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4 The Distribution of Gains and Losses from Changes in the Tax Treatment of Housing

Mervyn A. King

4.1 Introduction

Economists have long debated the merits of changes in the tax treatment of housing, and reform of housing policy has been a perennial topic of discussion both within and outside government in the United Kingdom. Given the size of government subsidies and the importance of housing in both the budgets and balance sheets of households, this interest is not surprising. Public subsidies (regardless of the precise definition of an economic subsidy) run to many billions[1] of dollars per annum, and investment in housing now accounts for 50% of the net worth of the United Kingdom personal sector.

Among the frequent suggestions for reform are the reintroduction of a tax on the imputed income of owner-occupiers (such a tax existed in the United Kingdom until 1963 and was known as Schedule A) and, as an alternative, the abolition of tax relief on mortgage interest. In the public sector the Conservative government elected in 1979 has proposed changes in the level of subsidies which would have a direct impact on the level of rents charged to local authority tenants. In assessing the effects of such policies it is clearly important to assess the distribution of gains and losses from any potential reform. Decision makers are naturally reluctant to commit themselves to change without detailed knowledge about who gains and who loses.

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1. 1 billion = 10^9.

The usual approach to such questions is to estimate the overall efficiency gain by an approximation formula (for example, the "triangle" measure of Harberger 1974) and to examine the distributional consequences only in rather aggregative terms or for hypothetical households (the well-known married couple with two children on average earnings). When individual household data are available, this is an inefficient and inaccurate method of calculating both the efficiency effects of a reform and the distributional consequences of a change. Even if it were possible to argue persuasively that a particular reform would lead to an increase in efficiency in the economy as a whole, policymakers should, and almost certainly would, demand from the economist information on the distribution of gains and losses from the reform. In this paper we present a method for computing the gains and losses from changes in housing policy by simulating the effects of different reforms using a data set for 5,895 individual households in England and Wales constructed from the Family Expenditure Survey. The aim of the paper is primarily methodological, and is to illustrate the calculation of gains and losses with reference to one particular reform, namely the reintroduction of a tax on imputed income from owner occupation. It should not be assumed that such a change is the most probable direction for reform in Britain (more likely, perhaps, is a continuation of the present trend toward phasing out mortgage interest deductibility), but it has been widely discussed and presents a good example for the methodology outlined here.

Calculations of gains and losses are carried out under two assumptions. First, we assume that behavior is unchanged, which is the kind of calculation performed by government departments. This figure is useful for purposes of comparison and corresponds to the "first-round" effect of the change. The second case is where we allow explicitly for behavioral responses using econometric estimates of the demand for housing derived from the same data set as we use for simulation. Incorporating behavioral responses enables us to compute exact measures of the welfare gain or loss for each household in the sample, and to examine not only the overall efficiency gains but also the distributive effects of a reform. We show that it is important not to view the distributive effects simply in terms of an average gain or loss for each decile, say, of the original distribution, but to examine the variation within each decile. We also examine some summary statistics which show the value a decision maker will attach to a reform corresponding to different sets of attitudes on his part toward vertical and horizontal equity. This enables us to evaluate a proposed reform in terms of the trade-offs between its effect on the average level of welfare (the efficiency gain), the distribution of welfare levels, and the ranking of households within the distribution. A diagram is used to show the trade-offs between these three effects.

Section 4.2 of the paper discusses the measurement of welfare gains and losses, section 4.3 discusses the government's revenue constraint, section 4.4 analyzes the valuation of a reform in terms of a social welfare function, section 4.5 describes some of the relevant features of the United Kingdom housing market and the measurement of housing costs, and section 4.6 presents the results of simulating a reform of the tax treatment of owner-occupied housing which removes the subsidies to owner occupation and distributes the proceeds as an equal lump sum to all households.

4.2 The Measurement of Gains and Losses

We wish to exploit econometric estimates of the demand for housing in our measurement of gains and losses from reform. To do this we assume that a household's preferences are defined over two commodities, housing services (H) and a composite commodity of other goods and services (C). These preferences may be represented by either a direct or an indirect utility function. For household h the two functions are given by

$$u_h = u(x_{Hh}, x_{Ch}) \,, \tag{1}$$

$$v_h = v(y_h, p_{Hh}, p_{Ch}) \,, \tag{2}$$

where

x_{Hh} = the quantity of housing services consumed,
x_{Ch} = the quantity of the composite commodity consumed,
y_h = posttax household income (assumed to be exogenous),
p_{Hh} = the tax-inclusive price of housing services,
P_{Ch} = the tax-inclusive price of the composite commodity.

Note that in general prices are household-specific. It is important to allow for price variation within the sample when analyzing housing policy because the price of housing services varies from household to household depending upon factors such as marginal tax rates and income-related subsidies. The form of the utility function we shall use in the simulations will be discussed below. First, we define what we mean by a reform.

In the supposed initial, or original, position, household h has exogenous income y_h^0 and faces prices p_{Hh}^0 and p_{Ch}^0. After the reform the household faces a new vector of postreform income y_h^p and prices p_{Hh}^p and p_{Ch}^p. A reform is defined as the mapping from the original to the postreform vector

$$\{y^0, p_H^0, p_C^0\} \rightarrow \{y^p, p_H^p, p_C^p\} \,. \tag{3}$$

Several issues arise in the definition of a reform. First, the postreform levels of incomes and prices cannot be chosen independently without considering their effect on the government's budget constraint. We shall consider revenue-neutral reforms, and the implications of this for the definition of the postreform variables are discussed below in section 4.4. Second, a reform which alters the prices facing consumers will change the aggregate demand for housing services, and in turn this may lead to a partially offsetting change in producer prices. The magnitude of this effect will depend upon the elasticity of supply of housing services. In the first simulations we shall ignore supply effects and assume that producer prices are fixed (i.e. an infinite supply elasticity). But we shall also examine an alternative assumption about the elasticity of supply. Finally, the effect of the change in the price of housing services on tenure choice will be ignored. In principle this can easily be allowed for in the analysis by letting the relevant price facing a household be that of the preferred tenure, owner occupation or rental (see Rosen and Small 1981), but in the United Kingdom rationing is the major determinant of housing tenure because of constraints in the capital market and the lack of a free market in rental housing (King 1980). Hence we have assumed that tenure choice is given. Future work will investigate the interaction between rationing and price, and their effects on tenure choice.

The reform we shall simulate is the removal of tax concessions to owner-occupied housing, with the additional revenue thus generated being distributed as a lump-sum subsidy. We shall assume that this is achieved by the introduction of a new tax on the imputed income from owner occupation (for further discussion of this see Atkinson and King 1980; Hughes 1980). The price index of other consumption will remain unchanged.

For each household in the sample we shall define two measures of the gain or loss resulting from the reform. The first is the impact or "first-round" effect of the reform, which is the effect on the household's cash flow assuming that the household does not change its behavior. We shall call this the *cash gain* (CG). It is the sort of statistic which government departments compute, and, although open to obvious objections, it is a natural first step in the analysis of any reform. It is independent of any assumptions about the form of the utility function (i.e. about household preferences). Cash gain is defined by

$$\text{(4)} \qquad \mathrm{CG} = \hat{y}^p - y^0 - (p_H^p - p_H^0)x_h^0 \,,$$

where x_h^0 is the original quantity of housing services consumed and $\hat{y}^p$ is an estimate of the postreform income consistent with a revenue-neutral reform given unchanged behavior. The true y^p will differ from $\hat{y}^p$ because of changes in household behavior. For a revenue-neutral reform

$$\text{(5)} \qquad \sum_h (\hat{y}_h^p - y_h^0) = \sum_h (p_{Hh}^p - p_{Hh}^0)x_{Hh}^0 \,.$$

It is clear from (4) and (5) that by definition the mean value of cash gain is zero. Because it ignores behavioral responses, the cash gain measure provides no information about the efficiency aspects of the reform, but it does indicate the immediate distributional consequences of the reform before households have had time to adjust their behavior.

In the long run, behavioral responses to the changes in prices and incomes will invalidate the use of cash gain as a measure of the change in a household's welfare. Our second measure of the cash value of the reform to a household allows for behavioral responses. This is defined as the sum of money the household would have accepted in the initial position as equivalent to the impact of the reform. We call this the *equivalent gain* (EG). In other words, carrying out the reform is equivalent to giving each household a sum of money equal to the value of its equivalent gain. It is defined in terms of the indirect utility function by

$$v(y^0 + \mathrm{EG}, p_H^0, p_C) = v(y^p, p_H^p, p_C) \ . \tag{6}$$

These two measures of the gain to a household provide exact measures of the welfare gain from a reform and its distribution among households. Cash gain measures the impact effect of a reform; equivalent gain measures its long-term effect.

In addition to the distributional effect of the reform, we shall wish to compute the efficiency gains, and this raises the question of the relation between our measure of the equivalent gain and conventional measures of the excess burden or deadweight loss from distortionary taxes. Exact measures of excess burden based on explicit utility functions are discussed by Mohring (1971), Diamond and McFadden (1974), Rosen (1978), Hausman (1981), Auerbach and Rosen (1980), and Kay (1980). The concept of equivalent gain offers a particularly simple and appealing way of computing an exact measure of deadweight loss because, for revenue-neutral reforms, the efficiency gain to the economy as a whole is simply equal to the sum of equivalent gains over households.

The reason for this is clear. A reform which is self-financing satisfies the overall production constraint of the economy (provided that the effect of the reform on prices and exogenous incomes has been correctly specified). Hence a revenue-neutral reform which produces a positive average equivalent gain is equivalent to a Pareto improvement combined with a set of lump-sum redistributions among households. In other words, if the mean value of equivalent gain is positive, then there exists a set of lump-sum transfers in the original position such that the reform makes each household better off by an amount equal to the mean value of EG. The sum of the equivalent gains is therefore an exact measure of the efficiency gain (or reduction in deadweight loss) from the reform.

In order to compute a value for the equivalent gain of each household we must specify both a functional form and parameter values for the indirect utility function. In this study we shall use estimates of the homothetic translog indirect utility function used to generate equations for the demand for housing services reported by King (1980). The indirect utility function takes the form

$$\log v = \log\left(\frac{y}{p_C}\right) - \beta_1 \log\left(\frac{p_H}{p_C}\right) - \beta_2\left[\log\left(\frac{p_H}{p_C}\right)\right]^2 . \tag{7}$$

Using the Roy-Ville identity we obtain the demand function

$$x_H = \frac{y}{p_H}\left[\beta_1 + 2\beta_2 \log\left(\frac{p_H}{p_C}\right)\right] . \tag{8}$$

Since the price of housing services varies across households, the demand equation given by (8) may be estimated using cross-section data. The following parameter estimates were obtained using household data in England and Wales from the Family Expenditure Survey for the tax year 1973/74 (King 1980; standard errors in parentheses):

$$\beta_1 = \underset{(0.0008)}{0.1022} ,$$

$$\beta_2 = \underset{(0.0009)}{0.0238} .$$

Although this specification assumes unitary income elasticities of demand, such an assumption may not be unreasonable given the results of Clark and Jones (1971) for the United Kingdom and Rosen (1979) for the United States, and also of other studies when viewed in the light of the biases discussed by Polinsky (1977) (for an elaboration of this point see King 1980).

From (6) and (7), and noting that in the reform simulated $p_C^0 = p_C^p = p_C$, we may solve for the equivalent gain to give

$$\mathrm{EG} = y^p\left\{\left[\frac{p_H^0}{p_H^p}\right]^{(\beta_1 + \beta_2 \log z)}\right\} - y^0 , \tag{9}$$

where

$$z = \frac{p_H^0 p_H^p}{p_C^2} .$$

For those households whose housing costs do not alter (namely renters) the value of their equivalent gain is equal to the lump-sum transfers they receive. For homeowners, however, the equivalent gain depends on the change in the price of housing services and the preference parameters.

4.3 Self-Financing Reforms

A reform is defined by specifying for each household a set of postreform prices and an income level. These values cannot be chosen independently but must satisfy an overall revenue constraint to ensure feasibility. A self-financing reform must yield the same level of total revenue as in the initial position, and we shall assume that revenue raised by reducing housing subsidies is returned to households in the form of a flat-rate lump-sum subsidy denoted by l. In practice this could be achieved by a combination of a rise in the tax threshold and an increase in cash benefits (principally unemployment benefit and basic retirement pensions) to those below the tax threshold. This is a good approximation to a lump-sum subsidy because the marginal rate of income tax in the United Kingdom is a constant for a very large fraction of the population (Kay and King 1980).

Preferences are assumed to be defined over housing services and a composite commodity of other goods and services. If the tax rate on the composite commodity is held constant, then

$$Nl = \sum_h \left(t^p_{Hh} p^p_{Hh} x^p_{Hh} - t^0_{Hh} p^0_{Hh} x^0_{Hh} + t_C p_C (x^p_{Ch} - x^0_{Ch})\right) , \tag{10}$$

where t_H and t_C are the tax-inclusive commodity tax rates on housing services and on other consumption, respectively, and where the former is household-specific.

From households' budget constraints we have that

$$p_C(x^p_{Ch} - x^0_{Ch}) = l + p^0_{Hh} x^0_{Hh} - p^p_{Hh} x^p_{Hh} . \tag{11}$$

Combining these two equations we have

$$l = \frac{1}{(1 - t_C)N} \sum_h \{p^p_{Hh} x^p_{Hh}(t^p_{Hh} - t_C) - p^0_{Hh} x^0_{Hh}(t^0_{Hh} - t_C)\} . \tag{12}$$

If the composite commodity tax rate varies across households, then in the above equation t_c is replaced by the unweighted average of the household-specific composite commodity tax rates. The only unobservable variable in this expression is the demand for housing in the postreform equilibrium. Given the demand function in (8), it is possible to solve explicitly for l, in which case

$$l = \frac{\frac{1}{N} \sum_h \{\alpha_h y^0_h - p^0_{Hh} x^0_{Hh}(t^0_{Hh} - t_C)\}}{1 - t_C - \frac{1}{N}\sum_h \alpha_h} , \tag{13}$$

where

$$\alpha_h = \left\{(t^p_{Hh} - t_C)\left(\beta_1 + 2\beta_2 \log\left(\frac{p^p_{Hh}}{p_C}\right)\right)\right\} .$$

4.4 The Social Value of a Reform

In addition to information about the distribution of CG and EG among households, we shall also compute several measures of the "social value" of a reform. By this we mean any measure which requires some assumption about the cardinality of individual utility functions, so that we may construct a social welfare function. To derive CG and EG requires only an ordinal measure of utility.

The first set of calculations is for various indices of inequality of both the original and the postreform distributions. It is conventional to examine the distribution of "income," but this presupposes an unidimensional measure of a household's welfare. Since prices differ between households and also between the original and postreform positions, the level of income is an inadequate measure of a household's welfare. The problem arises, of course, only when preferences are defined over more than one commodity. The obvious unidimensional measure is the value of the indirect utility function. But this requires a suitable normalization and does not avoid the problem of choosing a reference price vector at which welfare comparisons can be made. The normalization we shall choose is to define the concept of "equivalent income" (King 1983*b*). A household's equivalent income y_E is defined as that level of income which, at the reference price vector, gives the same level of utility as that which the household enjoys at the actual level of income and prices it faces. Formally,

$$v(y_{Eh}, p_{HR}, p_{CR}) = v(y_h, p_{Hh}, p_{Ch}) \,, \tag{14}$$

where p_R is the reference price vector.

From (7) we have that

$$y_{Eh} = y_h \left(\frac{p_{HR}}{p_{Hh}}\right)^{\beta_1} \left(\frac{p_{CR}}{p_{Ch}}\right)^{1-\beta_1} \times \exp\left\{\beta_2 \left(\left[\log\left(\frac{p_{HR}}{p_{CR}}\right)\right]^2 - \left[\log\left(\frac{p_{Hh}}{p_{Ch}}\right)\right]^2\right)\right\} . \tag{15}$$

With this expression for equivalent income we may compute values for both original and postreform equivalent income for each household in the sample. The choice of the reference price level is arbitrary, but the most sensible choice is to use the average level of prices in the original position. It is much easier to ask policymakers to provide relative valuations of increments to equivalent income at different levels of equivalent income (a measure of inequality aversion on the part of the policymaker) for the current (original) price level than for some other hypothetical price level. It is clear from (14) that with this choice of reference price level, if there were no differences between the prices faced by different households, then the original level of equivalent income would be equal to the level of original income and the postreform level of equivalent income would equal original income plus the value of the household's equivalent gain (King 1983).

A measure of inequality may now be defined over the distribution of household equivalent incomes, both before and after the reform. The inequality measure on which we shall concentrate is the Atkinson (1970) index, which imposes the condition that the inequality index should be independent of the mean of the distribution. This in turn implies a social welfare function which exhibits constant relative-inequality aversion. We compute this index for the two pairs of distributions which are the analogues to the two measures of household gain defined above. The first is a rather simpleminded comparison between the distribution of original income y^0 and the distribution of $y^0 + \mathrm{CG}$. This measure requires no assumption about individual preferences orderings and ignores behavioral responses. The second comparison is between y_E^0 and y_E^g. This describes the distribution of (suitably normalized) utility levels in the original and postreform positions.

For each of these comparisons we also compute the index of "horizontal inequity" proposed by King (1983*a*), which is a function of a variable d_h, where d_h is the absolute value of the difference between the equivalent income of household h in the postreform distribution and the level of equivalent income in the postreform distribution which corresponds to the rank of household h in the original distribution (normalized by mean postreform income). The Atkinson index of vertical inequality (I_v) and the index of horizontal inequity (I_H) are related to the index of overall inequality (I) by the simple relation

$$1 - I = (1 - I_H)(1 - I_v) \,, \tag{16}$$

$$I = 1 - \left[\frac{1}{N} \sum_{h=1}^{N} \left(\frac{y_{Eh}}{\bar{y}_E} \exp(-\eta d_h) \right)^{1-\epsilon} \right] \quad \epsilon \neq 1 \tag{17}$$

$$= 1 - \exp \left[\frac{1}{N} \sum_{h=1}^{N} \left(\log \frac{y_{Eh}}{\bar{y}_E} - \eta d_h \right) \right] \quad \epsilon = 1$$

for the distribution $\{y_{Eh}\}$, where ϵ and η are, respectively, the vertical and horizontal inequality aversion parameters. Both inequality aversion parameters vary from zero to infinity. When they are zero, the social welfare function is concerned solely with the efficiency gains from the reform. When ϵ and η are positive, the social welfare function takes into account not only efficiency gains but also changes in the shape both of the distribution and of the ranking within the distribution. The calibration of the parameters may be explained as follows. If the same social value is attached to a marginal dollar in the hands of a household with equivalent income y as to x dollars for a household with equivalent income ρy, then $x = \rho^{\epsilon}$. For example, when $\epsilon = 0.5$, one dollar taken from a household with twice average income has the same social value as 50 cents given to a household with one-half the average income. The social value of the equivalent income of a household which has changed positions in the distribution is equal to the social value of an income $ye^{-\eta d}$. When $\eta = 0.5$ a change in ranking equivalent to 10% of mean income ($d_h = 0.1$) is regarded as equivalent to a reduction in income of about 5%, and when $\eta = 5$ the corresponding reduction is approximately 40%.

Finally, we compute an exact measure of the social value of a reform which parallels our measure of the value of the reform to an individual household and which may be termed the "social equivalent gain." We assume a social welfare function of the form which underlies the inequality indexes given by (17). The social equivalent gain is the sum of money which, if distributed in such a way as to produce an equal increment in original equivalent income, would produce a level of social welfare equal to that derived from the postreform equilibrium. The social equivalent gain is denoted by SG and is defined by

$$\sum_h (y_{Eh}^0 + SG)^{1-\epsilon} = \sum_h (y_{Eh}^p \exp(-\eta d_h))^{1-\epsilon} . \tag{18}$$

This equation gives the social gain as a function of the two inequality aversion parameters. When they are both zero, only the efficiency aspects of the reform are taken into consideration. In general, however, positive values of ϵ and η mean that the distributional benefits of the reform are valued as well as the efficiency gains, and the total effect is expressed in terms of a money measure.

The social equivalent gain implicitly trades off efficiency versus distributional benefits, and this may be shown explicitly in terms of a diagram. If we set SG = 0, then (18) is a functional relation between ϵ and η which gives pairs of values of the two inequality aversion parameters for which the policymaker is indifferent between the original and postreform positions. This locus may be plotted on a diagram with ϵ on the vertical axis and η on the horizontal axis. If the reform results in an efficiency gain then the curve will cut the horizontal axis in the positive quadrant, whereas if there is an efficiency loss it will cut the vertical axis. Any point in the positive quadrant represents a particular social welfare function, and thus the diagram shows for which social welfare functions the reform will be approved and for which the status quo will be preferred to the reform.

4.5 Housing Costs and the United Kingdom Housing Market

4.5.1 Basic Assumptions

The most significant feature of the United Kingdom housing market is the variance of prices for housing services faced by different households.

This arises mainly within the rental sector (both public and private) in which the coefficient of variation of the price of housing services exceeds 0.4 (King 1980). The variance of housing costs within the owner-occupied sector is much less because the source of variation here derives mainly from differences in marginal tax rates. As mentioned earlier, the United Kingdom system closely approximates a linear tax schedule.

Nevertheless, there is substantial variation in housing costs between the different tenures. Owner occupation has grown rapidly and now accounts for about 60% of all dwellings. As in the United States, no tax is levied on the imputed rental income from owner occupation and interest on mortgages is tax deductible. In addition, no capital gains tax is charged on principal residences. These provisions provide a subsidy to owner occupation relative to the level of rents in the uncontrolled rental sector. About 30% of dwellings are rented public (local authority) housing, and only 10% are privately rented. Of the latter, in the sample period of 1973/74 most had controlled rents but some (furnished rental units) were uncontrolled. The combination of government subsidies and rent control led to rents in the subsidized rental sector well below the level of rents in the uncontrolled furnished rental sector.

The data set we shall use consists of the 5,895 households in England and Wales with positive housing costs which participated in the Family Expenditure Survey (FES) during the tax year 1973/74. (We have excluded households living in rent-free accommodation provided by employers.) The FES is a continuous stratified sample survey of household incomes and expenditures. Of the 5,895 households, 3,143 were in owner occupation, 1,752 in local authority housing, 765 in controlled private rental dwellings, and 235 in uncontrolled rental accommodation. Since 1973 the share of owner occupation has risen from 53% to almost 60%, with a corresponding decline in the private rental sector.

Household income is defined as "normal" gross household income plus income in kind (including imputed income from owner occupation) minus tax and national insurance contributions. Capital gains are excluded because they are not recorded in the FES. Estimates of "normal" income are provided by individuals in response to interview questions designed to elicit information about such factors as overtime earnings and short-time working. Consumption of housing services is measured by a dwelling's "gross rateable value." In the United Kingdom an official assessor assigns to each dwelling an estimate of its rental value known as the gross rateable value. Revaluations for all dwellings in England and Wales were made immediately prior to the survey period. The price index of housing costs for tenants is defined as expenditure (the sum of rent and rates [property taxes] minus any rebates) divided by gross rateable value. For owner-occupiers the price index of housing services is the "effective rental" plus rates (net of rebates) divided by gross rateable value. The "effective rental" of owner-occupied housing is the product of its rental value (which we measure by gross rateable value) and a factor denoted by μ, which allows for the tax subsidy to owner occupation. The value of μ may under certain assumptions be written as (Rosen 1979; King 1980)

$$\mu = 1 - a\tau \,, \tag{19}$$

where τ is the homeowner's marginal tax rate and $(1 - a)$ is the fraction of rental value accounted for by depreciation and maintenance. The value of a may be represented by the ratio of net to gross rateable value, both of which are recorded in the FES. This measure of housing costs does allow for inflation, and the reader is referred to King (1980). The price of the composite commodity varied among households because they were sampled at different dates during the year. The retail price index for consumption other than housing services was computed for each month and the appropriate index used for each household.

The reform we shall simulate is the introduction of a tax on imputed rental income. This is equivalent to setting the value of μ equal to unity. No change is made either in the level of subsidies to rental housing or to the price index of the composite commodity. Given these changes to the prices facing each household, the lump sum which is paid out of the additional revenue generated is computed from equation (13). Postreform income of each household is given by

$$y_h^p = y_h^0 + l \,. \tag{20}$$

It remains only to define the tax rates for each household. For owner-occupiers and local authority tenants the tax rate on housing services is defined by

$$t_H = \frac{p_H - 1}{p_H} \,. \tag{21}$$

For other private tenants the discrepancy between housing costs and rental value is not due solely to taxes but to factors such as rent control as well. In these cases the tax rate is equal to rates (net of rebates) divided by absolute expenditure (the product of p_H and x_H). The value of the tax rate on the composite commodity was taken to be the ratio of taxes on consumers' expenditure (other than housing) minus subsidies to consumers' expenditure at market prices in 1973 (tables 4.6 and 4.8, *National Income and Expenditure 1980*). This gives a tax rate of 15.6%.

The reform is now fully defined, and statistics on the efficiency and distributional effects of the reform described in sections 4.2 and 4.4 may now be calculated. The results are discussed below in section 4.6.

4.5.2 Alternative Assumptions

As set out above, our definition of the reform implicitly assumes an infinite elasticity of supply of housing services because we ignored any change in the producer price of housing services which might result from the changes in consumption. We take the producer price of the composite commodity q_C as *numéraire*. The supply of housing services is related to the relative producer price of the two commodities, and for purposes of simulation we shall consider the case in which there is a constant elasticity of supply of housing services. This is consistent with the following specification of the economy's production possibility frontier. Let this be denoted by the function

$$F(X_H, X_C) = 0 \ , \tag{22}$$

where

$$X_H = \sum_h x_{Hh} \ ,$$

$$X_C = \sum_h x_{Ch} \ .$$

In competitive equilibrium we have that

$$\frac{q_H}{q_C} = \frac{F_H}{F_C} \ , \tag{23}$$

where F_H and F_C denote the partial derivatives of F with respect to its two arguments. Assume that the production possibility frontier is described by

$$\frac{\alpha}{1+s} X_H{}^{1+s} + X_C = 0 \ , \tag{24}$$

where α and s are constants. Then from (23) and (24)

$$\frac{q_H}{q_C} = \alpha X_H^s \ . \tag{25}$$

The value of s is the inverse of the price elasticity of supply of housing services. Since q_C is taken as the *numéraire*,

$$q_H^p = \lambda q_H^0 \ , \tag{26}$$

where

$$\lambda = \left(\frac{X_H^p}{X_H^0}\right)^s \ . \tag{27}$$

For a finite supply elasticity the postreform values of the price of housing services are (for owner-occupiers and uncontrolled tenants) equal to the values given above by the definition of the reform multiplied by λ.

One consequence of a finite supply elasticity is that the market values of homes will be lower in the postreform equilibrium than in the original position. This reduces the wealth of homeowners and landlords. Since almost all rental accommodation in the United Kingdom is subject to rent control with security of tenure for tenants, the effect on the net worth of landlords is likely to be small and we shall ignore this. To convert the fall in house prices to an equivalent reduction in permanent income we multiply by an appropriate real interest r. Hence equation (20) becomes

$$(28) \qquad y_h^p = y_h^0 + l - Dr(1 - \lambda)V_{Hh}^0 ,$$

where $D = 1$ for owner-occupiers and zero otherwise, and V_{Hh}^0 = prereform market value of home.

We assume a value for r of 2.5% per annum, which is clearly an arbitrary choice; but in the absence of a model of portfolio behavior an assumption of this kind is necessary. No data on house prices are collected by the FES. Values of house prices were therefore imputed to each dwelling by using the estimated relation between house prices and rateable values found by Hughes (1981) using data from building societies. The fitted equation is quadratic with regionally varying coefficients (over the ten standard regions of England and Wales). Hughes's estimates refer to 1976, and these were adjusted to 1973 by an index of house prices (table V1.18, *Housing Policy Review Technical Volume*, part 2). We shall present results for two different assumptions about the supply elasticity. First, we take as the base case an infinite elasticity of supply ($s = 0$), which might be defended as a not unreasonable assumption in the very long run. Second, we consider an elasticity of 2.0 ($s = 0.5$), which is in line with empirical estimates for the United States (Huang 1973; Poterba 1980).

Since the postreform demand for housing depends upon both λ and l, equations (27) and (28) are two nonlinear simultaneous equations in λ and l, which are solved by iterative methods. Given equilibrium values for λ and l, postreform values of prices, incomes, and consumption may be computed, and the reform is completely defined.

If the desired lump-sum transfers are infeasible, then an additional dollar raised by the elimination of subsidies will have a social value of more than one dollar. This reflects the gains which could be obtained by using the extra revenue to reduce other distortionary taxes rather than using it, as assumed here, to make lump-sum payments to households. In principle, this alternative use of the revenue should be modeled directly in order to gauge accurately both its efficiency and distributional consequences. But since there are many alternatives, we will illustrate the possible outcome by regarding the effective lump-sum transfer made possible by the reform as equal to γl, where γ is the value of an extra dollar generated by the tax system. We shall consider two values of γ: 1.0 and 1.2, respectively. Two amendments to the equations defining a reform are necessary to incorporate γ. These are

$$(29) \qquad y_h^p = y_h^0 + \gamma l - Dr(1-\lambda)V_{Hh}^0 ,$$

$$(30) \qquad l = \frac{\frac{1}{N}\sum_h \left\{\alpha_h y_h^0 - p_H^0 x_H^0 (t_H^0 - t_C)\right\}}{1 - \gamma(t_C + \frac{1}{N}\sum_h \alpha_h)} .$$

4.6 Results

In this section we present the results of simulating the introduction of a tax on imputed rental income. The reform was defined in section 4.5. Table 4.1 shows some summary statistics of the effect of this reform for the base case with an infinite supply elasticity and $\gamma = 1$. The price of housing services is unchanged for tenants but is increased for owner-occupiers. The price of other consumption goods is unchanged, and income is increased on average because the proceeds of the new tax are distributed to households as a lump-sum subsidy. The values of prices and incomes before and after the reform are shown in table 4.1 together with the values of pre- and postreform equivalent incomes, the values of housing consumption, and the values of both cash and equivalent gain. All monetary values are in £ per week.

The lump-sum subsidy which can be financed is 83.3 pence per week in 1973 prices (from [20] this is the difference between mean y^0 and mean y^p), which corresponds to £2.42 per week at 1980 prices. The efficiency gains of the reform (which equal the mean value of equivalent gain per household) amount to 16.5p per week at 1973 prices, 48.2p per week at 1980 prices. This is almost exactly 20% of the value of the lump-sum subsidy and is equal to 0.4 of 1% of mean household income.

Even the summary results in table 4.1 show that in addition to the positive efficiency gain from the reform, the distributional effects are substantial. The maximum gain to a household is equal to the additional lump-sum payment, and this is exactly equal to the gain experienced by tenants. Some owner-occupied households, however, lose markedly. The maximum gain is much smaller than the maximum loss (comparing the figures in the "maximum" and "minimum" columns for the measures of gain). In the main this reflects the distribution of the tax receipts in the form of a lump-sum subsidy. If the revenue had been distributed in proportion to consumption or income in the original position, then the disparity between maximum gains and losses would have been much less. Nevertheless, even with the lump-sum subsidy more people gain from the reform than lose (see the columns "number positive" and "number negative"). Looking first at the value of cash gain, which measures the impact effect of the reform, we see that 54.3% of households gain from

Table 4.1 Summary Statistics of Reform, All Tenures

	Minimum	Average	Maximum	No. Positive	No. Negative	Standard Deviation	Coefficient of Variation
y^0	3.415	44.233	618.876	5,895	0	29.070	.657
p_H^0	.150	.982	7.572	5,895	0	.396	.403
p_C^0	1.000	1.034	1.064	5,895	0	.022	.021
y^p	4.248	45.065	619.709	5,895	0	29.070	.645
p_H^p	.150	1.117	7.572	5,895	0	.416	.372
p_C^p	1.000	1.034	1.064	5,895	0	.022	.021
y_E^0	2.948	44.188	601.890	5,895	0	28.846	.653
y_E^p	3.667	44.357	602.699	5,895	0	28.254	.637
CG	−12.551	.000	.739	3,199	2,696	.845	
EG	−10.497	.165	.833	3,622	2,273	.824	4.981
x^0	.353	4.912	53.496	5,895	0	2.342	.477
x^p	.221	4.239	61.406	5,895	0	2.650	.625

the reform and the balance lose. These figures underestimate the proportion of households which benefit from the reform, because they ignore behavioral responses. Incorporating behavioral responses into the calculation of gains, we find that the proportion of households which gain from the reform (have a positive value of equivalent gain) rises to 61.4%. In other words, ignoring behavioral responses leads to an underestimate of the number of households which would gain from the reform of 11.7%.

Table 4.2 shows the same set of summary statistics for owner-occupiers only. The mean value of equivalent gain is − 41.9p per week, whereas for households in rented accommodations the figure is + 83.4p per week. The price of housing services to owner-occupiers rises by 25.8%. As with the full sample, the mean value of equivalent gain is only a partial view of the effects of the reform. The distribution of the values of equivalent gain around the mean seems at least as significant as the value of the mean itself. This is illustrated by table 4.3, which shows the mean values of both cash and equivalent gain for deciles of the original income distribution. We also show for each decile the numbers of households which gain and lose from the reform. The mean value of equivalent and cash gain declines as we move up through the income distribution, and from the sixth decile upward the number of people who lose exceeds the number who gain from the reform. In the bottom three deciles all households gain from a reform, but in the top six deciles there are significant numbers of households who both gain and lose. In the fifth decile, for example, the mean value of equivalent gain is positive, but there are almost equal numbers of households who gain and lose. Clearly, when assessing the effects of a reform, one should not overlook the distribution of gains and losses within subgroups (such as deciles of the income distribution or tenure groups).

Summary measures of the effects of the reform on vertical and horizontal inequality are shown in tables 4.4 and 4.5. These show inequality measures as defined in section 4.3 for two comparisons of the distributions of (1) initial income and initial income plus cash gain, and (2) initial equivalent income and postreform equivalent income. In both cases it can be seen that the distributional effects of the reform are significant and that this particular reform reduces the measure of vertical inequality for all values of the vertical inequality aversion parameter. The effects of the reform on horizontal inequity are such that the index of overall inequality is higher in the postreform distribution than in the original distribution for low values of the vertical inequality aversion parameter, whereas for egalitarian social preferences the index of overall inequality is lower in the postreform distribution.

The value of the social gain is shown in table 4.6. The entries in this table measure the social valuation of the reform for different values of the vertical and horizontal inequality aversion parameters in £ per week.

Table 4.2 **Summary Statistics of Reform, Owner-Occupiers**

	Minimum	Average	Maximum	No. Positive	No. Negative	Standard Deviation	Coefficient of Variation
y^0	5.468	51.782	472.821	3,143	0	31.047	.600
p_H^0	.743	.982	1.363	3,143	0	.057	.058
p_C^0	1.000	1.033	1.064	3,143	0	.022	.021
y^P	6.301	52.615	473.654	3,143	0	31.047	.590
p_H^P	1.013	1.235	1.609	3,143	0	.057	.046
p_C^P	1.000	1.033	1.064	3,143	0	.022	.021
y_E^0	5.590	51.760	482.533	3,143	0	30.928	.598
y_E^P	6.293	51.342	471.821	3,143	0	30.196	.588
CG	−12.551	−.647	.648	447	2,696	.664	−1.027
EG	−10.497	−.419	.688	870	2,273	.735	−1.755
$\mathbf{x}^0$	.353	5.483	53.496	3,143	0	2.637	.481
x^P	.577	4.717	42.666	3,143	0	2.766	.586

Table 4.3 The Distribution of Gains by Deciles of Original Income (£ per week, 1973 prices)

Decile	Mean Income	Mean CG	Mean EG	No. Gainers†	No. Losers†	% Gainers
1	10.77	.52	.76	589	0	100
2	17.13	.34	.67	590	0	100
3	24.34	.28	.58	589	0	100
4	31.39	.24	.48	556	34	94
5	37.64	.13	.36	305	284	52
6	43.65	.05	.24	260	330	44
7	49.43	−.05	.14	246	343	42
8	57.07	−.24	−.09	193	397	33
9	67.64	−.40	−.32	173	416	29
10	103.20	−.87	−1.15	121	469	20
Overall	44.23	0	.17	3,622	2,273	61

†The "no. gainers" is the number of households with a positive value for equivalent gain, and the "no. losers" refers to households with negative equivalent gain.

When both parameters are zero, social preferences are defined only over the efficiency benefits of the reform, and the entry in the top left-hand corner of the table measures the average efficiency gain. This differs slightly from mean equivalent gain because the two measures of change in deadweight loss are defined with respect to different price vectors, the mean price level in one case and the actual price level for each household in the other. For zero values of the horizontal inequity aversion parameter, the social gain measures only the effect of the reform on vertical inequality, and it is evident from the table that the value of the social gain rises quite sharply as the value of the vertical inequality aversion parameter increases. For example, for an ϵ value of 2.0 the social gain is 63p per week, which is almost four times as large as the pure efficiency gain.

If we consider positive values for the horizontal inequity aversion parameter, then we see that for low values of the vertical inequality aversion parameter the social gain is actually negative. This is because the benefits in terms of a more equal distribution are offset by the social costs of the change in the ordering within the distribution brought about by the reform. This trade-off between the efficiency gains, the change in vertical inequality, and horizontal inequity is shown more explicitly in figure 4.1. In this diagram the line of indifference shows those combinations of the two inequality aversion parameters for which we are indifferent between the original and the postreform position. Any point in the positive quadrant represents a set of social preferences, and for preferences to the northwest of the indifference line the reform is preferred to the original distribution. For preferences to the southeast of the indifference line the original position is preferred to the postreform equilibrium.

Table 4.4 **Inequality Index for the Distributions of y^0 and y^0 + CG**

Index of Vertical Inequality

ε	Original Distribution	Final Distribution
.0	.000	.000
.5	.088	.085
1.0	.174	.168
2.0	.337	.324
5.0	.639	.610

Index of Horizontal Inequality

	η			
ε	.500	1.000	2.000	5.000
.0	.008	.015	.030	.072
.5	.007	.014	.029	.070
1.0	.007	.014	.027	.067
2.0	.006	.012	.024	.058
5.0	.003	.007	.014	.035

Index of Overall Inequality

	Original Distri-	Final Distribution η				
ε	bution	.000	.500	1.000	2.000	5.000
.0	.000	.000	.008	.015	.030	.072
.5	.088	.085	.092	.098	.111	.149
1.0	.174	.168	.174	.180	.191	.224
2.0	.337	.324	.328	.332	.340	.364
5.0	.639	.610	.611	.612	.615	.624

The calculations presented so far assume an infinite supply elasticity of housing services. Although estimates of the long-run supply elasticity are hard to come by, it is not implausible to suppose that it is a good deal less than infinite (White and White 1977). We have therefore repeated the calculations for an assumed value of the supply elasticity of 2.0, which seems in line with some of the estimates reported for the United States (Poterba 1980). The supply price of housing services is now endogenous to the model. Changes in the supply price reflect changes in factor prices (mainly in land prices), and these feed through to household incomes in the way described in section 4.5.

Summary statistics of the reform assuming a supply elasticity of 2.0 are shown in table 4.7. After the reform the fall in the producer price of housing services is 5.7% and the lump-sum payment which can be financed is 83.1p per week. The mean equivalent gain rises slightly

Table 4.5 **Inequality Index for the Distributions of y_E^0 and y_E^P**

Index of Vertical Inequality

ε	Original Distribution	Final Distribution
.0	.000	.000
.5	.087	.082
1.0	.171	.161
2.0	.330	.311
5.0	.635	.596

Index of Horizontal Inequality

ε	η .500	η 1.000	η 2.000	η 5.000
.0	.006	.012	.024	.058
.5	.006	.011	.023	.055
1.0	.005	.010	.020	.050
2.0	.004	.008	.015	.038
5.0	.001	.002	.005	.012

Index of Overall Inequality

ε	Original Distribution	Final Distribution η .000	.500	1.000	2.000	5.000
.0	.000	.000	.006	.012	.024	.058
.5	.087	.082	.087	.092	.103	.133
1.0	.171	.161	.166	.170	.179	.204
2.0	.330	.311	.313	.316	.321	.337
5.0	.635	.596	.597	.597	.598	.601

(compared with table 4.1) to 21.9p per week. No great significance should be read into this, because the fact that producer prices are endogenous does not in itself give rise to any additional reason for an efficiency gain. But since the reform entails moving from one second-best equilibrium to another, it is perfectly possible for the mean value of equivalent gain to rise when supply responses are taken into account. The approximate nature of the imputation of house prices (and the calculation of the implied fall in permanent income) means that there is uncertainty about the precise value of the mean equivalent gain.

Allowing for supply effects illustrates also the phenomenon noted by White and White (1977), namely that removal of the subsidy to owner occupation benefits renters not only because they receive a lump-sum payment financed out of the additional revenue but also because they face lower rents. The mean equivalent gain for tenants in the uncon-

Table 4.6 Social Gain (£ per week)

	η				
ε	.000	.5000	1.000	2.000	5.000
.0	.169	−.102	−.369	−.899	−2.426
.5	.319	.109	−.099	−.509	−1.699
1.0	.447	.292	.137	−.167	−1.050
2.0	.269	.552	.475	.323	−.124
5.0	.778	.769	.758	.738	.675

trolled sector is £1.08 per week with a supply elasticity of 2.0 compared with 83.3p per week for an infinite supply elasticity.

The final calculations refer to the shadow value of increased revenues. With a value of γ of 1.2 (and ignoring supply responses) the mean equivalent gain is 36.6p per week compared with 16.5p per week for $\gamma = 1.0$. The proportions of the sample which gain are, respectively, 68.1 and 61.4% for the two assumptions. Clearly, the efficiency gains are sensitive to alternative uses of the higher revenue generated by the tax on imputed income. The introduction of labor supply or other household decisions into the model would enable these alternative uses to be modeled exactly and will be the subject of future work.

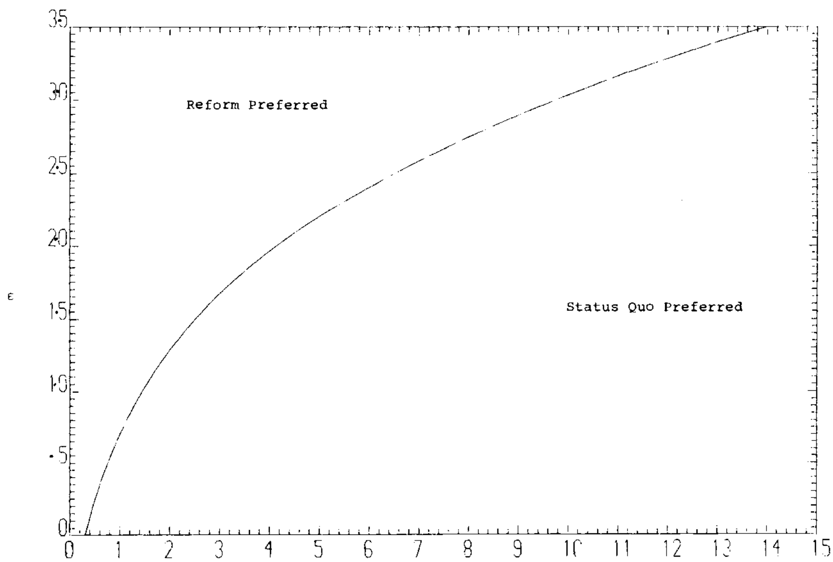

Fig. 4.1 Indifference line for reform.

Table 4.7 Summary Statistics of Reform, Supply Elasticity = 2.0

	Minimum	Average	Maximum	No. Positive	No. Negative	Standard Deviation	Coefficient of Variation
y^0	3.415	44.233	618.876	5,895	0	29.070	.657
p_H^0	.150	.982	7.572	5,895	0	.396	.403
p_C^0	1.000	1.034	1.064	5,895	0	.022	.021
y^p	4.246	44.928	619.707	5,895	0	29.002	.646
p_H^p	.150	1.075	7.138	5,895	0	.389	.362
p_C^p	1.000	1.034	1.064	5,895	0	.022	.021
y_E^0	2.948	44.188	601.890	5,895	0	28.846	.653
y_E^p	3.699	44.409	602.698	5,895	0	28.345	.638
CG	−12.551	.000	.739	3,199	2,696	.845	
EG	−7.869	.219	2.027	3,648	2,247	.742	3.388
x^0	.353	4.912	53.496	5,895	0	2.342	.477
x^p	.230	4.313	61.405	5,895	0	2.710	.628

4.7 Conclusions

We have presented a methodology for computing the gains and losses from tax reform which provides information on both the efficiency and distributional effects of reform. The figures refer to both the impact effect of the reform and the long-run consequences once households have adjusted their behavior. Behavioral responses were incorporated by using econometric estimates of the parameters of an indirect utility function. The efficiency and distributional aspects were linked by the concept of "equivalent gain."

The aim of this paper has been to illustrate a methodology that can be used for general tax reform analysis using large data sets so that the calculations described here become a more routine task than is usually the case in policy analysis, especially in government. The question of who gains and who loses from a reform is of economic and political interest, and with the growing use of microdata sets the economist will be able to provide to policymakers information relevant to this question.

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Comment Patric H. Hendershott

King calculates the impact of the reintroduction in the United Kingdom of a tax on the imputed rental income of owner-occupiers. This tax was in place prior to 1963, and it may be a viable policy option in the United Kingdom, in contrast to the United States. The calculated impacts of this tax reform, computed using data for nearly 6,000 households in 1973–74, include (*a*) the total efficiency gain; (*b*) the distributive effects by and within income deciles; (*c*) the distributive effects in terms of indexes of vertical and horizontal inequality; and (*d*) several measures of the social value of the reform. King emphasizes the methodology underlying his calculations rather than the calculations per se.

My remarks are divided into three parts. The first part is a summary of the calculation of individual household gains and losses and the total efficiency gain of the reform when the supply of housing services is infinitely price elastic. This calculation is a model of clarity and can serve as an excellent methodological guide for the analysis of the impact of a wide range of government programs. The second part of my discussion relates to the analysis when the supply price of housing services has a finite elasticity. I conclude with a critique of the use of the indexes of horizontal and vertical inequality in the measurement of the social value of the reform.

Gains and Losses of Individual Households

In a simple two-commodity model, housing (H) and a nonhousing composite commodity (C), King's "equivalent gain" (EG) (positive or negative) from the reform for a given household is the change in income that, at prereform prices, provides the household with the same utility that it would receive with the reform. That is, EG is calculated from King's equation (6):

$$v(y^0 + \mathrm{EG}, p_H^0, p_C^0) = v(y^p, p_H^p, p_C^p) \, , \tag{1}$$

where the subscripted variables are household-specific and are inclusive of good-specific net (of subsidy) taxes, y is nominal income less nonconsumption net taxes, and the superscripts denote original (0) and postreform (p) values. Implementation of this procedure requires (1) specification of an indirect utility function and the price and output adjustment mechanism of the economy, (2) a description of the government use of the additional tax revenues, and (3) an analysis of the direct impact of the tax reform on the household-specific price of housing services.

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King's specification takes the following form: a translog indirect utility function is hypothesized and employed to derive a demand function for housing services. Estimation of the demand function fully specifies both the utility function and the demand for the composite commodity. The two demands, in turn, fully determine the quantities of the two goods because infinite supply price elasticities are assumed. The revenue raised from the new tax are assumed to be returned to households in equal amounts as a rebate. The value of the rebate per household is computed and added to the original income of the household to determine the postreform nominal income.

For the aggregate economy, King assumes that money expenditures net of all taxes and inclusive of all subsidies are constant. That is,

$$(2) \qquad p_C^A X_{CT} + p_H^A X_{HT} = K \ ,$$

where the A superscript denotes average net of tax prices, the T superscript refers to total economy-wide quantities, and K is a constant. The reform-induced change in the quantity of the composite commodity is thus related to the change in housing consumed by

$$(3) \qquad \Delta X_{CT} = -(p_H^A / p_C^A) \Delta X_{HT} \ .$$

After a careful analysis of the current subsidy to individual homeowners, King meticulously computes the direct impact of the reform on the price of housing services for each homeowner and calculates its equivalent gain. The mean equivalent gains for households in different income deciles, as well the proportions in each that gain, are reported in his table 4.3. The bottom seven deciles gain on net, the rebates outweighing the additional taxes, although over half the households in the sixth and seventh deciles lose. Possibly because no households in the lowest three deciles are homeowners, all of them gain. One-fifth of the total tax imposed (the subsidy removed) constitutes an efficiency gain. Of course, if the increased government revenue were returned to households in a different manner, then the distributive effect could be much different. In fact, it would be a useful exercise to determine which method of returning the revenue—a general income tax cut that would benefit upper income households, for example—would minimize the distributive effect while maintaining the overall efficiency gain. This analysis is clearly written, internally consistent, and of wide applicability.

The Case of a Finite House Price Elasticity

In an extension of this analysis, King replaces the assumption of infinite housing supply price elasticity with an elasticity of 2. Thus the tax-induced decline in the demand for housing lowers the price of housing, and this cushions the rise in the price of housing services. Owners benefit from the latter but lose from the decline in the asset value of their houses.

With the finite supply elasticity for housing, the total efficiency gain increases by a third.

The source of the increased efficiency gain is likely the assumed constancy of the price of the composite (nonhousing) commodity. The tax-induced change in relative prices raises the demand for the composite commodity at the expense of housing. As a result, the supply price of the composite commodity would be expected to rise, just as the supply price of housing falls. The importance of the constancy of the composite commodity price can be seen most clearly by considering renters. Their postreform nominal income is assumed to equal their original nominal income plus the lump-sum rebate financed by the tax on implicit rents of owners. With the price of housing declining, renters gain further in addition to the lump-sum transfer. Their loss owing to the rise in the price of other goods is ignored; the assumption of constant nominal income when the aggregate price level is falling is inappropriate.

In this analysis King accounts for a decline in the market value of houses on homeowners. Although he does not present results by tenure mode or income decile, this effect would obviously magnify the redistribution from higher-income homeowners to lower-income renters. However, a full accounting of the impact of the rise in the price of the composite good might more than offset this redistribution. An increase in the real price of nonhousing capital will raise wealth both directly and indirectly via the market value of equities, and this gain will be sharply skewed toward higher-income households.

Calculation of the Social Gain

In his most ambitious undertaking, King calculates some measures of the social value of the reform. These measures depend on changes in equivalent income (y_E) and the utility or disutility that society or the individuals in it derive from the particular pattern of changes that evolve. Equivalent income is defined analogously to the sum of original income plus the equivalent gain (see equation [1]), except that the average values of original prices, rather than the household-specific prices, are employed. Why King shifts to average prices is not entirely clear, but I expect that this shift has little impact on the calculated social gain because the gain depends on the change in equivalent income where original equivalent income is the level that, evaluated at original average prices, gives the same utility as individual households earned prior to the reform. More specifically, the social gain (SG) is calculated from

$$(4) \qquad \sum_{h=1}^{N} (y_{Eh}^{0} + \mathrm{SG})^{1-\epsilon} = \sum_{h=1}^{N} (y_{Eh}^{p} \exp(-\eta d_h))^{1-\epsilon},$$

where the h subscript denotes individual households and ϵ, η, and d are "inequality" parameters. When $\epsilon = \eta = 0$, the social gain is simply the sum over all households of their changes in equivalent income. This gain ought to be the same as the efficiency gain of the earlier analysis.[1]

King views the efficiency gain as an inadequate measure of the social gain for two reasons. First, society is averse to inequality in income. Thus a reform that leads to a more equal distribution of income—such as the taxation of housing—provides a social gain beyond the efficiency gain. Second, households attach disutility to a drop in their ranking in the income distribution, even if their own income is unchanged. Moreover, this disutility is apparently greater than the utility gain of households who rise equally in the ranking. Thus any reform will cause a social loss to the extent that it alters the ranking of households in the income distribution.

I have some difficulty with King's treatment of each of these concepts. Insofar as society is averse to income inequality and there are no costs to removing it, income inequality will be eliminated. The fact that inequality exists suggests that it plays a useful role and that its removal would entail costs. Generally, it is felt that removal of income inequality would reduce incentives to work, and thus equity considerations are traded off against efficiency considerations. In this view, a reform that increases equality by definition worsens efficiency and, if the equity-efficiency trade-off is initially in balance, society will lose on net. King accounts for the equity gain but ignores the efficiency loss. While one can throw this loss into the category of "general equilibrium considerations to be dealt with later," it seems rather misleading to measure one effect and not another when one has reason to believe that the latter more than offsets the former.

There is substantial plausibility to the notion that a household's utility depends on its relative income (the Jones or Duesenberry effect). Further, increases in relative income seems unlikely to increase utility as much as decreases lower it. My difficulty here is that the indirect utility function underlying King's analysis does not incorporate any relative income effect; i.e. the microeconomic relation in the model is inconsistent with the macroeconomic social utility calculation.

An extremely simple way to include a relative income response would be to add log $[\phi(R)]$ to King's equation (9), where R is the household's rank in the income distribution and $\partial\phi/\partial R > 0$. If the household housing demand function could be maintained, then the equivalent gain equation (11), which is $\mathrm{EG} = y^p z - y^0$, where z depends on relative prices, would become

$$\mathrm{EG} = y^p z \frac{\phi(R^0)}{\phi(R^p)} - y^0 . \tag{5}$$

That is, the equivalent gain (and equivalent income) calculations would be altered (lowered in absolute value). The $\phi(R)$ function is related to

1. The average gain is 16.9p per week rather than 16.5p per week, the difference apparently being due to the use of average prices.

King's η, with $\phi(R) = 0$ when $\eta = 0$. Unfortunately, it is different to envision a ranking function that would not alter the form of the estimated housing demand function, and it would be especially difficult to model a function that captures the asymmetric impact of increases and decreases in household income ranking. But this is required to provide a microfoundation for the social utility function.

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