

UK Household Cost-of-Living Indices, 1979-92

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Preface

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1. Introduction

Cost-of-living indices measure the cost of reaching a given standard of living under different economic circumstances. Under changing prices, the true cost-of-living index is the relative cost of attaining a reference-level living standard at each set of prices. Traditionally in economics, the standard of living is measured by the goodness (utility) consisting in consumption.¹ If this is denoted by U^* , the true cost-of-living index number is

$$P(p^t, p^{t+1}, U^*) = \frac{c(p^{t+1}, U^*)}{c(p^t, U^*)}$$

where p^t is the vector of prices in period t , p^{t+1} is the vector of prices in period $t + 1$ and $c(p^t, U^*)$ is the cost function. The cost function denotes the minimum expenditure necessary to reach U^* with the current prices in period t .

True cost-of-living indices depend on the reference level of utility. This is typically proxied by income or total expenditure. Even if all households had the same tastes, the relative price changes between periods t and $t + 1$ will affect households differently if income or total expenditure affects expenditure patterns. The only circumstance, then, under which one can speak accurately about *the* cost-of-living index is one in which household preferences for consumption are such that expenditure patterns do not vary with total expenditure and the cost function is proportional to economic welfare; that is, where preferences are homothetic. If preferences are homothetic, then the cost function takes the form $c(p, u) = ub(p)$ for some function $b(p)$. The cost-of-living index based on this is $b(p^{t+1})/b(p^t)$ which is independent of utility. This is the only case in which this happens, so homotheticity is both necessary and sufficient for the existence of a single, representative cost-of-living index. If relative prices move and this condition does not hold, and there is ample evidence that it does not, then a single index measure cannot be appropriate for every household.

For example, Engel's famous studies of the consumption of poorer households concluded that the proportion of the household's budget spent on necessities declines as total expenditure and income increase. Homotheticity, however, implies unit income elasticities and this rules out the idea of luxuries and necessities. To illustrate this, consider the data on a typical necessity: domestic fuels.

¹ Sen (1985) argues persuasively against the usual approach of thinking about the standard of living as utility, income and wealth, suggesting a wider interpretation in which living standards are conceived of in terms of human functionings and capabilities. Sen may be right, but it is difficult to see how to implement his ideas with existing data.

Figure 1.1 shows the Engel curve¹ for domestic fuel drawn non-parametrically using UK data from the 1992 Family Expenditure Survey (FES). If household preferences were homothetic, the fuel share would be unaffected by total spending (and therefore invariant to (log) total expenditure). The Engel curve would be flat. However, the fuel share of total spending declines as the logarithm of total expenditure increases, illustrating non-homotheticity. This downward-sloping Engel curve is typical of goods that are usually thought of as necessities; poorer households with lower total expenditure spend a greater proportion of that total on necessities like fuel and food than do richer households.²

Figure 1.1
The Engel Curve for Domestic Energy, FES, 1992

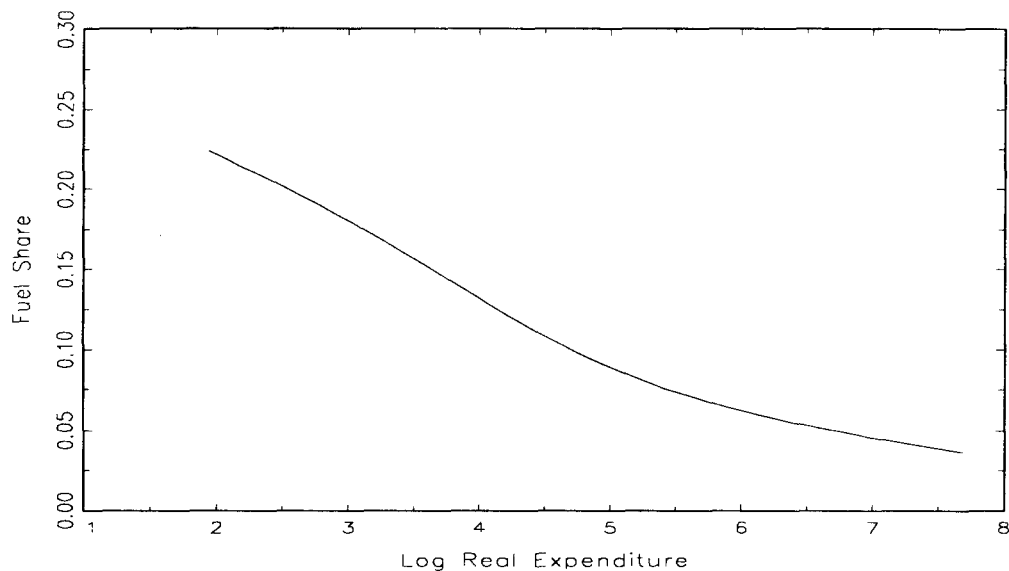


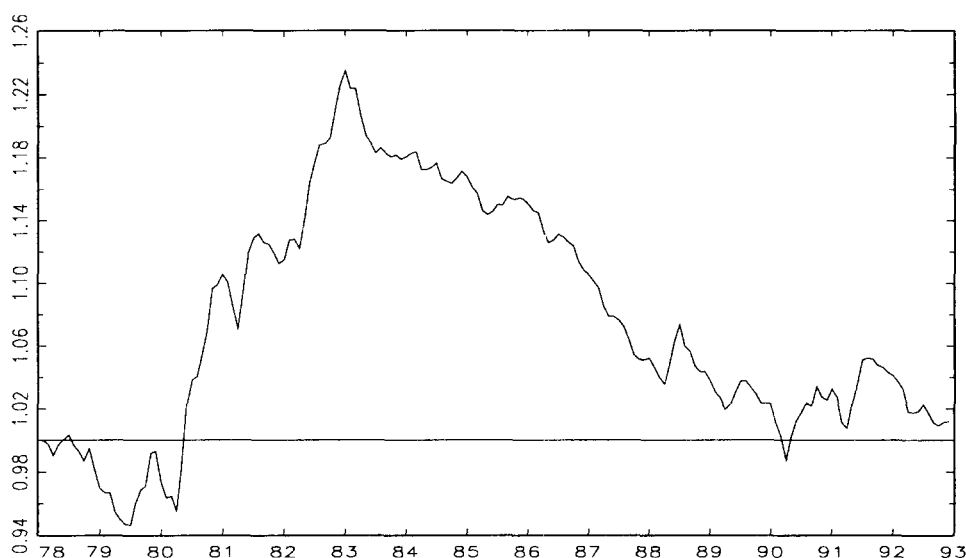
Figure 1.2 shows the price of domestic fuels relative to the all-item retail price index from 1978 to 1992. It is clear that there has been considerable relative price movement over this period, with domestic fuel prices increasing rapidly from early 1980 to a peak in 1983, and falling subsequently. Figures 1.1 and 1.2 are sufficient to show the existence of systematic differences between the cost of living of different households. Banks, Blundell and Lewbel (1994) illustrate non-homotheticity and utilise relative price movements in demand analysis for a range of broadly defined non-durable goods including domestic fuel. They show that Engel curves are neither flat nor always linear. However, within broad expenditure categories there are further variations in spending patterns which go beyond the Engel relationship illustrated, to include households' demographic characteristics and seasonal and regional effects. These factors are normally parametrised as dummy variables which shift the intercepts of the Engel curves. Furthermore, there

¹ The proportion of the total household budget allocated to fuel against log total expenditure.

² Luxuries are usually characterised by upward-sloping Engel curves.

may be price variations within commodity groups (between gas and electricity within the fuel group, for example). This suggests that to ignore within-commodity-group spending patterns and price movements may leave out important contributions towards variations in the cost of living between population groups and that therefore cost-of-living calculations should be made using the most disaggregated data available.

Figure 1.2
The Relative Price of Domestic Fuel, UK, 1978-92



The prima-facie evidence that the cost of living can vary between different sorts of households raises several issues. Firstly, given that there appear to be systematic differences in spending patterns between different groups in the population, has the pattern of relative price movements in the past led to differences in the growth of living costs between groups which are also systematic? If so, how different are they? To what extent have indirect tax reforms since 1979 contributed to this? Depending on the answers to these questions may come a raft of others. If the cost of living has risen faster at one end of the income distribution than the other, does this substantially alter our view of real income inequalities? Does it increase or reduce the growth in real income inequality and is it significant? Does the use of an average measure of increases in living costs (usually the retail price index) for the up-rating of a broad range of state benefits under- or over-compensate recipients?

This paper seeks to answer these questions by examining the pattern and extent of differences in cost-of-living increases for different groups within the population since 1979. The plan of the paper is as follows. Section 2 presents a discussion of the properties of some alternative cost-of-living indices and the data to be used in the study. Section 3 focuses on patterns of non-housing inflation for different income groups and demographic groups. Section 4 looks at the influence of indirect tax reform over the period on non-housing inflation. Section 5 examines the results

of the inclusion of housing costs in the analysis. Two possible methods of calculating housing costs are discussed and alternative all-item cost-of-living indices are calculated using both measures. Section 6 concludes.

2. Household Cost-of-Living Indices

This paper calculates population and subgroup cost-of-living indices using information on price movements from the 74 sub-indices of the retail price index for the period 1978 to 1992, and corresponding household expenditure data from the Family Expenditure Survey for the same period. This is the lowest degree of price aggregation available in published data. Because the price data are collected from national sources, there is no regional variation and as a result this paper ignores regional issues. Differences in cost-of-living indices between population groups are thus generated entirely by differences in their spending patterns, scaled by relative price movements.

Using these data, true cost-of-living indices are easily calculated if the form and parameters of the cost function are known. This requires estimation of a complete system of integrable demand equations at the lowest level of aggregation the data will allow. Banks, Blundell and Lewbel (1994) estimate an integrable five-good demand system using UK FES data from which they recover household cost functions. However, this approach is only practicable for a low number of very broadly defined goods and, as argued above, it incurs the cost of discarding information on variations in spending patterns within these groups. As a result, economists have attempted to devise measures that avoid the need for explicit estimation of welfare and behavioural responses to price changes.

Two of the most commonly used indices are the Laspeyres and Paasche. Their popularity stems from the fact that they require data which are usually readily available and use observed consumption to proxy the reference welfare level. The Laspeyres index is given by

$$P_L(p^t, p^{t+1}, q^t) = \sum_i \left(\frac{p_i^{t+1} q_i^t}{p_i^t q_i^t} \right)$$

and takes as a reference the level of commodity consumption in period t . The Paasche index takes the level of commodity consumption in period $t + 1$ and is given by

$$P_P(p^t, p^{t+1}, q^{t+1}) = \sum_i \left(\frac{p_i^{t+1} q_i^{t+1}}{p_i^t q_i^{t+1}} \right).$$

These two indices are simple to implement given data on prices and consumption in each period. Unfortunately, the circumstances under which they are exact versions of their corresponding base- or end-period utility referenced true indices are restrictive. Konüs (1924) derived the following famous inequalities:

$$P_L(p^t, p^{t+1}, q^t) = \sum_i \left(\frac{p_i^{t+1} q_i^t}{p_i^t q_i^t} \right) \geq \frac{c(p^{t+1}, u^t)}{c(p^t, u^t)} = P(p^t, p^{t+1}, u^t);$$

$$P_P(p^t, p^{t+1}, q^{t+1}) = \sum_i \left(\frac{p_i^{t+1} q_i^{t+1}}{p_i^t q_i^{t+1}} \right) \leq \frac{c(p^{t+1}, u^{t+1})}{c(p^t, u^{t+1})} = P(p^t, p^{t+1}, u^{t+1}).$$

The intuition behind these results is straightforward. In the case of the Laspeyres index, which uses base-period consumption as the reference weight, q^t may be one way of achieving u^t , but it is not necessarily the least-cost way once prices have changed to p^{t+1} . As a result, $\sum_i p_i^{t+1} q_i^t$, which is total expenditure at prices p^{t+1} , is always greater than or equal to $c(p^{t+1}, u^t)$, which is the minimum cost of achieving u^t with prices p^{t+1} . By analogous argument, the Paasche index, which uses end-period consumption weights to proxy welfare, is always less than or equal to the corresponding end-period true price index.

The only circumstance under which the Laspeyres and Paasche indices will be equal to the appropriate true indices is one in which household preferences exhibit no substitution effects, i.e. are Leontief in form. Then, in the Laspeyres case for example, q^t remains the least-cost way of achieving u^t even under the new price vector p^{t+1} . However, this model of household consumption is too restrictive and implausible if substitution effects are expected to be significant.¹

A useful alternative to the Laspeyres and Paasche indices is one proposed by Tornqvist (1936) which Diewert (1976) shows to be equivalent to the true index under a relatively more plausible model of household consumption behaviour. The Tornqvist index is given by

$$P_T(p^t, p^{t+1}, u^T) = \sum_i \frac{1}{2} (w_i^{t+1} + w_i^t) \ln \frac{p_i^{t+1}}{p_i^t}$$

where $w_i^t = \frac{p_i^t q_i^t}{\sum_i p_i^t q_i^t}$ is the budget share of good i in period t . This index is a close

local approximation to the true cost-of-living index if the logarithm of the cost function is a quadratic form in the logarithm of prices and utility, and where the reference utility level u^T is the geometric mean of u^t and u^{t+1} ; that is,

¹ Blundell, Pashardes and Weber (1994) find evidence of large cross-price substitution effects in UK FES data.

$$\begin{aligned}
P_T(p^t, p^{t+1}, u^T) &= \sum_i \frac{1}{2} (w_i^{t+1} + w_i^t) \ln \left(\frac{p_i^{t+1}}{p_i^t} \right) \\
&= \frac{1}{2} \left[\ln \left(\frac{c(p^{t+1}, u^t)}{c(p^t, u^t)} \right) + \ln \left(\frac{c(p^{t+1}, u^{t+1})}{c(p^t, u^{t+1})} \right) \right].
\end{aligned}$$

The form that household preferences take in this model is a great improvement over the Leontief preferences underlying the Paasche and Laspeyres indices. This is because the cost function explicitly allows for substitution effects. The Tornqvist index is therefore based upon a preferred model of household behaviour, and although it avoids the need to estimate substitution effects, it does not suffer the substitution bias inherent in the Paasche and Laspeyres indices.¹ It also has the advantage that this type of cost function can provide a second-order local approximation to any cost function² and performs relatively well in applied work on demand analysis.³

The calculation of a constant-utility Tornqvist cost-of-living index with more than two periods, however, would still require estimation of the parameters of the cost function. This approach was adopted by Fry and Pashardes (1985) in an empirical illustration based only on food expenditure data from the FES. To extend this across the full range of commodities in order to make a complete comparison would be computationally extremely expensive. As a result, this paper will proceed by calculating chained series of pairwise Tornqvist indices for each commodity. This will mean that each link in the chain refers to a different reference welfare level. Nevertheless, Diewert (1978) shows that these indices differentially approximate each other as well as the true index provided that variations in prices and expenditures between each period are small. He argues that this provides a strong justification for minimising period-to-period variations in prices and quantities by means of frequent rebasing and by chaining annual indices. This is the approach adopted here.

The next section looks at cost-of-living indices that omit housing costs. Housing is one of the biggest elements in total household spending, and expenditure patterns within the broad housing group vary widely both between households and over time. Furthermore, the principal housing price sub-indices such as rent and mortgage interest have experienced some of the largest relative movements of all goods. The wide variation in spending patterns, the big relative price movements and the overall importance of housing as a share of total expenditure mean that, for certain periods, the differential effects of housing costs may dominate those of other goods. Section 3 therefore abstracts from housing costs to look at other sources of variation.

¹ For a proof of this, see Appendix A.1.

² Christensen, Jorgenson and Lau, 1975.

³ Deaton and Muellbauer, 1980; Blundell, Pashardes and Weber, 1994.

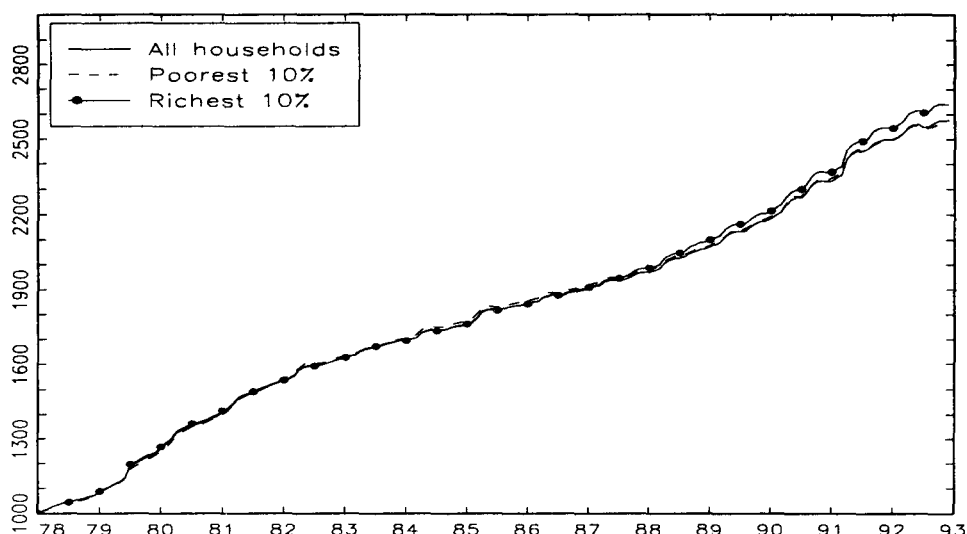
Section 4 examines the effects of indirect taxation. The period 1979 to 1992 has seen a variety of changes in both the rate and structure of VAT as well as excise duties, and Section 4 examines the extent to which these tax reforms may have differentially affected various groups within the population and contributed to the patterns discussed in Section 3.

Section 5 addresses the issue of housing costs. Given the overall significance of housing, the way in which housing costs, and in particular the costs of owner-occupation, are measured has an importance influence on cost-of-living calculations. Section 5 discusses two methods of calculation and presents results based on each. The sensitivity of the results to the methodology employed is illustrated and discussed.

3. Non-Housing Measures

There are several ways of discussing and illustrating group cost-of-living indices. Most previous studies (Fry and Pashardes (1986) and Bradshaw and Godfrey (1983), for example) present cost-of-living levels. Figure 3.1 presents the Tornqvist non-housing cost-of-living series for all households, the poorest 10 per cent of households and the richest 10 per cent of households (after-housing-costs equivalised measure¹) from 1978 to 1992.

Figure 3.1
Cost-of-Living Indices by Income Group
(1978 = 1000)

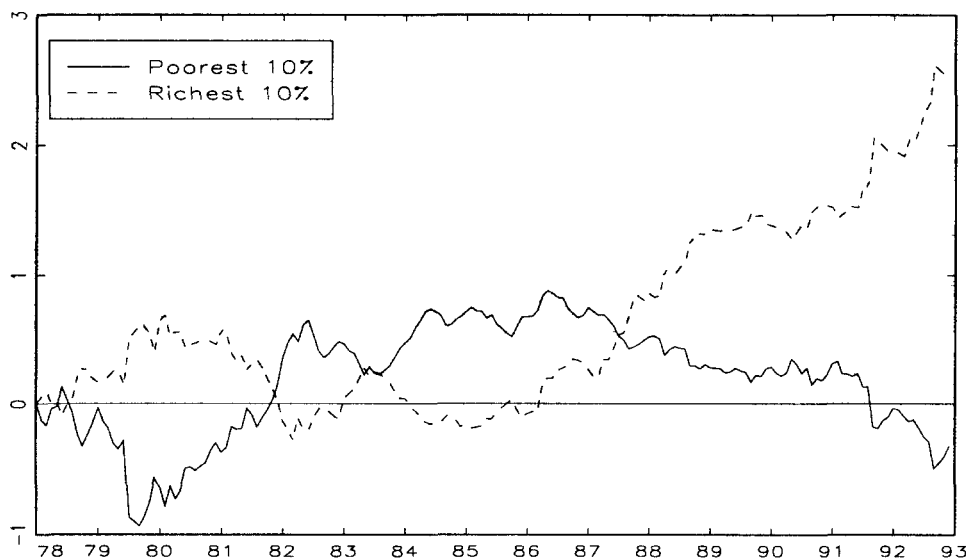


This is very uninformative, but serves to illustrate how close to one another the indices for the groups are. The only discernible difference comes in the last third of the series when the cost of living for the richest 10 per cent rises above the all-households average.

Figure 3.2 uses the same data but plots differences from the all-households mean, expressed as a percentage of the all-households index, for the two subgroups. The all-households index is therefore normalised to the zero line. This makes the differences visible. We can see that the cost of living of poorer households was higher than the all-households average for roughly 10 years (1982 to late 1991), but only by about half of one per cent on average. They end the period, however, with a cost-of-living index slightly below the average. The percentage difference for the richer households from the late 1980s is much more striking when presented like this, but is still small, ending at 2.46 per cent above average.

¹ See Goodman and Webb (1994).

Figure 3.2
Cost-of-Living Indices by Income Group: Differences from the All-Households Average
 (per cent)



The presentation of differences in levels is quite interesting but most of the policy-relevant issues are to do with annual changes in the level. Benefit up-rating, for example, is designed to compensate households for year-to-year changes in their cost of living rather than the levels. Figure 3.3 illustrates the annual change (inflation) in the Tornqvist¹ cost-of-living indices (exclusive of housing) for all households and for those in the top and bottom income deciles from 1979 to 1992.

Non-housing inflation rates for households at the top and bottom of the income distribution follow the average closely. In general, the all-households average rate lies between the other two but the ranking changes; there are periods when poorer households are facing a higher rate of inflation and richer households a lower rate than the average, and there are also periods when this is reversed. Figure 3.4 emphasises the between-group differences by plotting the difference in inflation rates from the average at each point. As in Figure 3.2, the all-households average index is therefore normalised to zero and the differences for each income group are traced around it. For example, in early 1982 when the average all-households inflation measure is around 8 per cent (see Figure 3.3), Figure 3.4 shows that the richest 10 per cent of households saw their cost of living increasing at a rate approximately 0.8 percentage points lower than average (i.e. at around 7.2 per cent), while the cost of living of the poorest 10 per cent was increasing at a rate approximately 0.8 percentage points faster than average (i.e. at around 8.8 per cent). The difference in inflation rates between the richest and poorest households was thus about 1.6 percentage points at this time.

¹ The final year has been calculated as a Laspeyres index.

Figure 3.3
Inflation Rates by Income Group
 (per cent)

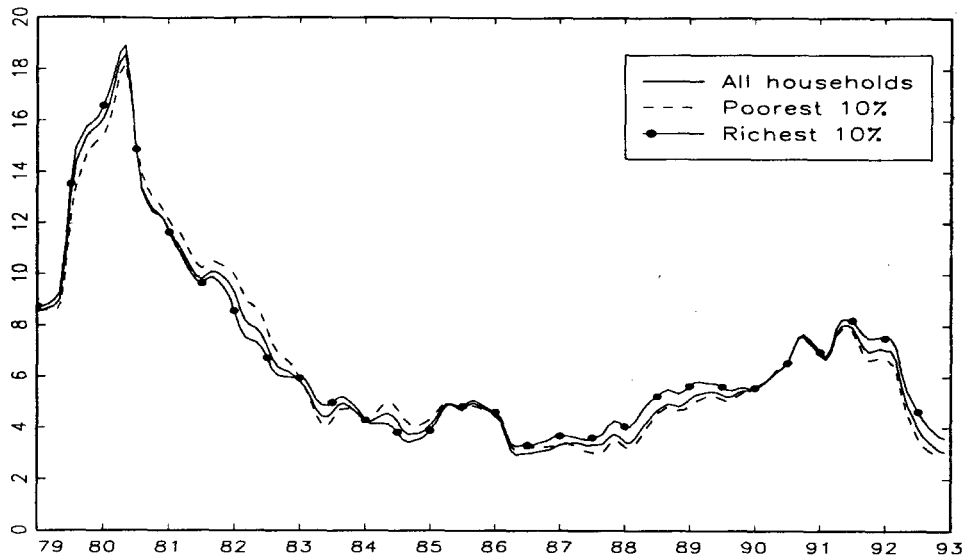


Figure 3.4
Difference in Inflation Rates by Income Group
 (percentage points)

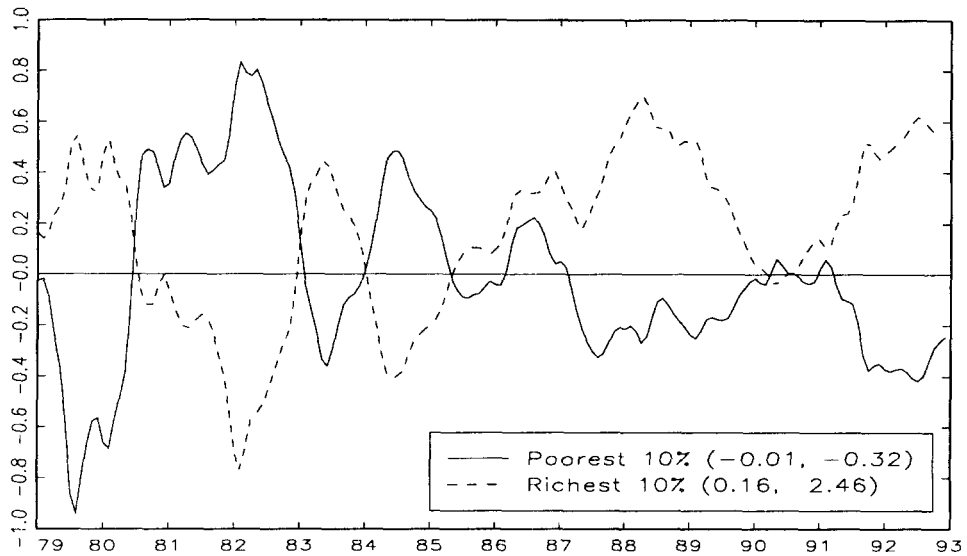


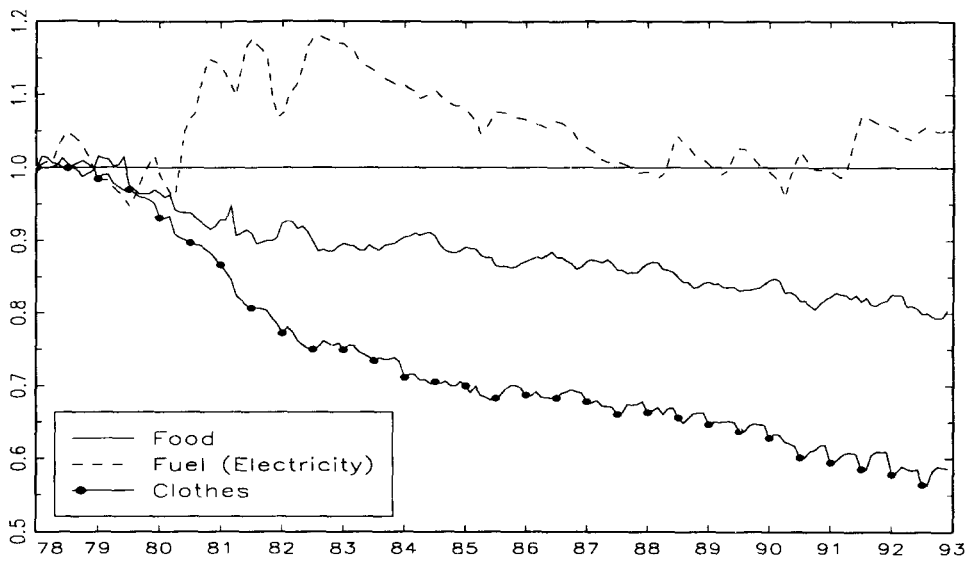
Figure 3.4 shows the cycling nature of the indices more clearly than Figure 3.3. Richer households had higher-than-average inflation until mid-1980, lower-than-average from then until late 1982, another year above average, another year below, and then a period from 1985 onwards of, generally, higher-than-average inflation with a brief dip in the first quarter of 1990. The first number in parentheses in the legend for richer households is the average difference from the all-households

Table 3.1
Proportion of Total Non-Housing Expenditure Allocated across Goods,
FES, 1978 and 1992

Group	Year	All	Poorest 10 per cent	Richest 10 per cent
Food	1978	0.24	0.34	0.16
	1992	0.17	0.23	0.10
Catering	1978	0.04	0.03	0.05
	1992	0.04	0.03	0.05
Alcohol	1978	0.06	0.04	0.06
	1992	0.05	0.05	0.04
Tobacco	1978	0.04	0.06	0.02
	1992	0.02	0.05	0.01
Fuel	1978	0.07	0.10	0.05
	1992	0.06	0.09	0.04
Durables	1978	0.07	0.05	0.10
	1992	0.07	0.05	0.08
Clothes	1978	0.10	0.08	0.10
	1992	0.07	0.08	0.06
Motoring	1978	0.13	0.09	0.16
	1992	0.15	0.11	0.15
Fares	1978	0.03	0.03	0.03
	1992	0.04	0.04	0.03
Entertainment	1978	0.05	0.03	0.08
	1992	0.11	0.05	0.22
Other	1978	0.17	0.15	0.18
	1992	0.21	0.21	0.23

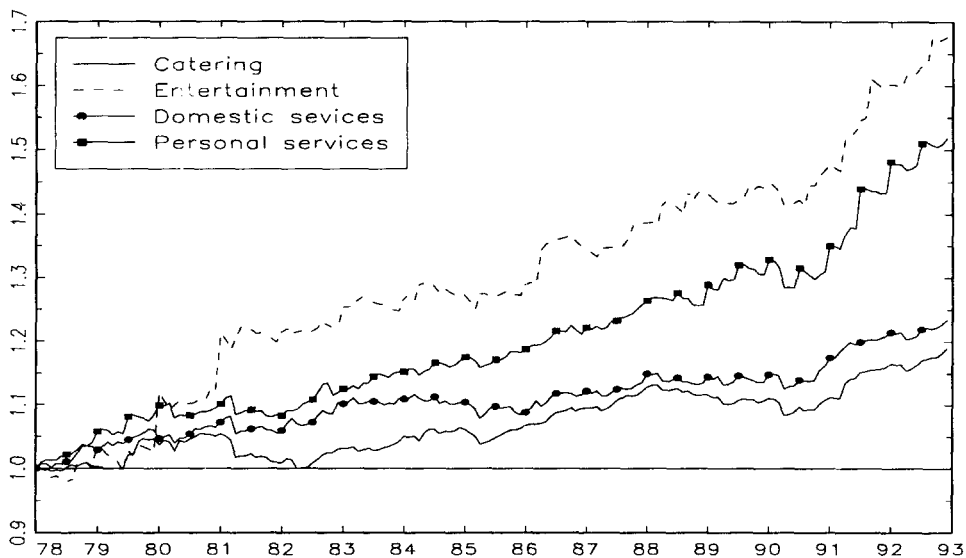
index for the whole period. This says that on average, inflation for richer households was 0.16 percentage points higher than the average for all households between 1979 and the end of 1992. The second number in parentheses shows the difference in the cost-of-living *level* at the end of the period expressed as a percentage of the all-households average *level*. This shows that at the end of the period, the cost of living of richer households was 2.46 per cent higher than average, and follows directly from their higher-than-average inflation rate. The corresponding numbers for poorer households show that, on average, their inflation rate was 0.01 percentage points lower than the average, and that by the end of the period their cost of living was 0.32 per cent less than the average. The end-period percentage differences correspond to the end-period differences in Figure 3.2.

Figure 3.5
The Relative Price of Necessities: Food, Fuel (Electricity)^a and Clothing



^a Poorer households' fuel consumption consists predominantly of electricity. See Baker and Crawford (1993).

Figure 3.6
The Relative Price of Luxuries: Catering, Entertainment and Services



The overall downward effect on relative inflation for poorer households is largely a product of falls in the relative price of necessities such as food and clothing and (since the early 1980s) domestic fuels (which form a relatively large part of their total spending), and increases in the prices of many luxuries such as eating out,

entertainment and other services (which form a relatively small part). Figures 3.5 and 3.6 illustrate these trends in relative prices, and Table 3.1 reports the average expenditure shares for each group at the beginning and end of the period.

The table shows that the average share of spending allocated to necessities (food, fuel, clothing) for all households has fallen from 0.41 to 0.30 over the sample period. The downward-sloping Engel curve relationship for necessities is apparent at both ends of the period. Richer households spend less on necessities than average (0.31 falling to 0.20), and poorer households spend more (0.52 falling to 0.40). The corresponding share increases have been in luxury goods such as entertainment and the 'other' category which is mostly services. One of the largest differences between the two groups over time is spending on entertainment, which has grown much faster among richer households. Engel relationships are not always smooth or linear and as a result the progression in inflation rates between deciles is not always smooth. Expenditure shares for the intermediate deciles are given in Appendix A.2. The expenditure patterns shown in the table, coupled with the relative price movements illustrated in Figures 3.5 and 3.6, largely explain why the *non-housing* cost of living of richer households increased by more over this period than that of poorer households did. Nevertheless, as Figures 3.1 and 3.2 show, these differences turn out to be relatively small by the end of 1992.

Figure 3.7
Difference in Inflation Rates by Employment Status of Head
 (percentage points)

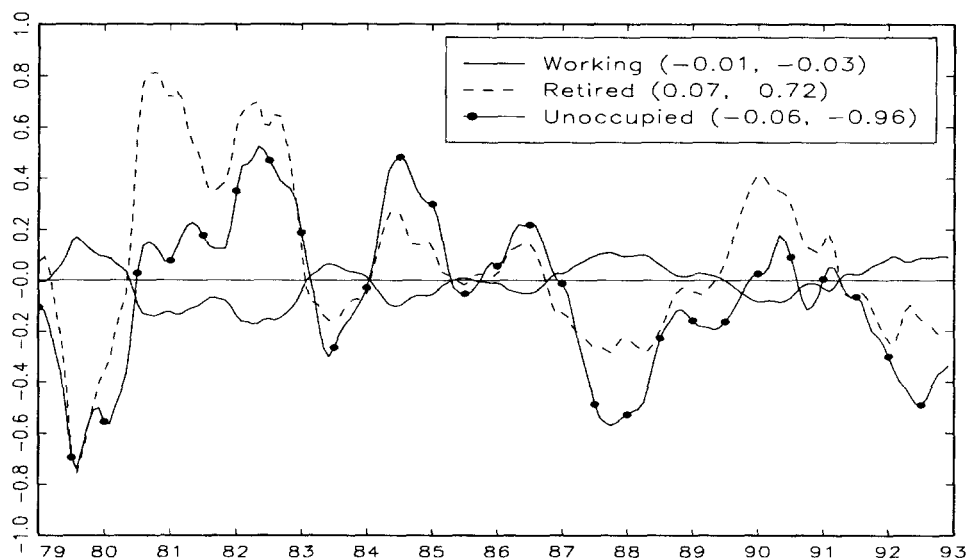


Figure 3.7 illustrates the difference from the all-households inflation index by employment status of the head of household. Employment status and income are closely related and therefore it is not surprising that the cycles of the retired and unoccupied groups are similar to those of the poorer households in Figure 3.4. The main differences lie in the period 1989-90 when inflation for these groups was above the average to a greater extent than it was for the poorer households shown

in Figure 3.4. As with the poorer households, the average difference for the unoccupied group is negative (-0.06 percentage points) as is the percentage difference in cost-of-living levels at the end of the period (-0.96 per cent). However, longer periods above the average for retired households in the early 1980s and in 1989-90 mean the retired households have done, on average, slightly worse with a positive average difference over the period (+0.07 percentage points) and corresponding higher cost-of-living level at the end (+0.72 per cent).

It is important to remember, however, that basing cost-of-living calculations on more closely defined population subgroups does not make the problem of non-homotheticity go away. By its very nature, an average index will have a variance around it. Given non-homotheticity, every household has its own cost of living, and even an average index calculated for a particular group will still not be representative of the experience of all of its members. Grouping households on the basis of one characteristic still leaves room for variation in others. Focusing on deciles of income, for example, will group together households which lie close to each other on the Engel curve. Variations in spending patterns within the group will still occur according to other household characteristics such as the presence of children. Nevertheless, such an index should be more representative than the all-households average.

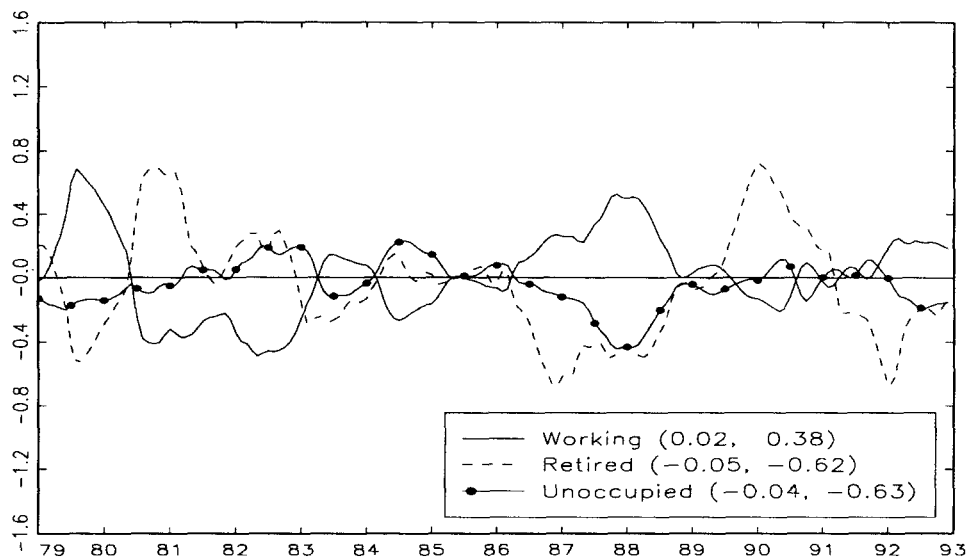
Taking the poorest 10 per cent of the population and calculating changes in their average cost of living gave Figure 3.4. It is important to remember that the poorest 10 per cent are not a completely homogeneous group. Variations in income and total expenditure are naturally small within the group and consequently differences in spending patterns due to households' positions along the Engel curve are also small. However, differences in household demographics within this section of the population may entail differences between Engel curves defined on these characteristics. There are, for example, poor households with children and poor households without children, young poor households and old poor households. These other factors will contribute to within-group variations in shares which may also be well determined.

In Figure 3.8, the poorest 10 per cent of the population is subdivided by employment status and the differences from the average *within* the bottom decile group traced. The zero line therefore corresponds to the normalisation around the average line for the poorest 10 per cent in Figure 3.4. Those households which may be thought of as the poorest amongst the poorest 10 per cent of the population (those in which the head is retired and drawing a pension or unoccupied¹) appear to have suffered least under inflation over this period. Average inflation rates for these groups are 0.05 percentage points and 0.04 percentage points below the average for their decile group (and therefore 0.06 percentage points and 0.05 percentage points below the all-households average for this period). By the end of the period, their cost-of-living levels are 0.62 per cent and 0.63 per cent below the decile average

¹ See Goodman and Webb (1994).

(0.94 per cent and 0.95 per cent below the population average). Working households within the decile have a higher-than-average inflation rate of +0.02 percentage points compared with the decile average (+0.01 percentage points compared with the population as a whole). This is because pensioners and unemployed households among the poorest 10 per cent are even more dependent on consumption of necessities than working households in the same group. Given the falls in the relative price of necessities over the period illustrated in Figure 3.5, their higher-than-average consumption of necessities has insulated them from inflation by more than the average for their group. The pattern which emerges across the income distribution is therefore preserved within the decile group.

Figure 3.8
Difference in Inflation Rates within the First Income Decile Group
by Employment Status of Head
 (percentage points)



A major demographic characteristic which influences households' expenditure patterns is the presence of children. Figure 3.9 shows the difference from the all-households average inflation index for those households with and without children. The differences are shown to be small, no more than ± 0.2 percentage points at the most in the very early 1980s. The presence of children, however, makes a household take on some of the spending characteristics of poorer households (adults forgo spending on luxuries like entertainment for more spending on necessities like food and clothing). As was shown earlier, the relative price of non-housing necessities has fallen, and therefore this sort of spending pattern reduces the incidence of inflation over the period on households which consume these goods. The presence of children within a household therefore results in an average inflation rate which is 0.07 percentage points below the population average over the period, and a cost of living 1 per cent below average at the end. Households without children, like richer households, are able to spend more on luxuries and over the period had a higher-than-average inflation rate.

Figure 3.9
Difference in Inflation Rates: Households with and without Children
 (percentage points)

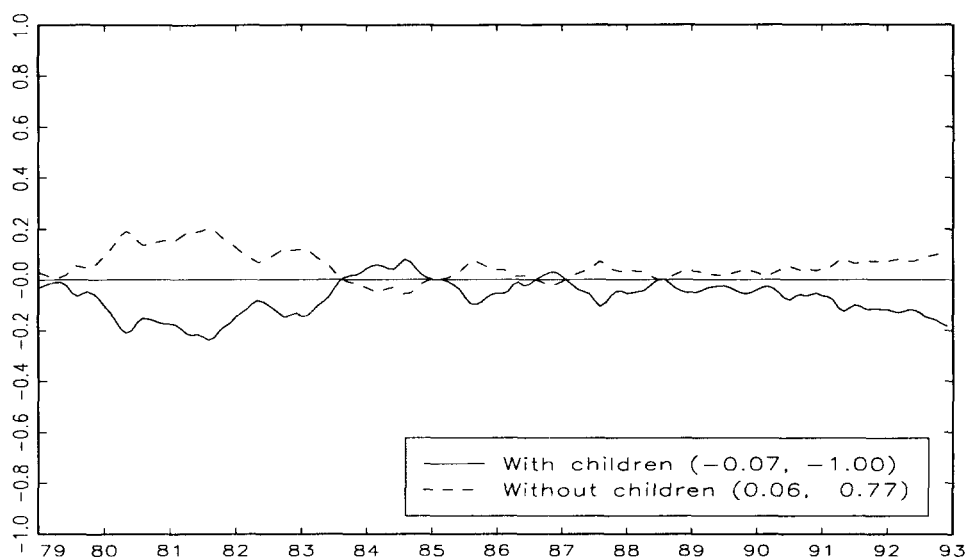
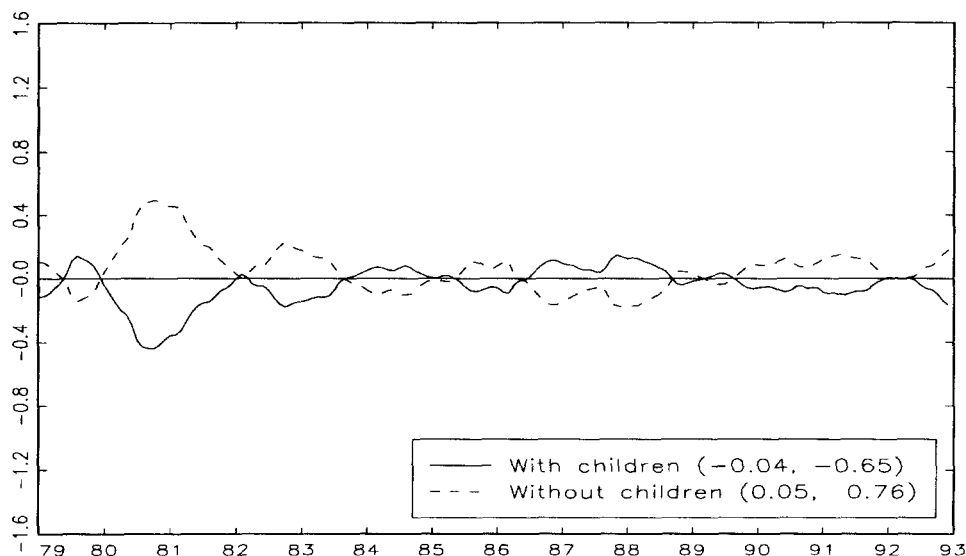


Figure 3.10 splits the bottom income decile group according to whether or not there are children in the household and traces the difference from the decile group average. As Figure 3.9 would suggest, the within-group differences generated are relatively small; however, the fact that children make a household spend more on necessities and that this reduces their inflation rate is illustrated clearly even amongst households in the bottom decile group. Households in the bottom decile group with children have experienced an average rate of inflation over the period 0.04 percentage points less than the decile group average (0.05 percentage points less than the all-households average). Poor households without children, with a little more money to spend on luxuries, had an average rate of inflation which was 0.05 percentage points above the decile group average (0.04 percentage points above the population average).

The general result which emerges from this analysis of non-housing inflation is that, because the price of luxuries has risen faster than the price of necessities over the period, households that allocate a higher proportion of total non-housing expenditure to necessities (either as a result of low household income or additional non-earning household members) have experienced a lower-than-average increase in their cost of living.

It should be obvious that conclusions based on the data presented in this section will be heavily dependent upon the period from which the data are drawn. If the starting-point had been in 1985, poorer households would have had a lower rate of group-specific inflation than is the case over the longer period. Richer households would have appeared to have experienced a higher rate. If the analysis

Figure 3.10
Difference in Inflation Rates within the First Income Decile Group,
with and without Children
 (percentage points)



had started in mid-1980 and ended in 1985, the conclusions would have been reversed. Equally, if the starting-point for this paper had been earlier than 1979, the conclusions drawn would have been substantially different.

This is demonstrated by previous studies such as Bradshaw and Godfrey (1983) and Fry and Pashardes (1986) which find an anti-poor bias in price increases based on observations over a shorter time period (1978 to 1983 and 1974 to 1982 respectively). Earlier studies¹ indicate that the post-war period has seen cycles in the cost of living over the longer term. For example, during the war, the price of necessities was kept low. However, in the period immediately after the war, the relative price of necessities rose fast, increasing the cost of living of poorer households. This bias was reduced in the early 1960s and then disappeared altogether by the beginning of the 1970s. However, food price rises in particular during the 1970s once more increased the cost of living of poorer households. This continued through the 1970s despite the food subsidies introduced by the government in 1974. With membership of the Common Market and the dismantling of the food subsidy schemes, food prices rose once more, and this, combined with rising fuel prices, saw the burden of inflation falling most heavily on the poor.

¹ Allen, 1958; Brittain, 1960; Tipping, 1970; Muellbauer, 1977; Piachaud, 1978.

4. Indirect Taxation

Since 1979, there have been various reforms to the structure and rate of VAT and excise duties. At the beginning of 1979, there was a two-tier VAT structure with an 8 per cent rate and a 12.5 per cent rate. In Geoffrey Howe's first Budget, this was replaced with a single rate of 15 per cent. At the same time, excise duties on alcohol and tobacco were cut and petrol duties raised. However, there were sharp increases in excise duties in Howe's third Budget in 1981, with beer up 24 per cent and cigarettes up 16 per cent. Beer and cigarettes bore most of the subsequent increases, and in the 1984 Budget, Nigel Lawson cut wine duties sharply. The next big indirect tax reform was Norman Lamont's decision to increase the VAT rate to 17.5 per cent in 1991. The widening of the VAT base in April 1994 to include domestic fuels does not fall within the period of this study although its implications for households across the income distribution are obvious from Section 3.

VAT is a broadly progressive tax. In 1992, roughly one-third of total expenditure by the poorest 10 per cent of the population went on goods and services on which VAT was charged. Spending on VATable goods accounted for nearly two-thirds of the total spending of the richest 10 per cent. This progressivity is entirely due to the base upon which VAT was levied and the spending patterns shown in Table 3.1. During the period 1979 to 1992, food, domestic fuels, passenger transport and children's clothing, *inter alia*, were zero-rated for VAT (i.e. entirely untaxed). Given that these types of goods are more important elements of total expenditure for poorer households, zero-rating means that the burden of VAT falls most heavily on better-off households.

The incidence of excise duties is more mixed. The main dutiable goods are tobacco, alcohol and petrol. In general, petrol expenditure is higher for richer than for poorer households because of wider car-ownership amongst wealthier households. As a result, petrol excise duties are progressive when looked at across the whole population.¹ Tobacco duties, however, are regressive. Table 3.1 shows that poorer households spend proportionately more than richer households on tobacco. This is due to higher rates of smoking in the bottom income decile rather than higher consumption by smoking households. Patterns of alcohol consumption and the incidence of duties, however, are more complex.

The Engel curve for alcohol is quadratic and has an upside-down U shape. Alcohol expenditure therefore has the characteristic of a luxury for poorer households (the upward-sloping portion of the curve), and of a necessity for richer households (downward-sloping portion of the Engel curve).² There is some evidence for this in Table 3.1. With income and expenditure growth over the 1978 to 1992 period,

¹ Amongst car-owners, however, petrol duties are regressive and fall particularly hard on poorer rural households for which car-ownership, and therefore petrol expenditure, are more of a necessity. See Baker and Crawford (1993).

² Banks, Blundell and Lewbel, 1994.

the alcohol share for poorer households increased from 4 per cent to 5 per cent consistent with movement up the positively sloped part of the Engel curve. The share for richer households fell from 6 per cent to 4 per cent, consistent with movement down the negatively sloped part of the curve. Within the alcohol commodity group, there are further differences, with richer households spending more on wines and spirits than poorer households, with a general shift from beer to wines and spirits over the period across all households. Because of their higher expenditure shares, the overall incidence of alcohol taxation is upon poorer households. A shift in the balance of alcohol taxation away from wines and spirits also impacts more upon poorer households.

To illustrate the effects of indirect tax changes on the cost of living of different income groups, price increases due to VAT and excise duty changes have been removed from the price indices from 1978 onward and the cost-of-living indices recalculated. Figures 4.1 and 4.2 show the differences from the average inflation index for the poorest and richest households. The solid lines correspond to the lines in Figure 3.4; however, here the indices are calculated using the Laspeyres formulation and not the Tornqvist. While this does not affect the mean deviation and end level (-0.01 percentage points and -0.32 per cent in the tax-inclusive series for poorer households), the variances of the paths have increased compared with Figure 3.4. This results from the properties of the Laspeyres index discussed in Section 2.

The problem with the Tornqvist index in this application lies in the use of the end-period weight. The end-period weight depends on the end-period price vector, so when the counter-factual tax-exclusive price series is used, the correct end-period weights are not observed. Instead, only the base-period weights are observed and therefore the Laspeyres index is calculated.

The first major difference between the taxed and untaxed series occurs in mid-1979. This corresponds to the VAT reforms in Geoffrey Howe's first Budget. The amalgamation of the two VAT rates to a single, higher, 15 per cent rate caused the faster increase in the cost of living of richer households and the slower-than-average increase for poorer households illustrated. One year later, the effects of the VAT increase drop out of the inflation rates for both groups, and return the tax-inclusive series to close to the tax-exclusive path.

Increases in excise duties, particularly on beer and cigarettes, and later the cut in wine duties are shown to push up inflation for poorer households between mid-1980 and 1987. The next period was one in which most excise duties were simply up-rated in line with inflation in each Budget, and the final feature of note comes with the increase in the VAT rate to 17.5 per cent in 1991 by Norman Lamont. Just as it did in 1979, the VAT increase pushed up cost-of-living inflation for richer households faster than for poorer households. Again, the effects only last one year.

Figure 4.1
Difference in Inflation Rates for the Poorest 10 Per Cent, with and without Taxes
 (percentage points)

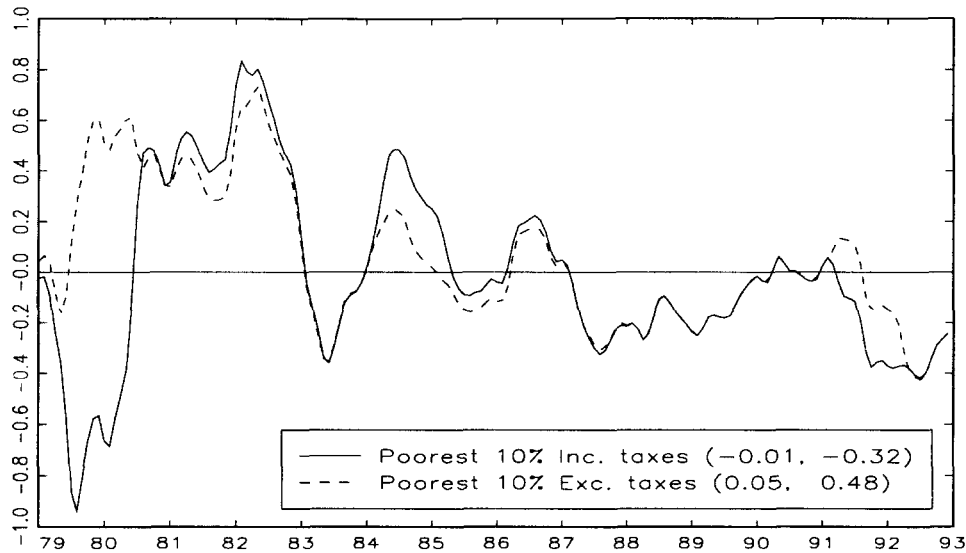
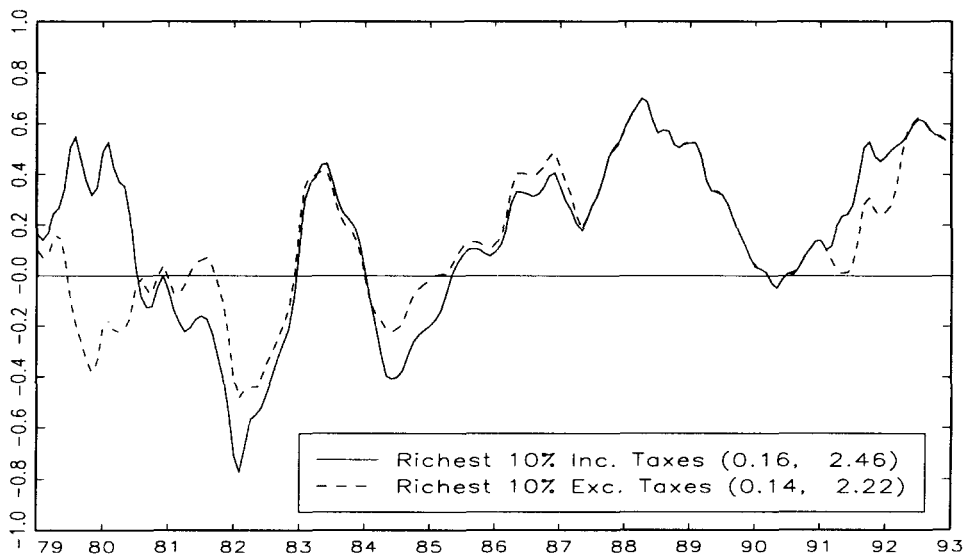


Figure 4.2
Difference in Inflation Rates for the Richest 10 Per Cent, with and without Taxes
 (percentage points)



Overall, the effects of indirect taxes have been to slow cost-of-living inflation for poorer households relative to the average. In the absence of VAT and indirect taxes, the poorest 10 per cent of households in the income distribution would have had an average increase in their cost of living which was 0.05 percentage points higher than average instead of 0.01 percentage points lower. Richer households'

cost-of-living increases would have remained higher than average due to increases in the relative price of luxuries, but by a lesser amount (0.14 percentage points rather than 0.16 percentage points).

5. Housing

Housing costs form one of the largest components of total household expenditure. In 1992, the RPI weight for housing was 17.2 per cent (2 percentage points more than for food). Within housing, shelter costs are the largest element. In 1978, the RPI weight for rents was 3.2 per cent of total expenditure and the weight for mortgage interest payments was 3.16 per cent. By 1992, the weights were 3.5 per cent and 6.4 per cent respectively. Not only are the weights relatively large, but the contribution of mortgage payments in particular has been quite volatile. Between 1988 and 1990, for example, the mortgage payment weight went from 4.2 per cent to 7.5 per cent. These factors together make the cost-of-living indices extremely sensitive to fluctuations in mortgage interest rates; on average, a 1 per cent increase in mortgage interest rates raises the RPI by 0.5 per cent. A priori, there is no reason to suppose that this increase in living costs would be distributed evenly across the population. Instead, it will impact almost immediately on home-owners, with rents possibly increasing after some time-lag. These different effects across tenure groups will add substantially to the differences in the non-housing cost of living for different population groups illustrated in Section 3.

Given the relative importance of housing costs, the way in which they are measured may have an important effect on the final index and the distributional impact of changes in it. In the case of households living in rented housing, no problems arise in measuring year-to-year changes in their shelter costs. The treatment of shelter costs for home-owners, however, is practically and conceptually difficult. At present, shelter costs for home-owners are represented in the RPI by nominal mortgage interest payments. Essentially, the current approach is to multiply the average outstanding mortgage debt (calculated as a weighted average of the value of mortgages taken out over the previous 25 years) by the current interest rate. This approach has several curious implications.

The use of the interest charge measures current expenditure by the household, but does not reflect the *price* of the shelter service which the house provides. In the same way as the price of a new consumer durable is unaffected by the monthly payments made to the finance company when it is bought on hire-purchase, there is a clear and obvious distinction between the *price* of shelter services and the *borrowing costs* of the household.¹ Mortgage costs go up and down with interest rates and fall to zero at the end of the term, but this is not related to the price of the flow of shelter services which the house provides. In a free market, the price of shelter services would be the imputed rent which the house would command.

At the same time as the current approach entails a high degree of sensitivity to interest rate changes, sharp variations in house prices hardly affect it at all due to the 25-year moving average. Current expenditure on shelter by incumbent home-owners will be unaffected, but if the price of shelter services is the imputed rent

¹ Robinson and Skinner, 1989.

then this should rise with house prices. In the UK, however, the imputed rent approach is difficult to apply because the house rental market is heavily influenced by the provision of public housing. This means that imputing changes in shelter costs for home-owners from changes in the average rent payable on a similar property would be inappropriate. This practice was abandoned in 1975.

There is a particular problem with the measurement of shelter costs for owner-occupiers (households which own their homes outright). These households do not make mortgage payments and so the use of mortgage interest payments for them would give a zero cost. Nevertheless, there must be some cost to owner-occupation; after all, the capital invested in the house may be more profitably invested elsewhere. Furthermore, these households own an asset which is slowly deteriorating physically and technologically. It is also an asset with a capital value which fluctuates. The concept of the user cost approach is an alternative designed to deal with this.

If a household were to borrow in order to buy a house at the beginning of the year, and sell it at the end, the costs to the household would be given by:

$$uc_t = \left[m_t(1 + r_t^m) + (1 - m_t)r_t^e + d_t - E \left\{ \frac{P_{t+1}^h - P_t^h}{P_t^h} \right\} \right] P_t^h$$

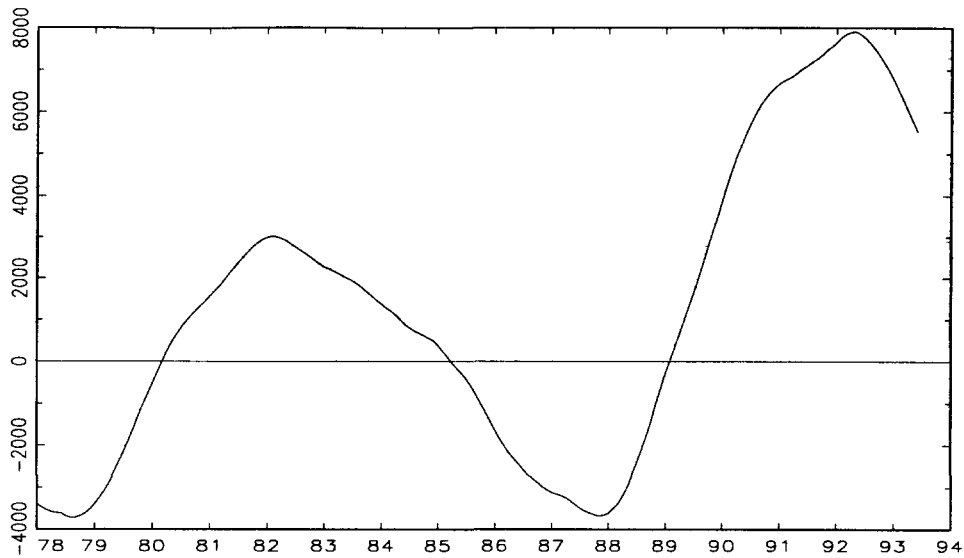
where m_t is the ratio of the amount borrowed to the purchase price, r_t^m is the tax-adjusted mortgage interest rate, r_t^e is the interest rate on alternative investments, d_t is the depreciation rate and transactions costs, P_t^h is the purchase price of the house and the final term in the square brackets reflects the expected capital gain (or loss) made on the house over the year. Dougherty and van Order (1982) show that in a competitive market, user costs equal imputed rents.

Under some, not particularly uncommon, circumstances (rapid house-price inflation and relatively low real interest rates), the capital gain on housing can outweigh the cost of borrowing and as a result the user cost can be negative. This is illustrated in Figure 5.1 which shows the user cost of shelter in the UK from 1978.¹

The house-price increases in the mid- to late 1980s show up clearly as the capital gains on housing sent the user cost negative at over -£3,500 p.a. at its lowest point. Similarly, the house-price collapse at the beginning of the 1990s and the high interest rates at the time combine to push the user cost up to a peak of around £8,000 p.a. The beginnings of the recovery in the housing market and the recent falls in interest rates pull the index down again at the end of the period.

¹ See Appendix A.3 for a description of the calculation of user costs.

Figure 5.1
The Nominal User Cost of Shelter
(pounds per annum)

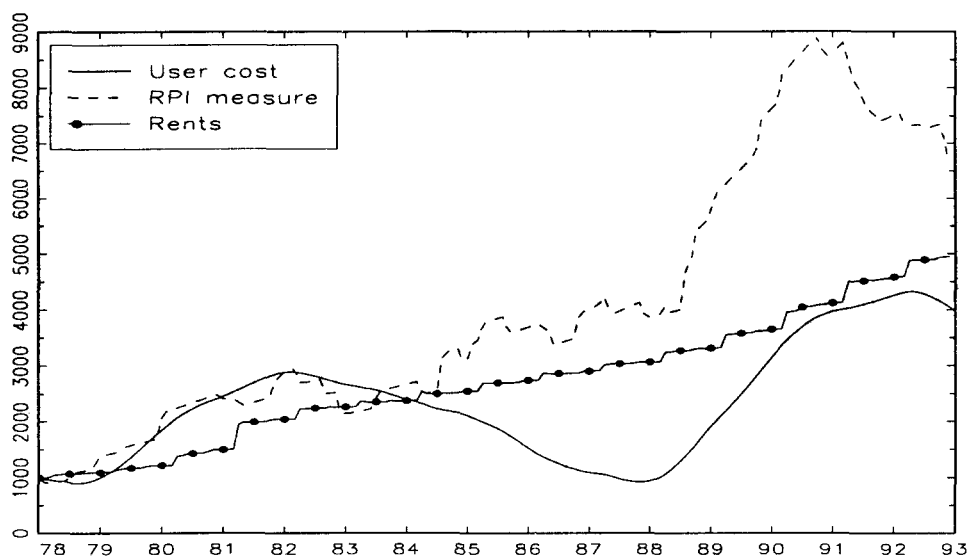


While shelter is a consumption good which is also an absolute necessity, it is also an investment good. The user cost approach admits this aspect explicitly and there is therefore nothing conceptually wrong with a negative price. This simply reflects the fact that during certain periods, housing has represented a good investment, the returns to which substantially outweighed the costs. A shelter cost price sub-index calculated from changes in the user cost series can be based so that it does not ever become less than zero and so that there are none of the practical problems involved in trying to take logs of negative numbers when calculating the Tornqvist index. Figure 5.2 shows the user cost index, the mortgage payment index used in the RPI and the price series for rents.

The fact that the influence of house-price movements on the RPI measure is negligible is illustrated quite clearly as the RPI measure continues to rise gently in the mid-1980s when house prices were rising rapidly. The RPI measure also peaks earlier than the user cost measure at the time when interest rates first started to fall. Because the lowest point in the house-price cycle was not reached for a few months after interest rates fell, the user cost measure continues to rise, although at a slower rate as interest rates fall. The pattern of steps in the rents series is due to the influence of annual changes in rents charged on public housing.

This illustrates one of the principal reasons why the RPI is unpopular with macroeconomists. They are mainly interested in having a price index that gives the rate at which labour income can be turned into goods and services. The interest rate is the rate at which current consumption can be traded for future consumption and its inclusion in the RPI increases the difficulty of controlling inflation (as measured by the RPI) with interest rates. Microeconomists, however, are interested

Figure 5.2
Shelter Costs: Rents, Mortgage Payments (RPI Method) and the User Cost
 (1978 = 1000)



in having a measure of changes in the cost of living on average or, as here, on average for different population subgroups. Increases in interest rates undoubtedly increase the cost of living for home-owners and therefore should be included.

The time-series patterns and the magnitude of the peaks and troughs of the two series are clearly different. As a result, the pattern and extent of the incidence of inflation will be quite different depending on which of the measures is used. The issue of the appropriate weight for the user cost series, however, is difficult to resolve. The concept of a user cost is notional. The cost is incurred by the household but accrued rather than actually paid. Mortgagees, for example, accrue capital gains and losses but only pay their monthly mortgage bills.

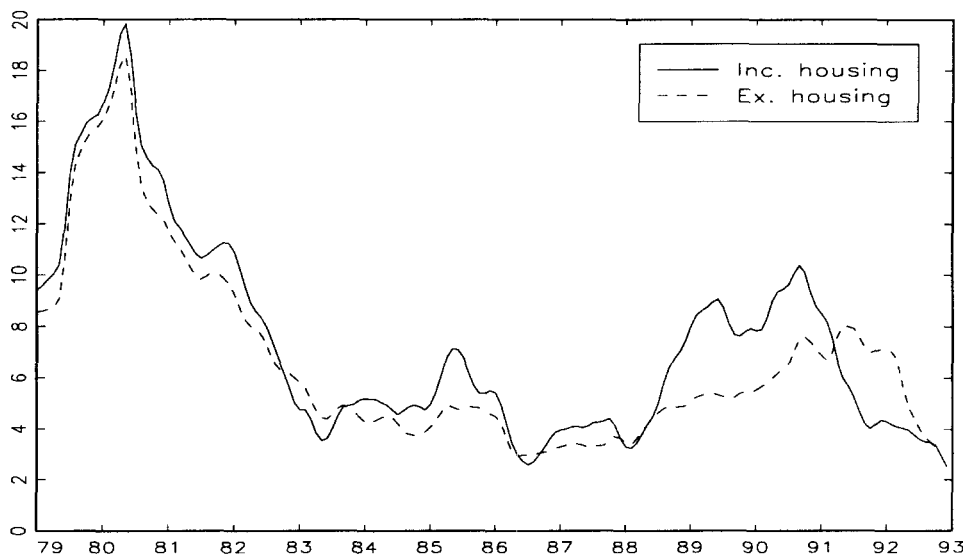
The usual weight applied to changes in the price of a good is the expenditure share where expenditure is price multiplied by quantity. In the case of housing, the implicit quantity is one. The expenditure is therefore the current price. This implies that the weight to apply to the user cost price series is the average nominal user cost itself. The main problem with this, however, is that the size of the weight is both large and extremely volatile, as can be seen from Figure 5.1. In 1978, for example, average total weekly non-housing expenditure was £68. The average weekly user cost was around -£70. In 1992, the average weekly user cost was around £150, while average total non-housing expenditure was £224. At other times (early 1980, 1985 and 1989), the user cost is zero. At the same time, annual increases in the user cost price series reach around 100 per cent in early 1979 and in 1988, while they are negative at other times. Including the user cost price series with the nominal user cost weight would result in an unacceptably volatile index which was completely dominated by shelter costs. This would not make for a particularly useful comparison between the two approaches. The approach adopted

here is a compromise aimed at focusing on the different effects of the two price series. The weight used under the user cost approach is mortgage payments for households with mortgages, and average mortgage payments for households that own their houses outright. This has the benefit of using similar weights to those used under the RPI method for mortgagees, but also gives a positive weight to owner-occupiers. Since $m^t = 0$ in the user cost expression for these households, a different series is generated for owner-occupiers. Section 5.1 presents results based on housing-inclusive cost-of-living indices calculated using the RPI method. Section 5.2 discusses and compares the effects of using the user cost approach.

5.1. The Mortgage Interest Approach

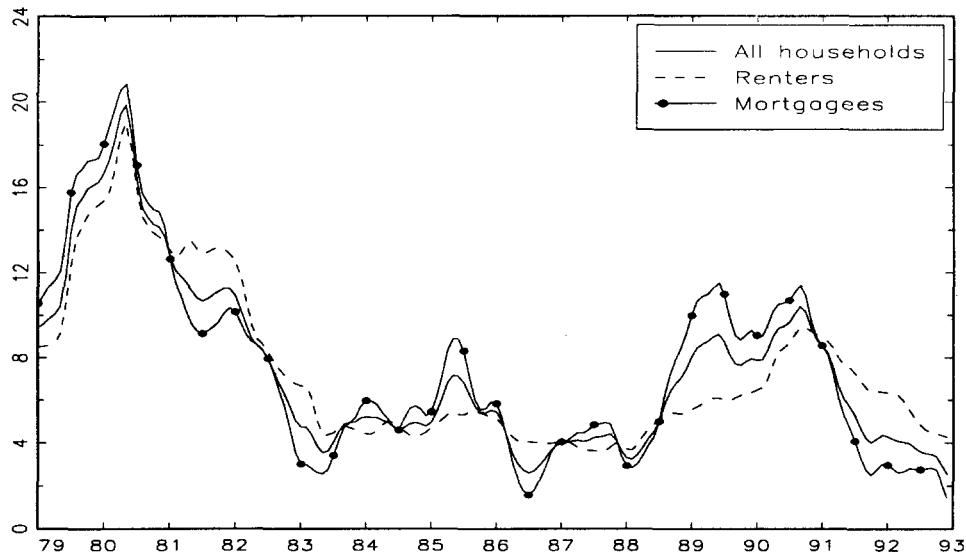
Figure 5.3 shows the Tornqvist all-households average inflation rate calculated with and without housing costs using the mortgage interest payment (RPI) method.

Figure 5.3
Annual Increase in Cost of Living, with and without Housing Costs:
All-Households, RPI Shelter Costs Measure
 (per cent)



Overall, the patterns in the two series are broadly similar as expected (housing, although important, is only one element of household expenditure). The effects of rents and mortgage payments, however, are clear, particularly in the late 1980s when increases in interest rates pushed inflation in the all-items index above inflation in the non-housing index. The differential effects on renters versus mortgagees are shown in Figure 5.4.

Figure 5.4
Inflation Rates by Tenure, RPI Shelter Costs Measure
 (per cent)



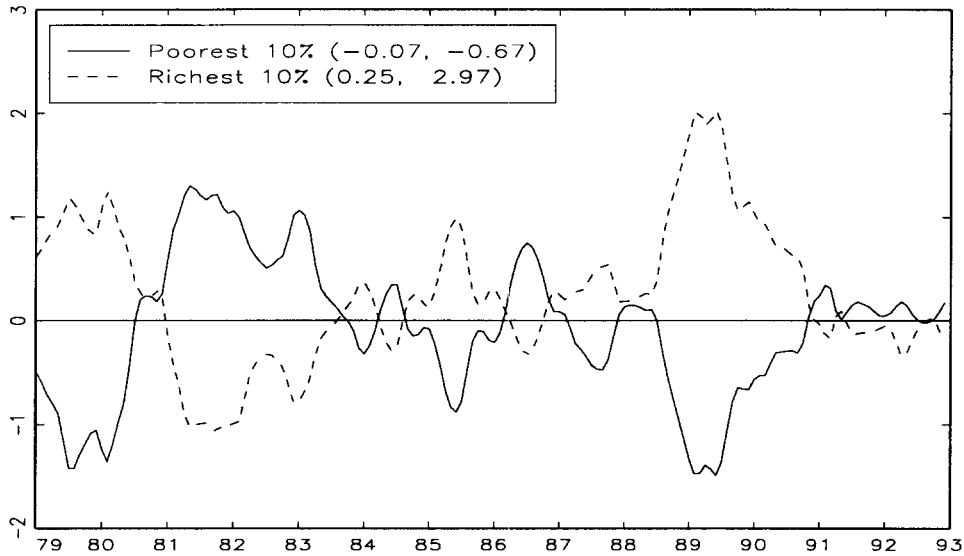
The first major point of departure is 1981 when local authority rents were increased sharply¹ as grants from central government were cut, and in the following year mortgage interest rates fell. The main differences, however, are apparent from 1988 onward as increases in interest rates pushed the cost of living of home-owners up faster while rents lagged. However, the interest rate cuts which enter the index from early 1990 had the reverse effect, cutting the rate of increase for home-owners relative to the average and allowing the cost of living for renters to catch up with the average as rents rose more sharply and interest rate cuts for home-buyers pulled the average down. By the end of the period, the average cost of living for households with mortgages was 1.07 per cent higher than the all-households average on this measure of shelter costs.

Figure 5.5 shows the difference in cost-of-living inflation for households in the top and bottom 10 per cent of the income distribution.² To a large extent, the differences are driven by differences in tenure types between the two groups. The increase in the cost of living for poorer households in early 1981 corresponds to the timing of the rent increase. Similarly, the fall in the mid- to late 1980s coincides with the increases in mortgage rates which are shown to impact on the richer households, the vast majority of which are home-owners.

¹ See Figure 5.2.

² Before-housing-costs measure: see Goodman and Webb (1994).

Figure 5.5
Difference in Inflation Rates by Income Group, RPI Shelter Costs Measure
 (percentage points)

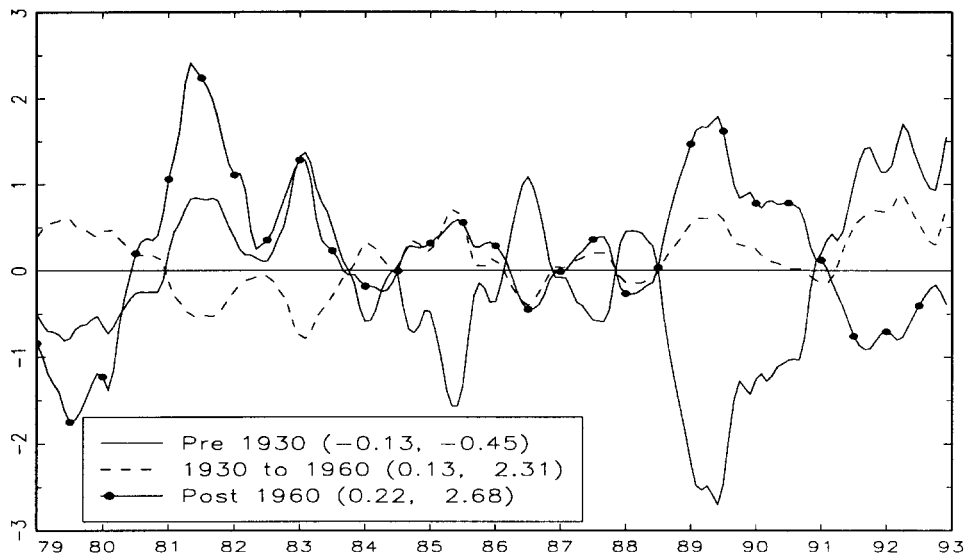


Compared with Figure 3.4, the inclusion of housing costs appears to amplify the cycles in the indices. Adding housing costs increases the average difference for poorer households from -0.01 to -0.07 percentage points and the final difference in levels from 0.32 per cent to 0.67 per cent less than the population mean. This is because, with the exception of the 1990s, increases in housing-costs inflation coincide with, and therefore increase, non-housing inflation. The 1981 rent increases, for example, coincided with a period of higher-than-average non-housing inflation for poorer households. Mortgage inflation at the end of the 1980s coincided with a period of higher-than-average inflation for the richer households. Only at the end of the sample period, in the 1990s, do the housing and non-housing effects appear to cancel each other out as rents rise once more relative to mortgages while non-housing inflation for the poorest 10 per cent fell.

Figure 5.6 shows the difference in inflation rates for three broad date-of-birth cohorts: households in which the head was born before 1930 (i.e. those where the head was aged 50 or more at the start of the period and over 63 at the end), those in which the head was born after 1930 but before 1960, and those in which the head was born after 1960 (i.e. households in which the head was under 19 at the beginning and 32 at the end).

The path for the youngest cohort is similar to that for renters and poorer households until about 1983. They seemed to be particularly hard hit in early 1981 by the combined effects of the rent increase and other, non-housing inflation. During the mid-1980s, this cohort appears to take on some of the characteristics of richer home-owners, possibly as a result of the right to buy council houses and as part of the general shift towards house-purchase. This turns out to be unfortunate since they then enter the period of high interest rates with more members who are

Figure 5.6
Difference in Inflation Rates by Head's Date-of-Birth Cohort,
RPI Shelter Costs Measure
 (percentage points)



mortgagees. The average difference from the all-households inflation rate is therefore quite high at 0.22 percentage points above average and consequently their cost-of-living level at the end is 2.68 per cent higher than average. There therefore appears to be quite a strong cohort-specific effect in which an ill-timed move into house-buying increased the cost of living of younger households. In contrast to those born after 1960, the eldest households did relatively well, finishing the period with a cost of living 0.45 per cent lower than average.

5.2. The User Cost Approach

Section 5.1 illustrated the differential effects of housing costs on various slices of the population using the RPI measure of shelter costs. Given the correlation of the proportion of mortgage-payers with income, it showed the effects of rent and mortgage increases on poorer and richer households. There was also some evidence of a cohort-specific incidence on younger households which began to buy their own homes so as to catch both the rent increases in the early 1980s and the interest rate increases at the end. This section looks at the same population groups but uses the user cost measure of the price of shelter, thus allowing the influence of capital gains to enter.

Figure 5.7 shows Tornqvist average inflation rates calculated exclusive and inclusive of housing costs, with shelter costs measured by the user cost method as well as the RPI mortgage interest payments method. Because the user cost and mortgage interest payment indices start off similarly, the differences from Figure

5.3 in the time path of the all-items index up to the early 1980s are slight. From that point onwards, however, they are quite striking. As the capital gains on housing impact upon the shelter costs index during the mid-1980s, the user cost method gives an average all-items inflation index which goes negative in 1986. Increased interest rates and capital losses at the end of the 1980s combine to push the all-items user cost measure well above the RPI measure.

Figure 5.7
Annual Increase in Cost of Living, with and without Housing Costs:
All-Households, User Cost Measure and RPI Shelter Costs Measure
 (per cent)

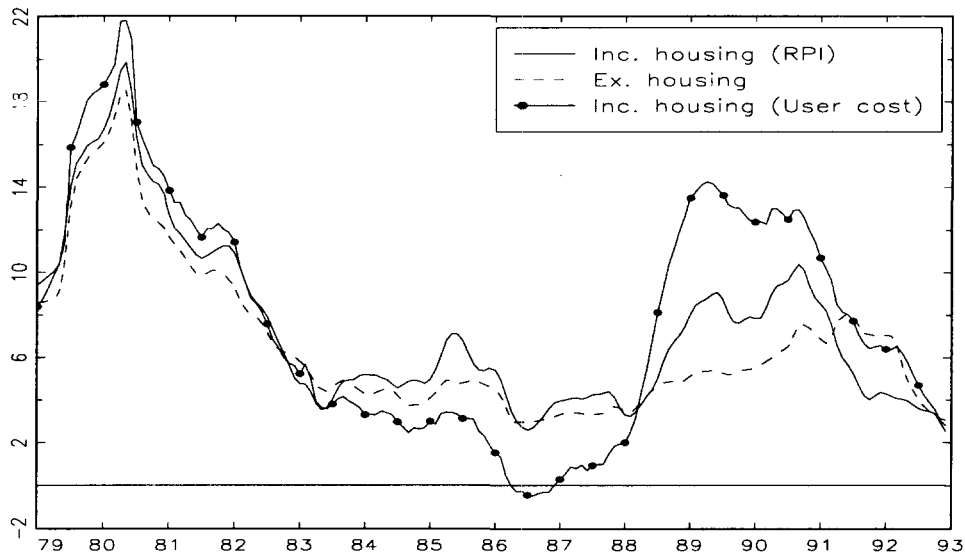
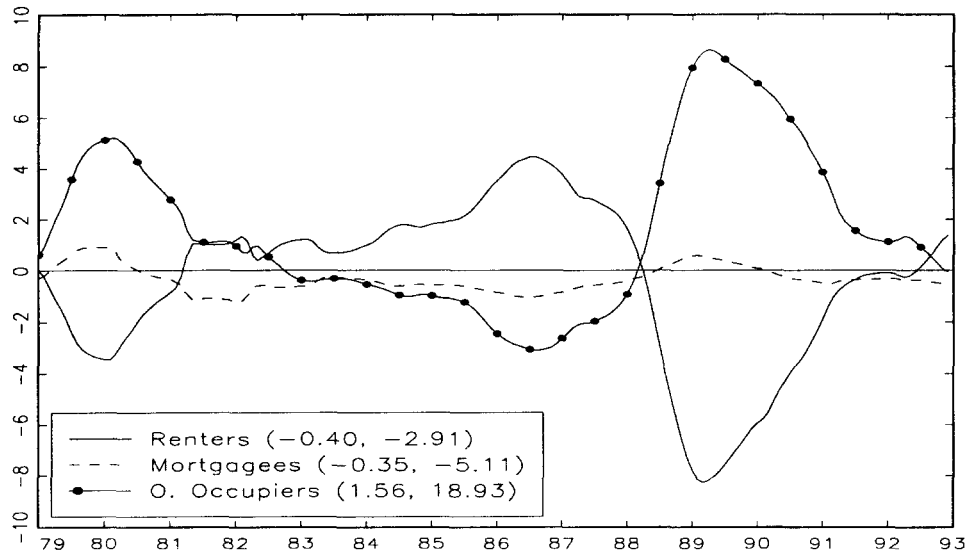


Figure 5.8 shows the effects of this pattern by tenure type. As expected, home-owners do relatively well during the housing boom, enjoying falls in their cost of living. Home-owners who own their houses outright in particular did very well in this period as their shelter costs reflect the capital gains without the mortgage costs. This, however, had the consequence that they were more exposed to the capital losses in the next few years. This gave owner-occupiers an inflation rate which was 1.56 percentage points higher than average over the whole period, but by the end of 1992 their cost of living was nearly 19 per cent higher than average. This was due to their exposure to capital losses on their homes in the late 1980s.

The previous section picked up the relationship between the proportion of mortgage-payers and income bracket - households on higher incomes were more likely to be paying a mortgage, and the size of mortgage was likely to be greater than that of less-well-off households. The RPI method, therefore, fails to pick up the large number of usually older households in the bottom income decile which

Figure 5.8
Difference in Inflation Rates by Tenure, User Cost Measure
 (per cent)



own their homes outright.¹ The user cost of housing does apply to these households because they experience capital gains and losses on the value of their homes. Figure 5.9 shows the difference for average inflation for the poorest and richest 10 per cent of the population. As expected, because of the number of owner-occupiers in the bottom decile, this is quite different from the corresponding figure using the RPI measure (Figure 5.5). Now, the inflation in the bottom decile is 0.75 percentage points higher than average over the period, leaving the bottom decile with a cost of living 9.19 per cent above average at the end of the period. This is due to the inclusion of capital gains and losses, and the use of the average mortgage payment as the weight for owner-occupiers.

Figure 5.10 shows the cohort differences corresponding to Figure 5.6 in Section 5.1. The pattern here is again markedly different. The oldest households now do worst, with an average inflation rate 0.88 percentage points higher than average and a cost of living at the end of the period which is 11.47 per cent higher than average. This is clearly due to what happens after 1987. The reason for the large hump in inflation for the eldest cohort is probably the treatment of households that own their houses outright. These sorts of households were therefore exposed to the capital losses on their homes which the user cost measure includes and this completely alters the picture to one where the cohort-specific effect falls not on the young but on the old.

¹In 1991-92, in the bottom income decile (before-housing-costs measure), 24 per cent of households own their homes outright and 28 per cent have a mortgage (Department of Social Security, 1994).

Figure 5.9
Difference in Inflation Rates by Income Group, User Cost Measure
 (percentage points)

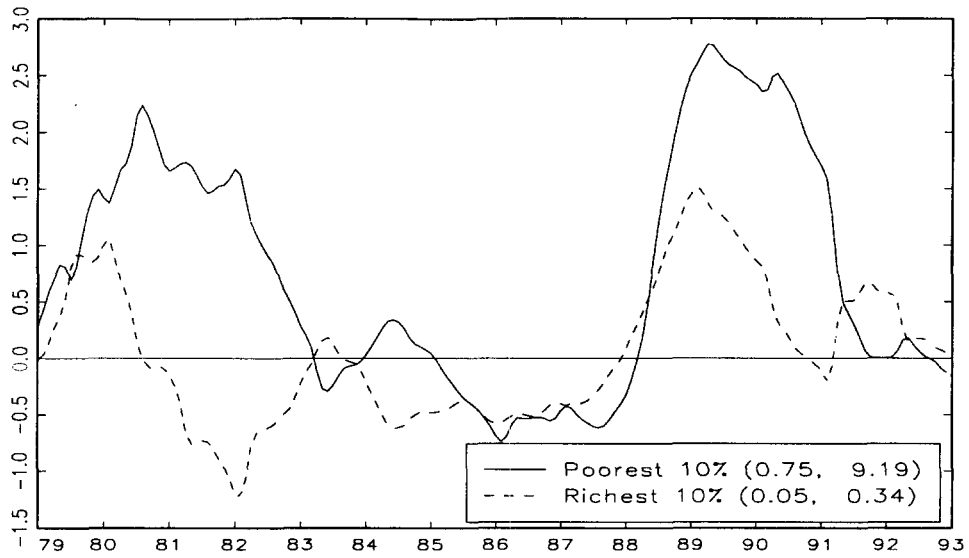
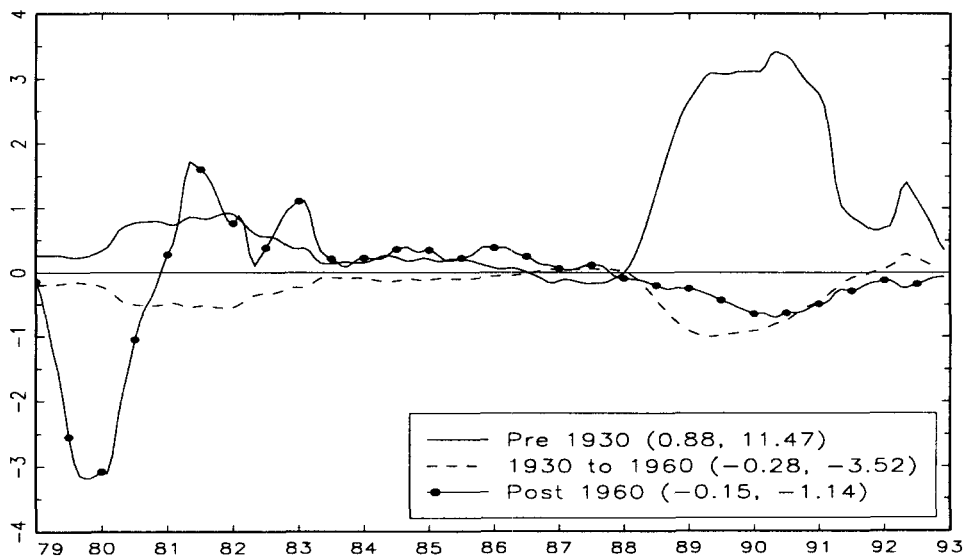


Figure 5.10
Difference in Inflation Rates by Head's Date-of-Birth Cohort, User Cost Measure
 (percentage points)



6. Conclusions

Several criticisms can be made of the approach adopted in this paper. Firstly, it focuses on differences in living costs which are a function of differences in spending patterns, scaled by common relative price movements. This is fine as far as it goes, but an obvious criticism would be that differences in spending patterns could be a function of differences in prices which we do not observe in these data. Apart from the regional aspect, which is not examined, this could also be correlated with household characteristics which are examined. For example, poorer households may not be able to travel to the superstore on the edge of town and take advantage of lower prices and savings through bulk purchases. If they are forced to buy at the corner shop, the prices they face will be different from those paid by richer households. This matters if the rates of change in these different sets of prices are different over time.

Secondly, the issue of quality changes has not been addressed. Quality improvements in goods and services over the period may mean that more utility is derived from consumption of some goods, e.g. video-recorders are better now than in 1979. This means that cost-of-living indices like those calculated here may overestimate cost increases because they do not adjust for quality improvements. A counter-argument may be that consumers become harder to please as quality improves over time. Higher quality would then be needed to elicit the same level of welfare in 1992 as in 1979. It is not possible to address the issue of quality with these data.

This paper does not resolve the issue of the treatment of housing costs. The sensitivity of the results to different measures of shelter costs is illustrated but further work is required to develop truly sensible treatment of shelter costs with an appropriate weight. This would provide enough material for a long paper in its own right.

The object of this paper has been to examine the extent and pattern of differences in the cost of living for subgroups of the population. Differences in the cost of living are shown to be generated largely by the shapes of the Engel curves for luxuries and necessities and the location of households along them. Differences in households' demographic features are also important and contribute to within-income-group variations. The main result, however, is that differences in the cost-of-living level at the end of the period studied are small, although they are shown to be heavily dependent on the way in which shelter costs are measured. However, relative inflation rates for different households cycle over the period and there are several periods in which inflation rates differ widely between the top and bottom of the income distribution and between demographic groups.

It is important to reiterate that these results are entirely dependent upon the period studied. A different period would have given different results. The run of data from 1979 to 1992 does, however, nest two other papers (Bradshaw and Godfrey (1983) and Fry and Pashardes (1986)) and shows that their results, like those here, do not apply more widely than over the period from which they draw their data.

The fall in the relative price of necessities and the corresponding increase in the price of luxuries over the period and the difference in expenditure patterns between rich and poor households have meant that the cost of living has increased faster for richer households than it has for poorer households. The progressive nature of indirect taxes between 1979 and 1992 has been shown to have contributed to this effect. This means that the real income of poorer households is higher at the moment, and the real income of richer households is lower at the moment, than standard low income statistics suggest, and this narrows the increase in real income inequality. However, this does not imply that it is good to be poor. The differences are small and the welfare effects of low income massively outweigh the effects of a slightly lower-than-average cost of living.¹

Given that these differences between groups are small, the obvious question is whether they matter when up-rating benefits etc. Benefit up-rating is designed to compensate poor households for year-to-year increases in the cost of living. On average, cost-of-living increases in line with the average index over the period would have been broadly accurate (in fact, they have been overly generous by a very small amount). This should not be taken to imply, however, that there is no need for the government to use an index more representative of the cost of living of poorer households to up-rate benefits. This paper has demonstrated that households in receipt of benefits have had both periods of higher-than-average and periods of lower-than-average increases in living costs in the order of around ± 2 per cent. These periods can last up to one or two years. Benefit up-rating on the basis of average increases has therefore overcompensated them for increases in their cost of living at some times and undercompensated them at other times. These period-to-period errors matter if there are liquidity constraints and households cannot reallocate the excess from one period to another to smooth their consumption. There almost certainly are such constraints, and this means that using the 'wrong' index imposes costs on poorer households even if the overall increase is more or less right when viewed over a longer period.

¹ See Stoker (1986).

Appendix A.1. The Tornqvist Index

Let the functional form of the cost function be a general translog defined by

$$\ln c(p, u) = \alpha_0 + \sum_i \alpha_i \ln p_i + \frac{1}{2} \sum_i \sum_j \gamma_{ij} \ln p_i \ln p_j + \beta_0 \ln u + \sum_i \beta_i \ln p_i \ln u + \frac{1}{2} \varepsilon_0 (\ln u)^2$$

where economic theory requires that the parameters satisfy the restrictions

$$\begin{aligned} \sum_i \alpha_i &= 1; & \sum_i \gamma_{ij} &= \sum_i \beta_i = 0 & \forall j & & \text{for adding up;} \\ \sum_j \gamma_{ij} &= 0 & \forall i & & & & \text{for homogeneity;} \\ \gamma_{ij} &= \gamma_{ji} & \forall i, j & & & & \text{for symmetry.} \end{aligned}$$

Rearranging the cost function gives

$$\ln c(p, u) = \ln a(u) + \sum_i \left[\alpha_i + \frac{1}{2} \sum_j \gamma_{ij} \ln p_j + \beta_i \ln u \right] \ln p_i.$$

Differentiating $\ln c(p, u)$ with respect to $\ln p_i$ gives the budget shares w_i , since

$$\frac{\partial \ln c(p, u)}{\partial \ln p_i} = \frac{p_i q_i}{c(p, u)} = w_i.$$

Here,

$$\frac{\partial \ln c(p, u)}{\partial \ln p_i} = \alpha_i + \frac{1}{2} \sum_j \gamma_{ij} \ln p_j + \beta_i \ln u + \frac{1}{2} \sum_j \gamma_{ji} \ln p_j = w_i.$$

Substituting w_i into the cost function gives

$$\ln c(p, u) = \ln a(u) + \sum_i \left[w_i - \frac{1}{2} \sum_j \gamma_{ij} \ln p_j \right] \ln p_i.$$

The translog true cost-of-living index is, then, the ratio of the cost function in period $t + 1$ to the cost function in period t evaluated at u^* :

$$P_{TL}(p^t, p^{t+1}, u^*) = \ln \left(\frac{c(p^{t+1}, u^*)}{c(p^t, u^*)} \right) = \sum_i \left(w_i - \frac{1}{2} \sum_j \gamma_{ij} \ln p_j \right) \ln \left(\frac{p_i^{t+1}}{p_i^t} \right).$$

Evaluating this index at u^t and u^{t+1} and taking the mean yields the Tornqvist index:

$$\begin{aligned} P_T(p^t, p^{t+1}, u^T) &= \frac{1}{2} [P_{TL}(p^t, p^{t+1}, u^t) + P_{TL}(p^t, p^{t+1}, u^{t+1})] \\ &= \frac{1}{2} \left[\sum_i \left(w_i^t - \frac{1}{2} \sum_j \gamma_{ij} \ln p_j^t \right) \ln \left(\frac{p_i^{t+1}}{p_i^t} \right) + \sum_i \left(w_i^{t+1} - \frac{1}{2} \sum_j \gamma_{ij} \ln p_j^{t+1} \right) \ln \left(\frac{p_i^{t+1}}{p_i^t} \right) \right] \\ &= \frac{1}{2} \left[(\sum_i w_i^{t+1} + \sum_i w_i^t) \ln \left(\frac{p_i^{t+1}}{p_i^t} \right) - \frac{1}{2} \sum_i \sum_j \gamma_{ij} [\ln p_j^{t+1} + \ln p_j^t] [\ln p_i^{t+1} - \ln p_i^t] \right]. \end{aligned}$$

The second term containing the γ_{ij} drops out because of symmetry, giving the Tornqvist index:

$$P_T(p^t, p^{t+1}, u^T) = \sum_i \frac{1}{2} (w_i^{t+1} + w_i^t) \ln \left(\frac{p_i^{t+1}}{p_i^t} \right).$$

Appendix A.2. Expenditure Patterns by Income Decile, 1978 and 1992

1978	All	Poorest 10%	Decile 2	Decile 3	Decile 4	Decile 5	Decile 6	Decile 7	Decile 8	Decile 9	Richest 10%
Food	0.24	0.34	0.34	0.32	0.29	0.27	0.25	0.23	0.21	0.19	0.16
Catering	0.04	0.03	0.02	0.04	0.04	0.04	0.05	0.05	0.05	0.05	0.05
Alcohol	0.06	0.04	0.03	0.05	0.05	0.05	0.06	0.06	0.07	0.06	0.06
Tobacco	0.04	0.06	0.05	0.05	0.05	0.05	0.04	0.04	0.04	0.03	0.02
Fuel	0.07	0.10	0.12	0.10	0.08	0.07	0.07	0.06	0.06	0.05	0.05
Durables	0.07	0.05	0.05	0.06	0.06	0.07	0.06	0.08	0.07	0.09	0.10
Clothes	0.10	0.08	0.09	0.09	0.09	0.10	0.11	0.10	0.10	0.10	0.10
Motoring	0.13	0.09	0.07	0.09	0.10	0.12	0.12	0.14	0.15	0.15	0.16
Fares	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.03	0.03
Entertainment	0.05	0.03	0.02	0.02	0.03	0.04	0.04	0.05	0.07	0.06	0.08
Other	0.17	0.15	0.17	0.16	0.17	0.16	0.17	0.17	0.16	0.17	0.18

1992	All	Poorest 10%	Decile 2	Decile 3	Decile 4	Decile 5	Decile 6	Decile 7	Decile 8	Decile 9	Richest 10%
Food	0.17	0.23	0.27	0.24	0.23	0.20	0.19	0.18	0.15	0.14	0.10
Catering	0.04	0.03	0.03	0.03	0.04	0.04	0.05	0.04	0.05	0.05	0.05
Alcohol	0.05	0.05	0.04	0.04	0.05	0.05	0.05	0.05	0.06	0.05	0.04
Tobacco	0.02	0.05	0.05	0.04	0.04	0.03	0.03	0.02	0.02	0.01	0.01
Fuel	0.06	0.09	0.11	0.09	0.08	0.06	0.06	0.05	0.05	0.04	0.04
Durables	0.07	0.05	0.05	0.07	0.06	0.07	0.07	0.07	0.06	0.07	0.08
Clothes	0.07	0.08	0.07	0.07	0.08	0.08	0.08	0.08	0.07	0.08	0.06
Motoring	0.15	0.11	0.08	0.11	0.12	0.15	0.15	0.17	0.18	0.18	0.15
Fares	0.04	0.04	0.03	0.03	0.04	0.03	0.04	0.04	0.04	0.04	0.03
Entertainment	0.11	0.05	0.05	0.06	0.06	0.08	0.09	0.10	0.11	0.12	0.22
Other	0.21	0.21	0.22	0.22	0.21	0.22	0.21	0.20	0.21	0.21	0.23

Appendix A.3. The User Cost Measure of Shelter Costs

User costs were calculated using average monthly house-price data supplied by the Department of the Environment. Expected capital gains were estimated non-parametrically using these data. Essentially, this process applied a 12-month weighted moving average around each data point. Following the Bank of England's treatment of user costs in its housing-adjusted retail price index, depreciation was set at 0.5 per cent, transactions costs at 2 per cent and average proportion of the price borrowed at 65 per cent. The mortgage interest rate is from Table 7.1L in *Financial Statistics* (HMSO). The opportunity cost calculations are based on the Treasury Bill yield from Table 38 in *Economic Trends* (HMSO).

Bibliography

- Allen, R. G. D. (1958), 'Movements in retail prices since 1953', *Economica*, vol. 25, pp. 14-25.
- Baker, P. and Crawford, I. (1993), 'The distributional aspects of environmental taxation', *Scottish Economic Bulletin*, no. 46, pp. 35-44.
- Banks, J., Blundell, R. and Lewbel, A. (1994), 'Quadratic Engel curves, indirect tax reform and welfare measurement', University College London, Discussion Paper no. 94-04.
- Blundell, R., Pashardes, P. and Weber, G. (1994), 'What do we learn about consumer demand patterns from micro-data?', *American Economic Review*, vol. 83, pp. 570-83.
- Bradshaw, J. and Godfrey, C. (1983), 'Inflation and the poor', *New Society*, vol. 65, pp. 247-8.
- Brittain, J. A. (1960), 'Some neglected features of Britain's income levelling', *American Economic Review*, vol. 50, Papers and Proceedings, pp. 335-44.
- Christensen, A. G., Jorgenson, D. W. and Lau, L. J. (1975), 'Transcendental logarithmic utility functions', *American Economic Review*, vol. 65, pp. 367-83.
- Deaton, A. and Muellbauer, J. (1980), 'An almost ideal demand system', *American Economic Review*, vol. 70, pp. 312-36.
- Department of Social Security (1994), *Households Below Average Income: A Statistical Analysis 1979-1991/92*, London: HMSO.
- Diewert, W. E. (1976), 'Exact and superlative index numbers', *Journal of Econometrics*, vol. 4, pp. 115-45.
- (1978), 'The economic theory of index numbers: a survey', in A. Deaton (ed.), *The Theory and Measurement of Consumer Behaviour: Essays in Honour of Sir Richard Stone*, Cambridge: Cambridge University Press.
- Dougherty, A. and van Order, R. (1982), 'Inflation, housing costs and the consumer price index', *American Economic Review*, vol. 72, pp. 154-64.
- Engel, E. (1895), 'Die Lebenskosten Belgischer Arbeiter-Familien früher und jetzt', *International Statistical Institute Bulletin*, vol. 9, pp. 171-80.
- Fry, V. and Pashardes, P. (1985), 'Constructing true cost-of-living indices from Engel curves', Institute for Fiscal Studies, Working Paper no. 65.
- and -- (1986), *The RPI and the Cost of Living*, Report Series no. 22, London: Institute for Fiscal Studies.
- Goodman, A. and Webb, S. (1994), *For Richer, For Poorer: The Changing Distribution of Income in the United Kingdom, 1961-91*, Commentary no. 42, London: Institute for Fiscal Studies.
- Konüs, A. A. (1924), 'The problem of the true index of the cost-of-living', reprinted in *Econometrica*, vol. 7, pp. 10-29.
- Muellbauer, J. (1977), 'The cost-of-living', in *Social Security Research*, London: HMSO.
- Piachaud, D. (1978), 'Prices and the distribution of incomes', in Lord Diamond (Chairman), *Royal Commission on the Distribution of Income and Wealth, Selected Evidence for Report 6*, London: HMSO.

- Robinson, W. and Skinner, T. (1989), *Reforming the RPI: A Better Treatment of Housing Costs?*, Commentary no. 15, London: Institute for Fiscal Studies.
- Sen, A. (1985), 'The standard of living: lecture I - concepts and critiques', in G. Hawthorn (ed.), *The Standard of Living*, Cambridge: Cambridge University Press.
- Stoker, T. (1986), 'The distributional welfare effects of rising prices in the United States', *American Economic Review*, vol. 76, pp. 335-49.
- Tipping, D. G. (1970), 'Price changes and income distribution', *Applied Statistics*, vol. 19, pp. 1-17.
- Tornqvist, L. (1936), 'The Bank of Finland's consumption price index', *Bank of Finland Monthly Bulletin*, vol. 10, pp. 1-8.