicit marginal tax rates on the labor income

[52] The hedonic price equation is based on data from New York City.

[53] Building on research similar to that described in Section 4.1, Murray assumes that the resource cost exceeds the market value of the unit by 17 percent.

[54] There is considerable variation in these figures across families.

[55] For a discussion of this statistical problem, see Heckman (1979).

of the poor. Analyses of public housing subsidies should therefore also take work decisions into account. However, it is difficult to say *a priori* in what direction current estimates are biased by the failure to do so.

4.4. Distributional implications

The studies by Murray and others have shown that public housing confers a relatively large benefit upon the recipients. However, this benefit is available only to a small number of poor people. As noted above, there are a few million public housing units, but in 1981, there were about 32 million persons whose income fell below the U.S. government poverty line.[56] Hence, many more people desire entry into public housing than it is possible to accommodate. It turns out that although the incomes of the recipients are concentrated at the bottom of the income distribution, many people gain entry who are better off than those who do not. [See Aaron (1972, p. 115).]

A related issue is the distribution of benefits within the group of families who actually gain admittance. Murray (1980, p. 31) regressed his estimates of the actual benefit on annual income, holding constant various demographic characteristics of the families. He found that there is indeed a negative relation between income and benefits. But the R^2 of the equation is only 0.70, suggesting that there is quite a bit of randomness in the way the benefits are distributed across tenants.

Aaron (1972, p. 12) has pointed out that public housing may have general equilibrium effects with important distributional implications. Presumably, the availability of public housing decreases the demand for low-cost non-subsidized housing, lowering the rents in that sector. This would tend to increase the real incomes of the tenants and lower the real incomes of the landlords. These issues do not yet appear to have received econometric attention.

4.5. Possibilities for reform

The consensus from the literature is that public housing is inefficiently produced, distorts consumption patterns on the part of the beneficiaries, and redistributes income capriciously.[57] Most economists have been against the program for years. Muth's (1973, p. 43) sentiment is probably typical: "The only possible justifica-

[56] U.S. Bureau of The Census (1982, p. 440).

[57] We have not touched upon the administrative complexity of the program and the associated costs. Mills (undated, p. 26) notes that "... a cadre of specialized talent has sprung up to advise building landlords and tenants on procedures to find their way through or around the bureaucratic maze ...".

tion for housing programs I can see is that they are politically feasible whereas increased income maintenance is not."

It has been suggested that if subsidies have to be maintained, then their link to public provision of housing should be broken. If the subsidy could be applied to private sector housing, then it would no longer be necessary for the public sector to get involved in apartment construction and management. In addition, recipients of aid would no longer be geographically concentrated and marked publicly.

As noted above, under the Section 8 program, there are indeed subsidies for low-income individuals who rent on the private market. However, as of 1978, only about 1.3% of publicly subsidized dwellings for the poor were associated with demand side programs [Quigley (1980, p. 162)]. And even under Section 8, recipients are limited in their choice of dwellings, cannot spend more than 25% of their incomes on rent, and can only choose from landlords who participate in the program.

A demand-oriented subsidy program that has received a good deal of attention is "housing allowances".[58] Each qualified individual would receive from the government a payment equal to the difference between the cost of standard housing established by the program and some fraction of his income. The allowance could be spent on any housing on the private market, providing that it met certain quality standards. Recently, a large social experiment (the Experimental Housing Allowance Program) was conducted in several cities to determine how housing allowances would affect people's behavior.[59] Analyses of the data by Hanushek and Quigley (1981, p. 204) and Venti and Wise (1982) suggest a moderate effect upon housing consumption; the income elasticity of demand for housing services in the experiment was below 0.5. Interestingly, the increased demand generated by the housing allowances does not seem to have had much effect upon housing prices in the communities where the experiment was conducted. This is probably because the supply of housing services is fairly elastic and the response to the increased allowance takes place gradually over time.

The main problem with the housing allowances system examined in the experiment is the stipulation that the dwellings meet various quality standards. The purpose of this provision is presumably to protect the poor from unscrupulous landlords who would take their money and provide no services in return. The evidence from the experiment indicates that it would be very hard to set sensible standards and that enforcement would entail substantial administrative costs. In addition, the imposition of standards reduced participation in the program significantly [Allen et al. (1981, p. 26)].

Muth (1973) has proposed the introduction of "rent certificates", which could be used by the poor to pay for their rents in any public or private housing that

[58]A number of alternative policy approaches are discussed in Congressional Budget Office (1982).
[59]For details on the design of the experiment and its results, see Bradbury and Downs (1981).

they deemed reasonable. Such a program comes very close to being an unrestricted cash transfer. Clearly, there are powerful interest groups which, for one reason or another, wish to see income support for the poor closely linked to their consumption of housing. Whether or not a scheme like Muth's is perceived to be tied closely enough to housing to be politically acceptable is an open question.

5. Conclusions

Empirical investigation of the effects of government policies upon housing behavior presents researchers with difficult methodological problems. Given that there is no "best" way for dealing with these problems, investigators are bound to produce different answers. Nevertheless, there appears to be widespread agreement that in the United States, the income tax treatment of owner-occupied housing and the public provision of low-income housing have substantially increased the consumption of housing services. In the process, economic efficiency has decreased.

Moreover, the housing related provisions in the federal income tax have lead to a more unequal distribution of income. It is unlikely that the disequalizing effects of these provisions have been mitigated by the equalizing effects of the expenditure programs. Thus, judged by the standards of conventional welfare economics, reform seems appropriate, and we have discussed a number of possibilities. Of course, it might be that current programs are moving us toward important social and political goals that lie outside the scope of welfare economics. But given that these goals have never been carefully articulated, it is impossible to tell whether or not such is the case.

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