CHILDREN AND HOUSEHOLD LIVING STANDARDS

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Published by
The Institute for Fiscal Studies
7 Ridgmount Street
London WC1E 7AE
(Tel. 071-636 3784)
(Fax 071-323 4780)

© The Institute for Fiscal Studies, January 1993
ISBN 1-873357-21-4

Typeset and printed by
Parchment (Oxford) Ltd
Printworks
Crescent Road
Cowley
Oxford OX4 2PB

PREFACE

The views of the authors do not reflect those of the Institute for Fiscal Studies, which has no corporate views. Many thanks are due to Paul Baker, Richard Blundell, Andrew Dilnot and Ian Preston for numerous helpful discussions, and also to the Central Statistical Office (CSO) for providing anonymised Family Expenditure Survey data. Particular thanks are also due to Christopher Giles and Steven Webb without whose work on low income statistics much of this report would have been impossible. All non-parametric analysis was carried out using the Gauss-based package NP-REG written by Alan Duncan and Andrew Jones. Funding from the Joseph Rowntree Foundation for this project is gratefully acknowledged, as is support from the ESRC under the programme of the ESRC Research Centre for Fiscal Policy. The authors would also like to thank Chantal Crevel-Robinson and Judith Payne for helping to prepare the manuscript for publication.

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CHAPTER 1
INTRODUCTION

Measuring the 'costs' of children is of immense practical importance in a whole range of policy areas relating to the incomes of families. In assessing the distribution of income, the progressivity and effectiveness of the tax and social security systems and the impact of government policies on the living standards of households, it is necessary to take a view on the nature and levels of these costs. Equivalence scales are intended to allow direct comparisons between households of different sizes to be made by, for instance, dividing the incomes of larger households by a particular scale to bring them into equivalence with those of smaller households. In this report we are concerned with the way in which such scales may be derived and the effects they may have on different areas of policy.

In doing this we concern ourselves largely with the direct costs of children — those that arise through the necessity of spending more in order to reach the same standard of living. We make much use of a very large data set based on several years of Family Expenditure Surveys (FESs) and look at estimation techniques based on observed economic (consumption) behaviour. Of course, costs arise from loss of earnings, but rather than considering this aspect of the costs of children, we concentrate on relative living standards *given* a certain level of income. On the other hand, there is little doubt that the majority of those who have children have made a decision to have them and no doubt derive utility from having them. We cannot measure this welfare gain.

A large and technical literature concerns itself with the 'impossibility' of making complete welfare comparisons between households by simply observing their economic behaviour, and in consequence a complicated debate has evolved over the exact meaning of 'welfare', 'happiness', the 'standard of living' etc. in an economic context. Economists have no way of completely identifying the happiness that an individual derives simply from having a child — the pure joy of hearing the patter of tiny feet, as it were. In addition, the literature has produced many techniques for calculating equivalence scales, each requiring different assumptions on how to identify economic well-being from observed behaviour (see Browning (1992) for a useful summary). Our purpose in this paper is to abstract from these issues, looking at the techniques which have been used, the results derived and the impact

of those results. A review of the main modelling techniques and estimates of equivalence scales is presented in Chapter 2. All forms of estimation are shown to suffer from certain problems associated with the identification of welfare. An intuitive account is given of the simple Engel (food-share) and isoprop (necessity-share) methodologies and of more advanced utility-based estimation techniques including recent work on 'life-cycle' equivalence scales (see Banks, Blundell and Preston (1992)). A more detailed account of the methodology used by McClements to derive scales which are widely used in policy formulation and inequality measurement is also given. A number of equivalence scale estimates based on the different methods of estimation are presented towards the end of the chapter.

The importance of equivalence scale estimates in a number of areas is well documented. In the measurement of poverty and inequality, the use of different equivalence scales can produce different results. If social security benefits are intended to bring different families up to a particular standard of living, then one would expect them to be based on some notion of equivalent income. These issues are addressed in Chapter 3. Actual social security benefits are shown not to be based on estimated scales, while the tax system takes little or no account of equivalent incomes. The impact on measured inequality of different scales has been discussed by a number of authors and a short review of their findings is presented. The effect of different scales on the official low income figures ('Households Below Average Income') produced by the Government is investigated in some depth. The DSS itself considered this issue to be of adequate importance to include an analysis of the sensitivity of the figures to different scales in a review of its methodology and to mark those figures in the official statistics which are especially sensitive. Other authors, for example Coulter, Cowell and Jenkins (1992), have claimed that the scales used by the DSS may lead to an under-recording of inequality. We assess these arguments and present new evidence.

One fact relating to equivalence scales which is often overlooked is that they are not necessarily constant over time. Changes in demographic structure and income may affect estimated scales. Changes in relative prices certainly will. Hence Chapter 4 examines such changes in detail using over 20 years of individual-level FES data. This demonstrates the way in which household structures and incomes have altered over the past two decades. Also using FES data, the expenditure patterns of people at different points in the income

distribution are examined in detail.

Having seen the importance of equivalence scales, how they are derived and how they have been used, we finally go on to make some measurements to construct our own scales. In Chapter 5 a number of results are presented based on relatively simple estimation techniques. Included is a section showing the effects of bringing the McClements scales forward to the present day (drawing on the finding of Blundell and Lewbel (1990) that knowledge of changes in relative price levels is enough to construct scales in one period *given* scales in a previous period).

The issues discussed in this report are vital from the point of view of policy-making and to all those working in fields relating to the welfare of families, especially those with children. However, we should stress now that we look at only one aspect of the many that are relevant in this very broad field. Having children is, for example, likely to result in lower incomes through reduced labour supply. Issues of intra-household sharing of income are also important. A detailed discussion of these is beyond the scope of this report but a brief review of the main issues is included at the end of Chapter 2.

CHAPTER 2
MODELLING THE COSTS OF CHILDREN

Before considering some estimates of the costs of children or the implications of such estimates, it is necessary to look briefly at the way equivalence scales are calculated, some of the issues involved and the assumptions made in using a particular technique. In doing this, we concentrate on methods based on observed patterns of consumption rather than on *subjective* techniques based on direct questioning over how much extra money people feel is needed to maintain a standard of living when children are present.

An equivalence scale is defined as the ratio of the cost (to a household) of achieving some particular standard of living, given its demographic composition, to the cost of a 'reference' household achieving that same standard of living. The 'reference' household is usually taken to be a married couple without children or a single childless adult. Alternatively, a scale could be thought of as the extra cost required to restore a household of a particular composition to the same standard of living as that of the reference household, other things being equal.[1] Once calculated, an equivalence scale can then be used to make the incomes of different households comparable. Suppose, for example, that we estimate that a couple with two children needs 1.5 times the income of a childless couple to reach the same standard of living. Then bringing their incomes into equivalence would imply dividing the income of the family with children by 1.5 and comparing the resultant equivalent income with that of the childless couple.

A major issue becomes immediately clear, even at this general level, and this concerns whether such extra costs should be expressed as a ratio of, or a difference between, the costs of the two households under comparison. Comparing ratios of costs implies that we are using some constant *proportion* of household expenditure as a measure of the cost of a child, i.e. a child will cost a rich family more than it will cost a poor family (assuming such costs or ratios are constant across households at different levels of welfare, an idea discussed later in this chapter). A specification that compared differences of costs would, however, imply

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[1] A simple theoretical notation is developed in Appendix A allowing us to consider this definition, and the issues that follow it, more rigorously.

that the cost of a child was fixed (in money), no matter what the income of the household. The most common approach is the ratio approach, and when considering the measurement of welfare or inequality in a population, it may be preferable. If one intends to compensate households in poverty for the presence of children, then the 'minimum cost' of a child can be constructed by making a judgement regarding the minimum level of adult expenditure and then calculating the implied compensation at this level of expenditure.

An example of the different effects that different assumptions over whether or not costs of children are constant or proportional might have can be seen by considering their implications for the construction of a tax and benefit system. If we believed that costs were constant, then the appropriate redistributive mechanism might be through a benefit like child benefit which is payable at the same level to all those with children. If, on the other hand, costs were considered to be proportionate to income, then the appropriate mechanism might be through a reduction in the tax rate applicable to families with children. A lower tax rate implies greater benefits for those on higher incomes.

The chief problem that the economist faces is to construct some measure of the standard of living of a household simply by observing its budget behaviour. To the extent that this is possible,[2] a number of techniques have arisen to enable us to measure the economic costs of children. (The possibility of using extra information on household welfare or needs — such as calorific information or psychometric surveys — is not dealt with until Section 2.5.) There has been a recognition of the differing needs of households with children for many years amongst economists, dating back to studies by Engel (1895) and Rowntree (1901). In recent years, however, some broader categories of approach have become clear. Loosely speaking, two strands of research can be distinguished — one trying to calculate the level of welfare explicitly, the other trying to find an appropriate proxy variable for household well-being. The latter approach (which Browning (1992) terms the 'reduced form' approach) is the most traditional and stems from the work of Engel, whereas the former has only been facilitated by recent developments in computation and econometric theory and owes much to the work of Gorman (1976), Barten (1964) and Deaton

[2] Once again, we assert that observed economic behaviour cannot truly identify a complete measure of household welfare (see Pollak and Wales (1979)), but from now on we will ignore this and use the term 'welfare' to mean 'that part of well-being which economists *can* identify'.

and Muellbauer (1980). We deal with the reduced form approach first.

Before we start, it is important to note that throughout this study we will use the terms income and expenditure interchangeably. In so far as they both represent the household's economic level of well-being, this is fine, but the important concept for applied analysis is total expenditure. There are two reasons why this is the case. Firstly, by concentrating attention on household expenditure we can allow some form of a two-stage budgeting process to simplify our model. In such a framework, household labour supply decisions are taken at the first stage to determine levels of income. At the second stage, the allocation of expenditure between different commodities is made, conditional on the income resulting from the first-stage decisions. With such a framework, we can model only the second stage, i.e. just the effects of children on expenditure behaviour, without needing to integrate information regarding the effect of children on the labour supply of the household. It seems natural that children will affect labour supply decisions, but joint estimation of the two stages of household decisions is complex. Instead, the literature has chosen to concentrate on the observed costs of children and model changes in household expenditure behaviour taking income as given. Secondly, however, in most of this paper we confine ourselves to models that are only concerned with a single time period so income and expenditure can be thought of as embodying similar information. When considering models that address the entire life cycle of the household, the choice of income versus expenditure for welfare comparison becomes more crucial (see Blundell and Preston (1992)), as households may choose to borrow or save in anticipation of the future, with the result that income and expenditure will contain differing information about the household.

2.1 Welfare Proxy Techniques

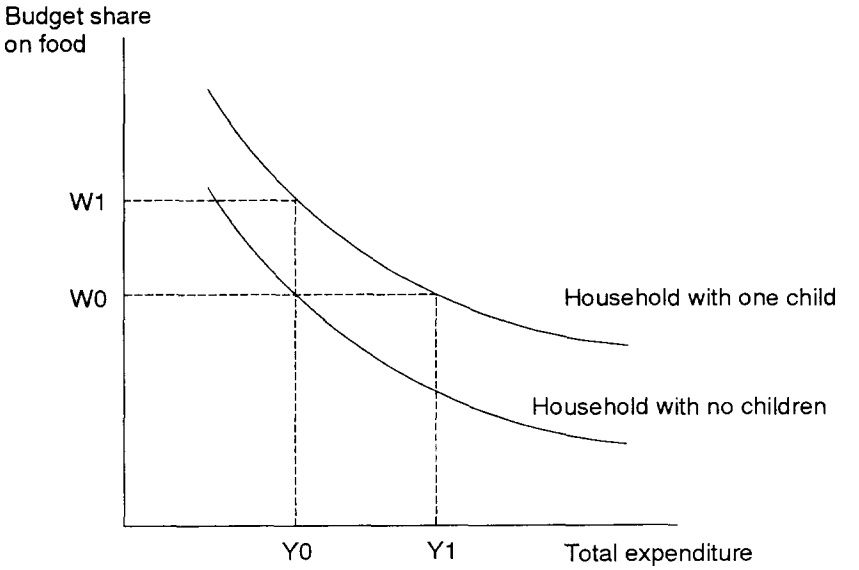
As described above, reduced form (or welfare proxy) techniques for calculating the costs of children are characterised by assuming that there is some measurable variable or household characteristic that has an indirect relationship with the welfare level of that household, and consequently that by examining this identifying variable we can infer information regarding the well-being of the household. In other words, some observed characteristic can be taken as a proxy for welfare. The oldest method of attributing welfare levels according to differing consumption bundles stems from 'Engel's Law' — the famous

observation that as households become wealthier, the proportion of their expenditure that is spent on food decreases. Consequently, Engel (1895) postulated that the budget share of food would be an appropriate indirect measure of welfare.

The negative relationship between food share and income is illustrated for two hypothetical household types in Figure 2.1. The presence of a child in a household will, other things being equal, increase the share of expenditure spent on food (from W0 to W1, say, at income Y0), implying that welfare has fallen (under the Engel identifying assumption). The size of the fall in welfare can be measured in this situation by the amount of income needed to restore that food share to its original value on the new Engel curve, that is the difference between Y1 and Y0 in Figure 2.1. The consistency of the negative relationship between the food expenditure share and total expenditure is well documented for the UK (see Banks, Blundell and Lewbel (1992), for example) and we use this fact to estimate some simple Engel scales, without imposing any belief on the exact form of the relationship, in Section 5.3 of this report. However, this does not mean that welfare is necessarily in fact proxied by the food share.

FIGURE 2.1

Engel Curves and Equivalence Scales



A more general technique that allows any *group* of goods as an indirect welfare measure is referred to as the 'isoprop' method, and one might think of some natural groupings of 'necessities' (for example, food, fuel, clothing and housing costs), the share of expenditure on which might indicate a more general index of 'deprivation'. The Engel assumption, which concentrates on food share, is just one of a range of possible assumptions that can be made within the isoprop methodology.

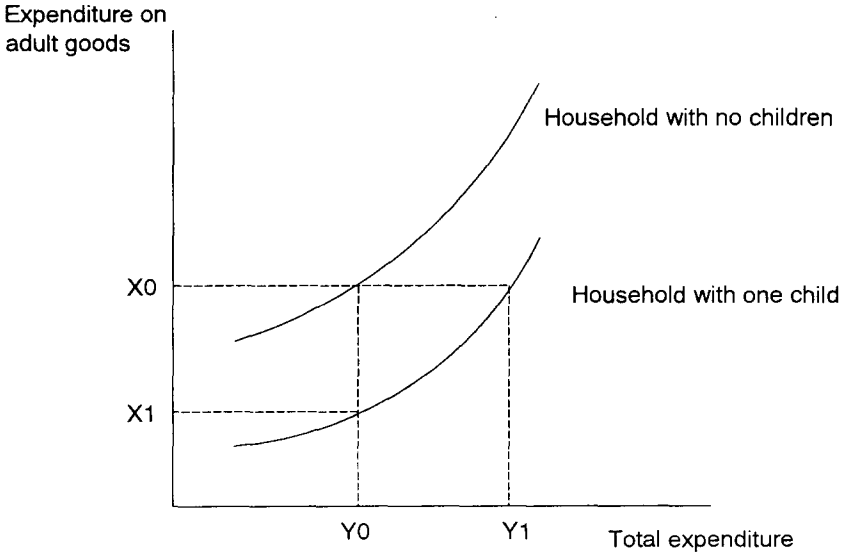
It is not clear, however, that the relationship between such a group of commodities and total expenditure will be simple. More specifically, if Engel (or other isoprop) curves are parallel straight lines in total expenditure for different demographic types, then the distance between them will be constant at any level of total expenditure and so an equivalence scale will be the same wherever it is calculated on the income distribution. In other words, the cost of children would be fixed and not dependent on expenditure. This property is referred to as the 'base independence' of equivalence scales. Whilst it is clear that no expenditure group Engel curves display this property, in the UK the empirical evidence suggests that food Engel curves are linear in the logarithm of total expenditure implying that equivalence scales calculated using the Engel technique will be approximately independent of base. It is almost certain, however, that UK data suggest Engel curves are non-linear for other commodity (or composite commodity) groups — see Banks, Blundell and Lewbel (1992) — and this must be taken into account when using isoprop techniques to calculate the costs of children. Although much has been written recently about the base independence quality (see Blackorby and Donaldson (1991), for example), it is far from clear whether it is a desirable property for a set of equivalence scales to possess. If we are examining household budget behaviour, it seems plausible that the estimate of the cost of children will depend upon the standard of living which the household is currently at, and typically isoprop estimation will need to be sufficiently complex to allow for this property. Incidentally, even straight-line Engel curves might not satisfy base independence if they are not parallel for differing household groups. (One might think that food is 'more' of a necessity for households with children than for those without.)

Apart from the Engel and isoprop assumption, the other common specification for a reduced form approach to identifying equivalence scales is the 'Rothbarth' technique. Under this specification, households are assumed to be at the same welfare if they consume the

same absolute amount of 'adult goods', i.e. goods of which children consume nothing and preferences for which are not affected by children. Again a single good could be used or alternatively a group of goods, and the most common categories of adult expenditure tend to be alcohol, tobacco and/or adult clothing. Figure 2.2 illustrates a typical relationship between the quantity of adult goods consumed and total expenditure — one would expect consumption to rise as income increases — for two household types. As a child arrives in the household, adult expenditures will fall (from X0 to X1, given a fixed Y0), and once again we would need to increase its income to Y1 to restore the household to its original level of adult expenditure. Indeed, once again one might not expect the relationship between adult goods and total expenditure to be a simple one, and we can consequently extend the specification of Rothbarth equivalence scales to allow non-independence of base properties to prevail.

FIGURE 2.2

Adult Goods and Rothbarth Scales



2.2 Utility-Based Equivalence Scales Estimation

The identifying assumptions underlying any reduced form approach to calculating equivalence scales are clearly strong — some people would not believe that the food share was an accurate representation of welfare, and possibly more would be sceptical about preferences for adult goods remaining constant as a child enters a household. Utility-based estimation of equivalence scales developed as a response to these criticisms and seeks to model the complete system of household economic preferences — allowing the presence of children to enter into preferences in the way which best explains observed economic behaviour. Having calculated demand responses, economic theory can then be used to calculate the implied welfare levels[3] for households of differing demographic characteristics but with all other factors being the same.

As the quality and quantity of data on individual households have increased, and the ability to process these data has increased simultaneously, one might have expected that such methods would have become more common and indeed more advanced. However, one factor has meant that the development of this area has been limited, and this relates to the identification problem of Pollak and Wales (1979). This problem is no less serious for utility-based approaches than for reduced form approaches; in fact, the problem is exacerbated by the fact that, to a certain extent, it enters through the back door and could catch the unwary reader napping. Whereas a technique such as that of Engel explicitly states its assumption ('the food share indirectly captures the level of household welfare'), a demand system approach claims to estimate the utility level itself. But there are many different sets of preferences over demographic composition that will generate the same observed demand behaviour, and *each* will generate a different equivalence scale. Consequently, even if the economists could decide which empirical specification fits the observed data best (and with many equations and complex estimation procedures this is far from being the case), they would still only have one of a very large number of equally correct and equally plausible equivalence scales as a result.

Responses to this problem have been varied. On the one hand, there has been a move back towards (albeit more sophisticated) reduced form approaches. A second response (see Blundell and Lewbel (1990)) has

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[3] See Chapter 1 and footnote 2 of this chapter.

been to use the full observed demand data to generate complete cost-of-living indices for various household types (these are completely identified) and then use the resulting indices to calculate an equivalence scale in a particular time period, conditional on knowing the 'correct' equivalence scale in some reference period (see equation A.9 in Appendix A). In other words, given (from somewhere) an equivalence scale in one period, it is always possible to calculate how that equivalence scale will have changed over time. This technique no longer requires the calculation of the 'fundamental' scale to be made by economists — this could be calculated using all possible data (economic and non-economic). The economist in this approach simply comments upon how the scale will have changed, given the observed path of prices and incomes since the equivalence scale was constructed. In Section 5.1 we apply this approach to some UK equivalence scales for the last 20 or so years.

A final response to the problem of identifying levels of welfare has been to look for ways of improving the information contained in estimation (whilst acknowledging that such an approach will never be complete). A recent example of this has been the work on the impact of children on households' intertemporal decision-making. Starting from the premiss that households borrow or save in anticipation of the future, Banks, Blundell and Preston (1992) show that it is possible to observe borrowing and saving behaviour in conjunction with demographic information and therefore add extra information into the standard utility-based approach. This technique is not explored in detail here but we do consider the 'life cycles' of households frequently in much of what follows.

2.3 Parametrising the Effect of Children

One of the most important issues in an empirical study of children and their effect on consumption behaviour is the specific way in which the effects are allowed to enter the model. A number of distinguishing characteristics would seem, a priori, to be important — including the number of children, their ages and possibly their sex. Many combinations of these characteristics have been experimented with in the literature and each embodies yet another judgement on the way that children affect household welfare (although this judgement is to some extent testable, as different models will explain the observed behaviour to differing degrees).

A common starting-point is to consider only the number of children,

regardless of age. The most restrictive form of this is to allow a single variable equal to the number of children, and this allows no economies of scale. Alternatively, one could allow a series of dummy variables — 'one child', 'two children' etc. — which would at least allow some non-linearity in the effect of children on household budgets. On the other hand, much of the labour supply literature has based itself on the assumption that it is the age of the youngest child that matters — whether in a linear or a non-linear way. (When looking at lost earnings, this may well be the single most important parameter.) However, all the above approaches seem, intuitively, to fail to capture the complete effects involved. Indeed, they have tended to be used in models for which estimating the effect of children is only a secondary issue.

An ideal parametrisation would include a dummy variable for every possible household type — accounting for at least numbers of children and all permutations of differing ages. In reality this is impractical. The number of parameters involved in such a specification would preclude sensible estimation, and in addition there may well be some restriction of the detail available in household-level data. A simple compromise is to divide ages into bands and allow either the number of children in each band or alternatively just the presence of a child in each band to affect household preferences and demand behaviour. Such age bands can also be adjusted to account for discrete breaks that we might expect to occur in preferences, such as when a child goes to school, for example, but have the disadvantage that they can attribute quite large jumps in costs to a change for which one might expect the cost to be smooth (for example, a food-share equivalence scale might jump upwards as a child moves from a 2–5 age band to a 6–10 age band). These considerations are clearly important issues in this area. Do children cost the same whatever their age and sex? To what extent are there economies of scale in the family? Both these questions will be fundamentally affected by the specification that the researcher adopts. In Chapter 5 we estimate some simple Engel scales under different parametrisations to get a feel for how the scales might be affected.

2.4 The McClements Scales

In this section we devote some time to looking in some detail at one particular technique for identifying equivalence scales, and one application of this technique to UK data. McClements (1977) estimated a set of equivalence scales from UK Family Expenditure Survey (FES) data over two years (1971 and 1972) using a method derived from the

commodity scaling of Barten (1964). The McClements study provoked considerable debate immediately after its publication (see Muellbauer (1979a and 1979b) and McClements (1979)) over the extent to which the calculated scales had identified anything that had not been initially assumed. The scales, however, did become widely adopted both by government and economists as the means of deflating household expenditures for the purpose of policy comparisons and evaluation, in particular in studies of income distribution. Given their status as a semi-official set of scales, we choose them for closer analysis. In what follows we attempt to outline the basis of this technique and summarise the debate over how much informational content the scales provide.

The McClements equivalence scales were essentially a quasi-utility-based approach that took as a starting-point the concept that children can be thought of as changing the price of consumption. This is known as Barten scaling. If a family has an extra child, for instance, then generating a certain amount of welfare[4] from the consumption of food becomes more expensive. Similarly, each good can be thought of as having some 'deflator' that reflects the cost of children. The work of Prais and Houthäkker (1955) gave its name to the technique of transforming this utility-based concept into a set of equations for each commodity that a household consumes which, taken together, allow the economist to construct an 'overall' equivalence scale. Fundamentally, this method is to calculate an Engel-type scale for each commodity group in the household budget set and then form the weighted average, where the weights are the equivalent elasticities of demand for the commodities (see Appendix A for a more detailed description of this transformation).

The problem with this technique is that the sum of household budget shares is, by definition, one. This means that if one divides the budget into, say, n commodity groups, then there is essentially only information on $n-1$ separate commodities since the final equation can always be written as some function of the others. This is the form of the identification problem associated with the Prais–Houthäkker technique.[5] The method that McClements chose to bypass this problem was initially to assume a set of individual commodity scales and then set some bands within which one could reasonably expect the scales to vary.

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[4] In this context we address welfare of the 'parents' or 'decision-maker' only; see Section 2.7.

[5] NB. This is a separate problem from that highlighted by Pollak and Wales (1979), and would exist even if we could fully capture subjective household welfare.

Once the prior estimates and variances are known, it is possible to apply the restrictions inherent in the Prais–Houthäkker system to the data to produce a final set of commodity scales and then an overall 'income' scale. Or is it? The work of Muellbauer in the ensuing debate claimed that such a method was not plausible and demonstrated this fact by showing that McClements had ended up with a set of equivalence scales that were extremely similar to the starting values he had chosen (see Table 2.1).

TABLE 2.1

Prior and Estimated Values of Equivalence Scales of McClements

	Age						
	0–1	2–4	5–7	8–10	11–12	13–15	16–18
Priors	0.11	0.17	0.19	0.23	0.26	0.28	0.36
1971 estimates	0.10	0.18	0.20	0.23	0.24	0.27	0.36
1972 estimates	0.08	0.17	0.21	0.22	0.26	0.27	0.35

Source: Muellbauer, 1979a.

Many claims and counter-claims were made over the differences and indeed the way that the starting values had themselves been created. Muellbauer (1979b) suggested a separate technique — to fix one of the commodity scales from non-economic data thus leaving the other n–1 to be freely estimated. Indeed, Muellbauer constructed a food scale from calorific data on nutritional needs and relevant prices and used these to identify an alternative system (see Section 2.6).

Whatever the outcome of this debate, it seems clear that the Prais–Houthäkker technique for the analysis of the costs of children is highly dubious and should, at least, be treated with caution. In addition it must be remembered that McClements was already using data five years out of date and, due to computational limitations, was restricted to analysing subsamples of only 450 households. Combinations of number of children and age of children effects could not be picked up and separate scales were estimated for each of these effects individually. Yet the McClements scales were adopted widely in policy analysis. In Section 2.6, we attempt to put these estimates into the context of other applied studies to provide a brief survey of the existing literature and some elementary basis for comparison of the kind of numbers involved.

2.5 Alternative Methodologies

All the methods for estimating equivalence scales described above can be characterised as being in some sense *objective*, being based on observed behaviour and econometric techniques. However, as we have already seen, these techniques all require the imposition of some identifying assumption based on external information or observation. In other words, complete objectivity could never be claimed for them.

Also within the tradition of objective construction of equivalence scales are those based directly on nutritional information and calorific needs. These have a long tradition in their use in studies of poverty dating back to the studies of Rowntree in the early years of this century. The original studies were concerned with the construction of poverty lines (or measures of minimum subsistence level incomes) for families of different types, and these lines clearly had equivalence relativities built into them. It was also on the basis of such minimum necessary incomes that Beveridge constructed his recommended benefit levels. More recently, Muellbauer (1980) has made use of calorific information in constructing equivalence scales (see below).

A nutrition- or subsistence-income-based approach to equivalence scale construction has certain initial attractions but suffers from a number of limitations. The first is that it can generally only be applied to construction of scales at subsistence or poverty levels of welfare. The scales are not necessarily applicable at other levels of welfare — the independence of base problem again. Just because to feed a child its minimum needs it takes, say, 20 per cent of the amount it does to feed an adult, this does not tell us anything about needs for other commodities. They are inevitably subjective to some extent; the basic needs of any family type are not necessarily easily measurable and are likely to be dependent upon society's level of welfare generally. Considerable discrepancies exist between, for example, the subsistence minima calculated by Rowntree and those calculated by Beveridge (see Dilnot, Kay and Morris (1984)).

Other, explicitly *subjective*, methods of constructing equivalence scales also exist. Their crucial defining characteristic is that they are based on individuals' responses to questions about how much income families of different types need to reach a particular standard of living. That is, they depend on the amount people *believe* families with children need relative to families without children to reach the same standard of living. These studies frequently have the effect of incorporating the utility derived from the presence of children in estimates of relative living

standards, thereby reducing the cost of children and flattening out the equivalence scale. Subjective scales tend to give considerably lower weights to larger households and those with more children than do the objective scales.

2.6 A Survey of Other Empirical Studies

The number of studies that have produced estimates of equivalence scales is enormous and it would be foolish to try to summarise even a large proportion of them in what follows. Instead, we have tried to select studies that we consider contribute to the debate over differences in technique or have particular relevance when considering the evolution of such scales in the UK in recent years. Inevitably some simplification will be necessary since the number of permutations of technique and parametrisation is prohibitive. Broadly speaking, however, studies can be divided into four categories. First we present a flavour of the nutrition- or needs-based scales, and then we look at some studies that have adopted Engel or Rothbarth methods. A third category we separate is specifically that of Barten/Prais–Houthäkker (P–H) studies since these can bring information to bear directly on the applicability of the McClements scales in policy analysis. Finally we outline the results of some more sophisticated utility-based approaches.

The method of presentation is a problem and will necessarily require some reduction of the complexity of original studies. We have opted for a series of tables and tried to document any simplifications that were necessary. In all of what follows, the base household is a childless married couple, which therefore has a scale of 1.00.

It can be seen from Table 2.2 that there is broad agreement in the reported costs of children based on nutritional information, both across time and across countries, in the studies listed. This is not surprising given that all the scales are based directly on amounts of nutrition that individuals of various ages are thought to need, and unless these estimates themselves vary, then the scales will not vary. Table 2.3 shows that this is far from the case when one considers reduced form estimates of equivalence scales. Deaton and Muellbauer (1980) demonstrate that it is reasonable to expect Rothbarth scales to lie below Engel scales given the same data, and indeed this seems to be borne out by studies which have used both techniques. Many of the studies in Table 2.3 reported a range of equivalence scales based upon differing commodity groups or evaluated at different levels of welfare (or, equally, total expenditure), but for brevity we report only the most comparable scale from each study.

TABLE 2.2

Scales Based on Nutritional Information and Needs

Author	Date	Country	Group (couple + ...)	Scale	Comments
Engel	1895	Belgium	Child 0–5	1.19	
			Child 6–14	1.31	
			Child 15–18	1.41	
Atwater	1895	US	Child 0–5	1.20	
			Child 6–14	1.32	
			Child 15–18	1.46	
Rowntree	1899	UK	One child	1.24	Based on dietary needs plus
			Two children	1.61	'minimum necessary expenditure'
			Four children	2.22	in 1899 survey of York
Bowley and Burnett-Hurst	1915	UK	Child 0–5	1.20	
			Child 6–14	1.30	
			Child 15–18	1.46	
Muellbauer	1968–73	UK	Child 0–5	1.26	Based on costs of consuming
			Child 6–18	1.45	recommended daily calorie intakes
Muellbauer	1968–73	UK	Child 0–5	1.23	As above, except allowing
			Child 6–18	1.40	substantial economies of scale

Note: Evidence for the Engel, Atwater and Bowley & Burnett-Hurst scales is reported in Decoster (1988).

Studies that have used Barten commodity scales to pick up the costs of children have typically used more diverse specifications of both numbers and ages of children in the household. The McClements scales were briefly summarised in Section 2.4 above, and provide a natural point of comparison. Much of the other evidence for this technique comes from the work of Muellbauer around the same time. (The interested reader is referred to Muellbauer (1980) for the most complete summary of this debate.) Muellbauer used the Engel scales and nutritional scales outlined in Tables 2.2 and 2.3 as identifying restrictions for his set of commodity scales and found that equivalence scales based upon nutritional assumptions for the food scale were significantly larger than those resulting from imposing an Engel scale on the food equation. Indeed, Muellbauer's Engel-based P–H scales were almost identical to those of McClements, while the nutrition-based P–H scales gave values ranging from 1.30 and 1.46 (for a child of less than five and more than five respectively) at weekly expenditure of £10 to 1.36 and 1.55 at a weekly expenditure of £30 (in 1970 prices).

Muellbauer, however, recognises the problems with the nutritional approach when he says 'The qualification ... is that people do not purchase the cost-minimizing bundle of essential nutrients. There are other factors of convenience, habit and variety in food spending' (Muellbauer, 1980, p. 174).

TABLE 2.3

Some Engel and Rothbarth Equivalence Scales

Author	Date	Country	Group (couple + ...)	Scale	Comments
Muellbauer (1979)	1968–73	UK	One child Two children Three children	1.17 1.34 1.51	
Muellbauer (1979)	1968-73	UK	Child 0–5 Child 6+	1.08 1.21	
Tsakloglou (1991)	1981–82	Greece	Child 0–5 Child 6–13	1.30 1.35	Engel technique; independent of base (IB) scale
Tsakloglou (1991)	1981–82	Greece	Child 0–5 Child 6–13	1.09 1.13	Rothbarth technique; non-IB scale calculated at median income
Ray (1986)	1968–79	UK	Child 0–2 Child 3+	1.01 1.23	Linear Engel curves
Ray (1986)	1968–79	UK	Child 0–2 Child 3–5 Child 6–18	1.00 1.03 1.11	Non-linear Engel curves
Deaton, Ruiz-Castillo and Thomas (1989)	1981	Spain	Child 0–4 Child 5–13	1.21 1.31	See note to table
Nicholson (1949)	1937–38	UK	Child 0–4 Child 5+	1.11 1.16	Rothbarth estimation; 'medium' welfare (60–70 pence weekly expenditure)

Note: Deaton, Ruiz-Castillo and Thomas (1989) also provide a test for the appropriateness of separating adult goods from other commodities and this restriction is accepted for their data set.

In a separate study, Muellbauer and Pashardes (1981) use 1969–78 UK FES data to estimate a Barten model of equivalence scales and find the costs of a couple with a child varying from (rather implausibly) 0.974 to 1.224 of the costs of a childless married couple depending on age and level of welfare.

With respect to these results, it is worth noting that it is theoretically quite possible to have an equivalence scale for a couple with a child which is below that for a couple without any children. Remember that an equivalence scale is meant to allow comparisons of welfare or utility. It is quite possible that having a child has a substantial effect on the preferences of the parents. In particular, it may become cheaper for them to reach a given level of welfare because they prefer indulging in relatively cheap activities — looking after the child — to deriving their entertainment more expensively in pubs, restaurants etc. which they may have preferred before becoming parents. Note that this depends on their *preferences* having changed; it does not depend on them no longer being able to afford to go out (although this may happen as well).

Taken together, though, the estimates of commodity scales have shown that in general, equivalence scales that are independent of the level of welfare at which they are evaluated will not completely capture the observed costs of children. It was this recognition of the need to fit the observed data more completely that led to the estimation of other utility-based models of welfare. Three such estimates are reproduced in Table 2.4.

TABLE 2.4

'Utility-Based' Equivalence Scale Estimates

Author	Date	Country	Group (couple + ...)	Scale	Comments
Ray (1986)	1968–79	UK	One child	1.21	
			Two children	1.42	
			Three children	1.63	
Blundell and Lewbel (1990)	1970–84	UK	Child 0–2	1.09	
			Child 3–5	1.14	
			Child 6–10	1.16	
			Child 11+	1.18	
Banks, Blundell and Preston (1991)	1970–88	UK	One child	1.22	Life-cycle scale — not strictly comparable; see text
			Two children	1.50	
			Three children	1.84	

An important point to make on our reporting of the life-cycle scales of Banks, Blundell and Preston (1991) is that their scales are a significant departure from the other scales reported in this summary. Information is used from UK data for all households both with and without children to try to capture the costs of a child over the lifetime

of the household rather than in one particular period. Such scales will be, by definition, independent of the age of the child, and indeed if one were to interpret them as a grounds for paying compensation, such as child benefit, then one would need to take account of the fact that the 0.22 lifetime cost has to be paid only in the period when the child is present (less than half the lifetime of the household). Hence implied single-period compensation should be adjusted accordingly when comparing such scales with their standard counterparts. In other words, the lifetime scale should be multiplied by just over two for some comparability to be achieved.

This wealth of empirical evidence shows just how varied estimates of equivalence scales for children can be. Relatively few systematic conclusions can be drawn. It seems that Rothbarth scales tend to produce the lowest estimates, that estimates such as those of McClements can vary widely from study to study, but also that the McClements scales currently used for policy analysis lie broadly in the centre of the set of estimates we have considered. In the chapters that follow, we try to establish the implication such variation in these theoretical estimates might have for applied policy analysis and consider the UK experience over the last 20 years to attempt to shed some light on this confusing set of numbers.

2.7 Towards Broader Measures of the Costs of Children

There are many wider issues pertaining to the costs of children than simply those outlined above. Even within the sphere of strictly economic costs, several separate areas can be distinguished in addition to those involved with observing how demand behaviour differs between households of differing composition. These areas have received differing attention, in some cases giving rise to a complete literature whilst in other cases warranting no more than a cursory mention in a small number of studies. We use this opportunity, having gone into some detail over the measurement of costs in the particular way with which we are concerned in this study, to set out a number of further considerations which should, at least, be kept in mind.

The first of these issues is to what extent an 'economic' cost of children should measure the lost earnings arising from the caring parent's labour market absence. These costs are undoubtedly quite large, and recent evidence suggests that the spouse's earnings may often never regain their level before the arrival of the children (see Blundell, Browning and Meghir (1989)). On the other hand, such costs will be

differentially determined according to the occupation and education of the parent (if we accept that education determines earnings), and if an economist were trying to calculate some minimum necessary cost of children, it would be far from clear how to capture lost earnings. The effect of children on labour supply is well documented and in theory there is no reason why one should not allow labour supply to enter into a utility-based model as above and treat it in exactly the same way (although one might believe that there are differences in the operational structure of the two markets). In addition, the rise in the number of lone-parent families throughout the 1980s has increased the importance of this issue (see Dilnot and Duncan (1992)) since such households often make up significant proportions of the set of 'low income' families. The question of loss of earnings during child-rearing periods is an interesting and important issue, especially if it only affects particular subgroups of the population; but it is also an issue we do not consider in detail and instead we concentrate on the consumption costs of children only.

An area of household welfare measurement that is gradually receiving more attention is that of life-cycle issues. It has long been observed that households borrow and save according to their expectations of the future. In the sense that the birth of a child (usually) heralds an anticipated change in circumstance, it will necessarily affect a household's behaviour in periods in which the child is not actually present in the household. Children change not only what their parents consume but also when they consume it. Such a phenomenon is documented in, for example, Attanasio and Browning (1991) and will have serious implications for standard measures of household welfare as it suggests that the economic observer cannot observe household welfare by simply looking at a household in a single time period. In a pair of papers, Banks, Blundell and Preston (1991 and 1992) consider this issue in depth and its importance in explaining observed UK consumption behaviour. A related issue that has generated a massive literature (particularly in the US) is concerned more with the *timing* of the entry of children into a household. To the extent that the child-bearing period can be controlled, households probably decide when, as well as whether, to have children. If this decision is based upon economic circumstances, such as the anticipated paths of income, then we might only observe children in certain types of household and this will have implications for the welfare economist trying to capture the economic welfare change directly attributable to children.

However, the situation is not nearly so simple as such a framework suggests. There is a considerable degree of uncertainty in choices about having children, in particular about future costs and future earnings, but also about the child-bearing decision itself. Of course, once one has had a child the decision is irreversible — they cannot be got rid of if they turn out to be more expensive than expected or if one's income falls unexpectedly, as a result of unemployment, for example. Consequently the result of what could well have been an optimal decision will possibly be suboptimal in the light of subsequent changes in circumstances, and such unplanned changes might often create the very circumstances in which we want to compensate households with children. In this case it is merely the presence of the child in particular circumstances that matters, and those circumstances pertaining to the timing of the child's arrival are, to some extent, less relevant.

Another possible effect of children is on households' financial behaviour. One could imagine the presence of children affecting both the portfolio choice of the household and the bequest motive itself. Such effects could be substantial and also involve welfare as well as strictly financial costs. However, to our knowledge, the existing work in this area is limited and inconclusive.

A final related subject is that of the allocation of welfare within the household itself. Consideration of this opens up a vast number of subsidiary questions in many areas of economics, but particularly in matters of household composition and welfare. The traditional approach typically considers the welfare of the head of the household or alternatively the adults in that household. Such an approach can be rationalised by considering the head adult to be, in some sense, a 'benevolent dictator' whose goal is to ensure an equally high level of welfare for every individual in the household, or by assuming that there is an equal-sharing rule in the allocation of household utility. Recent research has postulated that this might not be the case and the work of Chiappori (1992), for example, has shown how to develop a model that can identify sharing rules which allow the economist to focus on the welfare of individual members rather than of the unit as a whole. Sufficiently detailed sub-household-level data are very difficult to find, however, and the estimation of such a rule is extremely complex.

CHAPTER 3
THE CURRENT TREATMENT OF FAMILIES WITH CHILDREN

A number of the most important issues relating to the construction of equivalence scales have been discussed in some detail. The purpose of this chapter is to look at the ways in which equivalence scales are used in practice. We concentrate on two areas. The first relates to the tax and benefit system where the government acts directly on the incomes of families and individuals, often with the explicit intention of altering their level of welfare, and virtually always at least bearing their welfare level in mind. In doing this it is important that some judgement be made regarding the welfare levels of families of different sizes.

The second area in which equivalence scales are important, and are used explicitly, is in the measurement of poverty and inequality. Here their use is clearly necessary in comparing the living standards of families and households of different sizes. Different scales, produced using some of the different techniques, can result in substantially different results regarding the degree and nature of poverty and inequality. These results can themselves have a considerable impact upon policy formulation and priorities.

3.1 The Tax and Benefit System

In the tax and benefit system, in the absence of other overriding policy issues, one would generally want to treat people in similar circumstances and with equal welfare levels equally. This is set out explicitly, for example, in the UK Taxpayers' Charter: 'You will be treated in the same way as other taxpayers in similar circumstances'.

In fact, of course, the tax system makes no attempt to alter tax payments according to family size (see, for example, Lambert (1991) who shows the effects of this). The benefit system, on the other hand, does, and must. In designing any benefit which is meant to raise a family's standard of living to a certain level, some judgement needs to be made about how much is required to raise families of different types to the same level of welfare. These exact relativities need not necessarily then be incorporated in the benefit system if one wants, for other reasons, to favour certain family types or if one is concerned with other policy aims, but one needs a base against which to make these judgements.

It is also important in this context to distinguish between those parts of the tax and benefit system which are designed to bring the incomes of families with children into equivalence with those of childless families, and those parts which are designed to help replace earnings forgone as a result of having children. In general, provision for children falls into the first category. This is certainly true of the main means-tested benefits. A good example is family credit, which is a means-tested benefit payable only to low-earning full-time workers with children. As such, it takes explicit account of the extra needs of low earners with children by comparison with those without children for whom no such benefit exists.

There are a number of aspects of the UK tax and benefit system which take account of family size. In the direct tax system, the married couple's allowance is added to the ordinary single person's allowance of the husband of a married couple. Where both spouses are working, this results in a couple having more than twice the tax allowance of a single person — not what one would expect if one were interested in taxing equivalent income. Where only one member of a married couple works, however, the total allowance enjoyed by the working member is more than just a single allowance, but less than twice that allowance.

The tax system takes no account of the number of children in a family. Until the late 1970s, however, it did take account of this through a system of child tax allowances introduced after the war. These resulted in effective benefits for children which were to some extent proportionate to income. These allowances were finally abolished in 1978 and consolidated into a flat-rate payment of child benefit for each child. The level of child benefit presently (1992–93) stands at £9.65 per week for the first child and £7.80 for subsequent children. Child benefit is not intended to cover the full costs of having a child, however. It has a number of functions including helping to replace lost income from work and having a positive effect on incentives to take work. It is interesting to note the existence of a slightly higher benefit for the first child as compared with subsequent children. This differential was introduced in 1991 avowedly to take account of the fact that costs associated with the first child are greater than those associated with subsequent children — an argument that there are fixed costs and economies of scale, in other words. It seems clear that such a change was not made for distributional reasons since families with more children tend to be worse off than those with fewer children (see Dilnot,

Johnson and Stark (1991)). More about child benefit is said elsewhere.[1]

For the remainder of this section, we concentrate on the levels of means-tested benefits, in particular income support, and the equivalence scale relativities implicit in them. These are of interest in themselves as showing the minima below which the Government believes families of different types should not be allowed to fall, and if this is its intention there must be some explicit acknowledgement of the welfare levels implied by the benefit levels payable to families of different sizes. A second reason for particular interest in the implicit scales is that until 1985 the DSS produced regular statistics showing the numbers of people on, below and at certain proportions of the supplementary benefit[2] level. These were universally used as official poverty statistics, and hence the equivalence scales implicit in the supplementary benefit rates were also the effective equivalence scales used in measuring poverty. Since the latest DSS publication, updated figures have been produced by IFS for the Social Security Select Committee for 1987 and 1990.[3] On this, more details are given in the next section.

TABLE 3.1

Income Support Rates, 1992

	Personal allowances (£ per week)
Adults	
Single person, under 25	33.60
Single person, 25 or over	42.45
Lone parent	42.45
Married couple	66.60
Dependent children	
Under 11	14.55
11–15	21.40
16–17	25.55
18	33.60
Premiums	
Family premium	9.30
Lone-parent premium	4.75

[1] See, for example, Johnson, Stark and Webb (1989), Parker and Sutherland (1991) and Willetts (1991) for more detailed discussion of the role of child benefit and its possible alternatives.

[2] Supplementary benefit was the direct predecessor of income support, itself introduced in 1988 following the 'Fowler' reforms (see Dilnot and Webb (1988) for a discussion).

[3] See Johnson and Webb (1990).

Table 3.1 shows the income support rates, applicable from April 1992, for some of the family types in which we are interested. The method of calculating entitlements works in the following way. Everybody is entitled to a personal allowance which depends on marital status. To this is added the amounts shown for *each* child of the relevant age in the family. If there are any children in the family, a family premium is added; if there are children and the family head is single, a lone-parent premium is also added. Thus, for example, a married couple with one child aged eight and one aged 11 would be entitled to £111.85 per week (£66.60 + £14.55 + £21.40 + £9.30), while a single parent with one child aged 17 would be entitled to £82.05 per week (£42.45 + £25.55 + £9.30 + £4.75).

From these figures we can calculate the implicit equivalence scales, although the existence of premiums complicates this a little, since only one is added no matter how many children there are in the family. Taking a single person over the age of 25 as the reference family type, Table 3.2 shows the equivalence scales implicit in Table 3.1. In the first column, the premiums are ignored; the second column includes the effect of the family premium. One interpretation is that the scale including the premium can be taken as the equivalence scale relevant to the first child, while that excluding the premium is the scale relevant to all subsequent children — what one might call the 'marginal equivalence scale'. The rationale behind such a structure is presumably that there are some 'fixed costs' to having children which may exist independently of the number of children — two children cost less than twice as much as one child. This sort of fixed cost component is not generally picked up in most equivalence scale estimation, though we show in Section 5.2 that such a fixed cost term may be significant.

The questions to be answered relate to how and why the income support relativities are set, and to what extent they reflect the differing needs of families of different sizes as determined by equivalence scales of different sorts. In answering the first of these questions, we need to go back to the Beveridge Report (1942) and the introduction of National Assistance, the benefit which preceded supplementary benefit, itself the forerunner of income support.

Beveridge himself made no specific recommendations about the actual levels of National Assistance benefits. He was almost exclusively concerned with an insurance system and the levels of benefits set under such a system of social insurance. He did not even include specific allowance for children in the social insurance scheme, but rather a

system of universal allowances for all children other than the first child in each family. Nevertheless when the Unemployment Assistance Board set children's rates in 1946, it appears that it was influenced by the Beveridge Report, proposing rates similar to those put forward by Beveridge (see Field (1985)). But when it was replaced by the National Assistance Board in 1948, the adult rates were increased to take account of higher prices while children's rates were not adjusted.

TABLE 3.2

Equivalence Scales Implicit in Income Support Levels

	Excluding family premium	Including family premium
Adults		
Single person, 25 or over	1	1
Lone parent[a]	1.11	1.11
Married couple	1.57	1.57
Dependent children		
Under 11	0.34	0.56
11–15	0.50	0.72
16–17	0.60	0.82
18	0.79	1.01

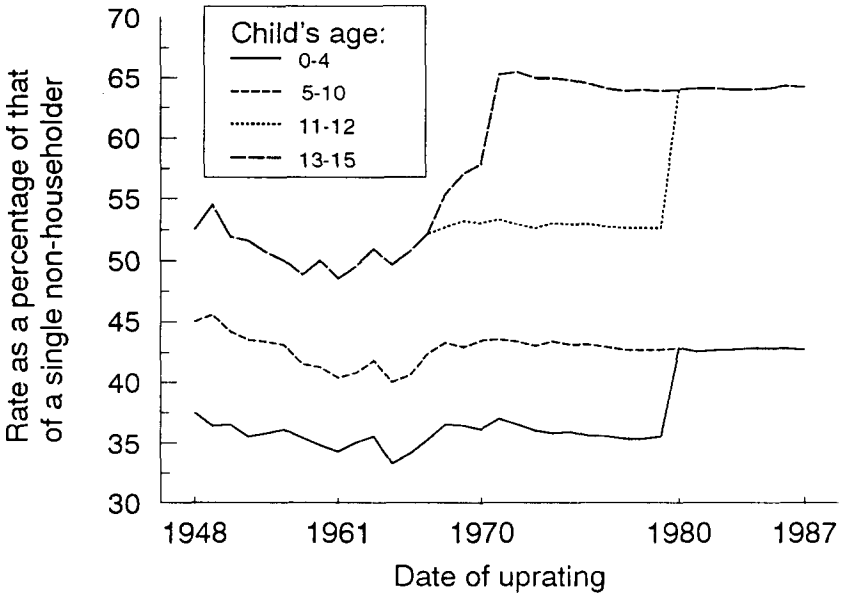
[a] Includes lone-parent premium.

Figure 3.1 shows how benefit rates for children of different ages changed between 1948 and 1987, the last year of operation of supplementary benefit, as a proportion of the benefit of a single adult non-householder. The figures are not continued to the present day because the structure of income support is not directly comparable with that of the benefits it replaced. What is clear from the graph is that the relative position of older children particularly has improved quite dramatically. Between 1967 and 1971 the equivalence scale assigned to a 13–15-year-old child increased from about 0.5 to about 0.65, a level which was maintained. Between 1948 and 1979 the scale for 11–12-year-olds remained virtually the same at around 0.5. Between 1948 and 1967 they maintained the same relativity as the 13–15 age-group, diverging from then as the older group's relative weight increased. In 1980, however, the two groups had their relativities equalised at the higher level, so since then the 11–12-year-olds have shared the 13–15-year-olds' weight of about 0.64. The younger ages were split into two groups, under 5 and 5–10, until 1980, maintaining reasonably constant relativities at about 0.36 and 0.43 respectively

throughout the period. In 1980, however, these two groups were also consolidated into one, with a relativity of around 0.43.

FIGURE 3.1

Implicit National Assistance and Supplementary Benefit Relativities for Children, 1948–87



These two groupings of 0–10 and 11–15 have persisted into the income support system with rather more generous weightings. Note, however, that the figures in Table 3.2 and Figure 3.1 underestimate the generosity of the income support (IS) system to children relative to the supplementary benefit (SB) system, because in the graph the scales shown are relative to the non-householder rate of SB while the figures shown in the table are relative to the over-25 rate of income support. (The householder/non-householder distinction in the SB system was replaced by an over-25/under-25 distinction in the IS system.)

Grouping the 0–4 and 5–10 age-groups together was done in the interests of being more generous to families with young children. However, our results presented in Chapter 5 indicate that there is a clear difference between these two age-groups in terms of calculated equivalence scales, with the older age-group having a significantly

higher calculated scale according to all the results presented. In fact, the changes made to the children's scales were clearly not based on any equivalence scale calculations but rather, as indicated earlier, a desire to be more generous to particular family types. The same was true of the move to the income support system, and indeed other parts of the 1988 'Fowler' reforms which specifically aimed to help families with children. This aim was made specific in the White Paper preceding the reforms in which the following remarks were made:

> Low Income Families with children are among those with the greatest needs today ... families with children — including one parent families — now make up over half of people on low incomes ... The number of pensioners within the low income population has reduced sharply but the number of families with children has risen significantly.

These observations were the main justification given for the introduction of the family premium. It was not justified by reference to any results drawn from work on equivalence scales. Nor are other relativities in the benefit system based on estimated equivalence scales. Rather, they appear to have been determined, at least partly, as part of wider policy considerations.

3.2 Poverty and Inequality Measurement

In studies of poverty and inequality, the aim is to compare people's standards of living either with those of other people or with a particular standard of living defined as a poverty line. This is usually done by using income as a measure of living standard. To do this, and to make comparisons between families or households of different sizes possible, incomes are virtually always equivalised and hence comparisons are made, and calculations done, using equivalent income. In this section we look at the equivalence scales that have been used in various studies, the effect on poverty and inequality estimates of using different scales and, in particular, the role of equivalence scales in the Government's own official low income statistics, Households Below Average Income (HBAI).

It is important to note that these observations regarding the importance of using equivalence scales in studies of inequality and living standards are important not only to within-year studies but also in making comparisons between years. For instance, changing household income over time may not necessarily reflect changing living standards if average household sizes are changing. This is especially important in the current UK context, given the considerable changes

in household size which have occurred over the past 20 years or so. This is illustrated in Figure 3.2 which shows the proportions of one-, two-, three- etc. person households in the UK between 1969 and 1989. The increase in the proportion of one-person households at the expense of the larger households has been quite dramatic. And as O'Higgins and Jenkins (1989) observe, in the European context 'Given both the rate at which average household sizes are changing and the apparent recent increase in the average household size of those in poverty, there is clearly a need for caution if basing poverty population estimates on household numbers'.

FIGURE 3.2

The Changing Pattern of Household Size, 1969–89

Source: FES reports.

Given the importance of using some equivalence scale in calculating poverty or inequality measures, the question of the effect of using different scales remains. We have already seen (Chapter 2) the wide range of scales which have been proposed and/or calculated. Work

which has looked at the effects of different scales includes that of Johnson and Webb (1989 and 1991), Coulter, Cowell and Jenkins (1992), Department of Health and Social Security (1988) and Department of Social Security (1992). Johnson and Webb (1989) looked at the impact of using McClements equivalence scales in the HBAI statistics as against the scales implicit in the old supplementary benefit system which had effectively been used in the previous series of poverty statistics (Low Income Families). The two sets of scales are in fact quite similar, but the SB scales gave somewhat more weight to second and subsequent adults in a household and to children, especially very young children. The actual scales are shown in Table 3.3. The impact of using the different scales was found to be relatively minor; for instance, the numbers below half average income changed from 8.1 per cent of the population using McClements scales to 8.5 per cent using SB scales, with, as one might expect, more families with children appearing in the poorest groups when the SB scales were used. Despite the small effects shown, the impact of the different methods of equivalisation was to have an unambiguous effect on the degree of measured inequality. Analysis demonstrated that the Lorenz curve for the McClements-based distribution lay entirely inside the curve for the SB-equivalised distribution, indicating that measured inequality was reduced by using SB rather than McClements equivalence scales.

TABLE 3.3

HBAI and SB Equivalence Scales

	HBAI	SB
Married couple	1.00	1.00
Single adult (householder)	0.61	0.62
Second adult (non-householder)	0.46	0.49
Third adult (non-householder)	0.42	0.49
Fourth adult (non-householder)	0.36	0.49
Child aged 16–17	0.35	0.38
Child aged 13–15	0.27	0.32
Child aged 11–12	0.25	0.32
Child aged 8–10	0.23	0.21
Child aged 5–7	0.21	0.21
Child aged 2–4	0.18	0.21
Child aged 0–1	0.09	0.21

The small effect found appeared to confirm the conclusions of a DHSS technical review (Department of Health and Social Security, 1988) that the choice of equivalence scale made relatively little

difference to the numbers appearing to be poor, or at particular points in the income distribution. In fact, this conclusion may have been overly sanguine and based on the use of two rather similar sets of scales chosen from a wide possible range.

Following an extensive review, the DSS concluded that some of its results were in fact quite sensitive to the particular equivalence scale used, and where this proved to be so, the sensitive figures were marked in the published tables. Nevertheless the McClements scales were maintained as the basic method of equivalisation because, as the HBAI report states (Department of Social Security, 1992), 'there was no other generally accepted set of scales and the McClements scale values were not extreme when compared with other scales'.

These statements appear to be true in themselves. Although estimates of equivalence scales for single people relative to married couples vary between around 0.5 (which assumes no gains from sharing) and nearly one (assuming two people can live just as cheaply as one), the most frequent scale values lie between 0.5 and 0.75, with the McClements scale, at 0.61, roughly in the centre of this range. Similarly the McClements scales for children, which vary from 0.09 (of a married couple) to 0.36, according to age, are close to the centre of scales used. Nevertheless it has been claimed that the McClements scale 'provides lower estimates of the extent of inequality and poverty than do other scales' (Coulter et al., 1992). This result was based on the finding that using equivalence scales at the two extremes of the spectrum (i.e. from a per capita measure to one taking no account of household size) did not give two different extreme measures of inequality. Rather, extreme values of equivalence scales were found to result in rather higher levels of inequality than more central values.

Coulter et al.'s work was based on the methodology of Buhmann et al. (1988) who showed that differences in equivalence scales could be summarised according to the formula:

$$\text{Equivalent income} = \text{Total income} \; / \; n^{\theta}$$

where n is the number of individuals in the income unit and θ is the elasticity of income unit 'need' with respect to unit size. A value of $\theta=1$ would correspond to using per capita income, i.e. simply dividing household income by number of people in the household, while a value of $\theta=0$ would be equivalent to making no adjustments for household size whatsoever. The obvious worry that one might have regarding this

particular methodology must relate to the fact that no differentiation between adults and children is made in taking account of different household size. In other words, four-adult households are treated in exactly the same way as two-adult two-children households.

Buhmann et al. show that equivalence scales derived from subjective studies (i.e. ones based on questions regarding what different families need to live) generally result in relatively low values for the elasticity, θ, of about 0.25. Estimates based on observed consumption patterns and identifying assumptions have higher values of around 0.36. Those used in policy-making, such as those embodied in benefit scales such as the official US poverty line, tend to have values nearer 0.55, while the highest elasticities, of about 0.7, are used in statistical studies by the OECD and other such bodies. Recall that higher elasticities imply making greater allowance for household size.

Atkinson (1990) reports the consequences of using different equivalence scales in a number of OECD countries in a table based on the work of Buhmann et al. Table 3.4 is drawn from Atkinson (1990). It is clear that the equivalence scale used can make a great deal of difference to the extent of measured poverty or inequality in some countries, e.g. Norway and the UK, but makes little difference in others, e.g. the US and the Netherlands.

TABLE 3.4

Consequences of Different Equivalence Scales: Evidence from the Luxemburg Income Study

Percentage of persons below 50 per cent of median (Percentage of these where head aged 60 or over)

	Type of scale			
	Subjective	Observed consumption	Policy-making	Statistical
US	17.9 (30.5)	17.8 (28.3)	17.2 (24.3)	17.2 (20.7)
Australia	16.0 (37.1)	14.8 (32.7)	12.3 (18.7)	11.7 (8.9)
UK	15.2 (66.2)	14.0 (64.9)	11.4 (55.4)	8.1 (34.9)
Canada	15.0 (32.3)	14.4 (29.9)	13.2 (22.7)	12.3 (15.1)
Switzerland	10.5 (45.4)	9.8 (39.9)	8.5 (30.1)	8.3 (19.0)
Norway	10.3 (54.6)	8.9 (49.3)	5.1 (22.5)	5.2 (18.4)
Sweden	7.9 (34.8)	6.5 (25.3)	5.4 (11.6)	5.3 (5.1)
West Germany	7.6 (64.3)	6.6 (60.2)	5.2 (50.4)	5.4 (34.3)
Netherlands	7.3 (15.7)	7.2 (12.8)	8.0 (10.8)	8.8 (9.4)

Source: Atkinson, 1990.

Coulter et al. state that the elasticity that summarises the McClements scale as used in the HBAI figures is approximately equal to 0.6. They then show that for most inequality measures, such a value minimises measured inequality. Given the wide range of scales available and the fact that no single one is generally accepted, this would be an important conclusion. Caution should be exercised in reaching this conclusion purely on the basis of their work, however, for a number of reasons. Firstly, as mentioned above, the elasticity measure takes no account of household composition, just of number of persons. Secondly, to draw general conclusions it is probably necessary to use data from more than one year; all the results reported by Coulter et al. are based on 1986 data. Thirdly, assigning a value of θ to a scale such as the McClements scale which depends on ages of children is not a straightforward task.

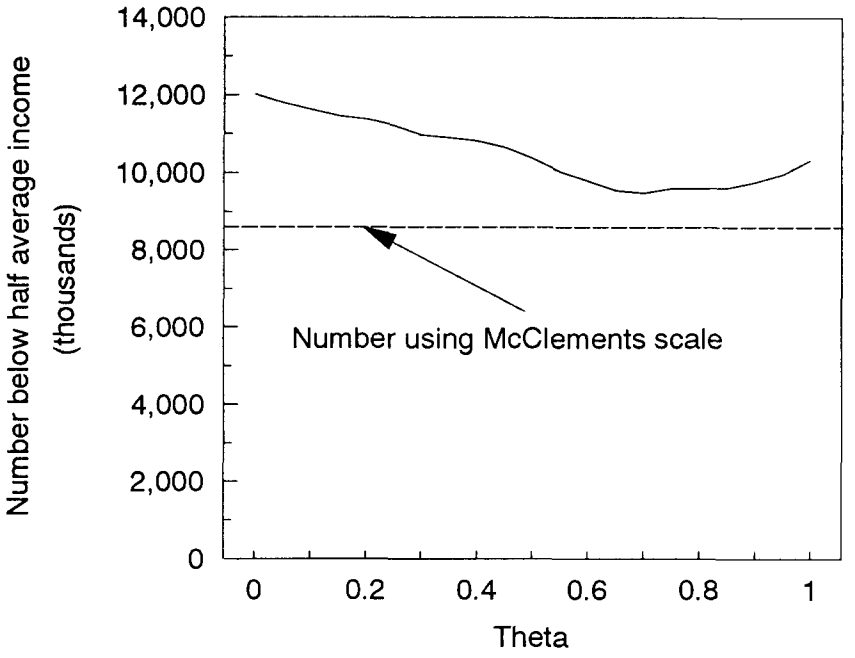
Experimentation with FES data used in producing HBAI tables at IFS suggested a mean value of θ for each household of 0.68. This was arrived at by using the equation shown above relating total income, equivalent income, household size and θ. The only unknown for each household is θ, which is thus readily calculable. This figure appeared to be remarkably stable over the period 1979 to 1989. There was, however, a wide variation in the value of θ for households of particular demographic types, from a low point of 0.33 to a maximum of 0.81. The former, low, value is that for a one-parent family with two young children, the latter, high, value is for a household containing three adults. The difference results from the fact that the McClements scale gives much greater weight to adults than to young children while the elasticity measure is dependent solely on number of individuals in the household. A simple average value for θ derived in this way is not necessarily the best representation of an equivalence scale and one might want to compare other aspects of the income distribution using the actual scale and using the elasticity measurement. Such an exercise resulted in the Coulter et al. estimate of θ=0.6.

To test the impact of using this 'average' equivalence scale rather than the actual McClements scale, we reproduce some of the HBAI results using the McClements scale, and also using average scales based on various values of θ. Figure 3.3 shows the number of individuals below half average income in 1987 at various values of θ between zero and one. (Otherwise, HBAI methodology is reproduced exactly.) The shape of the graph is very close to that of the figures produced by Coulter et al. in showing the effects of various values of θ on different measures of inequality, and its minimum does appear to be very close to a value of

θ=0.68. However, the smallest number below half average income using any value of θ is over 9.4 million compared with a figure of under 8.7 million arrived at using the actual McClements scale.

FIGURE 3.3

Numbers Below Half Average Income Using Various Values of θ, 1987



Such a result must give rise to doubts regarding the general applicability of the Buhmann et al. procedure as a way of summarising different equivalence scales. Because it does not distinguish children from additional adults in a household, giving them the same weight, this methodology will always underestimate the equivalent incomes of families with children relative to those without. Hence, there can be no guarantee that the same poverty and inequality measures will be achieved using a single value for θ as using any actual equivalence scale. In this case, the larger number below half average income is entirely accounted for by larger numbers of single and married people with children in this category, more than offsetting the falls in the numbers of all other family types.

This finding casts doubts on the assertion of Coulter et al. that the equivalence scale used by the DSS 'provides lower estimates of the extent of inequality and poverty than do other scales', an assertion which is based on the Buhmann et al. methodology. Indeed, further experimentation with the data used to produce the 1987 HBAI statistics showed that reducing the weight given to children in the equivalence scales by a half reduced the numbers recorded as being below half average income to 7.93 million, more than three-quarters of a million fewer than the number produced using the McClements scales themselves. Similarly, higher weights for children produced greater numbers below the half average income line. It should be noted that these results are contingent on the data and not necessarily true at all points in time. Increasing the weight given to children reduces the recorded equivalent incomes of families with children but also reduces mean equivalent income overall. Therefore while the relative incomes of families with children will fall, the relative incomes of other groups will rise. When there are a large number of families with children just above the relevant cut-off point, the numbers falling under that level will be substantial if the weight given to children rises. When there are plenty of childless families just below the cut-off point, a rise in weight given to children may push sufficient of these over that relative level to reduce recorded poverty or inequality.

It does seem to be true that the elasticity of need with respect to size which comes closest to approximating to the McClements scale minimises recorded poverty and inequality, but the relevance of this particular finding to policy is not necessarily clear. But our results again stress the importance of the exact equivalence scale used in studies of poverty and inequality. Furthermore, they show that the way in which children are treated appears to be of particular significance and that scales which depend just on numbers of people in a household do not adequately summarise a particular equivalence scale. Conclusions drawn from such scales do not necessarily stand up to more specifically defined scales. In the specific context of official HBAI statistics, greater weight given to children in the equivalence scale used appears to increase measured inequality, and lower weight reduces it.

More generally, it is clear that there are a large number of possible equivalence scales which may be used in income measurement, and the choice of scale is important in measuring either poverty or inequality. To the extent that this is true, it must be important to make the actual scale used in any study very clear and to show the impact of the use of

that particular scale. It is also important in such studies to show the impact of using different scales where these do have a substantial impact. The most recent DSS HBAI statistics do take account of these problems to a large extent, and information regarding the impact of different scales is to be found in that publication.

CHAPTER 4
EVIDENCE FROM THE UK, 1969–90

The estimation of equivalence scales can be done in a number of ways and a large number of different scales have been estimated. They are used in important policy-relevant areas and the use of different scales can have a considerable impact. But even if we are happy with the estimation procedures which have resulted in a particular set of scales, these scales need not be constant over time. Furthermore, as the population changes in its demographic structure and characteristics, the costs of children may change in ways which cannot be adequately captured by equivalence scales alone.

Hence in interpreting equivalence scales, and their role in measuring living standards, it is important to be aware of the nature of simultaneous changes in demographic structure, expenditure patterns and relative prices. In this chapter we start by using 22 years of Family Expenditure Survey (FES) data to look at demographic patterns over time. We then go on to look at the pattern of household expenditures over the income distribution as measured by the official HBAI statistics. Additionally, the changing relative prices and the costs of living which different demographic groups face are clearly of considerable importance in determining observed living standards, and the extent of such changes in the UK is examined in Section 4.2.

4.1 Evidence from Micro Data

In this section, use is made of 22 years of FES data, from 1969 to 1990, to look at changing demographic, income and expenditure characteristics across time and across the household life cycle.[1] The importance of life-cycle issues is discussed elsewhere in this report and by Banks, Blundell and Preston (1992). In particular, the costs of children may be spread over the period during which there are no children in the household, and expenditure patterns may be adapted to take account of children being expected in the future.

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[1] In all cases, the data used refer to the non-pensioner population.

Household Demographics

The changing size of households has been commented upon already, in particular the falling average size of households which emphasises the importance of using equivalence scales in comparisons across time as well as in cross-sectional analysis. This pattern was confirmed in Figure 3.2. The fall in household size between 1970 and 1990 resulted in a fall in the average household equivalence scale applicable from about 1.3 to 1.2 (among non-pensioner households). Hence to make a meaningful comparison between average household incomes in 1970 and in 1990 would require the former to be divided by about 1.3 and the latter by nearer 1.2.

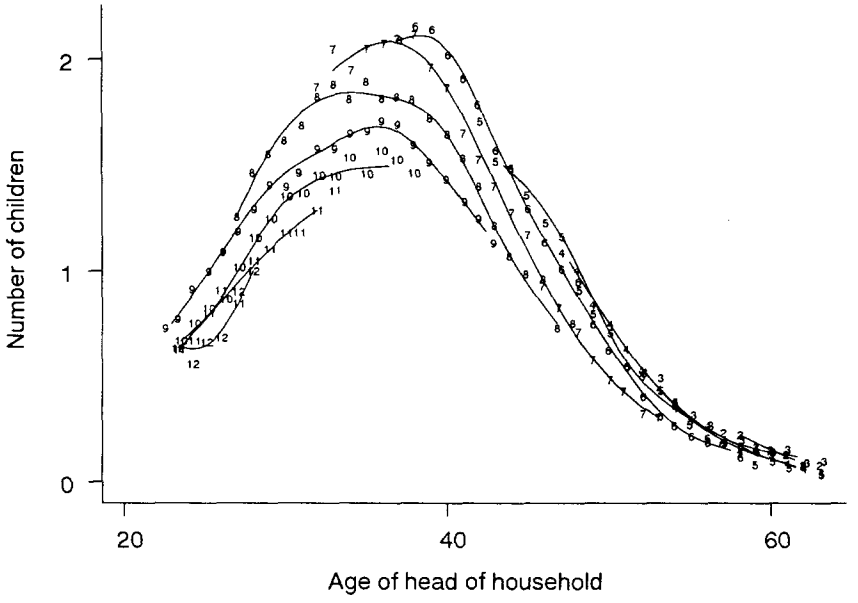
One of the most significant demographic shifts has been in the number of households containing children and in the average number of children in each household. The fall in these numbers has been one of the most important reasons for the fall in the average household size and applicable equivalence scale. In Figure 4.1 the FES population is split up into 12 cohorts according to date of birth. Each cohort covers a five-year period of birth dates. The first cohort is thus made up of those born before 1910, the second of those born between 1910 and 1914, the third of those born between 1915 and 1919 and so forth. The twelfth and last cohort is made up of those born between 1960 and 1964. Clearly the oldest cohorts only appear in the earliest years of data while the youngest cohorts only reach adulthood in the later years. (A fuller documentation of the cohort data and group sizes is presented in Appendix B.)

The difference between earlier and later cohorts is very clear from Figure 4.1. While the average number of children appears to peak at much the same age, between 35 and 40, for most of the cohorts, the actual number declines quite dramatically among younger cohorts. Cohorts six and seven, born between 1930 and 1939, and therefore likely to be having their children during the 1950s and 1960s, had the most children, with the average peaking at just over two per household at age 40 or so. There is a fairly dramatic drop to the next cohort, born between 1940 and 1944, and again to cohorts nine, ten and eleven. These changes are explained not only by the well-documented change in female fertility rates but also by increased lone-parenthood. For if the parents are living in separate households, the average number of children per household will be lower. In addition, however, we can observe some flattening of the peak as we move to more recent cohorts. This reflects the widening dispersion of the age at which mothers are

having children and consequently the fall in the height of the peak could partly represent a simple reduction in the concentration of children at age 38, say, rather than a fall in the number of children *per se.*

FIGURE 4.1

Numbers of Dependent Children in the Household over the Life Cycle, by Age and Cohort



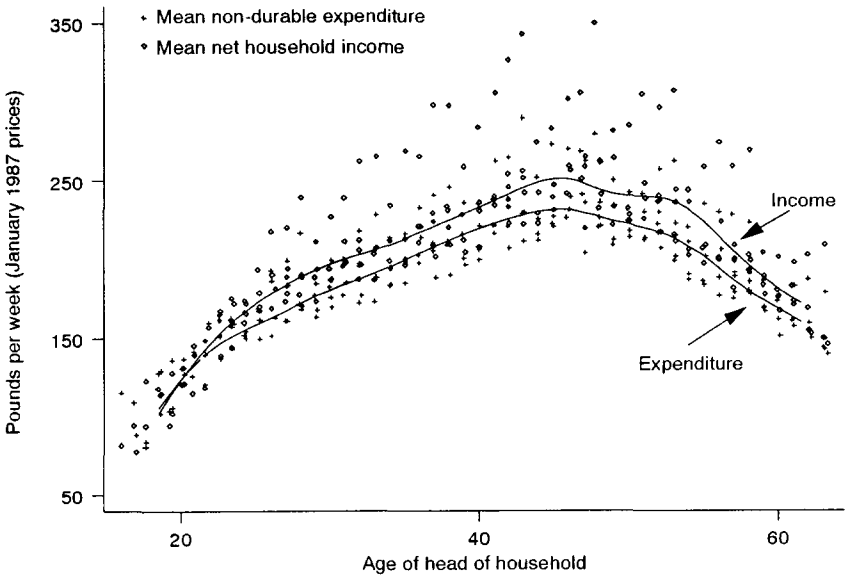
Published statistics indicate that the fertility rate, defined as the number of births per 1,000 women aged 15–44, has not changed substantially since the end of the 1970s. It stood at 64.2 in 1990, slightly above the average for the 1980s of 61.8. These numbers are, however, low by historical standards. The fertility rate in the period 1970–72 was 82.5 and that in 1960–62 was 90.3. There has also been a shift in the pattern of births. The small change in overall fertility levels over the 1980s hid substantial changes in fertility patterns by age. Thus while overall fertility rates were almost identical in 1979 and 1990 (64.1 and 64.2 respectively), the rate increased among 30–34-year-olds and 35–39-year-olds from 70.0 and 22.2 to 87.0 and 31.0 respectively. Among 20–24- and 25–29-year-olds there were drops from 112.3 and 133.0 to 91.9 and 122.7. These changes might be expected to have an effect on

the observed expenditure patterns of different groups.

The shift in the numbers of children and pattern of child-bearing may have a number of effects on consumers' behaviour. If fewer children are born then fewer people will need to save money in non-child-rearing years in anticipation of the future costs associated with children. On the other hand, an increase in later child-bearing may mean that the pattern of expenditure of those in their twenties might be rather different from what it would be otherwise. If the life-cycle changes do affect actual expenditure patterns then one might expect one-period equivalence scales to be measured differently at different points in time as a direct result of the changing demographic patterns. Should the trends that have been apparent over the past years continue, the cumulative effect on expenditure patterns and equivalence scale estimates may become considerable and the validity of scales estimated 20 years or more ago (like the McClements scales) may be reduced in consequence.

FIGURE 4.2

Mean Income and Expenditure over the Life Cycle

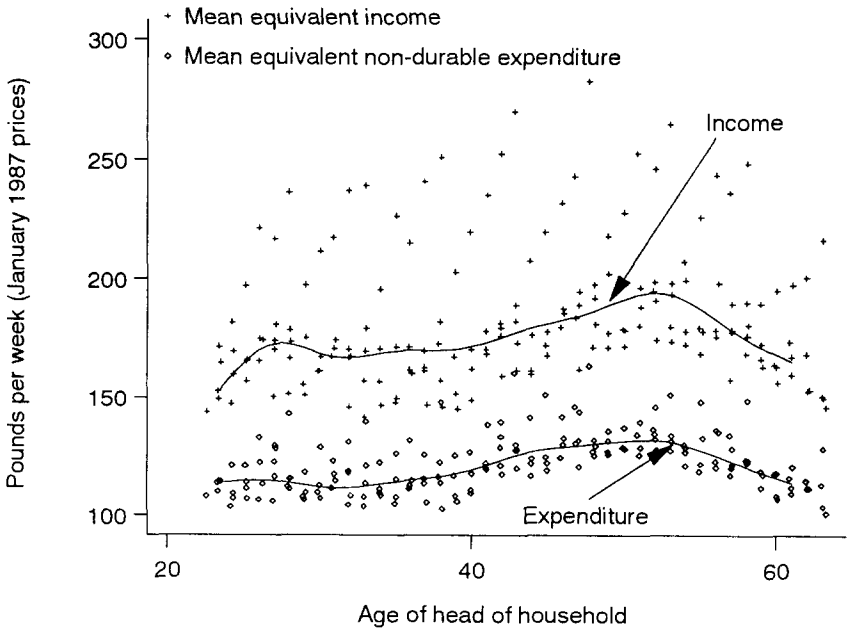


The evidence that both income and expenditure vary quite significantly across the life cycle of the household is clear and is presented graphically in Figure 4.2. Using the same run of data as that described and used above, it shows mean net household incomes and non-durable expenditures by age. Both rise fairly gradually from age 20 to about age 50 before tailing off quite sharply.

As it stands, data of this nature would appear to refute the Permanent Income Hypothesis and other theories which suggest that expenditure levels should be smoothed across the lifetime by saving in high income periods and borrowing in those stages of the life cycle during which incomes are low.

FIGURE 4.3

Equivalent Income and Expenditure over the Life Cycle



When incomes and expenditures are equivalised, however, a rather different and much flatter pattern of both incomes and expenditures emerges. This is illustrated in Figure 4.3 in which incomes and non-durable non-housing expenditures have been equivalised using the McClements scales (since we have made deductions from total

household expenditure, it must be noted that this graph contains no information about household saving). Blundell, Browning and Meghir (1989) provide similar evidence. Equivalent expenditures appear to be very flat between ages 20 and 40, with a slight bump between 40 and 60 years of age. Even equivalent income levels appear to be quite stable across the life cycle after a swift rise in the early twenties. This appears to indicate that, on average, people's income rises just enough to compensate them for the extra costs of children as they have them (remembering that average number of children reaches a peak at or about age 40).

It should be stressed, of course, that this result is only true on average and there remain plenty of families whose income, actual and equivalent, falls quite dramatically when they have children. Furthermore the uncertainty involved with maintaining income levels while children remain in the family unit is not captured. Once a child is born, it has to be supported for 16 years at least and frequently longer. During this period many families who expected to have adequate income will see that income fall as a result of circumstances such as unemployment. This may be a problem for a large number of families who expected to have enough income to support children when there is a serious recession. This in itself is a strong counter-argument to those who claim that no compensation should be provided to those who have children because by having those children they are expressing a preference and as such are no worse off than somebody with the same income who has chosen not to have children.

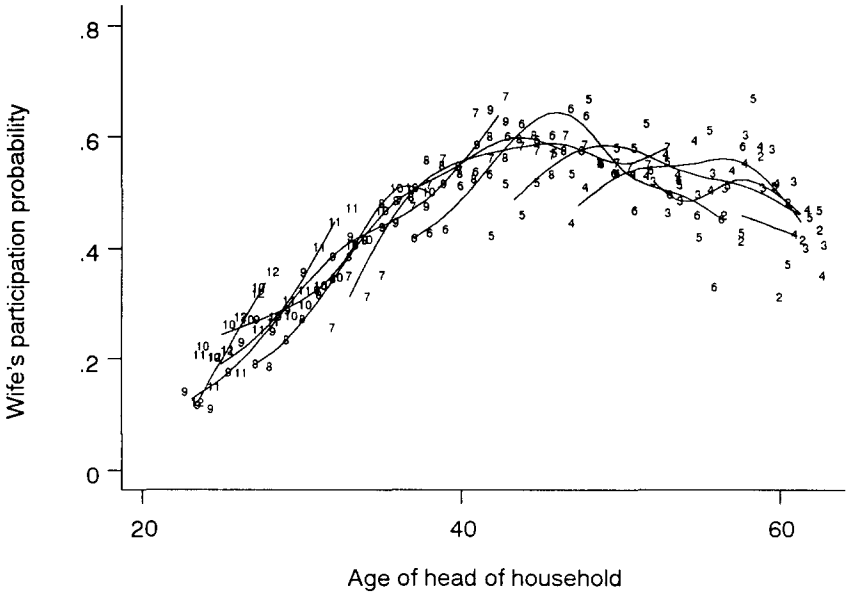
The maintenance of mean household income at a stable level across the life cycle, even during child-rearing years, is perhaps somewhat surprising given the much lower work participation rate of mothers, especially those with young children, compared with that of other married women. Even among those who do stay in work, average weekly hours of work tend to be much lower for mothers than for those without children. The pattern of wife's participation, by age and cohort, in households with children, is shown in Figure 4.4. This shows participation rates of 20 per cent or less for young mothers with (on average younger) children, rising to nearer 60 per cent for older parents with (largely older) children.

Some cohort differences are also discernible from Figure 4.4. The youngest cohorts have a noticeably higher participation probability than earlier cohorts at the same age. In fact, changes in participation patterns among women with children, especially young children, have

been quite substantial over at least the past decade. This has implications for the costs of children — in terms of income forgone and extra care paid for — as well as for the overall welfare of families at a particular income level. One might not consider a family with two children in which each parent works full-time and earns £15,000 per annum to be as well off as one in which one parent earns £30,000 and the other remains at home to look after the children. The cost of caring for the children will almost certainly be greater in the former case — one might even want to assign such families a higher equivalence scale.

FIGURE 4.4

Wife's Participation Probabilities: Households with Children



Such a discussion is rather beyond the scope of this study, but economic activity rates for women with children of particular ages in 1979 and 1990 are shown in Table 4.1. Among women with children under the age of five, there has been a doubling in the proportion working full-time, from 6 per cent to 13 per cent, and a six percentage point rise in the proportion working part-time. This change in working patterns may itself result in a substantial change in expenditure patterns

if there is not equal sharing within households and previously non-working spouses gain access to extra income.

TABLE 4.1

Economic Activity of Women of Working Age, 1979 and 1990

Percentage of all women in each group aged 16–59

	1979		1990	
	Full-time	Part-time	Full-time	Part-time
Youngest child				
0–4	6	22	13	28
5–9	16	44	19	47
10 or over	26	45	32	46
All with children	16	36	21	39
No children	51	18	51	22

Source: General Household Survey, 1990.

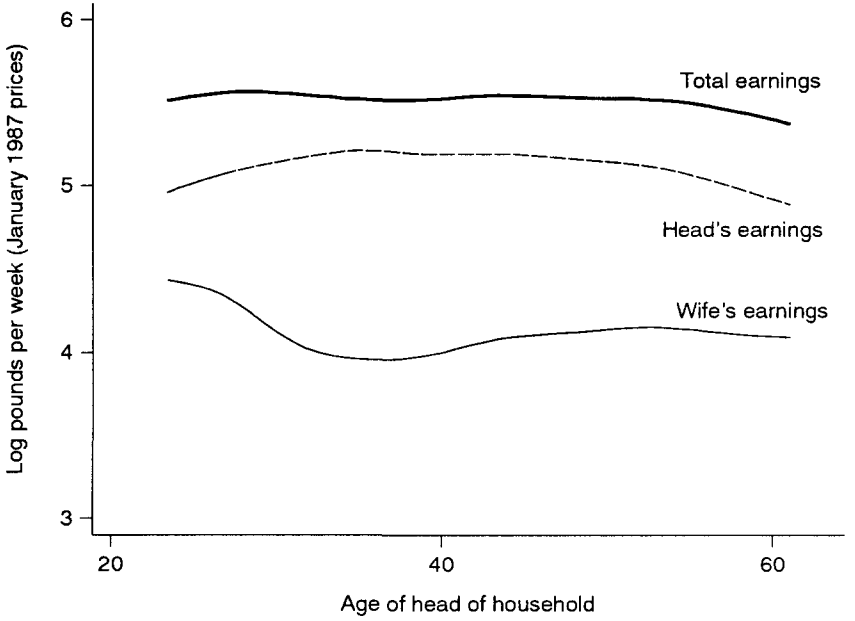
The changes among women with older children have been less pronounced but in the same direction. Overall there was an eight percentage point rise in participation among women with children against just a four percentage point increase among those without children. It is worth noting that this occurred despite a large increase in the number of lone parents (see Ermisch and Wright (1989)) and the fact that they became less, not more, likely to work. The pattern of work among lone parents is very different from that among married mothers, with almost as many working full-time as working part-time (18 per cent and 22 per cent respectively in the period 1988–90). The small proportion working part-time is a direct result of the structure of the benefit system which means part-time work is unlikely to be worthwhile for a single mother, especially if she has to pay for childcare in order to take it (see Dilnot and Duncan (1992) and Walker (1990)).

It remains true, of course, that married women with children are less likely to work, especially to work full-time, than are those without children. This is illustrated in the last two lines of Table 4.1. One might, then, expect household incomes to drop quite dramatically as children are born. In fact, as Figure 4.5 shows, the impact of much lower earnings among wives once child-bearing years are reached is offset to a large extent by higher earnings among husbands. This of course leaves equivalent income lower but does seem to be some evidence to suggest that much child-bearing and consequent loss of earnings by one parent

is accompanied by increased earnings by the other parent. (Again one must bear in mind our discussion of Figure 4.3 — this only represents the average and there are many households that will experience real earnings loss, in addition to the fact that there is significant uncertainty in the *future* income processes.) To the extent that planning in this way is possible, one might expect the observed behaviour of households planning to have children in the future to be affected by such expectations. They may, for instance, save less if they do not expect their income to drop dramatically once a child is born.

FIGURE 4.5

Mean Log Normal Household Earnings over the Life Cycle

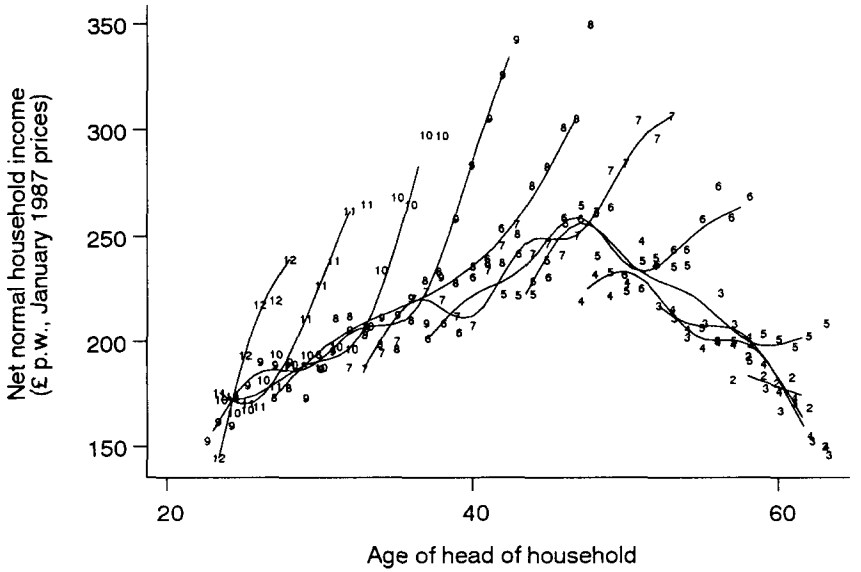


Finally, use is made of our long run of FES data to look very briefly at changing incomes and living standards over time and among those in different cohorts. Simple means are used and no attempt at equivalisation is made. Figure 4.6 gives a very sharp picture of the way in which average incomes have increased in recent years and in particular how younger cohorts have reached much higher average income levels much earlier than their predecessors. The sharply rising

parts of each of the cohort lines represent the period in the middle and later years of the 1980s when incomes were rising very swiftly. The result was that the youngest cohorts (12, 11, 10 etc.) had incomes massively above all previous ones at the same age.

FIGURE 4.6

Household Income Levels over the Life Cycle



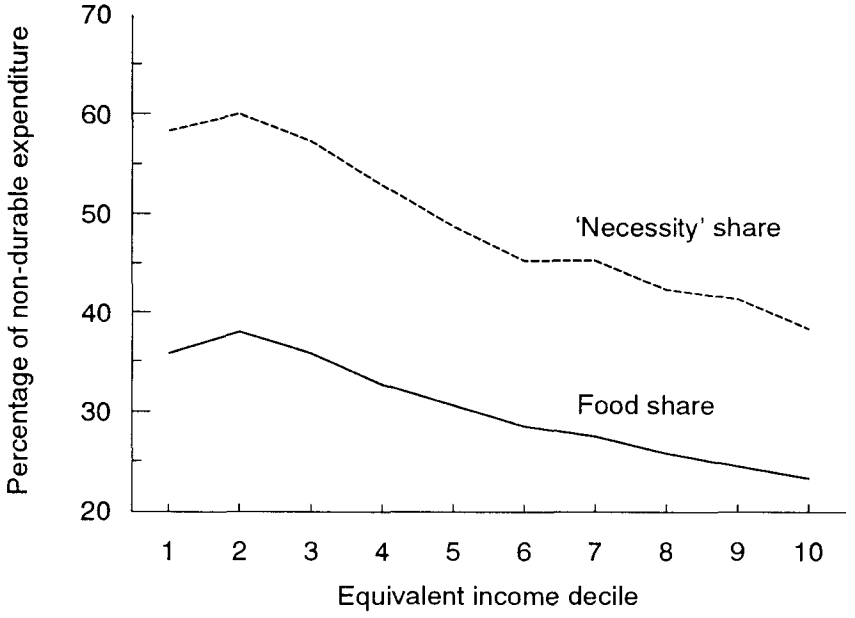
Household Expenditure Patterns

In this section we explore, in some detail, the expenditures of people at different points in the income distribution. To do this, we make use of the DSS's methodology used in producing its 'Households Below Average Income' (HBAI) statistics. The 1988 and 1989 Family Expenditure Surveys were used to produce precisely the income ordering used by HBAI and each income unit was sorted into its appropriate decile accordingly. This was done making use of the same McClements equivalence scales as actually used in HBAI. It then became possible to look at the expenditures of the various different sorts of families in each decile.

Given that equivalent incomes are used in placing people in deciles, the standard of living of those in each decile ought to be broadly the same. To some extent it ought to be possible to comment upon this by reference to the expenditures and shares of expenditures, in each decile and among different family types. Figure 4.7 shows the way in which decile median expenditure shares on food and on 'necessities' change as one moves up the income distribution. As one might expect, over most of the graph these shares fall as higher deciles are reached, reflecting the Engel observation and giving an indication of increasing living standards as higher income levels are reached. A striking feature of this figure is the extent to which the two lines are almost parallel. This (loosely) indicates that it is in fact *only* the food share which falls significantly as income rises, whereas the shares on other 'necessities' may be remaining reasonably constant.

FIGURE 4.7

Median Food and 'Necessity' Shares by Decile



The first decile, however, is out of line with the rest of the distribution. From the second decile onwards, the share of non-durable,

non-housing expenditure on food and the share of expenditure on 'necessities' (food, fuel and clothing) fall gradually. The odd position of the first decile in fact reflects its rather strange make-up generally. For within the poorest decile are to be found a number of households which appear to have no income whatsoever or even negative incomes. This latter group is almost entirely made up of the self-employed who have either recorded net losses or who have recently made large tax payments. As the HBAI document itself points out, 'it is unlikely that for many such households, this income measure reflects their actual current standard of living'.

This conclusion is backed up by information on expenditure levels. Those households with zero or negative incomes have mean expenditure 27 per cent above the population mean and median expenditure 10 per cent above the population median. We find that this results in the bottom decile as a whole having mean and median expenditures (total and non-durable) greater than the mean and median expenditures of the second decile. Given this, and given the nature of the poorest households in the bottom decile, we concentrate for most of the rest of our analysis on the second and subsequent deciles.

The main purpose of this section is to see how well the results from HBAI using McClements scales approximate to the Engel intuition that food share in expenditure is a good indication of living standard. Thus we might expect different family types in the same decile to have the same food share, on average, as each other. Where one family type has a significantly higher food share than others in the same decile, there may be some prima-facie case for thinking they have living standards lower than those of the other family types in the decile. Of course, this conclusion need not necessarily follow since the food-share methodology is only a very crude way of making welfare comparisons.

Results for each equivalent decile in 1988–89 are presented in Table 4.2. Each figure shows the median household food expenditure share for a family of a particular type in the relevant equivalent decile.

Two patterns are worth remarking upon. The first is that the food share of pensioners, particularly in the bottom four deciles, is substantially above that for all other family types. This does not, however, indicate that they actually spend more on food than other types of family. Rather, it appears to be a direct consequence of lower spending on other goods by pensioners than by other family types. For example, in the second decile, median non-durable expenditure among married pensioners was £61.30 per week, with food expenditure

of £25.60. Among non-pensioner married couples without children in the same decile, median non-durable expenditure was £68.30, and expenditure on food was £26.40. Despite having the same incomes, then, this may be taken as evidence to suggest that the living standards of pensioners on the same incomes as non-pensioners are lower. This may be because pensioners are actually saving more (or borrowing less) than non-pensioners (as noted in Blundell and Preston (1992)). This is especially likely if more of their income comes as interest on savings which is simply reinvested.

TABLE 4.2

Food Share in Non-Durable Expenditure, 1988–89

Per cent

Family type	Decile									
	1	2	3	4	5	6	7	8	9	10
Pensioner couple	39.9	40.8	37.7	31.3	34.1	30.3	31.0	(29.4)	(32.8)	(24.5)
Single pensioner	37.7	40.5	39.0	34.1	31.7	29.3	28.8	26.3	(27.2)	22.9
Couple + children	35.3	35.4	34.0	32.6	31.9	29.3	29.4	27.5	27.0	24.2
Couple, no children	33.3	37.3	34.6	32.7	31.3	29.2	27.3	25.8	25.0	23.7
Single + children	37.1	37.6	34.9	(30.5)	(26.7)	(25.1)	(23.5)	(24.4)	(21.7)	(25.6)
Single, no children	32.2	34.6	31.6	31.1	27.1	26.7	25.5	24.4	22.2	22.1

Note: Figures in parentheses are based on sample sizes of less than 100.

Note that this finding showing pensioners to have lower expenditure than non-pensioners at similar income levels has been reported before. Johnson and Webb (1991), for example, found using 1985 data that while fewer than one million pensioners had income below half the population average income, nearly three million had expenditure below half the population average expenditure. This finding, however, did not prove to be particularly robust to different years of data being used, with the difference in 1988 being much smaller.

The question as to whether income, however measured, or level of expenditure provides a better indication of welfare is itself a complex problem much discussed by economists and others. Some distributional studies have in fact used expenditure as the yardstick of comparison, for example the final commentary on the Second European Poverty Programme (European Commission, 1991). The straightforward argument in favour of using expenditure rather than income is that it may give a better indication of current living standard and of

'permanent' income. If one's welfare depends upon what one consumes, then expenditure would seem to be the appropriate measure. Furthermore, if one's current expenditure exceeds one's current income, this may reflect expectations of higher income in the future, while lower expenditure than income may reflect expectations of greater need (perhaps associated with having children or needing care in the future). In any event, it is certainly of interest to note different expenditure levels among different family types at similar equivalent income levels.

The other noticeable pattern in Table 4.2 is the fact that the food share of single childless people is consistently below that of other family types in the same decile (with the exception of single parents in deciles four to nine, but the numbers of single parents in each of these cells is rather small). It is also worth noting that in the lower deciles, couples with children tended to have lower food shares than those without children, whilst in higher deciles the reverse is the case.

Table 4.3 repeats the analysis of Table 4.2, but this time the expenditure shares refer to the proportion of (non-durable) expenditure which goes on 'necessities' (food, fuel and clothing). The most obvious similarity between these numbers and those in Table 4.2 is the relatively high shares again found among pensioners, although this time, particularly in the bottom four deciles, the 'necessities' share appears to be substantially higher among single pensioners than among pensioner couples.

TABLE 4.3

Share of Expenditure on 'Necessities', 1988–89

Per cent

Family type	Decile									
	1	2	3	4	5	6	7	8	9	10
Pensioner couple	63.0	61.2	56.1	56.3	51.6	49.6	47.3	(44.1)	(48.9)	(42.6)
Single pensioner	64.2	64.3	64.8	59.4	50.4	49.0	48.7	46.1	46.1	40.6
Couple + children	55.5	55.1	51.5	51.6	49.1	47.3	46.7	43.9	44.2	40.3
Couple, no children	52.7	54.0	51.4	50.7	48.5	45.9	45.3	42.0	41.4	39.5
Single + children	63.4	64.4	59.7	(53.7)	(50.3)	(42.3)	(40.6)	(42.1)	(42.8)	(43.2)
Single, no children	53.9	56.6	52.0	50.3	47.3	42.3	42.2	40.9	39.6	35.4

Note: Figures in parentheses are based on sample sizes of less than 100.

By contrast with Table 4.2, the 'necessities' share of single childless people is not everywhere below that of all other groups, particularly in the lower deciles. The final and very significant difference lies in the position of single people with children in the lower deciles. Their 'necessities' shares appear to be substantially higher than those of all other non-pensioner groups, particularly in the bottom three deciles. As with the high share among single pensioners, this result proved to derive from particularly high spending on fuel among poorer lone parents. In the second decile, for example, the median fuel share in expenditure was 12.7 per cent, but stood at 16.8 per cent for single pensioners and 15.5 per cent for single people with children. The other four groups all had median shares below the decile median.

It is also worth dividing the population into just three groups: pensioners, non-pensioners without children and non-pensioners with children. We look briefly at the second two of these groups, little more remaining to be said about pensioners as a group. As far as food shares are concerned, the medians, by decile, for those with and without children are virtually identical to each other in deciles two to four. From decile five onwards, families with children have higher food shares, by about two percentage points on average. Repeating the exercise by looking at 'necessity' shares, a somewhat different pattern is seen, with the 'necessities' share for those with children higher in all deciles than that for the childless. Both the food share and 'necessity' share results are shown in Table 4.4.

TABLE 4.4

Median Food and 'Necessity' Shares of Non-Pensioners with and without Children

Decile	Food share		'Necessity' share	
	With children	No children	With children	No children
1	35.8	32.1	58.0	52.9
2	35.7	35.8	58.8	55.1
3	33.9	33.1	53.0	52.0
4	32.3	31.8	52.1	49.3
5	31.3	28.7	49.2	47.1
6	28.5	27.7	46.2	43.4
7	28.9	25.9	46.4	42.8
8	27.2	25.0	43.6	41.0
9	26.5	23.1	44.0	40.1
10	24.2	22.8	40.1	37.6

A few clear conclusions can be derived from this analysis and a few important observations may be made about official HBAI statistics. Firstly, many of those in the bottom income decile and in particular those who appear in the data to have the least income (zero and negative incomes) have higher expenditure and lower food and 'necessity' shares than might be expected, casting some doubt on how poor some of them really are. Secondly, pensioners appear to spend less than other groups in the same decile, and a greater proportion of what they do spend appears to go on food and other 'necessities'. This is particularly true of poorer single pensioners. This may suggest using a higher equivalence scale for pensioners than for other similar family types, as was effectively done in the previous official poverty statistics, the Low Income Families series. Thirdly, single people with children in the lowest income deciles appeared to use a substantially higher proportion of their expenditure on 'necessities', in particular fuel, than did other non-pensioner groups. This may indicate lower living standards than are being measured. Finally, although the food expenditure share of families with children was similar to that of those without children, 'necessity' expenditure was higher in all deciles.

4.2 Relative Prices and the Cost of Living

In Chapter 2 we outlined some simple techniques for estimating equivalence scales from observed demand behaviour. A serious and now well-documented limitation of the Engel, Rothbarth and Prais–Houthäkker techniques is that they assume that the distribution of household consumption is unaffected by changes in relative prices. In practice, this problem is bypassed by estimating such equivalence scales on a single year of data in which relative prices can reasonably be assumed fixed, so substitution is not a problem. This raises the question of whether these equivalence scales apply in any price regime other than that in which they were estimated.

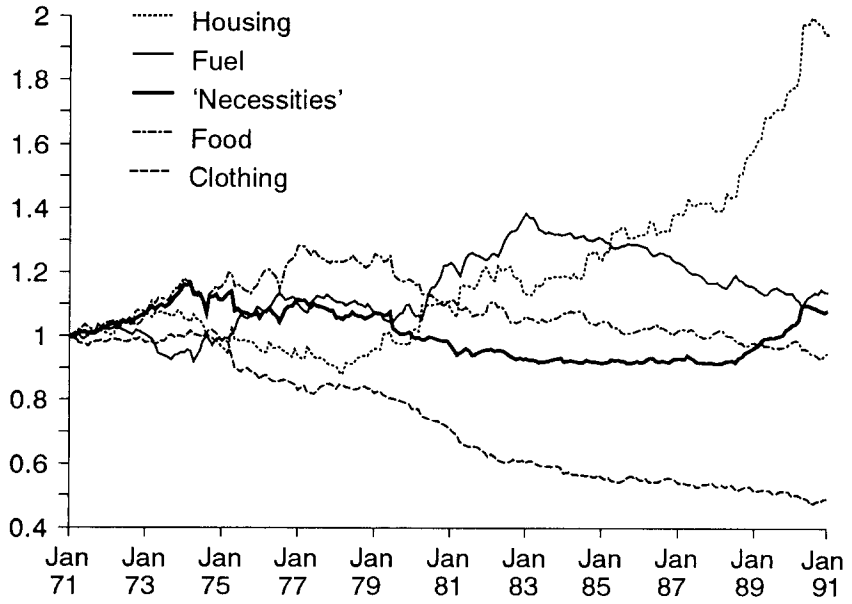
If one thinks of equivalence scales as comparisons of demographics in the same price situation, then the similarity to cost-of-living indices — comparisons of prices in the same demographic situation — becomes obvious. In fact, Blundell and Lewbel (1990) have proved that if an equivalence scale in one period is known, then one can write down the equivalence scale in any other period in terms of the base equivalence scale and the cost-of-living index between the two periods. The important point about this, however, is that equivalence scales are *only* the same in any two periods when the cost-of-living indices are the same.

Consequently, to continue to use McClements scales in 1989 requires us to believe that relative prices have been unchanged since 1972.

Figure 4.8 shows the path of relative prices (with January 1971=1) over the last 21 years for those goods that typically make up the largest proportion of household budgets. In each case the price is expressed relative to all other goods, and the bold line shows the path of a 'necessities' price index — for food, clothing, fuel and housing — relative to 'non-necessities'. The path of relative prices is clearly not constant, but a number of other interesting trends present themselves. Firstly, there has been a marked continuous fall in the relative price of clothing throughout the last 20 years. On the other hand, the relative price of housing has been rising continuously, with well-documented increases in the late 1980s. Another important factor, given the relative price of household budget shares, is the relative price of food — this

FIGURE 4.8

Prices (Relative to 'Other Goods'), 1971–91



rose throughout the 1970s and then fell throughout the last decade.[2]

The paths of these prices have implications for how one would expect the costs of children to vary over time. Certainly in recent years the relative prices of 'necessities' excluding housing have all been falling. Coupled with the increase in housing costs, this would lead one to expect a fall in equivalence scales that did not include compensation for housing costs whereas a scale that included housing might be closer to being constant over time (or even rise).

[2] Incidentally, a product of the housing and food trends is that, since low income households spend a greater-than-average share of their income on these commodities, they would, at least in the 1970s, have been experiencing increases in the costs of living greater than those calculated in the Retail Price Index (see Fry and Pashardes (1986)).

CHAPTER 5
EMPIRICAL ANALYSIS

In this chapter we attempt to apply some of the concepts in this report to over 20 years of UK data on household behaviour. We have already described some important characteristics of the Family Expenditure Survey in Chapter 4, and its usefulness for analysing expenditure decisions is well documented (see, for example, Atkinson, Gomulka and Stern (1990), Baker, Blundell and Micklewright (1989) and Blundell, Pashardes and Weber (1989)). Briefly, it comprises an annual survey of some 10,000 households (of which usually about 7,000 respond) and records information on demographic characteristics, incomes and expenditures. Expenditures are recorded over a two-week diary period during which respondents are asked to record every transaction they make. Together with the fact that the FES has been recorded on a more or less consistent basis since 1969, this means that such a data set is ideal for looking at the changing costs of household composition. In this part of the report, we do not use the cohort-level information described in Chapter 4 and Appendix B but instead concentrate on the full individual household-level annual data sets. We make a number of selections and transformations to the data to aid the estimation process. The most important is that we drop the self-employed and all pensioners from the survey before we estimate anything. In the case of the self-employed, there tends to be enormous measurement error in their recorded incomes and expenditures to the extent that any identification of expenditure patterns is almost impossible. Rather than make complex adjustments, we simply choose to exclude any household where the head is self-employed from our sample. Similarly we drop pensioner households because of difficulties of comparing spending patterns and incomes between pensioner and non-pensioner households. Finally we only estimate models for households resident in England, Scotland and Wales.

Expenditures and incomes are deflated to January 1987 prices, and we split consumer expenditure into 10 commodity groups — food, fuel, clothing, alcohol, tobacco, transport, services, durables, housing and 'other expenditure'. Of these, it is customary to estimate most relationships using non-durable non-housing expenditure. A number of issues preclude the use of durable good information and these centre around the problem of purchase infrequency (remember that the diary

period is only two weeks so most households will record zero purchases) and difficulties in separating the flow of durable services that the consumer enjoys from the very lumpy purchase of the good itself. Such issues cannot be considered in our framework, so we choose to define total expenditure as the sum of non-durable non-housing expenditure (housing expenditure is also problematic and very poorly measured). For one recent year (1989), however, we are able to draw on the analysis of Households Below Average Income, and add back in the true housing cost index for each household as used to construct the HBAI series. This allows us to estimate a scale including housing, but this still suffers from problems, particularly with households who own property outright. It is clear that the presence of children will affect decisions over durable and housing consumption, and it should be remembered that our scales in general do not take account of these effects. (Incidentally, this is the case with almost all other studies, and any attempt to include such factors could possibly create more problems than it solved.)

5.1 McClements Scales over Time

In Section 4.2 we showed that data analysis allows us to consider how a specific equivalence scale has evolved over time using cost-of-living indices (see Appendix A), and in this section we consider how the McClements scales have evolved given the path of relative prices shown in Figure 4.8. We used the FES from 1969 to 1990 and split the sample into 11 demographic groups according to the criteria in Table 5.1.

TABLE 5.1

Household Types

Type	Composition	Type	Composition
A	Single adult	F	MC + two children 0–5
B	Married couple (MC)	G	MC + two children 6–10
C	MC + child 0–5	H	MC + two children 11–18
D	MC + child 6–10	I	MC + child 0–5 + child 6–10
E	MC + child 11–18	J	MC + child 6–10 + child 11–18
		K	MC + child 0–5 + child 11–18

We can then construct average annual commodity shares for each group and use these in the construction of cost-of-living indices. We choose to use the Divisia index which expresses a change in costs as the sum of the change in individual prices weighted by the share on each individual group in the base period, i.e.

$$\Delta \ln P = \sum_{i=1}^{n} w_{i0} \left(\ln P_{i1} - \ln P_{i0} \right)$$

where w_{i0} represents the budget share on commodity i in period 0.

An alternative 'true' cost-of-living index is that of Tornqvist (1936) favoured by Diewert (1976) which instead chooses to weight individual price changes by the average share in the base and reference periods:

$$\Delta \ln \tilde{P} = \sum_{i=1}^{n} \frac{1}{2} \left(w_{i1} + w_{i0} \right) \left[\ln P_{i1} - \ln P_{i0} \right].$$

The main criticism of the Tornqvist index is that changes in price will be underestimated since the reference period share, w_{i1}, will already include some adjustment to the new price.[1] On the other hand, the fact that it includes both base and reference shares means that the price index series is reversible — a property that the Divisia index does not possess. However, in our sample the variation in shares was sufficiently small to make both price indices extremely similar. We use the Divisia in what follows.

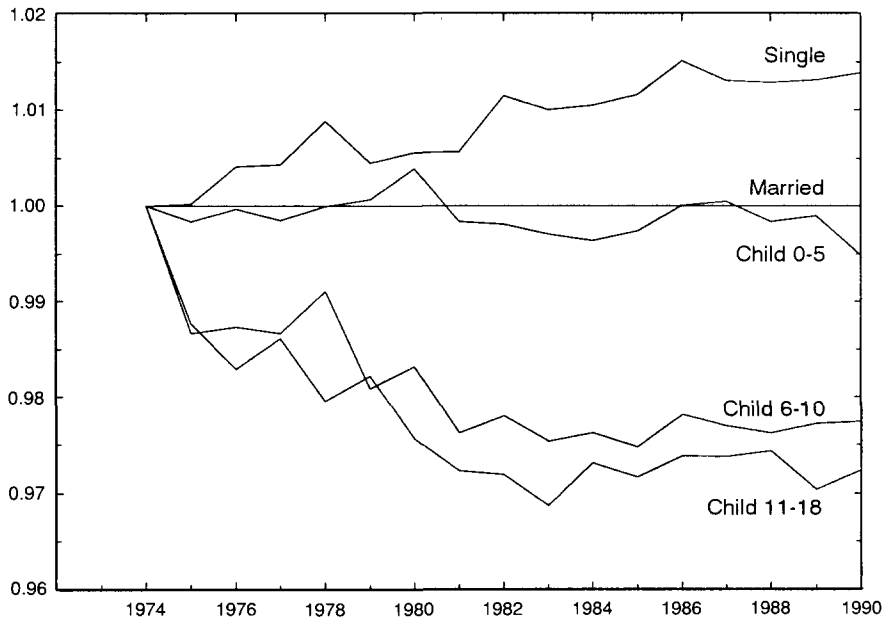
It is important to note that one could construct similar cost-of-living indices for the finely disaggregated Retail Price Index indices and individual households' diary records within the Family Expenditure Survey. Due to the natural groupings within the FES expenditure codes, however, we simply calculate these indices over our grouping of 10 commodities and the relevant RPI group index. The Divisia indices for groups A to E are presented in Figure 5.1. In this figure, each Divisia index is expressed *relative* to that of the base household, i.e. the figure expresses how costs have changed for a household of a particular type in relation to the base case of a household with two adults and no children. Indeed, it is this very concept which we use to evolve equivalence scales through time. It is clear from the figure that the

[1] If the price of food rises, the share would typically fall, so the average of w_0 and w_1 will be less than w_0 and that price change will have less weight in the price index.

magnitude of these differences in costs is small. On the other hand, it does seem that households with children have experienced a small relative fall in costs. On reflection, this is not surprising. Despite the humped profile of the relative price of food from 1970 to 1990 (see Figure 4.8) which will make up a large proportion of the price index, the prices of other significant budgetary items such as clothing and fuel have been falling relative to the prices of other goods. Since these items will tend to comprise a higher proportion of the budget of households with children, their relative price index will fall.

FIGURE 5.1

Divisia Cost-of-Living Indices
Relative to Married Couple with No Children

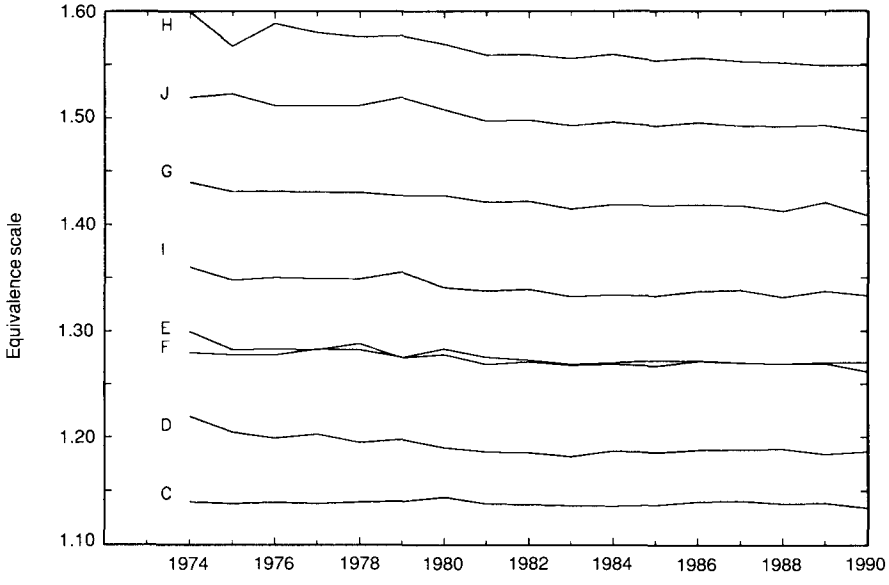


These cost-of-living indices are then applied to the McClements equivalence scales. Since our indices are constructed only from 1974 onwards (due to the change in grouping of the RPI after 1987 meaning that price series for some groups do not exist before 1974), we have to

assume here that the McClements scales were as 'correct' in 1974 as they were in 1972. In this case, Figure 5.2 shows that the relativities in McClements's study, for each household type as defined in Table 5.1, have not changed significantly over time, with the only observable pattern being a slight decline in the scales attached to families with children.

FIGURE 5.2

McClements Equivalence Scales from Cost-of-Living Indices, 1974–90



This analysis basically shows that if the McClements scales were, in some sense, 'correct' in 1972, then one might expect similar scales today. In the following section we re-estimate some simple forms of equivalence scales with recent data under differing parametrisations of household demographics to try to establish how such issues affect scales, given the recent changes in demographic structure of the UK outlined in Section 4.1.

5.2 Some Reduced Form Estimates

It is necessary, of course, when estimating the Engel relationship, to control for factors, apart from just children, that influence the observed demand behaviour of the household. In all our estimation we control for region, tenure, seasonal variation, the age, education and labour market status of the head of the household, and of course the number of adult members. In addition, we try to allow the food share to vary with wealth independently of children by including wealth variables such as ownership of cars, central heating and washing-machines in our regression model. Consequently the number of parameters becomes quite large and to report fully all parameters in all equations would be impractical. Instead we choose to summarise all our specifications by their implied equivalence scales below and present our estimated parameters and standard errors (for the total expenditure and children parameters only) in Appendix C.

TABLE 5.2

Selected Data Set: Some Sample Statistics

Variable	Mean
Total real expenditure	263.17
Log real non-durable expenditure	4.99
Food share	0.30
No children	0.55
One child	0.18
Two children	0.19
Three children	0.06
At least one child 0–2	0.11
At least one child 3–5	0.16
At least one child 6–10	0.27
At least one child 11–16	0.23
At least one child 17–18	0.02

Note: Data are selected sample from 1989 and 1990 FESs with expenditure codes that are not adjusted for HBAI housing costs and a food share defined out of non-durable non-housing expenditure.

In the estimations underlying Table 5.3, we use 1989 and 1990 FES data to estimate Engel curves for the budget share of food out of non-durable non-housing expenditure. We use instrumental variables estimation to allow for the endogeneity of log expenditure; all other

TABLE 5.3

Engel Scales under Differing Parametrisations of Children

Parametrisation	Group (in addition to married couple)	Scale
(1) Presence of children only	Any household with at least one child	1.46
(2) Number of children (linear)	Each child	1.26
(3) Number of children (non-linear)	One child	1.29
	Two children	1.56
	Three children	1.85
(4) Presence of children (age-banded)	One or more children 0–2	1.11
	One or more children 3–5	1.21
	One or more children 6–10	1.45
	One or more children 11–16	1.49
	One or more children 17–18	1.31
(5) Number of children (age-banded)	Each child 0–2	1.12
	Each child 3–5	1.22
	Each child 6–10	1.30
	Each child 11–16	1.35
	Each child 17–18	1.41
(6) Number of children (age-banded) and fixed cost	Each child 0–2	1.17[a]
	Each child 3–5	1.22
	Each child 6–10	1.37
	Each child 11–16	1.41
	Each child 17–18	1.46
(7) Age of youngest child and number of children	Youngest is 0–2	1.14[b]
	Youngest is 3–5	1.30
	Youngest is 6–10	1.43
	Youngest is 11–16	1.43
	Youngest is 17–18	1.30
(8) Presence of children (age-banded) and number of children	One or more children 0–2	1.11[c]
	One or more children 3–5	1.20
	One or more children 6–10	1.33
	One or more children 11–16	1.38
	One or more children 17–18	1.40

[a] The scales in specification (6) include a fixed cost element of 0.08. That is, the age-related elements are 0.09, 0.14, 0.29, 0.33 and 0.38 respectively. Such a scale would, by definition, give more weight to the first child than to subsequent children.

[b] The scales in specification (7) depend on the number of children. Reported scales are for a household with one child. Add 0.25 for each *extra* child.

[c] The scales in specification (8) depend on the number of children. Reported scales are for a household with one child. Add 0.23 for each *extra* child.

variables are assumed exogenous. The instruments that we use to predict log expenditure in the first stage are net weekly household income, asset income, employment and occupational dummies for the head of household, interest rates and regional dummies. The data set (with selection described above) comprises 8,941 households, and some simple descriptive statistics are provided in Table 5.2.

A number of features in Table 5.3 are worth mentioning. The fact that we use instrumental variables to control for the endogeneity of total expenditure means that standard measures of the degree to which each specification fits the observed data are not really relevant. However, our investigations of this issue suggested that it was specifications (8) and (6) that fitted the data most effectively, whereas simple parametrisations such as those in (1) and (2) did not explain as much observed variation in the food share. In addition, the resulting scales from the simple specifications seem to be more at variance with the existing literature.

A second striking feature of these results is that two of our specifications do not appear to rise continuously with the age of the child. This may possibly reflect the fact that children remaining in education until age 18 may be from wealthier households, or that spouses may be returning to the work-force. However, we have tried to control for these factors in our estimation. It is more likely that the low number of children in the 17–18 age band is determining this parameter. Only six households have more than one child in this age band so the parameter is effectively a 'per child' cost. In the larger groups, however, the parameter on simply the presence of children in the age-group will be picking up the costs of more than one child. If one believes that costs of children should rise monotonically with age, then this would imply that some account for numbers of children in each age band will be required.

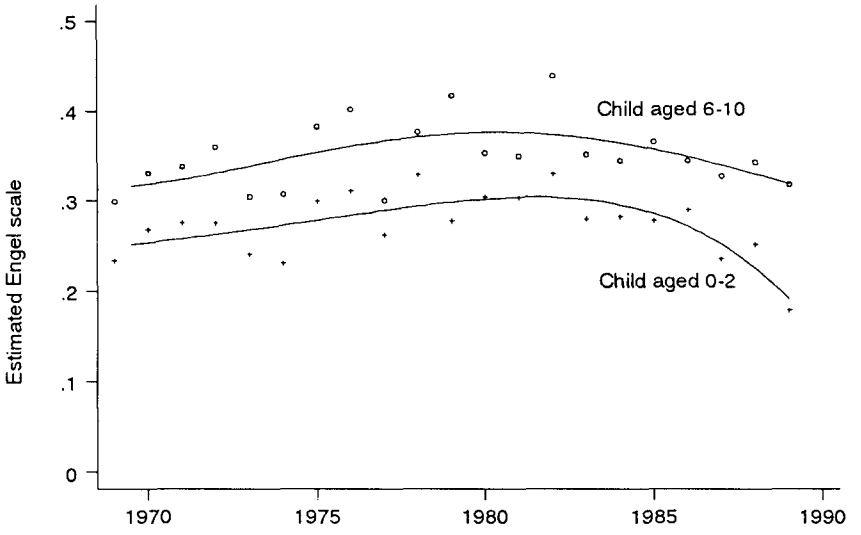
The specification that we adopt in the analysis that follows is specification (6), i.e. that the number of children in age bands matters in addition to there being some fixed cost of having a child. The reason for this is simply one of parsimony, since it can be expressed as a certain amount per child of a particular age (plus a single fixed cost) whereas specification (8) involves slightly more complicated manipulation to arrive at the final scale for a household. It can be seen from Appendix C that the children parameters in specification (6) are also particularly well determined.

Figure 5.3 plots smoothed estimates of this Engel specification separately for every year of FES data since 1970. The estimate of each

scale in each year is plotted with a symbol and we have then smoothed these estimates over time to see how such scales have trended over the last 20 years. To keep the figure simple, we plot only the scale for a child aged 0–2 and a child aged 6–10. As one might expect, these scales have fallen over the last 10 years — a decade of falling relative prices for 'necessities' and rising real incomes.

FIGURE 5.3

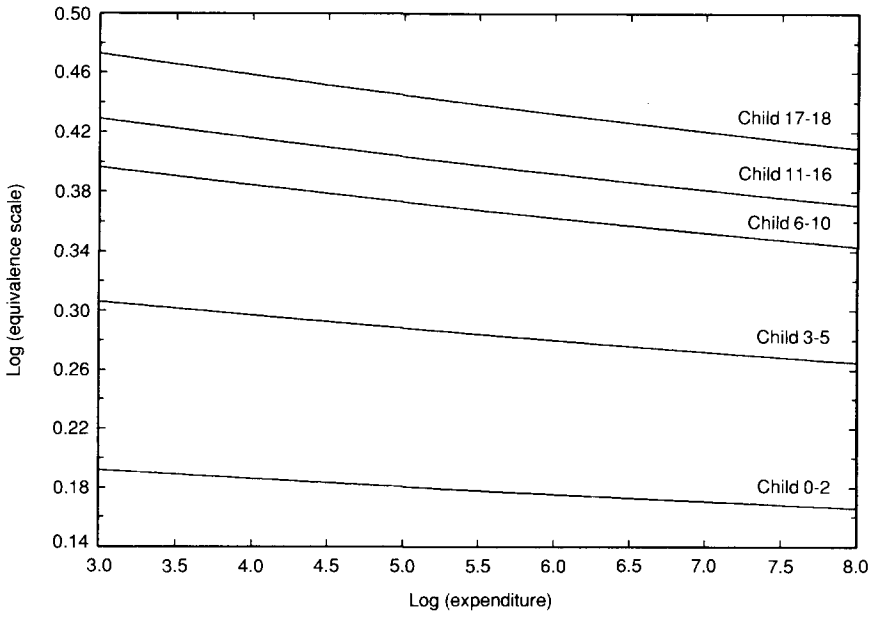
Log Engel Scales for Two Age-Groups over Time



In Section 2.1 we introduced the possibility that equivalence scales may vary according to the level of welfare at which they are calculated. In Figure 5.4 we present Engel scales calculated from Engel curves that are *quadratic* in the logarithm of total expenditure, estimated from our 1989–90 FES sample. This implies that the equivalence scales will depend in some way on the expenditure level. As might be expected, these scales show falling observed costs of children as the base level of expenditure (or welfare) increases.

FIGURE 5.4

Non-Base-Independent Engel Scales, 1989–90



5.3 Non-Parametric Estimates of the Engel Relationship

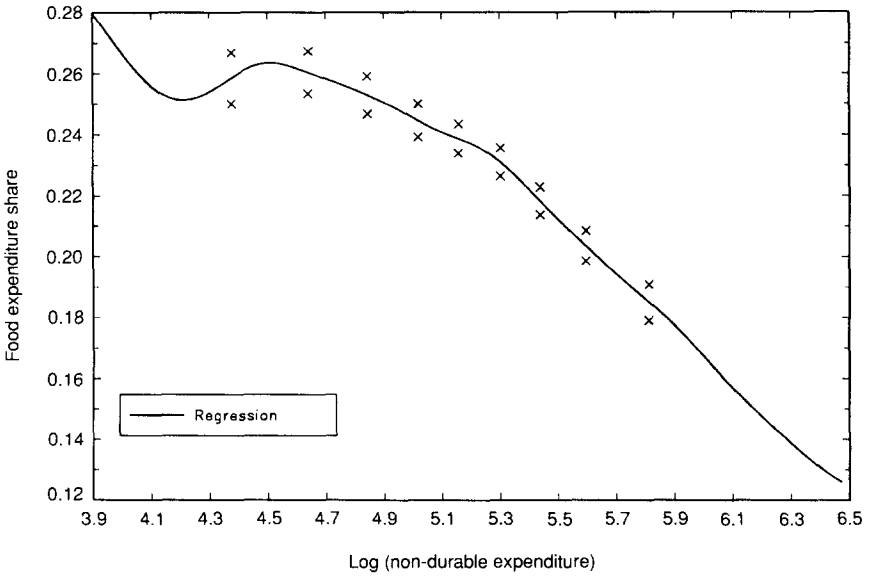
Recent advances in econometric theory have shown how fundamental relationships in data can be estimated without having to parametrise the relationship explicitly. The theory of non-parametric or Kernel regression provides a powerful data description technique, and in this section we apply such methods to consider the nature of the Engel relationship for UK households.[2] In Figures 5.5–5.7 we show the relationship between commodity shares and log expenditure for food and then all 'necessities' including housing costs (using total expenditure *including* the HBAI housing cost measures) for 1989 FES households. In both Figures 5.5 and 5.6 the confidence bands for the non-parametric Engel curves are indicated by crosses and calculated at

[2] We will not discuss the methods themselves; the interested reader is referred to Härdle (1990). All non-parametric calculations in what follows were carried out using the Kernel regression package, NP-REG (see Duncan and Jones (1992)).

the tenth, twentieth etc. to ninetieth percentiles of expenditure data. It can be seen that the underlying relationship is strongly linear in all but the extreme tails of the expenditure distribution, reinforcing the conclusions of Figure 4.7 above.

FIGURE 5.5

Non-Parametric Engel Curve for Food: All Households



It is also possible to split these relationships down by household composition, although because the number of observations required for much of the theory to go through is large, one cannot disaggregate the sample to a very great extent. As an illustration of this, Figure 5.7 shows non-parametric Engel curves[3] for food split by number of children in the household (for married couples only) for a pooled data set of three years in the middle of our sample. Pooling of years is required to keep the number of observations in each demographic group large enough for the non-parametric techniques to apply.

[3] The dashed lines in Figure 5.7 indicate confidence bands for the Engel curve of childless households.

FIGURE 5.6

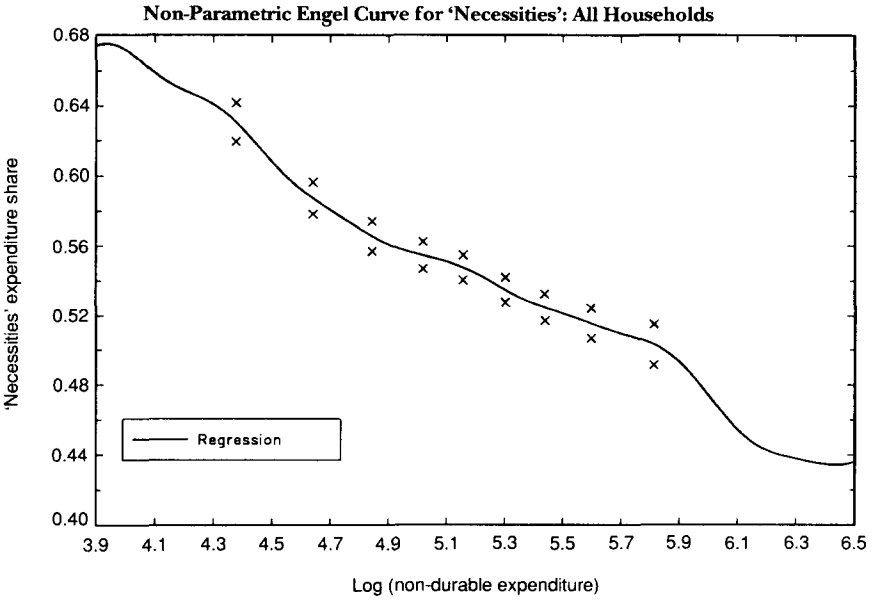
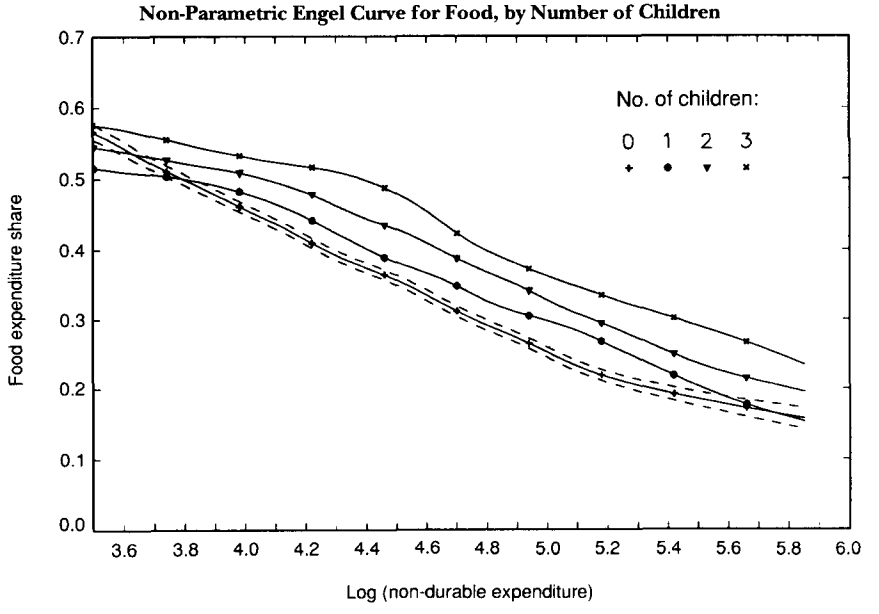


FIGURE 5.7



Our final empirical investigation corresponds in some sense to Figure 5.7 and calculates the Engel scales implied by these non-parametric analyses, i.e. we calculate numerically the distance between the curves at various expenditure points. These results are presented in Table 5.4 (once again calculated for non-parametric regressions using our preferred 1989 FES subsample). The equivalence scales are evaluated at various points on the distribution of the food share — specifically the median and the fortieth and sixtieth percentiles. As we have estimated the Engel relationship (albeit non-parametrically), each of these points will correspond to points on the expenditure distribution for a particular family type, and the relevant points of the base case log expenditure are also reported. Once again we see that the equivalence scale falls when evaluated at a higher level of expenditure, as our parametric analysis above indicated, and in particular it seems that the equivalence scale capturing costs of the first child may be significantly higher for households below the median level of welfare.

TABLE 5.4

Non-Parametric Engel Scales, 1989 FES/HBAI

Food share	Quantile	Log expenditure	Number of children	Scale
0.250	40%	5.22	1	1.233
			2	1.665
			3	1.877
0.225	50%	5.46	1	1.232
			2	1.568
			3	1.667
0.200	60%	5.70	1	1.127
			2	1.391
			3	1.662

Note: The level of log expenditure corresponding to each food share corresponds to that of the base household (married with no children) including housing costs as predicted by the non-parametric Engel curves.

The investigations in this chapter seem to demonstrate a number of features of UK household expenditure behaviour. Firstly, it seems that there has been a slight fall in observed costs of children over the last 20-odd years whether one chooses to measure this by taking old equivalence scales and applying them to recent price regimes or by continuously constructing simple equivalence scales over time. It also

seems clear that parametric estimation of the Engel relationship (under any reasonably flexible parametrisation of family structure) for the UK using the most recent data available generates equivalence scales that are reasonably similar both to each other and to those estimated in the past literature. The fundamental nature of the relationship between food and 'necessity' shares and total expenditure was shown (without imposing any prior parameters) to be highly linear whether one includes measures of housing costs or not, and this adds weight to the argument that if one chooses to identify welfare through the Engel technique, then the form of the identifying relationship has stayed remarkably stable over time. The presence of children appeared to shift Engel curves in a parallel manner, but non-parametric equivalence scales suggested that there was some evidence that such scales might decline as the welfare level at which they are evaluated increases.

Of course, this chapter has only addressed the complexities of one particular technique for identifying the consumption costs of children. A similar exercise could be carried out with Rothbarth scales or much more complex estimates of equivalence scale relativities. What we have demonstrated, however, is that many elements that affect observed expenditure behaviour have either stayed reasonably constant or, to some extent, counteracted each other with the result that our estimated Engel scales are comparable with many estimates that have used earlier data.

CHAPTER 6
CONCLUSIONS

The importance of equivalence scales and the cost of children has long been recognised. Browning (1992), for example, quotes a Norman parish priest writing in pre-revolutionary France about workmen:

> As young men they work and when by their work they have got themselves decent clothing and something to pay the wedding costs, they marry, raise a first child, have much trouble in raising two, and if a third comes along their work is no longer enough for food and the expense. At such a time they do not hesitate to take up the beggar's staff and take to the road.

Times may no longer be that hard but there remain considerable costs associated with raising children. Couples with children are twice as likely to have incomes below half the national average than are those without children. The position of single people with children (a group with whom the Norman priest was presumably rather less concerned) is considerably worse.

Indeed there are other respects in which the priest remarked upon areas of great interest to economic theory. His observation that the workmen waited until they had enough money to marry and have children is an illustration of the endogeneity of fertility, and the whole quote tells us something about living standards over the life cycle. These are areas with which economics is still only beginning to get to grips.

Despite the importance of these problems, no generally accepted method of measuring the costs of children has been devised. Economists, in basing their work on estimating equivalence scales on observed consumer behaviour, have the problem of being unable fully to identify welfare. Identifying assumptions have to be made of which the best-known example is that associating share of expenditure on food with welfare — the Engel assumption. The McClements scales used by the DSS in its low income statistics are based on a rather different methodology, but one that still requires some identifying assumptions to be used. The scales derived and used appear to depend very heavily on those assumptions, which were themselves based on some plausible estimates of what an equivalence scale should look like. Not surprisingly, given this, the McClements scales appear quite plausible and lie very much in the centre of the range of estimated scales.

Given that equivalence scales are intended to allow the living

standards of families of different types to be brought into equivalence, one would have expected them to be in evidence in the design of a redistributive tax and benefit system. In fact, the tax system appears to take no account whatsoever of differences in equivalent income. The benefit system has to, giving more to those with children and more to older children than to younger children. Nevertheless there seems to be little evidence that a consistent notion of equivalence lies behind the system as it stands and the current benefit system is most certainly not based on any particular set of estimated scales. Given the difficulties involved in constructing these, this is perhaps not too surprising.

One area in which estimated equivalence scales are used is in the measurement of income inequality. As noted above, the official government inequality statistics are based on the McClements scales. The statistics are in fact quite sensitive to the particular scales used and there have been some suggestions that the McClements scales minimise measured inequality. In fact, over a plausible range of values, the main determinant of the degree of measured inequality, or in particular of the numbers with incomes below half the average, appears to be the weight given to children in the scales. Increasing the relative weight given to children was found to increase measured inequality; reducing the weight reduced measured inequality.

Looking at the way in which demographic structure and income and expenditure patterns have changed over time indicated, among other results, falling household size, increased participation in the work-force by women with children and increased income and expenditures among younger cohorts. Within the income distribution, as officially measured, the Engel result of falling share of expenditure on food with higher living standards (as adjusted using the McClements scale) was borne out. The exception was the poorest group where there appear to be some substantial measurement problems. The reliability of official data regarding this group must be in some doubt. Otherwise there appeared to be some evidence that the food share of pensioners at the same equivalent income level as other groups was relatively high. Lone parents appeared to spend a particularly high proportion of their expenditure on 'necessities', especially fuel, by comparison with others in the same equivalent income band.

One of the worries associated with using the McClements scales is that they are based on rather old data (from 1971–72). Our analysis, however, indicated that the changes in relative prices over the period since then have not had a significant effect on altering the scales, *given*

them as a starting-point. Furthermore, our own estimates using an Engel-type methodology are reasonably similar to the McClements scale. A number of important points emerged, however. The way in which children are specified in the estimation (by number, age band etc.) had significant effects on the results. Secondly, there did appear to be some fairly strong evidence for the existence of a fixed cost element to children — that is, two children cost less than twice one child. This makes some sort of intuitive sense and the notion of a fixed cost is incorporated in the income support system through the existence of the family premium. No such effect is included in the McClements scale. From a methodological point of view, using non-parametric Engel curves indicated that these results did not depend upon the imposition of linearity in the usual parametric estimation methods.

In conclusion, the most important result to come from this study is perhaps that while the construction of an ideal equivalence scale is likely to defeat the ingenuity of economists, at least in the foreseeable future, the scale used in official statistics appears to be as good as any. There is some evidence, though, that there may be scope for the introduction of a fixed cost element in this scale as there is in the income support system.

APPENDIX A
THE COMPARISON OF HOUSEHOLD WELFARE

Background Theory

Suppose a household wishes to minimise the cost of attaining some level of utility, u, where there is some function describing the way in which consumption and demographic factors are 'mapped' onto utility (let us call this $v(\mathbf{x}, \mathbf{z})$). This minimisation procedure will lead to the household choosing some level of expenditure that is determined by the prices and demographics facing the household. Formally, we can write this as

$$X = c(u, \mathbf{p}, \mathbf{z}) = \min_{\mathbf{x}} \{ \mathbf{p}.\mathbf{x} | v(\mathbf{x}, \mathbf{z}) \geq u \} \tag{A.1}$$

where $\mathbf{p}$ represents a vector of prices facing the household, $\mathbf{x}$ represents a vector of demands for individual goods and services, $\mathbf{z}$ is a vector of demographic characteristics of the household, and X is its level of total expenditure. We can then write down a (relative) equivalence scale for household h in period 0:

$$m^h = \frac{c(u^0, \mathbf{p}^0, \mathbf{z}^h)}{c(u^0, \mathbf{p}^0, \mathbf{z}^0)}, \tag{A.2}$$

i.e. the ratio of the cost of achieving a given level of utility, u_0, when facing prices $\mathbf{p}_0$, of a household with some demographics, $\mathbf{z}_h$, to that of the reference household with demographics $\mathbf{z}_0$. Alternatively we could think of an absolute equivalence scale (if we assumed a constant scale) where children embody a fixed cost

$$\mu^h = c(u^0, \mathbf{p}^0, \mathbf{z}^h) - c(u^0, \mathbf{p}^0, \mathbf{z}^0) . \tag{A.3}$$

In microeconomic data sets we are able to observe expenditures $\mathbf{x}$ and demographics $\mathbf{z}$, and if the data span more than one time period we can merge in the appropriate prices $\mathbf{p}$ (where the bold notation indicates a vector of individual prices, expenditures etc.). This, one might think, enables us to solve indirectly for household utility and then construct

minimum costs and therefore equivalence scales. The point of Pollak and Wales (1979), however, is that although the mapping from a utility function, $U(\mathbf{p}, \mathbf{x}, \mathbf{z})$, to an observed demand is unique, the reverse is not true, i.e. an observed demand could have been generated by *any* increasing transformation of that utility function, $\tilde{U} = \phi(U(\mathbf{p}, \mathbf{x}, \mathbf{z}), \mathbf{z})$. If we are willing to assume full ordinal comparability of utilities, as any equivalence scale technique implicitly does, then we could indeed construct cost functions and complete equivalence scales from a data set such as the Family Expenditure Survey.

If one is willing to make stronger assumptions, one can eliminate the need to estimate a complete set of demographic-dependent preferences, and these assumptions can be interpreted as restrictions on the form of the cost function. For example, the isoprop (or Engel) assumption can be written as a restriction on preferences in the form

$$c(u, \mathbf{p}, \mathbf{z}) = D(u, p_0, \mathbf{p}_{\neq 0})\ \alpha(u, \mathbf{p}_{\neq 0}, \mathbf{z}) \tag{A.4}$$

where p_0 is the price of the Engel commodity and $\mathbf{p}_{\neq 0}$ is the vector of all other prices. As the share on the Engel commodity — good 0 (e.g. food) — is given by

$$w_0 = \frac{\partial \ln c(.)}{\partial \ln p_0} \tag{A.5}$$

(see Deaton and Muellbauer (1980) or Muellbauer (1974)), we can then write:

$$w_0 = \frac{\partial \ln D(u, p_0, \mathbf{p}_{\neq 0})}{\partial \ln p_0} + \frac{\partial \ln \alpha(u, \mathbf{p}_{\neq 0}, \mathbf{z})}{\partial \ln p_0} = w_0(u, p_0, \mathbf{p}_{\neq 0}), \tag{A.6}$$

that is, in any given price regime the share on commodity 0 is an indicator of welfare u that is independent of demographics and can consequently be used for welfare comparison. Similarly, under the Rothbarth identifying assumption, the cost function is decomposed additively and the commodity *demand* rather than the share becomes the welfare measure that is independent of the demographic composition of the household:

$$c(u, \mathbf{p}, \mathbf{z}) = D(u, p_0, \mathbf{p}_{\neq 0}) + \alpha(u, \mathbf{p}_{\neq 0}, \mathbf{z}) \tag{A.7}$$

$$\Rightarrow q_0 = \frac{\partial c(.)}{\partial p_0} = \frac{\partial D(u, p_0, \mathbf{p}_{\neq 0})}{\partial p_0} + \frac{\partial \alpha(u, \mathbf{p}_{\neq 0}, \mathbf{z})}{\partial p_0} = q_0(u, p_0, \mathbf{p}_{\neq 0}) \cdot \quad \text{(A.8)}$$

Clearly in this situation, equivalence scales will still depend on the price regime in which they are estimated, but when estimated in a time period over which relative prices are stable, the price terms will also drop out. The Engel and Rothbarth techniques do not require this but applied studies have invariably taken advantage of this fact and estimated such scales on single cross-section data sets.

As Blundell and Lewbel (1990) show, it is still possible to recover an equivalence scale in any price regime, $\mathbf{p}$, from this base equivalence scale (estimated in regime $\mathbf{p}^0$, say), but only if one knows the evolution of cost-of-living indices $L(\mathbf{p}, \mathbf{p}^0, \mathbf{z})$ which, unlike equivalence scales, are unique for all transformations $\tilde{U}(U, \mathbf{z})$:

$$m^h(u, \mathbf{p}, \mathbf{z}) = \frac{L(\mathbf{p}, \mathbf{p}^0, \mathbf{z}^h)c(u, \mathbf{p}^0, \mathbf{z}^h)}{L(\mathbf{p}, \mathbf{p}^0, \mathbf{z}^0)c(u, \mathbf{p}^0, \mathbf{z}^0)}, \quad \text{(A.9)}$$

$$\text{where } L(\mathbf{p}, \mathbf{p}^0, \mathbf{z}^h) = \frac{c(u, \mathbf{p}, \mathbf{z}^h)}{c(u, \mathbf{p}^0, \mathbf{z}^h)},$$

Functional Forms and Estimation Techniques

Estimation of an equivalence scale usually requires a choice of functional form for the Engel curves and a popular starting-point is the 'Working–Leser' specification (see Working (1943) and Leser (1963))

$$w_i = \alpha + \beta \ln X, \quad \text{(A.10)}$$

that is, Engel curves that are linear in the logarithm of total expenditure. It is natural to think of both the intercept and the slope of these curves depending on the demographic structure of the household, $\alpha = \alpha(z^h)$ and $\beta = \beta(z^h)$, but this formulation results in equivalence scales dependent on the level of welfare at which they are evaluated. On the other hand, if we could restrict the Engel curves such that $\beta(z^h) = \beta$ for all h, then an 'exact' or 'independent of base' equivalence scale could be calculated as

$$\ln m^h = -[\alpha(z^h) - \alpha(z^0)]/\beta. \quad \text{(A.11)}$$

An exact equivalence scale therefore embodies a testable restriction on the Engel curves — that the slopes are equal for all household types. If the restriction is rejected by the data, one is forced either to report equivalence scales at some chosen level of expenditure (say the quartile points) or to report the distribution of equivalence scales over the sample (or a hypothetical continuous expenditure range).

A linear specification (whether exact or not) may not necessarily fully capture the variation in the observed data on expenditure shares. For particular commodities (particularly clothing and alcohol) in a data set very similar to that used in this study, Banks, Blundell and Lewbel (1992) give parametric and non-parametric evidence in favour of Engel curves that are quadratic in the logarithm of total expenditure. Essentially this three-parameter Working–Leser specification allows goods to be luxuries in some areas of the income range and 'necessities' in others. In this case, exactness implies a set of non-linear restrictions on the parameters on $\ln X$ and $\ln (X)^2$ that is not easily tested.

APPENDIX B
DESCRIPTION OF FAMILY EXPENDITURE SURVEY COHORT DATA

Table B.1 shows a cross-tabulation of the numbers of households in each annual Family Expenditure Survey with the head of household's date of birth falling into a particular range. It includes all households except those resident in Northern Ireland and those that record negative total non-durable expenditures. The process of constructing the pseudo-cohort data set that we use for the figures in Section 4.1 involves taking means (or alternatively medians) within each of these cells. It is important to realise that by doing this we do not need to assume that all the households in each cell are, to some extent, the same. Instead all we require is that the *composition* of the cohort is *constant over the time period involved.* Consequently we exclude cohorts that may contain very young or very old members.

TABLE B.1

FES Pseudo-Cohort Data from a Time Series of Cross-Sections: Dates of Birth and Cell Sizes over Time

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	Total
Earliest:	n/a	1910	1915	1920	1925	1930	1935	1940	1945	1950	1955	1960	
Latest:	1909	1914	1919	1924	1929	1934	1939	1944	1949	1954	1959	1964	
Example:	Queen Mother	Ronald Reagan	Dennis Healey	George Bush	Margaret Thatcher	Norman Tebbit	John Smith	John Major	Bill Clinton	Graham Gooch	Madonna	Frank Bruno	
Year													
1969	2,165	648	614	701	647	611	626	530	284	8	0	0	6,834
1970	1,866	603	493	623	558	594	511	547	404	31	0	0	6,230
1971	2,025	684	583	719	616	592	644	607	523	94	0	0	7,087
1972	1,776	610	565	692	621	610	598	671	569	154	1	0	6,867
1973	1,874	641	534	752	566	569	560	591	655	220	9	0	6,971
1974	1,624	589	537	615	535	549	587	597	618	279	19	0	6,549
1975	1,589	690	534	642	582	582	613	649	713	415	49	0	7,058
1976	1,525	665	557	672	567	559	586	605	704	495	115	1	7,051
1977	1,366	649	566	645	564	580	580	613	785	553	148	6	7,055
1978	1,211	613	548	642	613	529	555	604	752	571	226	8	6,872
1979	1,141	594	460	624	504	507	557	581	708	658	288	29	6,651
1980	1,000	617	525	605	554	539	557	641	741	590	396	45	6,810
1981	999	632	570	695	583	578	603	687	832	670	450	96	7,395
1982	855	599	527	656	614	564	584	626	828	676	575	175	7,279
1983	749	551	522	629	514	525	554	609	736	682	528	237	6,836
1984	676	506	530	685	575	535	530	629	675	698	567	281	6,887
1985	616	545	481	637	555	518	545	569	762	660	604	353	6,845
1986	550	492	511	655	507	501	543	612	706	680	660	497	6,914
1987	473	443	523	682	600	483	546	580	742	692	728	578	7,070
1988	465	458	463	637	540	525	532	587	759	683	650	611	6,910
1989	368	405	482	661	599	534	534	577	721	660	685	663	6,889
1990	328	394	424	587	545	506	500	536	648	623	695	683	6,469
Total	25,241	12,628	11,549	14,456	12,559	12,090	12,445	13,248	14,865	10,792	7,393	4,263	151,529

Note: Shaded cells show cohorts in which members may be over 65 or under 21 years of age. Such cells are included in the table for completeness but are subsequently dropped in any descriptive or econometric analysis in the report.

TABLE C.1

Engel Curve Parameter Estimates, 1989–90 Family Expenditure Surveys

Variable	Specification (1)		(2)		(3)		(4)		(5)		(6)		(7)		(8)	
	Param.	t-ratio	Param.	t-ratio	Param.	t-ratio	Param.	t-ratio	Param.	t-ratio	Param.	t-ratio	Param.	t-ratio	Param.	t-ratio
Ln expenditure	−0.105	−25.14	−0.104	−25.43	−0.104	−25.43	−0.105	−25.23	−0.105	−25.40	−0.105	−25.32	−0.105	−25.39	−0.105	−25.42
Dummy for any children	0.049	19.31									0.008	2.25				
Number of children			0.027	24.65									0.026	15.28	0.024	10.47
One child in household					0.031	10.47										
Two children in household					0.058	18.43										
Three+ children in household					0.089	21.82										
Number of children 0–2									0.012	3.57	0.008	2.05				
Number of children 3–5									0.021	7.82	0.018	5.83				
Number of children 6–10									0.028	15.79	0.025	12.32				
Number of children 11–16									0.032	15.99	0.028	11.21				
Number of children 17–18									0.036	5.26	0.031	4.44				
Any children 0–2							0.011	3.15							−0.013	−2.97
Any children 3–5							0.020	6.34							−0.004	−1.20
Any children 6–10							0.039	14.13							0.007	1.86
Any children 11–16							0.042	14.43							0.010	2.48
Any children 17–18							0.034	4.72							0.012	1.62
Youngest is 0–2													−0.013	−2.70		
Youngest is 3–5													−0.002	−0.49		
Youngest is 6–10													0.012	2.64		
Youngest is 11–16													0.012	2.77		
Youngest is 17–18													0.004	0.33		

Note: Other parameters (see Section 5.2) in Engel curves are not reported but are available from the authors on request.

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