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The demographics of housing demand; household formations and the growth of owner-occupation

by

M J Dicks

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CONTENTS

THE DEMOGRAPHICS OF HOUSING DEMAND; HOUSEHOLD FORMATIONS AND THE GROWTH OF OWNER-OCCUPATION

'A testimony of large numbers of population in thirteenth century villages ... will be found in the numbers of men called up by the manorial Lords for the great annual 'boon works'. The ratio of men to acres was obviously changing. Indeed the change was sufficiently dramatic to bring about eventually a veritable land hunger.'

Taken From Postan (1975)

Section 1: Introduction

Most economists agree that if the population of a region rises then so will the demand for housing. Often it is assumed that there is a linear relationship between the two, although rarely is this assumption tested. In this paper we try to take the analysis a little further by examining trends in the number of households and hence in the aggregate headship rate (the ratio of households to population). This is because we want to test whether demographic factors are a more complex (and perhaps more subtle) influence on housing demand than most previous research implies. Thus, Whitehead's (1974) suggestion that although 'a more exact measure of the effect on housing demand could be given in terms of headship rates ... there is little to be gained by using them rather than a more general measure such as population' can be tested directly by using the results of this paper in a more complex model of the housing market. Dicks (1988) follows such an approach, thus making some progress along one of the 'avenue(s) for further improvement' left open by Hendry's (1984) research into the housing and mortgage markets.

In this paper, however, we examine how changes in the age structure of the population cause shifts in housing demand. We do this by modelling household formation, distinguishing between 'age-related' factors and 'economic and social' factors, with the former being treated as largely exogenous to the housing market. Using this distinction we ask how important demographic factors have been in explaining the rise in the aggregate headship rate during the 1970s and first half of the 1980s. We also examine the growth of owner-occupation over the same period, illustrating the divergent trends among the

'old' and 'young' sections of the population. Our calculations suggest that around 2 3/4% points of the 4 3/4% point rise in the aggregate headship rate between 1971 and 1985 occurred solely because of demographic factors, with the rest being due to changes in real incomes, interest rates, house prices and other economic factors. This can be contrasted with the results one would have obtained by simply examining the growth in overall population size. The latter would have suggested a rise of just one-tenth of the true magnitude being due to demographic factors. Forecasts from our model are also presented. They are broadly in line with those made by the Department of the Environment (see page 31 below).

This paper is organised as follows. In Section 2 we examine trends in population growth and in the number of households in Britain. Next, we illustrate how we can split movements in the aggregate headship rate into those due to demographic factors and those resulting from economic and social influences. After a short discussion of the existing literature we provide our own estimates of household formation in Britain during the 1970s and early 1980s. These suggest (like most previous studies) that it is mainly demographic factors which have caused the surge in housing demand over the period. A more disaggregated analysis (based on age-specific headship rates) emphasises these results and serves to highlight the divergence between the behaviour of the 'young' and the 'old'. Finally, in Sections 7 and 8, we briefly examine the growth of owner-occupation during the last two decades. We find that although population effects have been significant (as has the rise in headship rates), economic factors must have played a major role, especially in recent years. Another potentially important factor is change in the distribution of households by type; there are now relatively more small households and these typically have higher ownership rates than do most others. More research is needed, however, if we are fully to understand households' tenure choice.

Section 2: Population Size and Structure, the Number of Households and the Aggregate Headship Rate

Between 1975 and 1985 the value of dwellings owned by the personal sector rose from below £120bn to more than £550bn (a rise of more than 70% even in real terms - ie relative to the consumers' expenditure deflator). As a result housing rose as a share of household sector net wealth from 0.4 to 0.6. Dicks (1987) suggests that this may, in part, reflect the fact that strong growth in house prices has meant that housing investment has become a relatively more attractive proposition, with house prices rising on average by more than 3% pa in real terms during the 1970s and close to 3 1/2% pa between 1980 and 1987.[1] But high house prices will also have restricted the ability of first-time buyers to enter the market, although more recently deregulation of the financial markets has led to greater competition amongst lenders, increasing households' access to funds and weakening the liquidity constraints which previously restricted choice. Thus, loan-to-value ratios for first-time buyers using building societies rose from 0.74 in 1980 to 0.85 by the third quarter of last year, and loan-to-income multiples for the same group averaged 2 1/2 during the 1970s but 3 1/2 last year.[2] Moreover, with banks now taking a bigger share of the mortgage market and tending to lend more 'generously' these figures may well <u>under-state</u> the rise in these ratios which have taken place in the market as a whole. Other economic and social factors are obviously important in explaining changes in the demand and supply of housing and its finance (see, for example, Dicks (1988) for a more complete model of the housing market). However, demographic factors are also likely to play a role.

Table 1 shows that the UK's enumerated population[3] has risen from 50 1/4mn in 1951 to 56 3/4mn in 1986, a rise of some 13%. Moreover, if death and birth rates and net migration turn out as projected by the Government Actuary then

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1 And, of course, much faster in some regions (such as Greater London).

2 Note that these limit the <u>maximum</u> amounts borrowers can take. In practice, average advance to income ratios for the same group rose from close to 1 2/3 in 1980 to around 2 last year.

3 Definitions of terms used in this paper are given in Appendix A.

by the year 2000 the UK population should be close to 59mn (a further rise of 4%). Chart 1 illustrates what this implies in terms of rates of growth of the population. Having increased by nearly 6% during the 1960s, the resident population rose by less than 1% during the 1970s although, if the projections are accurate, then during the next two decades the average annual rates of growth should pick up slightly (leading to increases of 2% during the 1980s and 2 1/2% during the 1990s). Should we infer from these figures that the demand for housing will grow at similar rates? In this paper we hope to show why it would be unwise to draw such a conclusion.

One reason for this is that we should try to take into account changes in the age structure of the population. Table 2 shows the age distribution of the UK population for selected years during the period 1951-81.[4] Whereas the total number of persons increased by 10% during the thirty years (males rising by 11% and females by 8%), the number of persons aged under 18 rose by less than 8% (with 8% more males and 7% more females), whilst the number of persons over retirement age rose by 42% (44% more males and 41% more females). As a result the dependency ratio[5] rose from 56.6% in 1951 to over 62.2% in 1981. The slower than average growth in the number of young people reflects large fluctuations in birth rates during much of the period (with the number of births per 1000 of the population at 16.0 in 1950-52, 15.8 in 1970-72 and 13.0 in 1980-82). This, in turn, results from changes in the age distribution of the adult population and movements in age-specific birth rates. Thus, while birth rates fell between 1974 and 1984 for women aged 20-24 (from 123.2 to 95.5), for women aged 30-34 they rose (from 59.9 to 73.6). However, the numbers of women in the two categories rose by 19% and 12% respectively during the same period, so that the former effect dominates in the aggregate measure.

The rapid rise in the percentage of the population which is over retirement age from 14% in 1951 to 18% in 1981 is mainly due to the fast rates of growth of the population in the early part of the century (Table 1), although falling

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4 Chart 2 shows more recent data based on GB's resident population.

5 Defined (for our purposes) as those under 15 or over retirement age, as a percentage of the remaining population.

death rates will have played some part.[6] Between 1901 and 1911 the UK population rose by close to 10% (with births running at an annual rate of more than 1mn). However, it took nearly two decades to complete the next 10% rise in total population (as have consequent rises of a similar magnitude). As a result there was a particularly large cohort of persons aged 60-70 in 1971 (this category having increased by 18% during the 1960s, compared with just 12% during the 1950s). As these people retire they not only produce extra pressures on the state's pension and health schemes but provide new demands on the housing stock.[7] We might, therefore, expect to see an increase in the number of people trading-down, which should lead to a rise in the number of 'large' properties supplied to the market and a simultaneous increase in the demand for smaller dwellings.[8] Feinstein and McFadden (1987) report that such 'downsizing' is a common phenomenon amongst the American elderly. Since increasing numbers of 'old' persons will also lead to a rise in the number of last-time sellers, an increasing proportion of whom are likely to have been owner-occupiers (see Section 8) then this could also have serious repercussions in the housing finance market. Increases in the value and number of bequests might lead to increased demand for housing services assuming younger households do not fully anticipate this increase in wealth, but it may also reduce some households' demand for mortgage finance. Of course, while bequeathed wealth in the form of housing may add to demand it must add more to supply. The influence of ageing on moving and household wealth in the US has been studied by Venti and Wise (1987). They find, somewhat surprisingly, that when the elderly move housing equity is as likely to increase as decrease.

The changing age distribution of the population may lead to changes in the demand for housing if the process of household formation and dissolution has a fairly rigid, age-specific structure. Chart 2 shows both the total number of

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6 The death rate for the 85 and overs has fallen from 290 in 1900-02 to 225 in 1980-81 for males and from 263 to 180 for females.

7 For a discussion of some of the issues relevant to the National Insurance system see Atkinson (1985), DHSS (1984) and Hemming and Kay (1981).

8 Of course, these changes may accentuate regional pressures on the housing stock if many of those wishing to retire want to live in the same area, or (more unlikely) they originate from the same area.

households and total resident population for Great Britain between 1971 and 1985. Although both series have grown over the period as a whole it is clear that average household size has fallen significantly; ie there has been a rise in the aggregate headship rate (the ratio of the total number of households to population). During the 1970s this is likely to have been an important factor in explaining why the demand for housing remained so strong. Thus, whilst in 1971 just 34% of the population were household heads, by 1985 this figure had risen to nearly 39%. To illustrate the potential impact of this trend it is worth noting that had the aggregate headship rate remained at its 1971 level throughout the period then by 1985 there would have been just 18.9mn households, compared with the actual of 21.5mn.[9] Hence, over the period as a whole, more than 90% of the increase in the total number of households which occurred was due to the rise in the rate at which household formation has taken place and changes in the age distribution of the population and less than 10% to growth in the population itself. These figures also illustrate why models which ignore household formation (and use say aggregate population instead to measure housing demand) are likely to very much overstate the importance of other factors. Of course, we are assuming that housing services involve some economies of scale - this being necessary even if population is to be an adequate indicator of housing demand. It is also necessary if housing costs are to have the effect on household formation assumed (see Section 3 below). The failure to take into account changes in the number of households could perhaps be a factor in explaining why Hendry's (1984) house price equation is so sensitive to changes in income. It is to an analysis of why the aggregate headship rate rose so markedly that we now turn.

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9 Note that in calculating our estimates of the number of households we are using the results of the General Household Surveys to gauge average (mean) household size. These figures will not correspond exactly with estimates from the 1971 and 1981 Censuses, although the two sources show broadly similar trends. Of course, it may be important to distinguish between medium or long term trends in headship rates and short-run variation around those trends. Headship rates calculated from Census data can only be used to study trends. Short-run variation around these trends, if it exists, can only be picked up by using higher frequency data and has not been investigated previously.

Section 3: Explaining the Rise in the Aggregate Headship Rate

Shifts in the aggregate headship rate can be decomposed into two elements - those due to shifts in the age and size of the population and those due to changes in age-specific headship rates. Defining the aggregate headship rate (HR_t) at time t as the ratio the total number of households (H_t) to the total population (P_t);

$$HR_t = \frac{H_t}{P_t} \qquad t = 1, 2 \ldots T \qquad (1)$$

then we can define headship rates for a particular age category (a) in a similar manner;

$$HR_{at} = \frac{H_{at}}{\overline{P_{at}}} \qquad \begin{matrix} a = 1, 2 \ldots A \\ t = 1, 2 \ldots T \end{matrix} \qquad (2)$$

where typically we will want to index households' age categories by reference to the ages of the households' heads.[10] Clearly this implies the identities;

$$\sum_a H_{at} = H_t \qquad t = 1, 2 \ldots T \qquad (3)$$

$$\sum_a P_{at} = P_t \qquad t = 1, 2 \ldots T \qquad (4)$$

Using (1) to (4) we can express the aggregate headship rate in terms of the age-specific headship rates (by simply substituting (3) and (4) in (1) and the result in (2)). This gives us;

$$HR_t = \sum_a HR_{at} S_{at} \qquad t = 1, 2 \ldots T \qquad (5)$$

$$\text{where } S_{at} = P_{at}/P_t \qquad (6)$$

(ie S_{at} refers to the share of the total population in category a at time t).

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10 For a definition of 'household head' see Appendix A.

We can now use (1) and (5) to decompose changes in the aggregate number of households into two components. From (1) it can be seen that;

$$\Delta H_t = HR_t P_t - HR_{t-1} P_{t-1}$$

Substituting for HR_t from (5) gives;

$$\Delta H_t = \sum_a HR_{at} P_{at} - \sum_a HR_{at-1} P_{at-1}$$

$$= \sum_a HR_{at-1} P_{at} - \sum_a HR_{at-1} P_{at-1} + \sum_a HR_{at} P_{at} - \sum_a HR_{at-1} P_{at}$$

$$= \sum_a \Delta P_{at} HR_{at-1} + \sum_a \Delta HR_{at} P_{at} \qquad (7)$$

The first term in (7) shows the effect of changes in the population's size and age structure on the number of households, whilst the second shows the effect of changes in age-specific headship rates.

Research in the US suggests that population growth and changes in the age distribution explain much of the increase in the number of households that has occurred in recent decades. Of course, simply because it is claimed that 'age' effects household formation does not mean that this is for non-economic reasons. Thus, for example, Haurin, Hendershott and Ling (1987) in a study of home ownership rates of married couples in the US, conclude that age affects tenure choice because older households have higher incomes, more wealth and more certain incomes (amongst other things).[11] It should also be noted that the concept and definition of a separate household used in the US are not the same as those used here. The US Bureau of the Census defines a household as comprising all the persons who occupy a 'housing unit', with such a unit being a house, an apartment or other group of room(s) which is occupied or intended for occupancy as separate living quarters (that is when the occupants do not live and eat with any other persons in the structure and

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11 Of course, one might expect income and age to be strongly correlated - at least I hope they are! Unfortunately, hope too is probably age-specific, in which case one might expect to see my degree of cynicism and not my income rise?

there is direct access from the outside or through a common hall). In American housing stock statistics the counting unit is also the 'housing unit', which means that in the US households cannot share a dwelling with other households, by definition. In Britain, however, two or more households can share the same dwelling if they have separate housekeepings and do not (since 1981) share a living room or sitting room. A move from part of the house to a whole house or flat therefore constitutes household formation (by definition) in the US, whereas in Britain it might or might not, and often does not. The reduction in the number of sharing households shown in, for example, Table I.14 of Department of the Environment (1977) would be counted in the US as part of household formation, but it is not so counted in Britain, which means that, for reasons of definition alone, one would expect the effect of income and housing costs on household formation to be more readily detectable and measurable in the US than in Britain.

Hendershott and Smith (1985) report that 17 1/2mn of the 25 1/2mn rise between 1961 and 1978 in the total number of households in the US was due to changes in the population and its age structure and only 8 mn was due to rises in age-specific headship rates. Moreover, their more recent research (reported in Hendershott (1987)) suggests that during the first half of the 1980s population effects were sufficiently strong to generate a rise of 9 1/2mn in the number of American households, with harsher economic conditions restricting the actual rise which occurred to just 8mn. This suggests that the family life-cycle (marriage, pre-child period, child rearing period and 'empty-nest' period) is sufficiently general to explain most household formations (for more details see, for example, Rudel (1987)) and that the 'demand for privacy' and other economic arguments play only a minor role. Some figures for this country are shown in Table 3. These illustrate that even if one were to assume that headship rates had not changed at all between 1971 and 1985 then changes in the population's size and structure would have been sufficient to 'explain' more than 40% of the rise in the number of households.[12] Before we examine whether or not these demographic effects stand up to a more rigorous analysis we discuss some social and economic variables which may be important in explaining the rate of household formations.

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12 A slightly lower figure than that implied by Ermisch (1985).

Section 4: Models of Household Formation

(i) Economic Factors

Ermisch (1981) suggests that we can explain household size by using a household production function approach in which time and goods are regarded as inputs into a process which generate non-marketable output from which individuals can obtain satisfaction. In such a production function it is assumed that there may be economies of scale, so that not only hours of domestic work time and inputs (such as housing or durable goods' services) are relevant but also the size of the household. The latter variable also enters the utility function directly, however, since individuals desire privacy. The (interior) solution to the model requires that the gain in utility from an additional household member (in terms of extra production of home-base services) is exactly offset by the loss of utility associated with the reduction in privacy which his/her membership would entail.[13] Such a model implies that the effect of changes in wage rates on household size can be split into income and substitution effects, with the latter more likely to be negative if scale economies are large.[14] Evidence from the General Household Surveys for 1973 and 1976 was found to support this contention, which would imply that previous American studies which reported a positive relationship between income and the probability of being established as a separate household reflected not just the desire for privacy but scale economies.[15]

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13 Note that the problem of household size being discrete is not addressed, so that these marginal gains and losses can be equated (an equilibrium exists), even though (as the author recognises) the conditions do not imply uniqueness of the equilibrium.

14 The substitution effect is equivalent to the effect of a change in the real wage rate on optimal household size if the individual were to be compensated by changes in non-labour income so as to be able to obtain the same level of utility as prevailed before the change in the wage rate.

15 Although, as Borsch-Supan (1986) notes, Ermisch's model has little overall explanatory power 'pointing to poor model specification or noisy cross-sectional data'. The latter would seem the more likely given the fairly respectable R^2's (of close to one-third) in Ermisch's work - not an unusually low figure for cross-section studies.

More recent research (see, for example, Borsch-Supan (1986)), highlights that although real incomes might be expected to play a big role in explaining non-demographic changes in the rate of household formation, one also needs to consider the cost of privacy/independence. Thus, one should expect to find a negative effect from housing costs (whether rents, debt-service costs or the opportunity cost of investing in owner-occupied property), although he recognises that 'spurious price elasticities (will be) estimated when sitting tenants in rental housing receive 'tenure discounts' by paying less than the prices paid by recent movers'. Much the same problem might be expected to arise if one were to use council house rents to proxy housing costs and one ignored supply constraints in modelling British household formations. Of course, taxes are likely to play a crucial role both in determining the relative price of owning to renting and in determining the relative returns from investing in housing as opposed to financial assets. For a discussion of some of the issues involved see King (1980), Rosen and Rosen (1980), Poterba (1984), Gordon, Hines and Summers (1986), Hendershott, Follain and Ling (1987) and Section 5 (below). An important problem in trying to measure the costs and returns involved in owner-occupation is how one gauges expected capital gains, expected interest rates and expected inflation. Most studies assume fairly simplistic (often irrational)[16] behaviour by the agents involved and yet seem to have obtained fairly successful results.[17] For some applications see Hendry's (1984) model of UK house prices, Hendershott and Smith's (1985) model of US household formations and Rudel's (1987) model of US tenure choice. Perhaps more important is the fact that rational expectations of house prices might sometimes make ex ante costs negative, suggesting that demand would then be unbounded. In practice, of course, rationing in the mortgage market is likely to severely restrict the supply of mortgage funds available over these periods. Dicks (1987) suggests that rationing may have been an important factor in explaining mortgage growth during the 1970s and 1980s, although it is not a feature of the model used here to explain household formation.

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16 In the sense of the rational expectations hypothesis.

17 Which, of course, suggests that if the agents involved feel the results are fairly successful rather brings into doubt the meaning of irrationality. For a discussion of some of the issues involved in modelling rational agents see Binmore (1987).

(ii) Social Factors

One might expect that the rate of household formation would depend upon the number of marriages and divorces which occur (see, for example, Holmans (1970)). However, the impact of a rise in either of these variables is less than clear. An increase of one in the number of marriages may, for example, reduce the number of households if both partners were previously household heads or raise it if both were previously living with parents. Similarly, one extra divorce may lead to one additional household being created if both husband and wife form separate households afterwards or a reduction of one if both move back in with parents/friends. Moreover, the outcome is likely to depend upon other economic factors already included as regressors in most models, which might explain Hendershott and Smith's (1985) poor results when they tried incorporating a number of different divorce variables as regressors in their model. For the UK Holmans, Nandy and Brown (1987) have used the results of the OPCS Longitudinal Study to estimate the number of successor households generated by divorce and hence the net increase in households it produces in the short-run (that is before offsets brought about by remarriages). For every 100 couples which divorced between 1971 and 1981 they report that 97 had their own households (so that there were 97 dissolutions of married couple households per 100 divorces). Since around 72% of the divorced men and 81% of the divorced women became household heads there were 153 successor households per 100 marriages. Given the current divorce rate (of around 145,000 a year) they suggest that, in round terms, divorces may be contributing a net increase of 80,000 households a year which, as they point out, 'is a very substantial number in comparison with the estimated net increase of about 160,000 a year in the number of households in total'.[18]

A second factor found to play a major role in explaining household formations in the US is changes in aid for families with dependent children (the ADFC program). Hendershott (1987) suggests that this was the main factor explaining why the actual increase in the number of households during 1980-85

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18 In addition, the increased incidence of divorce has raised the proportion of one-parent faimilies, which now comprise 20% of households with children. However, as Wall (1987) makes clear, this is in no way unexceptional - early widowhood in the seventeenth century had much the same effect. Indeed, he suggests that 'the intervening centuries were if anything the exceptions'.

was less than that predicted by his model (which only allowed for the effects of population growth and changes in the age-distribution). In his view revisions to the AFDC program were sufficient to lead to a decline of 1 1/4 mn in the number of household formations during this period.

Why should aid programs play such a big role? Hendershott and Smith (1985) claim that the "price" effect of an increase in real benefit should be larger than any income effect.[19] But both effects should have the same sign, since increases in income will raise the demand for privacy (and hence raise the rate of household formation) whilst the fact that benefits are negatively related to household income should mean that couples can raise effective benefits by splitting up and establishing separate households a rise in real benefits further encouraging such moves (this being their "price" effect). Part of the reason why the AFDC variable used by Hendershott and Smith plays such a major role could be that it explains much of the sharp rise in the divorce rate which occurred in the US between the late 1960s and early 1970s, although Bishop's (1980) survey finds little evidence that AFDC payments increase marital instability. However, by using the change in the number of families receiving aid as an explanatory variable they naturally bias the coefficient towards one.[20] Hence, in more recent work Hendershott (1987) uses the real level of AFDC payments per recipient. Emphasis in this paper is placed on cost of privacy arguments.

For the UK a number of aid programs exist designed to raise welfare. These have contributed to a marked rise in replacement ratios throughout much of the post war period, although in recent years they have fallen back somewhat (see, for example, Egginton (1987)). The biggest element of the social security program in terms of number of beneficaries is child benefit (12.2mn in 1986/7) followed by pensions (9.6mn), rate rebates (7.1mn), rent rebates (3.7mn) and supplementary benefit (2.4mn on the short-term rate and 0.9mn on the long-term rate). It should be noted, however, that these figures relate to the number of people, not the number of households, who receive benefit. An example of the importance of this distinction is illustrated by the fact that only 6.8mn families received child benefit during 1986/7. A second point to note is that benefit levels (per beneficiary) vary enormously over the different

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19 Of course, the rules relating to cohabitation may also be relevant.

20 This might also explain why some of their divorce variables are insignificant.

programs. Thus, in terms of total costs to the Exchequer, it is pensions which dwarf all the other schemes, costing some £17 1/2bn in 1986-87. This compares with just £7bn for supplementary allowances,[21] £4 1/2bn of child benefit and £2 1/2bn each for invalidity benefit and rent rebates. Since we do not want to fall into the trap of estimating an identity we use real benefits per beneficiary as a regressor in estimating the impact of these programs (rather than the number of families receiving support).

A number of other social factors cannot easily be measured but may be important nevertheless. One of these is increasing health standards which have raised average life spans and may, according to Hendershott and Smith (1985), explain the (positive) 'trend' growth term in their equation (due to their retaining a constant in their equation). Alternative explanations, for example that there has been a shift in tastes (with people born after the Second World War more likely to form household heads than was previously the case) are also possible. If this story is correct then it may simply reflect a change in expectations (in terms of future income streams) - perhaps due to greater investment in human-capital-in which case we might expect to find educational standards play a role in explaining the rise in headship rates. It may, however, reflect the fact that we have <u>not</u> included wealth in our list of economic factors. For this reason we have tried following such an approach below (Section 6).

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21 Excluding some £1bn of supplementary pensions.

Section 5: Estimating a Model of Household Formation in Great Britain During the 1970s and 1980s

(i) The Model

We now present a simple model of household formations based on the identity (7) (Section 3) in which we first substitute for ΔHR_{at} thus making explicit the roles we anticipate for the various economic and social variables. First, to estimate the first term of (7) the population is split into 9 age categories.[22] We then calculate what change we would have expected to occur in the total number of households had headship rates remained constant between each year and the next but the population grown and age structure altered as they in fact did. This is what we describe as 'demographic' growth in the number of households and is treated as exogenous to the housing market.[23] If we replace the first term of (7) by these predicted 'demographic' changes (denoted ΔHD) we would expect ΔHD's estimated coefficient to be fairly close to one, provided we have also included the correct economic and social factors in our model. Obviously the more detailed our information on the population's age structure the better fit we would expect to get.

We now summarise our analysis of the economic and social factors we think are relevant (Section 4) by assuming that individual headship rates are a function of incomes, the cost of housing (rents, mortgage costs and ownership costs), wealth, marriage and divorce rates and benefits (covering both pensions and other benefits). Thus, we can write;

$$HR_{at} = HR_{at}\ (Y,\ R,\ O,\ M,\ W,\ MR,\ DR,\ B) \qquad a = 1,\ 2\ \ldots\ A \qquad (8)$$

$$\qquad\qquad +\ -\ -\ -\ +\ -?\ +?\ + \qquad\quad t = 1,\ 2\ \ldots\ T$$

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22 Ideally we would like to break the population into more categories, particularly around the ages of 20-30 which are the prime years during which individuals form new households, but we are limited by the data set available from the General Household Surveys.

23 Note that it is the 'demographic' element which should be treated as one of the main housing demand variables in our model of the housing market as a whole. See Dicks (1988).

where the expected signs of the partial derivates are indicated below each term.[24] Y denotes real personal disposable income per capita, R real rents, O real costs of owner-occupation for those owners without mortgages and M for those with, W real wealth, MR the marriage rate (per 1000 of the population), DR the divorce rate and B real benefits. Our data is described in more detail below [Section 5(ii)]. Substituting (8) in (7) and replacing the first term with ΔHD gives;

$$\Delta H = \alpha_0 + \alpha_1 \Delta HD + \alpha_2 P_t \Delta Y + \alpha_3 P_t \Delta R + \alpha_4 P_t \Delta O + \alpha_5 P_t \Delta M + \alpha_6 P_t \Delta W + \alpha_7 P_t \Delta MR + \alpha_8 P_t \Delta DR + \alpha_9 P_t \Delta B \quad (9)$$

where, for simplicity, we have assumed that the HR_{at} functions are identical for each age group.[25] We expect $\alpha_0 > 0$ (if tastes have changed in the same way as in the US), $\alpha_1 = 1$ (if our demographic factors are well measured), $\alpha_2 > 0$, α_3, α_4, $\alpha_5 < 0$, $\alpha_6 > 0$, α_7 and α_8 unknown (but probably $\alpha_7 < 0$ and $\alpha_8 > 0$) and $\alpha_9 > 0$.

As a first step we follow Hendershott and Smith (1985) in estimating (9) without bothering to test whether the headship rate functions do vary significantly across age groups. Later (Section 6 (iii)) we extend our analysis to allow for the possibility that headship rates for older age groups may be more/less sensitive to some of these factors than are those for younger groups. Data limitations prevent us from testing whether the dynamics of the household formation process varies with age too. One might expect, for example, a quicker response of young individuals to a rise in income than for older individuals. Borsch-Supan (1987) has detected a growing discrepancy in behaviour between the old and young US population.

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24 It has been suggested to me that since (8) is a <u>stock</u> equation (in trying to explain the proportion of persons aged a who are household heads at time t) then we should include the <u>stocks</u> of married and divorced persons as a proportion of the population aged a, not the <u>flows</u>. We hope to address this question in future research.

25 Of course, HR is bounded between zero and one so that our assumption of a linear relationship can only be approximately correct. Nevertheless, given our limited dataset this should not be much of a problem.

(ii) The Data

Population

Annual figures for the resident population of Great Britain each year from 1971 to 1986 have been provided by the OPCS split into five-year age groups (up to the 85-89 category) plus the 90 and overs. The population shares of the various age categories we have chosen to use are shown in Table 4, whilst Chart 3 shows how the population distribution has evolved over the period. Both serve to illustrate the strong growth in the number of elderly persons and the reduction in the share of 'young' persons (those under 16) described in more detail in Section 2.

Households

Figures for the total number of households in Great Britain for 1971 and 1981 are available from the Censuses. These suggest a general downward trend in average household size, with a fall of 5 1/2 to 6% occuring during the decade (depending on which population definition is used). For comparison, Table 5 also shows figures based on the General Household Survey - a continuous survey (which has been running since 1971) based on a sample of the general population resident in private (non-institutional) households. The effective sample size of the survey has fallen during the 1980s, due to a 14% reduction in the sample of selected addresses (to just below 12,500). Nevertheless, at close to 10,000 in 1985 the effective sample size covers more than 25,000 persons and so is probably sufficiently large to enable broad comparisons with the results of the Censuses. Table 5 shows that the GHS data does indeed show a fall of similar magnitude in average household size to that implied by the Census data (of close to 7%), even though the levels of the former are between 2 and 4% lower.

Headship Rates

It might be thought preferable to work with headship rates that are specific for marital status as well as age and sex, since if the headship rates used are specific for age and sex only then the influences on marital status are among the influences that determine headship rates whereas if the headship rates are marital status specific as well then explaining and predicting marital status can be split off as a separate problem. However, the GHS does

not have a large enough sample for marital status specific headship rates to be calculated. The only data source (apart from the Censuses) which are large enough are the Labour Force Surveys. These have been used to study changes in headship rates post-1981, and were used for the 1985-based household projections recently published by the Department of the Environment. A reason for thinking that marital status is important is that comparison of marital status specific headship rates shows that, age for age, headship rates are highest among the currently married, lower among the formerly married, and lowest among the never-married. There is a problem, however, in that the growing divergence between de facto and de jure marital status that results from unmarried cohabitation is producing difficulties for projection systems like that of the Department of the Environment which work with marital status specific headship rates. It is probably better, therefore, that we use only age-specific headship rates and try proxying the effects of changes in the number of marriages and divorces by entering these variables directly in our model.

Our estimates of average household size from the GHS have been used to measure the total number of households in Great Britain for each year between 1971 and 1985. Then, using data from the GHS (on the proportion of households with age of head of household in the various age categories - see Table 6) we have estimated the total number of households for each category, which together with the population estimates can be used to measure age-specific headship rates. Tables 7 and 8 and Charts 4 and 5 show our results. Although the aggregate headship rate rose steadily throughout much of the period (the fall in 1981 reflecting simply the change in definition of household - see Appendix A), this masks the diversity of trends evident in age-specific headship rates. For the youngest category (age of head less than 25) there was some growth in headship rates over the period (of around one-tenth) but this is little compared to that which occurred for the (25-29) category (for which they rose by one-fifth).

The largest category in terms of number of households is now that headed by individuals aged between 30 and 44 (see Table 6). However, this was never the case during the 1970s (during which the (45-59) category was bigger). The change is mainly the result of bigger rises in headship rates for the former group (up from an average of 50 in 1971-75 to 52 1/2 in 1981-85) and

fairly stable rates for the older category (up just 1 to 55 over the same period).[26] One might guess from the fast-rising headship rates for the (25-29) year olds that it is mainly younger middle-aged individuals whose headship rates have risen quickest within the (30-44) category. More disaggregated data (for England and Wales) published in King (1986) suggests that this is indeed the case. Table 8 indicates that our data compares well with that used by King. More interestingly his figures illustrate a phenomenal rise in the headship rates of young females at a time when divorce rates for these groups also rose sharply. Thus, even though we might find (like Hendershott and Smith (1985)) that it is hard to identify an effect on headship rates using aggregate divorce rates a more detailed search within age (and sex) categories ought to prove more fruitful.

Turning to the older age categories we find that between 1971 and 1985 headship rates rose by close to one-tenth for those in their 60s but at a faster rate for the more elderly, particularly the very old. This suggests that we might expect to estimate a positive constant (representing a shift in 'tastes') unless other terms manage to pick up these trends.[27] Of course, the difficult question when studying headship rates is deciding how much disaggregation to use. An inspection of the columns in Table 7 for the older age groups rather suggests that sampling variation is present. For this reason we use fairly broad categories when estimating headship rate functions for specific age groups below (Section 6 (ii)). We have also smoothed our estimates of age-specific headship rates by using a kalman filter package to estimate the underlying trends in the data.

Incomes

We have tried using a number of different income measures, the simplest of which is Real Personal Disposable Income per capita, as published by the CSO. However, since we are also interested in finding a role for benefits and pensions we have tried splitting total household disposable income (again

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26 Note that the population distribution has not skewed in the same way as has that for households (Charts 3 and 4).

27 Interestingly, Wall (1987) suggests that one result of the dramatic increase in the number of people living alone (particularly elderly women) is that the composition of UK households has changed by as much during the last 25 years as it did between the pre-industrial era and the 1960s.

measured on a per capita basis) into 'grants', 'pensions' and 'other income' (before adjusting for taxes, which we assume fall entirely on the latter). Table 4.9 of the CSO Blue Book has been used for this purpose.[28] One could argue that none of these measures are likely to be independent of demography or of household formation. For this reason we have also tried using average earnings of full-time (male) workers to proxy labour income and per capita wealth as a measure of unearned income.

Housing Costs

(a) Rents

We follow Rosen and Rosen (1980) and Hendershott and Smith (1985) in proxying real rents (R) by looking at the rent components of the consumers' expenditure deflator relative to other elements. This split between households and 'other' of the non-imputed element has been provided to us by the CSO and it is the former that we have used (relative to other elements of consumer prices). In addition, we have tried using the rent component of the housing element of the Retail Prices Index relative to other retail prices.[29] Note that neither of these approaches avoids the problem that Government policies will have restricted rents in the council house sector to below what a free market would have generated, making necessary various forms of rationing (eg queues of potential council house tenants) and raising rents in the private sector. Our aggregate measure of rents may be inaccurate, anyway, since the acute shortage of rental accommodation (especially in London) has lead some landlords to charge 'black market rents' and to attempt to avoid the Rent Acts by making new lets on licences and other 'devices'. For a discussion of some of these issues see Minford, Peel and Ashton (1987).

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28 Note an additional advantage of using this data is its treatment of gross interest receipts as income and life assurance premiums as expenditure.

29 Data previous to 1974 had to be estimated, (using the Housing component of the RPI) since subgroup data was not then published.

(b) **The Costs of Home Ownership**

We follow an approach to measuring the cost of homeownership that is similar to that of Diamond (1980), and of Hendershott and Shilling (1982). We thus distinguish between costs for owners with a mortgage (M) and those for owners who own outright (O). For the former we calculate mortgage payments, assuming loan-to-value ratios, house prices and interest rates typical of the average first-time buyer borrowing from a building society and assuming a standard 25 year repayments mortgage. We then make the relevant adjustments for tax relief (at the standard rate). Since loan-to-value ratios are generally below one, even for first-time buyers, we then calculate interest costs on equity invested in property by multiplying the average first-time buyer's deposit by the average building society rate on shares and deposits (adjusted for tax). To this we add costs of depreciation and maintenance which we have proxied by assuming that each is equal to 1% of the average house price.[30] Next we add average rates (per dwelling) to give total costs, which are deflated using the consumers' expenditure deflator.

One final adjustment is necessary - for expected real capital gains.[31] Most previous studies assume these can be proxied by assuming adaptive expectations. Diamond (1980) justifies this on the grounds that 'economies of scale in expectation formation cannot easily be used to reap profits through large-scale arbitrage operations'. However, as Hendry (1984) makes clear, buying a house is generally the most important financial transaction that individuals make, so that endowing them with 'sensible' expectations would seem a minimum requirement. In his model it is assumed that individuals know lagged values of house prices, interest rates, earnings and the volume of mortgage lending. These are then used to generate 'reasonable' expectations. Given our limited data set we have followed the simplest approach of proxying expected gains by looking at moving averages of past

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30 According to Rosen and Rosen (1980) this is general real estate market practice in the US.

31 Although, one could argue that these are irrelevant to first-time buyers if they are rationed in the mortgage market. We test this (extreme) assumption by also including one cost measure which assumes zero gains.

changes in house prices. In future work (using longer runs of data) we hope to examine this issue again in more detail.[32] For those owners without mortgages we need to measure the opportunity cost of equity tied up in housing. This we proxy by assuming these funds could, instead, have been invested in gilts. Since other costs are broadly similar to those for people with mortgages it is not surprising that the total real costs for the two groups have moved fairly closely in line.

Wealth

A number of different measures of household and personal sector net wealth were used (see Dicks (1987) for more details of the sources). We tried distinguishing both between financial and non-financial assets and between net and gross wealth, although it was recognised that including dwellings in our measure could make measuring capital gains in the housing cost term even more difficult. All measures were deflated by the consumers' expenditure deflator.

Marriage and Divorce Rates

These were taken directly from the Annual Abstract of Statistics (Tables 2.13 and 2.14). Since we know, from Section 5, that headship rates for women aged 15-40 rose faster than for other groups we also tried using divorce and marriage rates for females under 45 as separate regressors.

Benefits

Figures for standard rates of supplementary benefit, unemployment benefit and pensions are published in Social Security Statistics. These were deflated using the consumers' expenditure deflator and assumed (wrongly!) to be tax-free. Since, in practice, such taxation is unlikely to yield much revenue this is hopefully not a big problem. Another variable we tried was the gap between supplementary benefit rates for single and married householders (again deflated by the consumers' expenditure deflator). This, it was hoped, would

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32 Our main problem in this work has been the limited sample period of our dataset. We might try to overcome this by working with the Family Expenditure Survey, which is available as far back as the late 1950s, although it is based on a much smaller sample than the GHS.

provide a measure of the incentive for married couples to split into two households (since supplementary benefit is paid according to the requirements and resources of each household). However, since our data (again taken from Social Security Statistics) excludes housing costs, our measure may not prove to be very useful. A similar variable was constructed using (real) pension rates for single and married couples.

Section 6: Results

(i) Using Aggregate GHS Data

It should be noted at the outset that we have very few observations with which to estimate (9), since the GHS has only been published since 1971. Prior to that year, however, the Family Expenditure Survey (FES) was available and this provided some information on the age distribution of household heads. First, however, we consider our results based on the GHS data.

Table 9, column A, shows a fairly general specification. Given our limited degrees of freedom it is perhaps rather surprising to note that all the variables take the expected sign (although, of course, the marriage and divorce variables might in theory make either a positive or negative contribution). The most striking result in A is the significance of the 'demographic' term. Its coefficient is very close to what was expected (one) - the relevant test being easily accepted in all our models - and this term clearly does much of the work in "explaining" the rise in the number of households. Since we would expect headship rates to respond only slowly to changes in income or wealth we have experimented with longer lags on these terms to see if this would improve the model's fit. Column B shows a specification in which we have measured income (RPDI) as a 4-year average (including current income), although, as a comparison between Columns A and B shows, the model is not very sensitive to different dynamics. We also tried using a measure of household disposable income (which made very little difference to our results) and, on a tested-down version of the model, we tried splitting household income into pensions, other benefits and other income, although with little success.[33] We did find, however, that replacing the aggregate divorce variable with the number of divorces where the age of the wife is 45 or over improved our model (Column C). A further important distinction turned out to be that between RPDI and average earnings. Column D shows a specification based on using a 4-year average of full-time male earnings. This too shows a clear improvement on previous specifications.

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33 We also found that real pensions/benefits per recipient were insignificant, as were the gaps between pensions/benefits for single householders and couples.

As regards the rent term, we found that using the RPI component instead of the relevant element of the consumers' expenditure deflator failed to improve the fit of the model. The costs of housing for those with and without mortgages (M and O respectively) were very strongly correlated whatever lags we used on house prices to gauge expected capital gains (we tried using up to 8-year moving averages). Hence, we could only include one of the two variables at a time in our equations. In practice, which of the two and what lag length on house prices we used made little difference to other terms in the model. The equations reported in Table 9 measure gains in M on a 2-year basis and use the rent component of the RPI.

We had very little success with wealth variables (perhaps somewhat surprisingly in the case of our equations based on average earnings), finding no role for either physical or financial assets, although in the case of the former this is likely to reflect the fact that most of any rise in the value of these assets will be due to higher house prices which already enters M via our expected capital gains term. A small effect from financial wealth might have been expected, although the fact that net financial wealth was insigificant may be due to the fact that nearly all debt comprises mortgage liabilities which will, of course, be positively correlated with housing demand and (probably) the number of households.

The coefficient on our marriage rate variable implies that headship rates for single people who marry are at least one-half of those who are married. This seems plausible given that nearly one-half of those who married in 1985 were aged under 25 and we know that the headship rate for this age group (as a whole) was then below 13% whilst for all other age groups headship rates lay between 40 and 70%, but a better check on whether or not marriage and divorce rates are important explanatory variables is to try using age-specific rates to help explain age-specific household formation.

One problem with a specification like those in columns A and B is that the divorce and marriage variables are not significant at the 95% level. Constraining their coefficients to be equal but opposite in sign failed to improve this aspect of the model, although we did find that using the divorce rates for the over-45s gave better results (Column C). When using average earnings as our income variable we found that constraining equality between the aggregate marriage and divorce coefficients did slightly improve the model (Column E), although the resulting specification still had a larger standard

error than that which kept the over 45s distinction (Column D). The coefficient on the divorce variable in the latter implies a somewhat smaller effect on household formation than does the work of Holmans, Nandy and Brown (1987) (see above, page 13).

The final term we report in each of our models is the constant. This is large and positive in every case, implying a significant (unexplained) trend in the rate of household formation. Like Hendershott and Smith (1985) we could claim that there has been a shift in tastes (towards privacy/independence) although other explanations are possible (for example, the constant may be proxying supply factors). We noticed that an equation without a constant had a slightly larger standard error, but more importantly perhaps it suggested a much bigger role for income (see Column F, for example). It is also noticeable that for such an equation the data 'preferred' a bigger coefficient on HD than one, although the F-test for the unit restriction is still passed. The effect of imposing such a restriction, however, is to increase the role of income still further (Column G). These results rather hint that distinguishing between permanent and transitory income would help improve our explanation of household formation. The former should be rather less variable than actual income and so may be being proxied to some extent by the constant in our equations. Since we have written our model in terms of changes in the number of households we obviously cannot hope to have explained the long-run trends in headship rates, but anyhow census data is probably more appropriate for such a study.

Overall, our results suggest that demographic factors explain much of the rise in the number of households during the 1970s and first half of the 1980s. However, changes in incomes, wealth, the costs of homeownership, marriage and divorce rates and, perhaps, tastes have also played a part. An equation like D in Table 9 suggests that broadly one half of the rise in the number of households over the period was due to changes in the population and its age distribution.

(ii) Using Aggregate FES Data

Before turning to the use of disaggregated data we consider some results based on FES data.[34] This provides us with a check on whether or not our previous results look reasonable, given the limited number of observations on which they were based, although it should be noted that the FES is based on a much smaller sample than the GHS (around 18,000 people in 1986) and so is likely to be subject to greater sampling error.

Table 10 shows some similar specifications to those reported earlier, based on a sample running from 1972 to 1986 (thus using the same start period as we have used with previous work). The only departure from previous practice, in terms of the explanatory variables used, is the inclusion of household (as opposed to personal) income, the former being found to give slightly better results. When a 4-year lag was used (Column A) all the coefficients were found to have the same signs as when used to explain GHS estimates of the number of households and all had t-values greater than one. A shorter lag on income (as in Column B) gave slightly better results overall, although at the expense of losing the effect from housing costs.

When we tried extending the sample period to include the period 1965 to 1971 we found that although all of the variables were correctly signed (with the exception of that pertaining to the number of marriages) few were significant - most of the 'explanation' being due to a large constant (see Column C). There was also evidence that the errors from this regression were autocorrelated, residuals tending to be positive during the 1960s, negative in the 1970s and positive again since 1983. This rather suggests that the 'trend' rate of growth of the number of households (ie that due to the constant) may be falling, perhaps because of the reduction in the number of households which are liquidity constrained. Clearly more work is needed if we are to understand fully the apparent shift in household formation over the last two decades. One possible explanation, to which we turn next, is that household formation behaviour differs between age groups.

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34 This is a UK-based survey, so that we would expect minor differences in headship rates from those implied by the (GB-based) GHS.

(iii) Using Disaggregated GHS Data

The approach used in Sections 6(i) and 6(ii) is much the same as that used in previous research (see, for example, Hendershott and Smith (1985)) - ie we have estimated (9) directly. Implicit in such an approach, however, is the restriction that either each age group has the same headship rate function (see (8)) or that the population shares of each group remain fixed over the sample period (see (7)). In this section we briefly test this restriction by splitting our sample of households into three separate age categories, which we will refer to as young (age of head is under 30), middle-aged (age of head is over 30 but under 45) and old (age of head is 45 or over). We use the subscripts Y, M and O to denote these categories. We then estimate (9) for each group using some economy-wide variables (such as housing costs) and some group-specific variables (such as income).[35] This enables us to test whether different age groups behave differently.

Table 11 shows a typical equation for the young category. Like Ermisch and Overton (1985) we find that income has a smaller effect for young households than it does for older ones. Rather surprisingly, however, we found it difficult to identify significant rent or housing cost terms (our best efforts being to include mortgage costs rather than rents). Nevertheless, we did find a small role for wealth which may, in part, be picking up anticipated captial gains on housing. The constant implies an unexplained declining 'trend' rate of household formation of around 20,000 per annum (although not a significant one), which suggests that the 'shift in tastes' explanation (found necessary to explain US data) is not appropriate in the UK (since one would expect a bigger (positive) effect for young age groups than for old ones).

Two equations for the middle-aged are reported in Table 12. The main problem we found in trying to model this group's rate of household formation was that age-specific income seemed to be less useful than aggregate income. Even this, however, was only found to play a significant role when the constant was excluded from the regression (compare Columns A and B). Cost terms were, as one might expect, found to be very important explanatory variables with an

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35 Of course, it would be nice if all our variables were available on a group-specific basis but in practice they are not.

especially large effect from mortgage costs, but we could find no role for divorce variables.[36] The standard errors on each of the equations do, however, suggest that we have come much closer to 'explaining' household formations for this age-group than we have done for the young category. This may, in part, reflect the fact that supply factors, such as the availability of mortgage finance to first-time buyers is more likely to be a limiting factor for the latter group.

Our best equation for the old category is reported in Table 13. We found that rental costs appear to play a larger role for this group than do other housing costs and that within the latter mortgage costs play no part whatsoever.[37] Income effects appear to be fairly large, but we could find no (separate) role for pensions or other benefits, or wealth. Nevertheless, overall the equation has a fairly small standard error. Again it is interesting to note the large role implied for our divorce variable and the importance of the constant. The latter provides evidence for little in the way of a shift in tastes (since it is mainly the older age groups who appear to be forming more households than we would expect given incomes etc..). This suggests that it may be acting as a proxy for other (missing) variables. The insignificance of the marriage and divorce variables may be due to our having used flow rather than stock variables in our headship rate equation (see footnote 24). However, it is also possible that higher divorce rates have led to an increase in the number of single parent households, and that this may have affected headship rates. Since most single parent households are headed by mothers under the age of 45 this would explain why our divorce variable is significant in the aggregate equation but not for the old category. An alternative explanation is that household formation by never-married men and women increased very markedly, as has been suggested by Holmans, Nandy and Brown (1987).

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36 Obviously more research is needed here. Becker (1981), for example, thinks that the distinction between first marriages and re-marriages an important one.

37 This is hardly surprising since nearly all the old owner-occupiers own outright (see Charts 8 and 9 and Section 7 below).

All-in-all our disaggregated equations provide fairly convincing evidence that behaviour does vary significantly across age groups and that it is therefore worthwhile continuing research along these lines. Even our aggregate equations provide a fairly accurate description of past trends in household formation, however, [38] suggesting that we should be able to forecast future growth in housing demand due to demographic factors fairly well (provided, of course, that we can forecast accurately population, incomes etc ...). By way of illustration Table 14 shows our predictions (using model D, Table 9) where we have taken the Office of Population Censuses and Surveys' predictions of population growth (see OPCS (1987)) and assumed that both average earnings and consumer prices continue to grow at their 'average' rates (measured over the period 1971-85), whilst real rents, housing costs and the divorce and marriage variables remain at current values. For purposes of comparison we also show the Department of the Environment's 1983-based and 1985-based projections of the number of households in England and Wales for selected years over the next two decades. (They project headship rates by fitting a scaled tanh curve to census and labour force survey data (see Department of the Environment (1988)) and so do not allow for the possibility that incomes, housing costs etc may influence household formation.) Their projections have been re-scaled to give GB estimates (which, of course, is equivalent to assuming that household formations in Scotland will take place at the same rate as in England and Wales, which they probably will not). Nevertheless, such a simplification does make it clear that our model forecasts fairly similar rates of growth.[39]

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38 This is all the more surprising given that only a decade ago the Department of the Environment claimed that, "no-one has yet been able to relate changes in headship rates in any formal way to the cost or availability of housing, or to incomes". See Department of the Environment (1977), p113.

39 In practice our use of 'average' rates of growth of prices and average earnings results in perhaps too strong growth in real earnings, which may be a factor in explaining our faster rate of increase in the (projected) number of households. Also, some of the gap between our model and the 1983-based projections is likely to reflect the Department of Environment's low (predicted) headship rates for males under 45. According to King (1986) "a more reasonable scenario ..... would add (to their projection) a further 350,000 households to the national (English) figure", whilst a more optimistic housing market scenario "would add a further 200,000 by 2001."

Section 7: The Growth in Owner-Occupation

Our results presented in the previous section suggest that both demographic and economic factors have influenced the rate at which household formations has taken place over the last two decades, although, rather surprisingly, economic variables appear to have played only a secondary role. We might expect, however, that they would be more relevant to households' tenure decisions. For this reason we now briefly examine trends in the aggregate ownership rate (the ratio of homeowners[40] to the total number of households) and in ownership rates for specific age categories and for specific household types. Much of the evidence from the US suggests that the difference between rents and the costs of owner-occupation plays a significant role in explaining the rise in the aggregate ownership rate during the last two decades. However, rising real incomes growth also makes a contribution as does the changing size and age structure of the population and the increased rate of household formation.

In Section 3 we showed how it was possible to decompose shifts in the aggregate headship rate into two main elements. Below we analyse shifts in the aggregate ownership rate in much the same way, but with the added complication that we also distinguish between different types of household (singles, couples, families, etc), different ages (of head of household) and different categories of owner (those with a mortgage and those without).

Let O_t denote the number of owners at time t, which can be distinguished between those with a mortgage (OM_t) and those who own outright (OO_t). We denote the aggregate ownership rate (OR_t) as simply the ratio of all owners to the total number of households;

$$OR_t = \frac{O_t}{H_t} = \frac{OO_t + OM_t}{H_t} \quad t = 1, 2.....T. \qquad (10)$$

Similarly, we can define ownership rates for specific categories distinguishing between age groups (indexed by a) and between types of household (indexed by m);

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40 ie Owner-occupiers: for our purposes we will sometimes need to distinguish between those with and those without mortgages.

$$OR_{amt} = \frac{O_{amt}}{H_{amt}} \qquad \begin{matrix} a = 1, 2 \ldots\ldots A \\ m = 1, 2 \ldots\ldots M \\ t = 1, 2 \ldots\ldots T \end{matrix} \tag{11}$$

Using (10) and (11) and the (obvious) adding-up constraints across type and age, we can express the aggregate ownership rate in terms of our age and type specific ownership rates;

$$OR_t = \sum_a \sum_m OR_{amt} \, Z_{amt} \qquad t = 1, 2 \ldots\ldots T \tag{12}$$

$$\text{where } Z_{amt} = H_{amt}/H_t \tag{13}$$

Now, using (10)-(13) we can decompose changes in the number of owners into a number of elements. From (10) we can see that;

$$\Delta O_t = OR_t H_t - OR_{t-1} H_{t-1} \tag{14}$$

Next we use (12) to substitute for OR_t, giving;

$$\Delta O_t = \sum_a \sum_m OR_{amt} \, H_{amt} - \sum_a \sum_m OR_{amt-1} \, H_{amt-1}$$

$$= \sum_a \sum_m OR_{amt} \, H_{amt} - \sum_a \sum_m OR_{amt-1} \, H_{amt}$$

$$+ \sum_a \sum_m OR_{amt-1} \, H_{amt} - \sum_a \sum_m OR_{amt-1} H_{amt-1}$$

$$= \sum_a \sum_m OR_{amt-1} \, \Delta H_{amt} + \sum_a \sum_m \Delta OR_{amt} \, H_{amt}$$

$$= \sum_a \sum_m OR_{amt-1} (P_{amt} \, HR_{amt} - P_{amt-1} \, HR_{amt-1})$$

$$+ \sum_a \sum_m \Delta OR_{amt} \, P_{amt} \, HR_{amt}$$

$$- \sum_a \sum_m OR_{amt-1} \Delta P_{amt} HR_{amt-1}$$

$$+ \sum_a \sum_m OR_{amt-1} P_{amt} \Delta HR_{amt}$$

$$+ \sum_a \sum_m \Delta OR_{amt} P_{amt} HR_{amt} \qquad (15)$$

The first term of (15) represents the effects of population changes on the number of owners, assuming headship rates and ownership rates remain unchanged. The second term represents the effects of changes in headship rates given the true population distribution is known but assuming ownership rates are unchanged, whilst the third term represents the effects of changes in ownership rates given the true population distribution and headship rates are known. An alternative means of interpreting changes in the ownership rate is to follow Hendershott's (1987) approach, by concentrating on the effect of changes in type-specific ownership rates (OR_{mt}). These are defined as;

$$OR_{mt} = \frac{O_{mt}}{H_{mt}} = \frac{\sum_a O_{amt}}{\sum_a H_{amt}} \qquad \begin{matrix} m = 1, 2 \ldots\ldots M \\ t = 1, 2 \ldots\ldots T \end{matrix} \qquad (16)$$

Clearly we can use (16) and (10) to write;

$$OR_t = \sum_m OR_{mt} K_t \qquad (17)$$

where $K_t = \left(\frac{H_{mt}}{H_t} \right)$ (ie K_t is the share of households of type m).

We can rewrite (17) as;

$$OR_t = \sum_m \left(\frac{O_{mt}}{H_{mt}} \quad \frac{H_{mt}}{H_t} \right)$$

$$= -\sum_m \left(\frac{O_{mt}}{H_t} \right)$$

$$= -\sum_m \left(\sum_a \frac{O_{amt}}{H_t} \right)$$

$$= -\sum_m \left(\sum_a \left(\frac{O_{amt}}{H_{amt}} \right) \left(\frac{H_{amt}}{H_{at}} \right) \left(\frac{H_{at}}{P_{at}} \right) \left(\frac{P_{at}}{P_t} \right) \left(\frac{P_t}{H_t} \right) \right)$$

$$= \sum_m \left(\sum_a \frac{OR_{amt} \quad Q_{amt} \quad HR_{at} \quad S_{at}}{HR_t} \right) \qquad (18)$$

where $Q_{amt} = \left(\frac{H_{amt}}{H_{at}} \right)$

(ie Q_{amt} is the share of households in age category a who are of type m)

To isolate the impact of changing population age-shares we can use (18) to calculate OR_t holding the age-specific ownership and headship rates and household composition shares constant (ie just the S_{at} in (18) would be free to change). Similarly the joint impact of changing age and household-composition shares can be isolated by holding the age-specific ownership and headship rates constant (and letting both the S_{at} and the Q_{amt} vary in (18)). The results of carrying out such an analysis are discussed below.

Section 8: Ownership Rates during the 1970s and 1980s

Table 15 and Charts 6 and 7 show ownership rates (based on GHS data) for each of the age categories used previously to analyse headship rates. Clearly, nearly all of the rise in the aggregate ownership rate (from 49% in 1971 to 60% in 1985) is due to the rise in the proportion of homeowners with mortgages, since the percentage of outright owners has remained between 22 and 25% throughout the period (witness the alpine slopes in Chart 6 compared with the polders of Chart 7 as regards the time domain). Within the former category the fastest rates of increase have been amongst the 45-59 age group (up 60% in total), although there has also been strong growth in the 30-44 category. The sharp rise during the 1980s in ownership rates of the 45-59 age group is likely to reflect the increase in council house sales, due to the much higher discounts in effect from June 1979 ownards. This permitted tenants to buy their properties at much reduced prices, giving an opportunity for house purchase to people in the 40s and 50s whose opposite numbers a generation younger would have become owner-occupiers as a matter of course. Thus the result of the increase in council houses sales has been to push owner-occupation down the scale of incomes only modestly, but to extend it markedly up the range of ages.

For younger households ownership rates were fairly constant during the 1970s, but recent years have witnessed a sharp upturn. For example, rates for the 25-29 category increased by close to one-quarter during the first half of the 1980s having remained flat throughout the 1970s. Much of this rise is likely to reflect changes in the supply of mortgage finance, with greater competition amongst lenders leading to a reduction in the constraints which previously impinged on (potential) borrowers. Finally, figures for older households have shown little variation, with the over-sixties' ownership rate increasing by just 7% between 1971 and 1985. This is due to the fact that, for higher age groups, the ownership rate is likely to change mainly through ageing. Thus, for example, the 65-59 category of household heads in 1986 were aged 50-54 in 1971 and so will retain, with little change, the tenure proportions of the 50-54 category in 1971.

Tables 16 through 18 provide a more disaggregated analysis of ownership rates for selected years over the last decade.[41] Details of the household types we have used are given in Appendix A. Because of the high degree of disaggregation it should be emphasised that some of the categories are based on extremely small samples (with obvious implications for drawing generalisations for the population as a whole). Table 16 shows that ownership rates are generally higher for males than females and usually higher for small households (except individuals) than for large ones. More interestingly ownership rates do not appear to be similarly related to age across household types (although they nearly always rise with age until middle-age, and are more stable thereafter). Thus, taking the age category at which ownership rates peak for each of our ten household types we find that in 1975 one was in the 25-29 category, four in the 30-44 category, two in the 45-59 category, two in the 60-64 category and one in the 90+ category.[42]

Table 17 indicates that, by 1980, this picture had changed somewhat with ownership rates peaking rather more often in the 30-44 age range. Moreover, by 1985 the position had been reached in which all but two of the type-specific modal ownership rates were in this category (see Table 18). This was despite the fact that ownership rates of the 45-59 category had risen fastest over the period as a whole.

Our figures also show that ownership rates have generally grown faster for small households (especially young and middle-aged individuals) than for large ones. Thus, whilst most categories of individual householders between the ages of 25 and 60 had ownership rates of between 30 and 40% in 1975, there had risen to between 45 and 65% in 1985 (up broadly one-half). This group includes both widows and widowers and (generally younger) men and women living alone. Very few widows and widowers move from renting to owner-occupation and those that do are, in the main, balanced by moves the other way. Hence, their tenure is largely that of the married couples of which they are survivors, which is strongly influenced by ageing in the way mentioned above (page 33). However, among young and middle-aged never-married men and women

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41 These figures, which have not previously been published, were kindly provided by the GHS Unit at the OPCS.

42 Note that we have excluded those categories with very small samples in calculating these figures.

there is a strong upward trend in the proportion of owner-occupiers (see, for example, Holmans, Nandy and Brown (1987)). Table 19 illustrates how important changes in the type-structure of the household population may have been in explaining rising ownership rates, for it is particularly noticeable that the fraction of households aged 25-45 in small households (mainly couples) rose quickly between 1980 and 1985 and it is these groups which have the highest ownership rates (see Tables 16 to 18). This also suggests that marital status is important; age for age, married couple households are more likely to be owner-occupiers than are households headed by formerly married or never-married heads. Similar considerations apply to the small families category, which can be either married couples with children or lone parent families - the former being much more likely to be owner-occupiers.[43]

To try and gauge the effects of changes in the age distribution of the population on the aggregate ownership rate we have used (15) to decompose ΔO into a number of components. Table 20 shows that between 1971 and 1985 the number of owners rose by 3 3/4mn, three-quarters of which was due to more households taking on mortgage debt (especially during the 1980s - see Charts 8 and 9). Changes in the population's size and age structure increased ownership by a little over 1/2mn, and higher headship rates contributed close to 3/4mn. But the vast majority of the increase (a little under 2 1/2mn) was due to higher ownership rates. We do not attempt to analyse why households have shifted towards owning rather than renting, although Dicks (1988) attempts to build a simple model of the housing market which can be used for this purpose. A few points are worth noting, however. Firstly, it is unlikely that "housing demand" can tell us the whole story, since subsidised rents in the public sector housing market has led to rationing of council houses, whilst (in the past at least) the supply of mortgage finance has also been sometimes restricted and of course, developments in the construction industry may have had repercussions. Secondly, regional effects may be important. For example, housing has become a particularly attractive investment in London and the South East in recent years, in part because of supply constraints such as planning restrictions in the 'Green Belt'. Finally, it is obvious that incomes, house prices, interest rates and taxes

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43 The connection between marital status and tenure is also evident in other countries. Research carried out by Ermisch (1986) suggests that there may be a stronger link between marriage and leaving home in Britain than in countries with more fluid markets for rental housing, such as Denmark.

will have each played a significant role. If they are to explain the surge towards ownership which has occurred during the 1980s, however, then one must expect to find a 'big' income elasticity, a 'small' interest rate elasticity and a strong effect from anticipated capital gains.

APPENDIX A: Definitions and Terms[44]

Family

A family is defined as:

(a) a married couple on their own, or

(b) a married couple/lone parent and their never-married children, provided these children have no children of their own.

Head of Household

The head of the household is a member of the household and (in order to precedence) either the husband of the person, or the person, who:

(a) owns the household accomodation, or
(b) is legally responsible for the rent of the accomodation, or
(c) has the accomodation as an emolument or perquisite, or
(d) has the accomodation by virtue of some relationship to the owner in cases where the owner or leasee is not a member of the household.

When two members of a different sex have equal claim, the male is taken as head of the household. When two members of the same sex have equal claim, the elder is taken as head of the household.

Household

Between 1971 and 1980 the definition used by the GHS was (in summary):
A single person or a group of people who all live regularly at the address and who are all catered for, for at least one meal a day, by the same person.

In 1981 a new definition was adopted, intending to make the survey comparable with the 1981 Census definition. The new definition is:

A single person or a group of people who have the address as their only or main residence and who either share one meal a day or share the living accommodation.

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44 Taken from the GHS and Social Trends.

Household Type

We have used the following categories:

Individuals	:	1 adult
Small (adult) households	:	2 adults
Small 'Families'	:	1 or 2 persons aged 16 or over and 1 or 2 persons aged under 16.
Large 'Families'	:	1 or more persons aged 16 or over and 3 or more persons aged under 16, or 3 or more persons aged 16 or over and 2 persons aged under 16.
Large (adult) Households	:	3 or more persons aged 16 or over, with or without 1 person aged under 16.

Note that the term 'family' in this context does <u>not</u> necessarily imply any relationship. Hence, the GHS' definition of the large adult household does not preclude such a household being a family in the more usual sense of the word (see definition above). Neither does it preclude the household including a non-adult member (hence we have dropped the term 'adult' in the text). Note also that a small 'family' may be larger than a 'large adult household'.

Population

Enumerated Population: These figures relate to the population enumerated at successive Censuses and mid-year estimates.

Resident Population: These figures include all those usually resident in the area, whatever their nationality. Members of HM and non-UK armed forces are taken to be resident at their stationed address. Students are taken to be resident at their term-time address.

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Table 1: The UK Population[1]

	Thousands	Average annual increase
1901	38237	
		)385
1911	42082	
		)195
1921[2]	44027	
		)201
1931[2]	46038	
1941	na	}209
1951	50225	
		)258
1961	52807	
		)312
1971	55928	
		)42
1981	56352	
		)82
1986	56763	
		)138
1991	57452	
		)151
2001	58957	

(1) Census enumerated population up to 1951; mid-year estimates of resident population from 1951 to 1986 and mid-1985 based projections of resident population thereafter.

(2) Figures for Northern Ireland are estimated.

Table 2: The Age Distribution of the UK Population[1]

Thousands (% of total persons)	1951		1961		1971		1981[2]	
MALES								
Under 5	2215	(4.4)	2162	(4.1)	2312	(4.2)	1717	(3.2)
5-14	3566	(7.1)	4159	(7.9)	4561	(8.2)	4159	(7.5)
15-29	5073	(10.1)	5159	(9.8)	5915	(10.7)	6294	(11.4)
30-44	5461	(10.9)	5225	(9.9)	4909	(8.8)	5401	(9.8)
45-64	5554	(11.1)	6397	(12.1)	6452	(11.6)	6003	(10.9)
65-74	1561	(3.1)	1602	(3.0)	1976	(3.6)	2210	(4.0)
75 and over	687	(1.4)	776	(1.5)	828	(1.5)	1019	(1.8)
All Males	24118	(48.0)	25481	(48.3)	26952	(48.5)	26803	(48.7)
FEMALES								
Under 5	2111	(4.2)	2051	(3.9)	2194	(4.0)	1632	(3.0)
5-14	3433	(6.8)	3964	(7.5)	4321	(7.8)	3946	(7.2)
15-29	5255	(10.5)	5100	(9.7)	5764	(10.4)	6115	(11.1)
30-44	5663	(11.3)	5300	(10.1)	4850	(8.7)	5359	(9.7)
45-64	6425	(12.8)	7003	(13.3)	6931	(12.5)	6293	(11.4)
65-74	2128	(4.2)	2369	(4.5)	2737	(4.9)	2839	(5.2)
75 and over	1091	(2.2)	1442	(2.7)	1765	(3.2)	2102	(3.8)
All Females	26107	(52.0)	27228	(51.7)	28562	(51.5)	28286	(51.3)
All Persons	50225		52709		55514		55089	

(1) Census enumerated population.

(2) 1981 data cover the 'usually resident' population and are not strictly comparable with earlier data.

Table 3: Changes in the Number of Households during the 1970s and the first half of the 1980s

Thousands	Age Categories (by age of Head of Household)							
	All Households	< 25	25-29	30-44	45-59	60-64	65-69	70-79	80+
Changes between 1971 & 1985;									
Total;	2775	204	415	1128	-464	150	43	853	446
Of which;									
Due to population growth(1)	1182	114	149	777	-491	-43	-114	525	265
Due to changes in headship rates	1593	90	266	351	26	193	157	329	181
Changes between 1971 & 1975;									
Total;	987	2	247	4	-360	117	299	563	114
Of which;									
Due to population growth(1)	330	-24	198	60	-180	-21	64	189	43
Due to changes in headship rates	656	26	49	-56	-182	138	235	374	72
Changes between 1975 & 1980;									
Total;	732	70	-23	428	170	-232	70	78	172
of which;									
Due to population growth(1)	430	81	-144	479	-93	-203	-1	233	78
Due to changes in headship rates	301	-11	121	-52	263	-30	71	-155	94
Changes between 1980 & 1985;									
Total;	1056	132	191	697	-274	265	-326	212	159
of which;									
Due to population growth(1)	420	57	95	238	-220	181	-177	103	144
Due to changes in headship rates	636	75	96	459	-55	84	-149	109	16

(1) ie If headship rates for <u>each</u> age category had remained at their base year levels then this is the change in the number of households one would have expected, given the changes in the population's structure and size which occurred.

Table 4: Population shares by Age Category (selected years 1971 - 1985)

	CATEGORY								
	0-15	16-24	25-29	30-44	45-59	60-64	65-69	70-79	80 +
1971	25.4	13.1	6.6	17.5	18.3	5.8	4.9	6.1	2.3
1973	25.2	12.6	7.4	17.5	17.9	5.7	5.0	6.3	2.4
1975	24.8	12.6	7.5	17.7	17.6	5.7	5.1	6.6	2.4
1977	23.9	13.1	7.2	18.3	17.6	5.4	5.1	6.9	2.5
1979	23.0	13.6	6.9	19.1	17.7	4.9	5.1	7.2	2.6
1981	22.1	14.3	6.8	19.5	17.0	5.2	5.0	7.3	2.8
1983	21.2	14.7	6.9	19.8	16.7	5.7	4.6	7.4	3.0
1985	20.8	14.8	7.2	20.1	16.5	5.6	4.5	7.5	3.2

Table 5: The number of households in Great Britain (1971 and 1981)(1)

Figures are based on a 10% sample		1971	1981
All private households with usual residents		18317	19493
Of which;			
Households with no family		4068	5162
Households with one family		13986	14161
Households with two or more families		263	170
Resident population		54388	54815
Enumerated population		53979	54286
Average household size	(2)	2.97	2.81
	(3)	2.95	2.78
	(4)	2.91	2.70
Aggregate headship rate	(2)	33.7%	35.6%
	(3)	33.9%	35.9%
	(4)	34.4%	37.0%

(1) As measured by the Censuses. Note the change of definition of household between 1971 and 1981 (see Appendix A).
(2) Based on the resident population figures.
(3) Based on the enumerated population figures.
(4) Based on the General Household Surveys.

Table 6: Household Shares by Age of Head of Household (selected years 1971-1985)

	16-24	25-29	30-44	45-59	60-64	65-69	70-79	80+
1971	4.2	7.1	26.3	29.3	9.9	8.4	11.2	3.6
1973	4.1	8.3	24.5	28.1	9.8	9.4	11.7	4.2
1975	4.3	8.6	25.3	26.3	9.7	9.0	12.8	4.0
1977	4.1	8.5	25.4	26.2	8.8	9.0	13.7	4.3
1979	4.3	7.8	26.1	26.2	8.0	9.4	13.5	4.7
1981	4.1	7.5	27.3	25.4	8.5	8.8	13.7	4.6
1983	4.2	7.5	26.7	24.0	9.4	8.5	14.3	5.4
1985	4.6	8.1	28.2	23.3	9.4	7.5	13.8	5.3

Table 7: Headship Rates by Age Category (selected years, 1971-85)

	AGE CATEGORY								
	All	<25	25-29	30-44	45-59	60-64	65-69	70-79	80+
1971	34.4	11.0	37.0	51.5	55.0	58.8	58.9	63.3	53.4
1973	35.4	11.5	39.8	49.6	55.4	60.4	66.3	65.6	62.4
1975	36.0	12.2	41.1	51.5	53.7	61.3	63.6	69.9	58.7
1977	36.9	11.6	43.6	51.1	55.0	59.8	65.1	73.6	62.6
1979	37.5	11.8	42.4	51.2	55.6	61.5	69.1	70.7	66.9
1981	37.0	10.6	40.9	51.9	55.4	60.2	65.3	69.3	60.8
1983	37.9	10.8	41.1	51.2	54.5	62.9	70.4	72.7	68.3
1985	39.1	12.1	43.7	54.8	55.3	65.4	65.0	71.5	64.9

Table 8: Headship rates for Great Britain and for England and Wales by Age Category and by Sex

	AGE CATEGORY								
	Under 25	25-29	30-44	45-59	60-64	65-69	70-79	80+	ALL
Great Britain(1)									
1971	11.0	37.0	51.5	55.0	58.8	58.7	63.3	53.4	34.4
1981	10.6	40.9	51.9	55.4	60.2	65.3	69.3	60.8	37.0
England and Wales(2)									
1961	6.0	33.4	43.8	52.3	57.8	60.6	63.4	58.6	32.7
1971	11.7	40.1	47.7	53.1	60.2	64.3	68.8	68.7	35.0
1981	10.3	41.5	50.2	54.7	59.7	64.4	70.9	73.8	37.2
Of which:									
Males									
1961	11.0	63.7	83.4	91.2	92.4	91.2	86.7	72.5	54.2
1971	20.3	74.5	88.1	92.9	94.6	94.1	92.0	82.4	56.5
1981	15.4	71.5	88.9	93.7	95.3	95.4	94.2	87.9	58.2
Females									
1961	1.0	2.2	4.5	15.4	30.0	39.0	49.2	51.9	12.6
1971	2.8	5.0	6.5	15.2	29.9	40.6	55.0	63.2	14.7
1981	4.9	11.1	11.1	16.5	27.9	38.7	55.3	68.5	17.2

(1) Based on the General Household Survey.

(2) Based on figures provided by the Department of the Environment and used by King (1986).

Table 9

Dependent Variable; ΔH

Explanatory Variable;	Coef. (t-value)				
	A	B	C	D	E
ΔHD	1.098(3.2)	1.000(-)	1.000(-)	1.000(-)	1.000(-)
P_t ΔY^{ϕ}	0.001(0.3)	0.001(0.2)	0.002(1.0)	-	-
$P_t \Delta WY\phi$	- -	-		0.127(2.5)	0.125(2.3)
$P_t \Delta R$	-0.305(0.8)	-0.310(0.9)	-0.404(1.2)	-0.553(2.1)	-0.422(1.6)
$P_t \Delta M$	-0.081(0.9)	-0.095(1.3)	-0.072(1.2)	-0.984(2.7)	-0.088(2.5)
$P_t \Delta MR$	-0.115(2.0)	-0.113(2.2)	-0.150(2.8)	-0.096(2.2)	-
$P_t \Delta DR$	0.086(1.7)	0.089(1.9)	-	-	-
$P_t \Delta DRO$	-	-	0.356(2.5)	0.281(2.4)	-
$P_t \Delta (DR-MR)$		-	-	-	-0.070(2.0)
C	65.9(2.0)	75.1(8.3)	73.1(8.8)	66.2(9.7)	64.7 (8.8)
Standard Error;	18.2	17.1	15.5	12.4	13.0
R squared	0.83	0.83	0.86	0.91	0.89
DW Statistic	1.22	1.20	1.44	2.44	2.27
Ljung Box Statistic	2.37	2.49	1.12	0.94	0.56
F-test of linear restriction;	-	0.08	0.84	0.04	0.07

ϕ See text (page 25).

Table 10

Dependent Variable; ΔH

Explanatory Variable;	Coef (t-value)					
	A		B		C	
ΔHD	1.000	(-)	1.000	(-)	0.715	(4.7)
P_t ΔYϕ	0.002	(1.1)	0.002	(1.8)	0.003	(1.2)
P_tΔR	-0.310	(1.2)	-0.348	(1.4)	-0.154	(0.4)
P_tΔM	-0.054	(1.4)	-0.014	(0.3)	-0.055	(1.1)
P_tΔMR	-0.058	(1.3)	-0.101	(2.3)	0.012	(0.3)
P_tΔDR	-		-		-	
P_tΔDRO	0.138	(1.2)	0.187	(1.7)	0.081	(0.6)
C	88.4	(13.7)	85.0	(13.7)	119.2	(10.0)
Standard Error;	13.5		12.3		18.4	
R Squared;	0.91		0.92		0.79	
DW Statistic;	0.90		1.02		0.73	
Ljung Box statistic;	5.13		4.03		9.55	
F Test of linear Restriction;	3.29		2.83		-	

ϕ See text (p 28).

Table 11

Dependent Variable; ΔH_y

Explanatory Variable;	Coefficient	(t-value)
ΔHD_y	1.000	(-)
$P_t \Delta Y_y$	0.001	(1.8)
$Pt\Delta R$	-0.713	(1.4)
$Pt\Delta O$	-0.212	(1.7)
$Pt\Delta MR$	-0.214	(2.0)
$P_t \Delta DR$	0.184	(2.1)
$P_t \Delta W$	0.002	(2.6)
C	-19.8	(1.7)

Standard Error:	26.9
R Squared:	0.76
DW Statistic:	1.39
Ljung Box Statistic:	1.28
F-test of linear restriction;	0.09

Table 12

Dependent Variable; ΔH_m

Explanatory Variable;

	Coef (t-value)	
	A	**B**
ΔHD_m	1.000 (-)	1.000 (-)
$P_t\Delta Y$	0.003 (0.9)	0.007 (16.3)
$P_t\Delta R$	-0.425 (4.6)	-0.372 (4.6)
$P_t\Delta M$	-0.630 (5.7)	-0.743 (8.8)
$P_t\Delta MR$	-0.045 (3.0)	-0.049 (4.6)
$P_t\Delta DR$	-0.005 (0.4)	-
$P_t\Delta W$	0.001 (7.4)	0.001 (8.4)
C	13.8 (1.6)	-
Standard Error:	4.2	4.3
R Squared:	0.995	0.998
DW Statistic:	2.24	2.66
Ljung Box Statistic:	0.33	2.37
F-test of linear restriction;	1.52	0.94

Table 13

Dependent Variable; ΔH_0

Explanatory Variable;	Coefficient	(t-value)
ΔHD_0	1.000	(-)
$P_t\Delta Y$	0.004	(2.7)
$P_t\Delta R$	-0.279	(1.0)
$P_t\Delta O$	-0.122	(1.5)
$P_t\Delta MR$	-0.081	(1.1)
$P_t\Delta DRO$	0.223	(1.2)
C	44.2	(7.2)
Standard Error;	17.5	
R Squared;	0.83	
DW Statistic;	2.18	
Ljung Box Statistic;	0.29	
F-test of linear restriction;	0.21	

Table 14: Projections from Our Simple Aggregate Model(1) Compared with those from the Department of the Environment

Number of Households, thousands. (Percentage changes on five years previous)

	1986	1991	1996	2001
Our Model (Great Britain)(2)	21,212 (4.8)	22,440 (5.8)	23,557 (5.0)	24,422 (3.7)
Department of the Environment (England and Wales)				
1983-based projections:	18,922	19,741	20,311	20,596
1985-based projections:(3)	19,231	20,216	20,872	21,352
Department of the Environment Based Estimates (Great Britain)				
1983-based projections:(4)	20,871 (4.0)	21,774 (4.3)	22,403 (2.9)	22,717 (1.4)
1985-based projections:	21,212 (4.2)	22,199 (4.7)	23,022 (3.7)	23,551 (2.3)

(1) See Column D of Table 9.

(2) These have been re-scaled to give a similar figure for 1986 as the D of E 1985-based GB projections.

(3) All figures uplifted by 137,000 owing to apparent understatement of the 1981 mid-year total.

(4) These are simply the D of E projections re-scaled using a scaling factor of 1.103, as suggested by the Census National Report Part I Table 18.

Table 15: Ownership Rates by Age Category (selected years, 1971-85)

A Outright Owners (%)(1)

	AGE CATEGORY								
	Under 25	25-29	30-44	45-59	60-64	65-69	70-79	80+	ALL
1971	2.0	3.0	8.0	21.0	40.0	43.0	43.0	41.0	22.2
1973	2.0	3.0	9.0	21.0	40.0	40.0	43.0	38.0	22.7
1975	2.0	3.0	8.0	22.0	36.0	44.0	44.0	41.0	23.5
1977	1.0	3.0	7.0	22.0	38.0	42.0	43.0	45.0	22.8
1979	1.0	3.0	6.0	23.0	35.0	43.0	40.0	40.0	22.0
1981	1.0	2.0	7.0	23.0	39.0	45.0	43.0	41.0	23.0
1983	2.0	2.0	7.0	24.0	40.0	44.0	44.0	45.0	24.1
1985	0.0	2.0	6.0	22.0	44.0	47.0	47.0	45.0	23.5

B Owners with a Mortgage (%)(1)

1971	30.0	50.0	48.0	27.0	11.0	4.0	3.0	2.0	27.0
1973	26.0	51.0	50.0	27.0	9.0	3.0	2.0	1.0	26.5
1975	28.0	50.0	50.0	29.0	10.0	3.0	1.0	1.0	26.8
1977	31.0	49.0	54.0	30.0	10.0	4.0	1.0	1.0	28.4
1979	33.0	49.0	57.0	31.0	9.00	4.0	2.0	1.0	29.6
1981	29.0	50.0	57.0	34.0	11.0	4.0	1.0	1.0	30.7
1983	28.0	53.0	62.0	39.0	13.0	5.0	2.0	1.0	33.1
1985	34.0	60.0	66.0	43.0	14.0	5.0	1.0	1.0	36.9

(1) Rounded to the nearest percentage point.

Table 16: Ownership rates by age of head of household, by sex and by household type

1975 All figures are percentages

	Household types[1]									
	Individuals		Small Households		Small Families		Large Families		Large households	
AGE	M	F	M	F	M	F	M	F	M	F
<24	12.0	3.2	50.0	(0.0)	29.2	3.2	(0.0)	(0.0)	20.0	(20.0)
25-29	30.4	22.6	68.2	(25.0)	55.2	25.0	31.1	0.0	61.5	(16.7)
30-44	32.3	39.3	69.9	31.8	70.7	32.0	47.7	28.6	58.7	33.3
45-59	34.7	42.5	53.2	31.9	58.6	39.5	50.4	15.4	49.3	29.3
60-64	33.9	38.4	50.6	43.5	50.0	(50.0)	57.1	(0.0)	46.4	46.2
65-69	39.2	39.2	54.1	45.9	(50.0)	(0.0)	(20.0)	(25.0)	46.6	36.3
70-79	39.7	42.2	50.7	46.4	(33.3)	(0.0)	(20.0)	(66.7)	44.3	33.3
80 +	41.7	30.3	50.0	33.3	(0.0)	NA	(100.0)	(50.0)	46.7	57.1

M Males
F Females

NA No households were sampled in these categories.

Figures in brackets refer to categories where the total number of households in the sample was 10 or less.

(1) For definitions of household types see Appendix A.

Source: Unpublished data from the General Household Survey.

Table 17: Ownership rates by age of head of household, by sex and by household type

1980 All figures are percentages

AGE	Household type(1)									
	Individuals		Small Households		Small Families		Large Families		Large Households	
	M	F	M	F	M	F	M	F	M	F
< 24	9.4	9.3	59.6	(20.0)	31.3	2.5	(40.0)	(0.0)	(40.0)	(0.0)
25-29	41.3	29.8	78.2	7.7	52.8	14.9	36.6	(14.3)	52.6	(33.3)
30-44	57.4	41.3	76.5	47.8	70.3	35.1	54.3	31.8	61.9	28.6
45-59	34.1	46.7	60.5	38.0	64.1	31.6	52.3	(22.2)	60.7	41.8
60-64	33.9	45.2	57.1	45.2	61.9	(0.0)	(50.0)	(0.0)	54.4	20.8
65-69	42.0	37.6	53.8	37.6	(55.5)	(50.0)	(33.3)	(100.0)	40.7	38.5
70-79	40.0	37.8	53.7	37.8	(66.7)	(0.0)	(16.7)	(0.0)	48.4	54.5
80 +	31.7	35.6	53.9	35.6	NA	NA	(0.0)	NA	47.4	(37.5)

M Males
F Females

NA No households were sampled in these categories.

Figures in brackets refer to categories where the total number of households in the sample was 10 or less.

(1) For definitions of household types see Appendix A.

Source: Unpublished data from the General Household Survey.

Table 18: Ownership rates by age of head of household, by sex and by household type

1985 All figures are percentages

AGE	Individuals		Household type(1) Small Households		Small Families		Large Families		Large Households	
	M	F	M	F	M	F	M	F	M	F
< 24	29.7	10.7	66.7	16.7	34.0	2.4	(25.0)	(0.0)	28.6	(0.0)
25-29	54.7	44.4	84.1	69.2	62.5	13.3	46.0	18.2	38.1	(42.9)
30-44	59.6	64.6	83.7	78.0	78.4	51.4	63.6	41.4	76.6	38.1
45-59	44.3	44.5	70.2	40.0	71.9	34.2	56.1	(25.0)	73.6	55.0
60-64	42.2	44.1	65.1	56.1	68.4	(50.0)	(16.7)	NA	61.9	46.2
65-69	35.7	41.7	61.2	56.0	(28.6)	(100.0)	(50.0)	NA	55.3	(22.2)
70-79	40.9	42.8	56.6	46.9	(100.0)	(33.3)	NA	NA	38.7	41.7
80 +	50.0	36.9	59.0	59.6	(0.0)	(0.0)	NA	NA	(90.0)	(37.5)

M Males
F Females

NA No households were sampled in these categories.

Figures in brackets refer to categories where the total number of households in the sample was 10 or less.

(1) For definitions of household types see Appendix A.

Source: Unpublished data from the General Household Survey.

Table 19: Household Types as a Percentage of Total Households for each age category

Household Type

	AGE CATEGORY								
	All	<25	25-29	30-44	45-59	60-64	65-69	70-79	80+
Individuals									
1975	20.3	15.8	8.3	5.0	11.2	25.8	33.8	51.2	66.4
1980	22.4	24.1	14.3	6.7	13.9	22.8	35.4	49.2	64.7
1985	24.4	26.5	14.9	9.2	14.3	28.2	36.0	51.8	68.3
Small Households									
1975	30.8	42.2	28.1	9.5	31.7	51.6	51.4	39.7	26.7
1980	30.7	34.9	27.2	10.1	30.5	53.4	51.4	42.9	30.2
1985	31.4	33.8	32.2	14.4	31.4	50.6	51.3	42.4	28.1
Large Households									
1975	15.9	3.9	1.8	8.5	35.0	19.0	12.8	7.7	6.1
1980	17.2	3.3	2.5	11.2	37.9	20.7	11.8	7.2	4.9
1985	16.9	5.3	3.5	12.8	39.9	18.1	11.4	5.4	3.4
Small Families									
1975	22.1	36.0	52.0	47.9	13.5	2.2	1.2	0.7	0.2
1980	21.3	35.5	47.2	49.9	10.8	2.2	1.0	0.4	0
1985	20.7	31.8	41.8	46.8	9.9	2.5	1.1	0.4	0.2
Large Families									
1975	10.9	2.1	9.8	29.1	8.6	1.4	0.8	0.7	0.6
1980	8.5	2.2	8.8	22.1	6.8	1.0	0.4	0.3	0.2
1985	6.6	2.6	7.6	16.9	4.4	0.6	0.3	0	0

Source: Unpublished data from the General Household Survey.

Table 20: Changes in the Number of Owners during the 1970s and the first half of the 1980s

Thousands

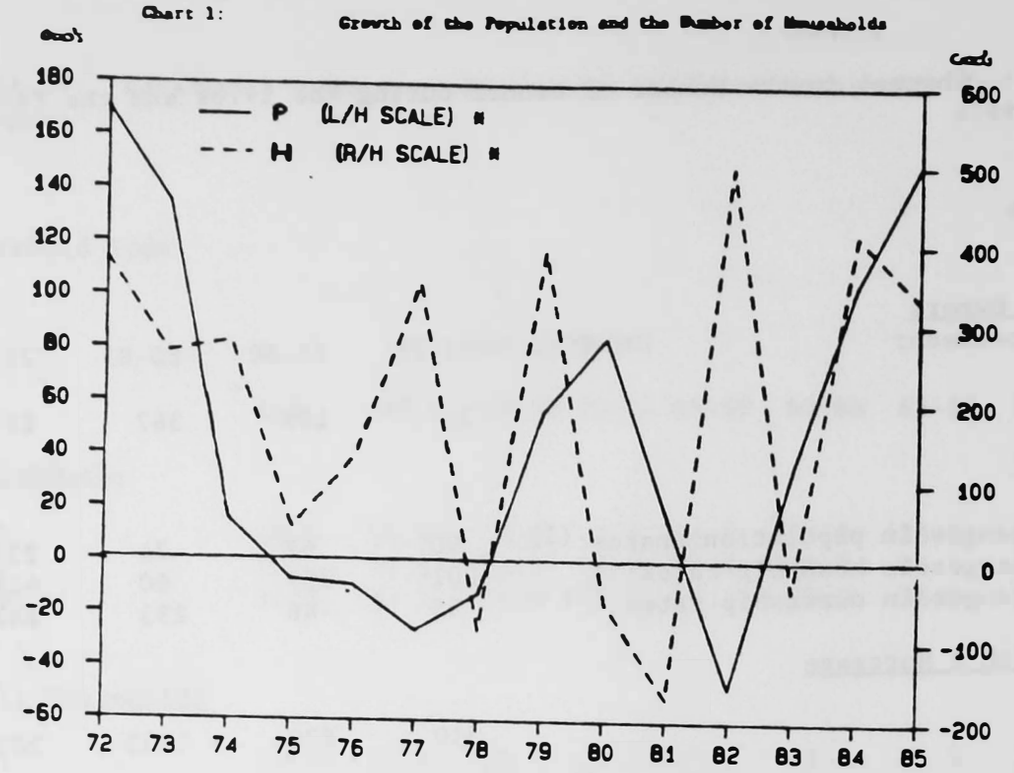
Outright Owners Changes between;	71-75	75-80	80-85	71-85
Total:	347	178	367	891
Of which:				
Due to changes in population shares:(1)	90	67	74	231
Due to changes in headship rates:(2)	201	157	60	418
Due to changes in ownership rates:(3)	55	-46	233	242
Owners with a Mortgage				
Total:	310	879	1703	2892
Of which:				
Due to changes in population shares:(1)	79	143	137	358
Due to changes in headship rates:(2)	99	3	274	378
Due to changes in ownership rates:(3)	132	733	1292	2156

(1) ie What we would have expected had both headship and ownership rates remained at their base year levels (but population shares varied).

(2) ie What we would have expected had ownership rates remained at their base year levels (but population shares and headship rates varied) minus row 1.

(3) ie The difference between the actual rise in number of owners and what we would have expected had ownership rates remained at their base year levels.

Chart 1: Growth of the Population and the Number of Households



* CHANGE OVER PREVIOUS YEAR

H refers to Households

P refers to Population

Chart 2: Population and the Number of Households

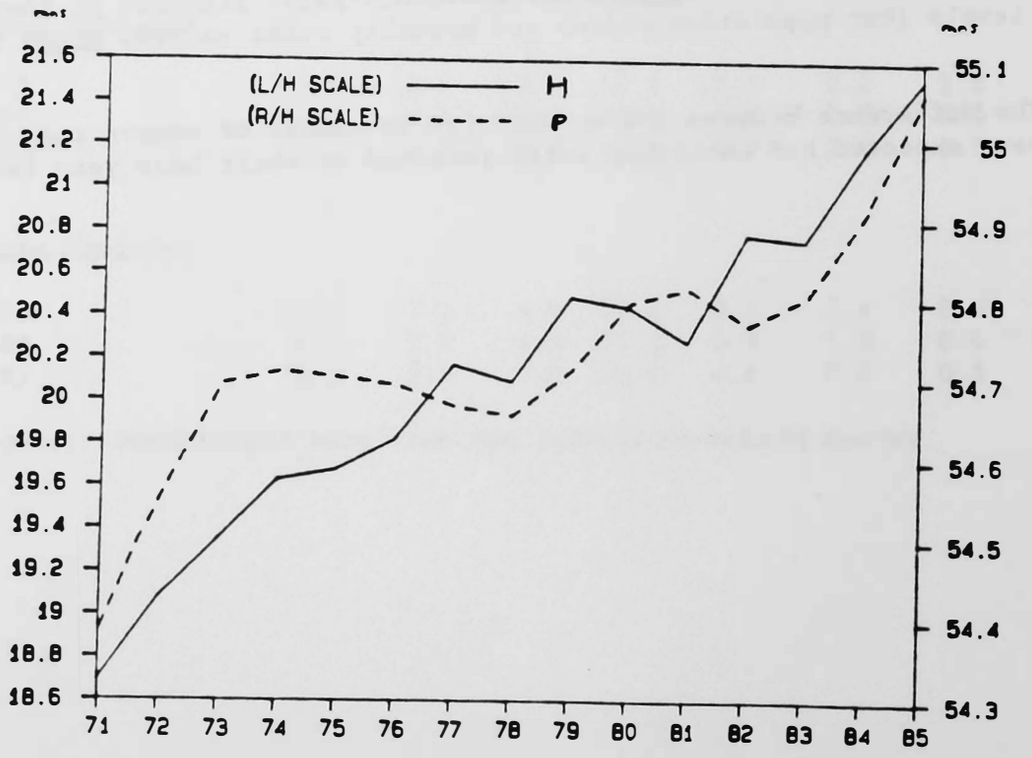


Chart 3: Population by age category

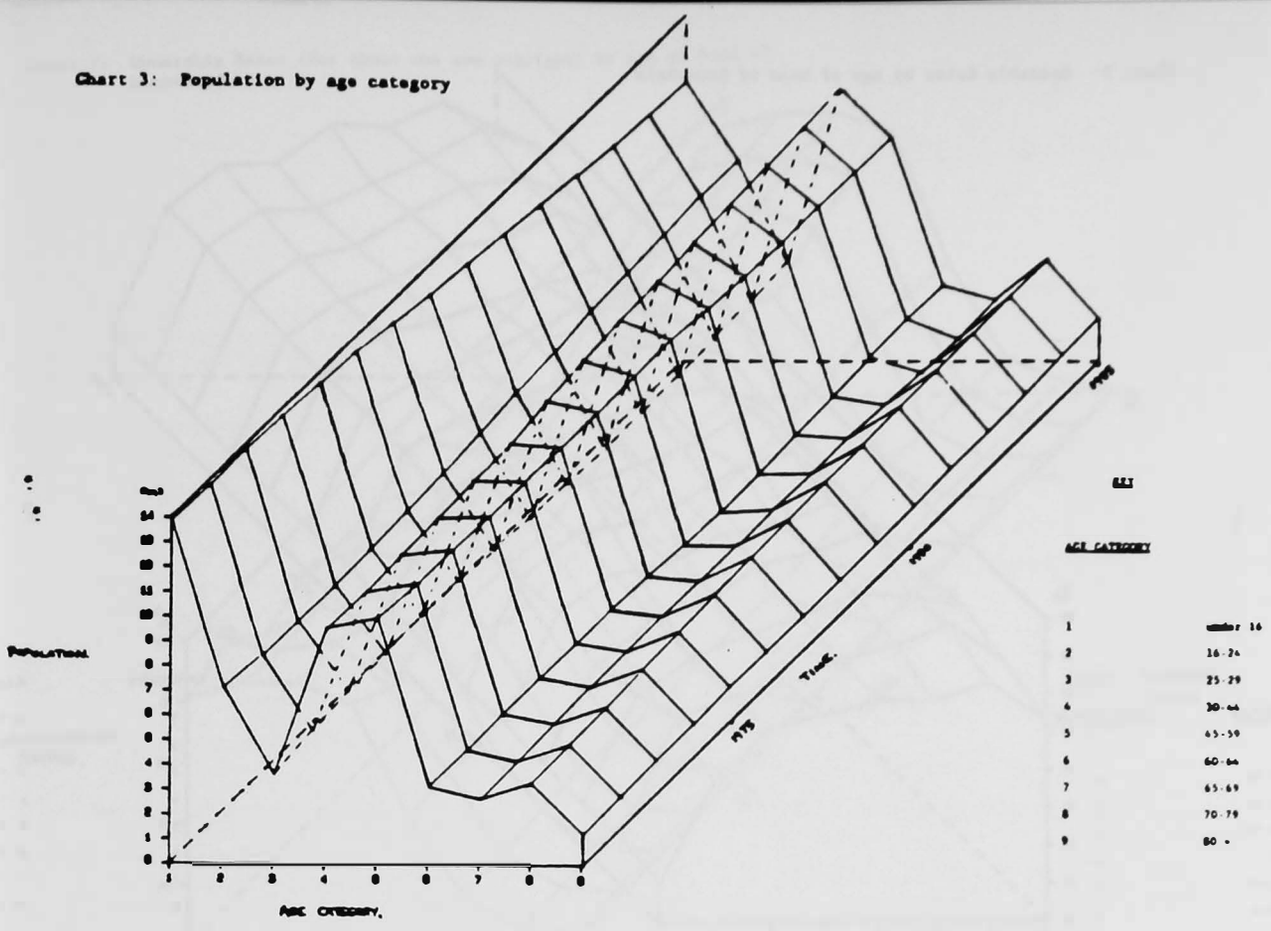


Chart 4: Households by age of head of household

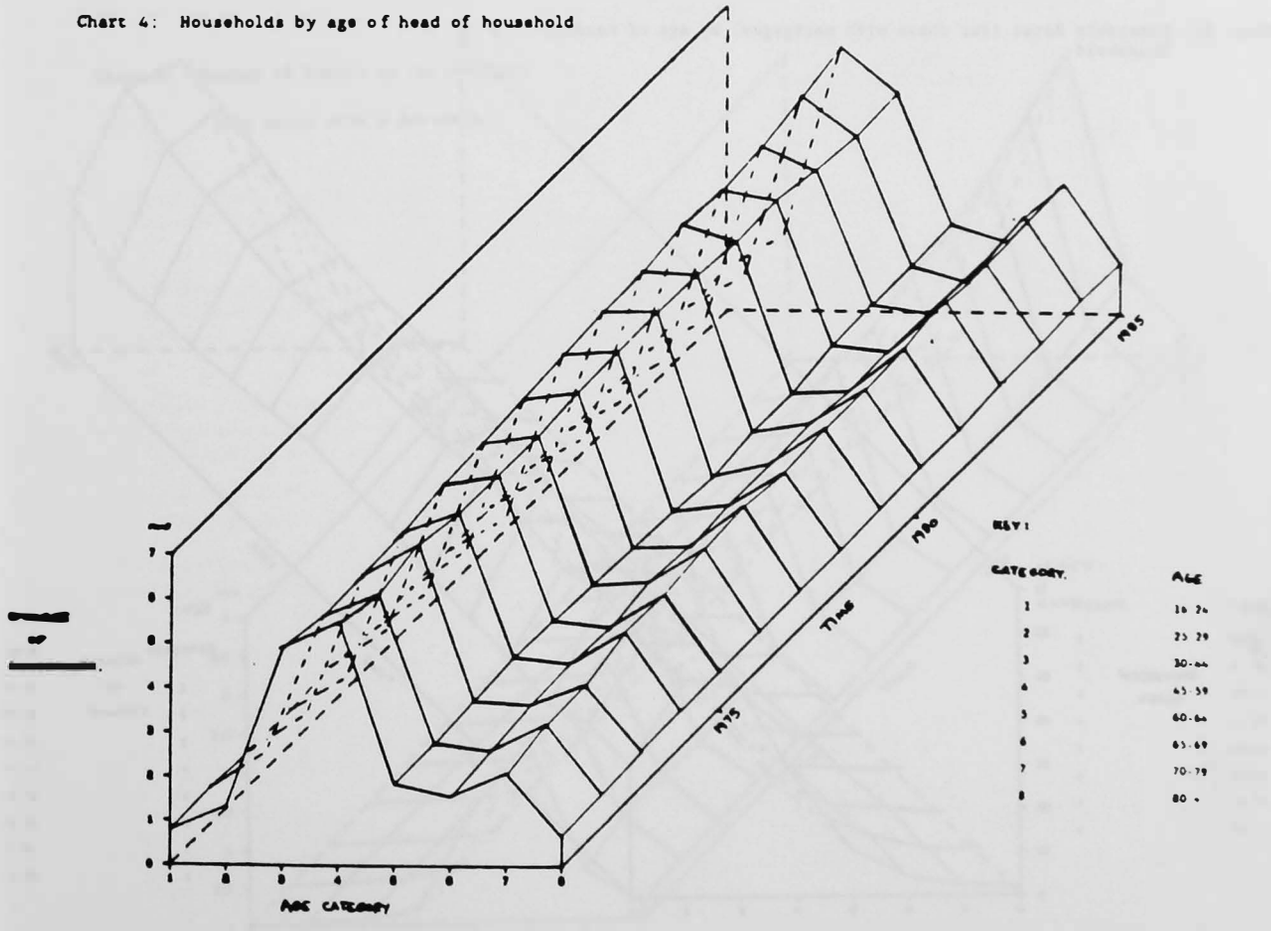


Chart 5: Ownership Rates by age of head of household

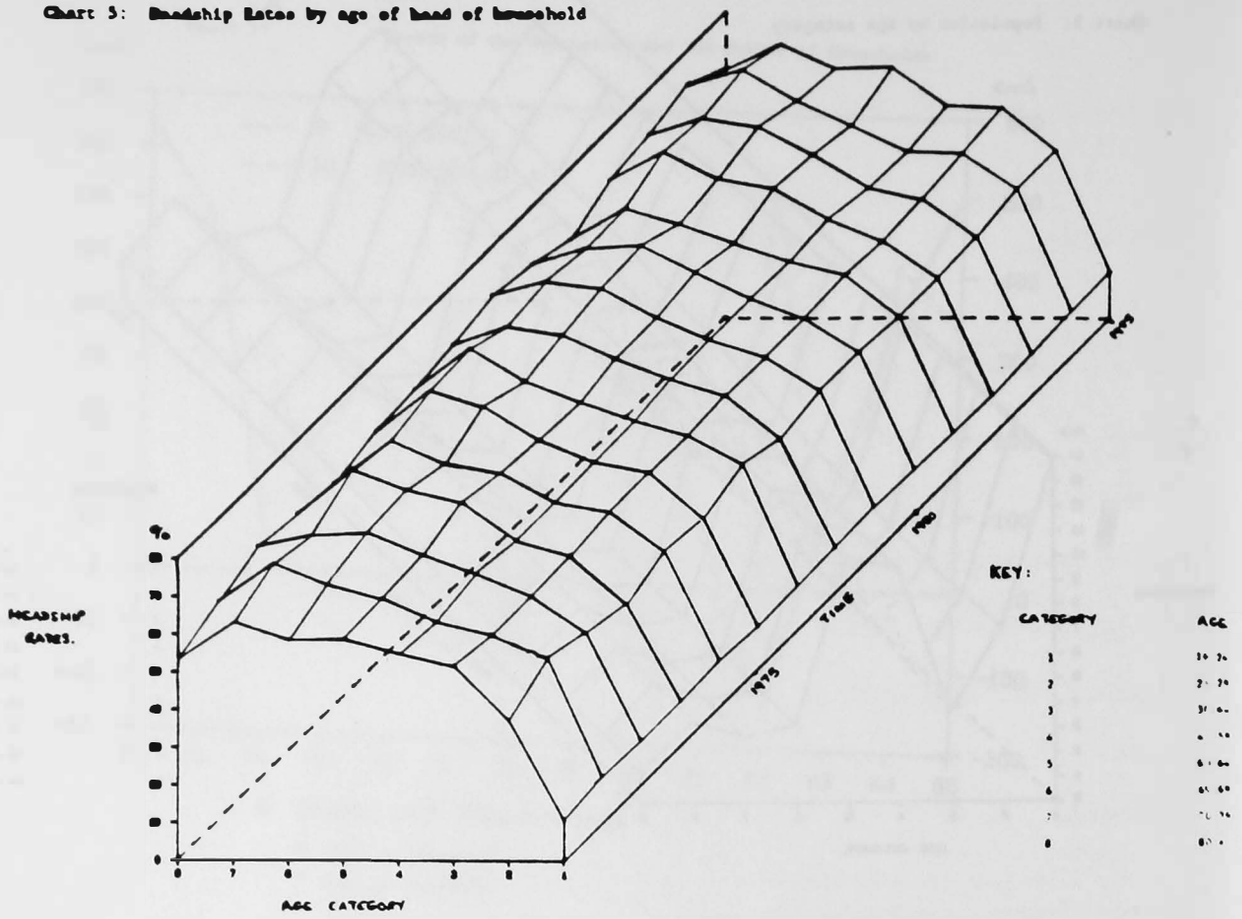


Chart 6: Ownership Rates (for those with mortgages) by age of head of household

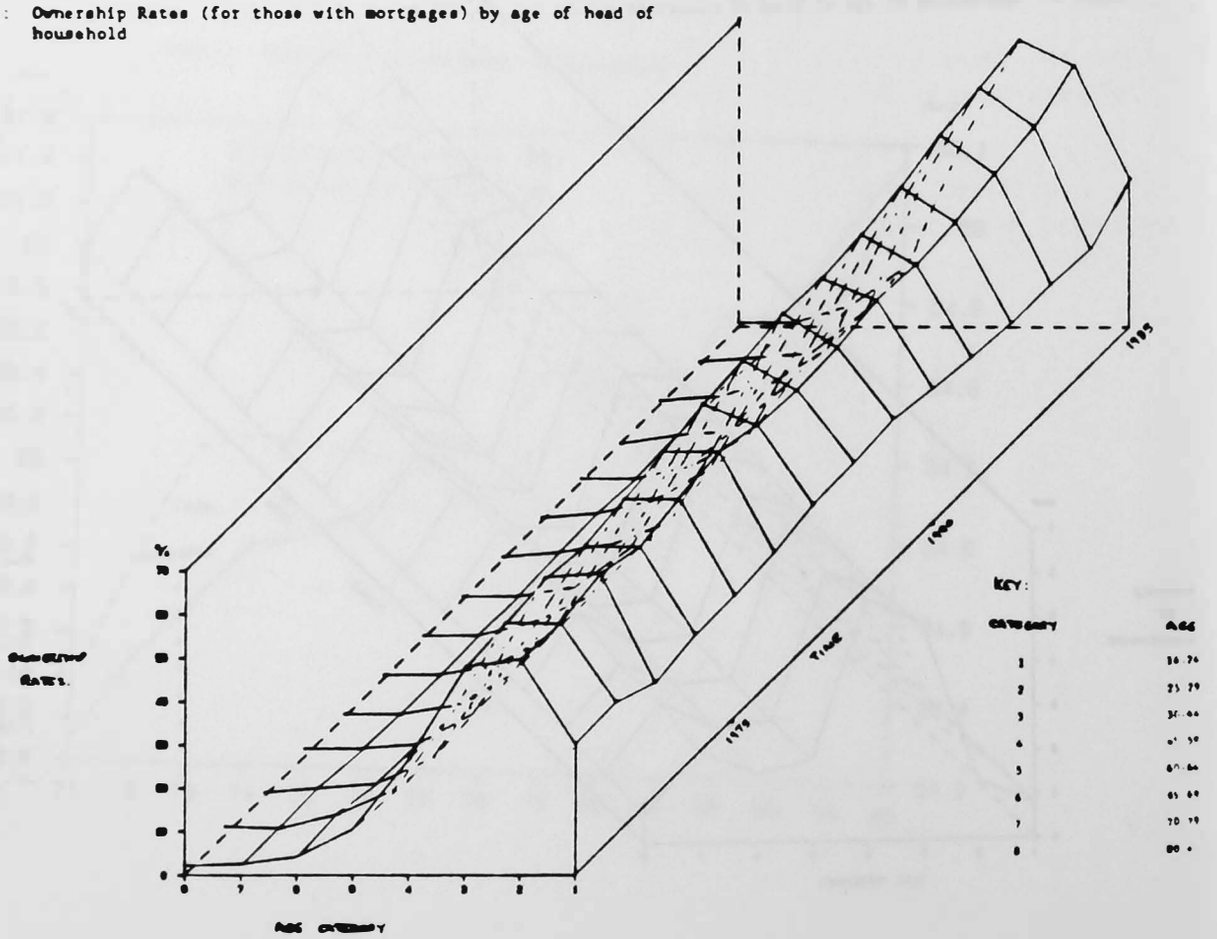


Chart 7: Ownership Rates (for those who own outright) by age of head of household

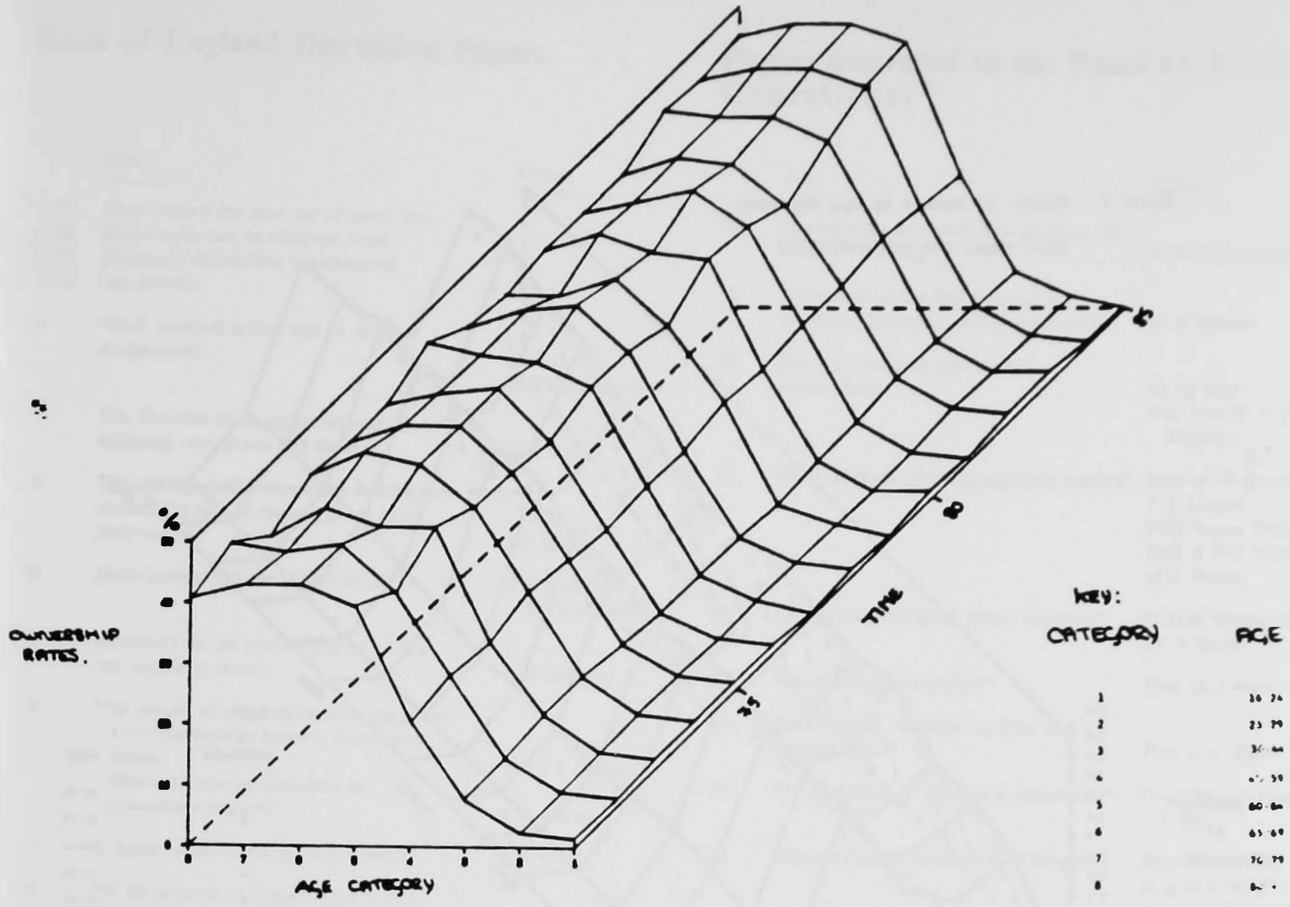


Chart 8: Number of Owners by Age Category

(for those with a mortgage)

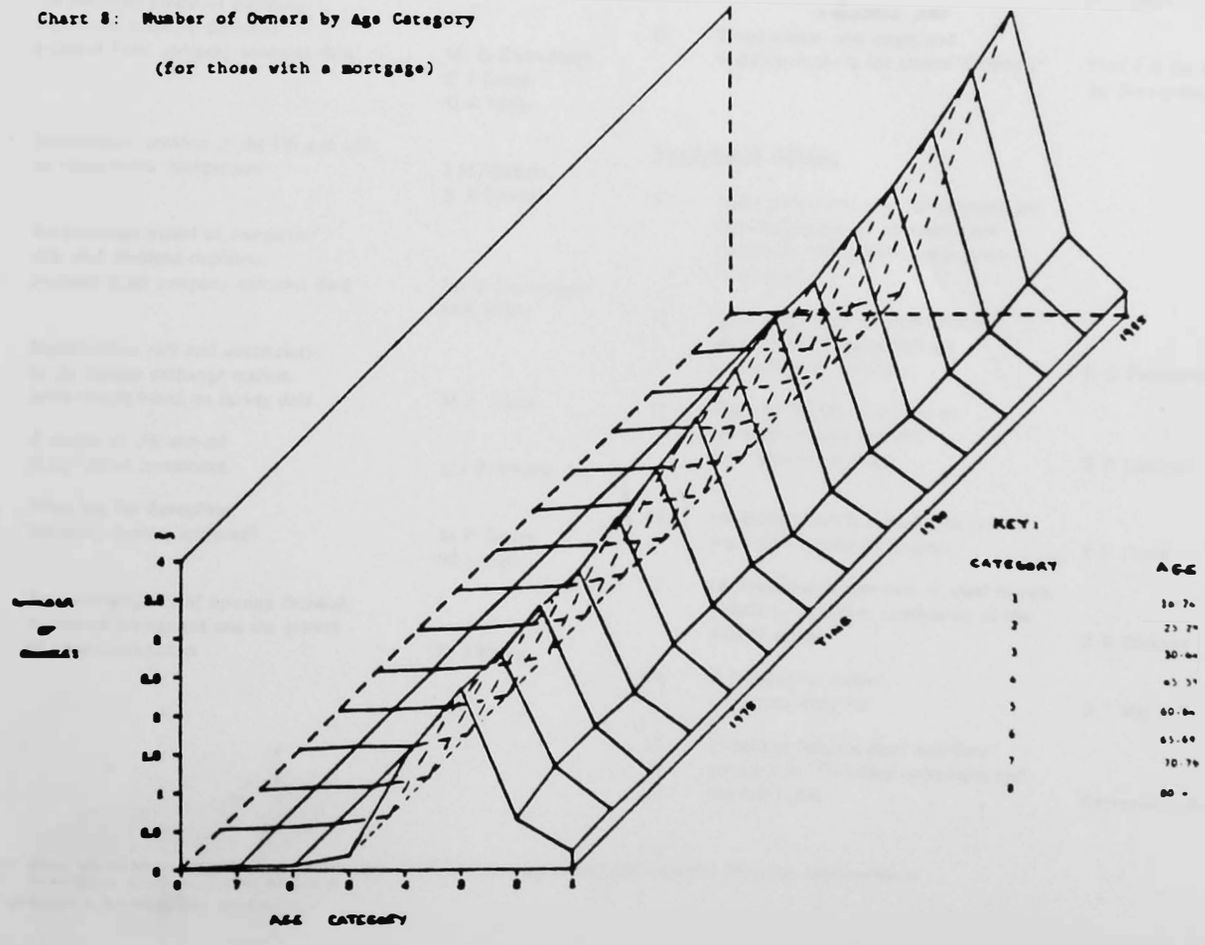
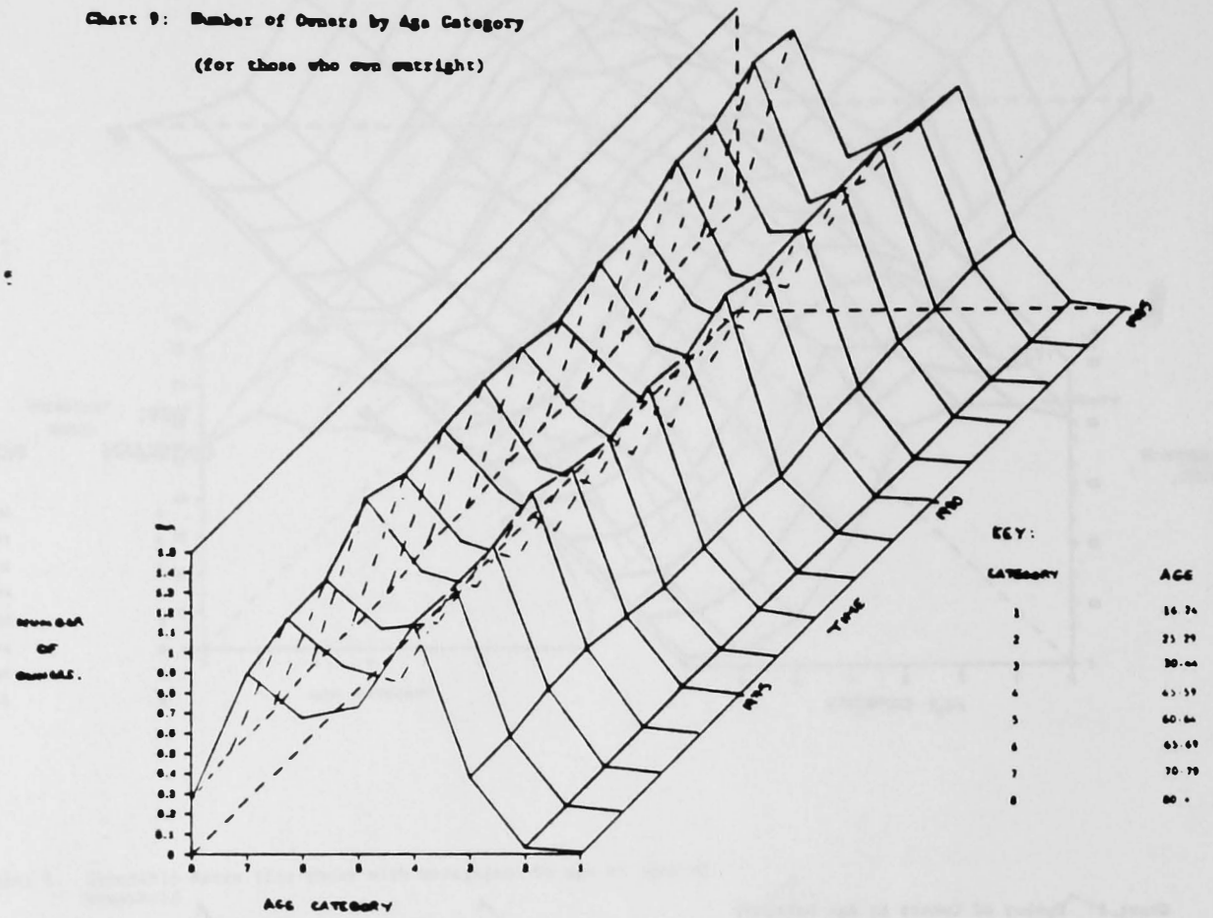


Chart 9: Number of Owners by Age Category

(for those who own outright)



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	Title	Author
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7	The direction of causality between the exchange rate, prices and money	C A Enoch
9	The sterling/dollar rate in the floating rate period: the role of money, prices and intervention	I D Saville
10	Bank lending and the money supply	B J Moore A R Threadgold
15	Influences on the profitability of twenty-two industrial sectors	N P Williams
18	Two studies of commodity price behaviour: Interrelationships between commodity prices Short-run pricing behaviour in commodity markets	Mrs J L Hedges C A Enoch
23	A model of the building society sector	J B Wilcox
24	The importance of interest rates in five macroeconomic models	W W Easton
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29	Expectations, risk and uncertainty in the foreign exchange market: some results based on survey data	M P Taylor
30	A model of UK non-oil ICCs' direct investment	E J Pentecost
31	What has the European Monetary System achieved?	M P Taylor M J Artis
32	The demographics of housing demand; household formations and the growth of owner-occupation	M J Dicks

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	Title	Author
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9	Institutions in the financial markets: questions, and some tentative answers*	M V Posner
10	The arguments for and against protectionism*	M Fg Scott The Hon W A H Godley
14	The usefulness of macroeconomic models*	Prof W H Buiter T F Cripps Prof Angus Deaton Prof A P L Minford M V Posner
15	Factors underlying the recent recession*	G D N Worswick Dr A Budd
17	Why do forecasts differ?*	Prof M J Artis
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14	Modelling the UK economy in a stock-flow consistent manner	E P Davis
15	International comparison of asset market volatility : a further application of the ARCH model	R R Dickens
16	A three sector model of earning behavior	D J Mackie
17	Integrated balance sheet and flow accounts for insurance companies and pension funds	Raymond Crossley

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(a) Other papers in this series were not distributed.