Housing Affordability in England

YIP Ngai Ming

for the degree of Doctor of Philosophy
University of York
Department of Social Policy and Social Work

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Acknowledgement

Declaration

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Signature :

YIP Ngai Ming

Date:

Abstract

Triggered by the state of the housing market and a change in the housing association subsidy system, housing affordability became a topical issue of discourse in Britain towards the end of the 1980s. Yet, there is little research both on the extent of the problem at the national level and how affordability should be measured. This research attempts to advance understanding in these issues based on data from the 1991 Family Expenditure Survey and the 1988 General Household Survey. In this thesis, a new definition of the residual income measurement has been proposed and threshold affordability ratios has also been established using a composite approach to affordability measurement combining the ratio and the residual income measurement, in additional to an experimentation on a behavioral approach to the measurement of affordability. Findings in this thesis suggest that, measured by the ratio measurement and the traditional residual income measurement, about a quarter of households in 1991 were in unaffordable housing. Social tenants and tenants in the unfurnished private rented sector, lone parents, the elderly persons and households with unemployed household heads and claimants of housing benefit were more likely to be in unaffordable housing. However, there is no evidence in support of distinct patterns in household expenditure between households who were affordable to housing and those who were unaffordable. It is also controversial to regard households who were unaffordable to housing but at the same time over-consuming housing to be in voluntary unaffordability problem owing to the difficulties such households would have in adjusting their level of housing consumption. This thesis also points to the close relationship between housing affordability, housing benefit and social tenancy which suggests the inadequacy of the housing benefit system and state provision of housing in protecting households from the problem of housing affordability. A section of this thesis was devoted to the examination of the ability of tenants to buy in the late 1980s where tenure preference has been incorporated in the measurement of such ability. It was found that the majority of tenants in 1988 could not afford to buy and tenants living in London and the South East, single person households, lone parents and households on a low income were the least able to afford buying. Though the Right to Buy scheme would improve the capacity of these households in council housing to become home owners, they are still households who were the least able to buy.

List of Abbreviations

AIC	Akaike information Criterion
BES	Business Expansion Scheme
BLS	Bureau of Labour Statistics
BSA	Building Society Association
CIPFA	Chartered Institute of Public and Finance Accountancy
CML	Council of Mortgage Lenders
CORE	Continuous Recording System
CPAG	Child Poverty Action Group
CSO	Central Statistics Office
DoE	Department of the Environment
DSS	Department of Social Security
FES	Family expenditure Survey
GDP	Gross Domestic Product
GHS	General Household Survey
HAG	Housing Association Grant
HB	Housing Benefit
HBAI	Households Befow Average Income
HRA	Housing Revenue Account
JRF	Joseph Rowntree Foundation
MHLG	Ministry of Housing and Local Government
MIRAS	Mortgage Interest Relief At Source
NFHA	National Federation of Housing Associations
NLR	Non Linear Regression
OLS	Ordinary Least Square
OPCS	Office of Population Census and Surveys
PCA	Principal Component Analysis
RMRB	British Market Research Bureau
RRI	Retail Price Index
RTB	Right to Buy
TCI	Total Costs Indicator
VAT	Value Added Tax

CHAPTER 1
INTRODUCTION

1.1 THE CONCERN

Housing is a popular concern in most societies, regardless of whether they are in the West or in the East, in prosperous economies or in countries where most people are still struggling for survival. It is particularly so in my home town, Hong Kong, where over six million people are crammed into an area of just one thousand square kilometres (350 square miles) of which only about 30% is inhabitable. It is no wonder that acquiring decent shelter in the territory becomes almost a formidable task.

The past two decades saw Hong Kong's thriving economy develop into one of the wealthiest areas of the world, and the cost of securing a decent home has risen in a similar way. The price of an ordinary two bedroom apartment in a middle class area may cost more than ten to fifteen years the annual salary of a recent university graduate. Most people have no choice but to tolerate the living conditions that can, at best, be regarded as third world standards. This is the problem of affordability I encounter which motivates my concern about the issue, in addition to the five folds increase in price I would have had to pay for the flat I am living in if I haven't bought it eight years ago.

Yet, doing research on the affordability in England, a country which seems familiar as well as remote (as Hong Kong is a colony of Britain but the two places are thousands of miles apart), is very much a demanding challenge. Deterred by the difficulties of comprehending the housing, economic and social systems that were completely unfamiliar to me, but tempted by the extensive research materials, the scholarly environment and rich data, I made the decision which might be one of the most difficult one in my life.

1.2 THE PROBLEM

I then realised that affordability is not a problem only in Hong Kong where there is too little land to accommodate too many people, but it is also a problem shared by other

areas of the world. The problem is particularly interesting in England in the 1980s. Changes in housing and social policy, together with the boom and bust of the housing market as well as the fluctuations in the economy, provide an invaluable arena for the academic study of affordability.

The state of the housing market and the change in housing association finance were believed to have triggered the concern of affordability in the UK in the 1980s. Mortgage arrears and property repossessions has increased by respectively 20 and 23 folds in the 1980s whereas house price peaked in 1988-89 which experienced a three fold increase over the beginning of the decade (DoE, 1981; 1991). This aroused concern over the affordability and access as well as the sustenance of home ownership. On the other hand, an introduction of a new housing association financial regime aroused concern over whether rent levels would be affordable to the increasingly residualised and marginalised social tenants.

Changes in other areas of housing and social policy might also produce some latent effects on affordability. Deregulation in the private rented sector, a new policy in setting local authority rents, the new housing benefit system which was introduced in 1988, a growing income inequality, worsening employment market and an unstable economic could also precipitate a new wave of affordability problems.

Notwithstanding the significance claimed for the problem, it soon gave the impression of playing a game at a Christmas party: everybody was asked to guess the height of a tall Christmas tree but no one was allowed to actually measure it. The case of the study of affordability is even worse: no yardstick exists and there is not even a conversion table from imperial to metric, not to mention the Chinese foot I used to use. Housing cost to income ratio was originally used as a measurement of affordability in the United States which subsequently became popular in other countries such as Canada and Australia. All of the commonly adopted threshold ratios, which are pivotal to the measurement, was believed to have been set only as "a thumb of rule" (Lane 1977). The absence of any scientific or empirical basis for the threshold ratio attracted the most critical comments when it was "imported" into the UK in the 1980s (Maclennan et al, 1990, Hancock, 1993). To rectify the alleged weakness of the ratio measurement, the residual

income approach was proposed (Brownill el al, 1990; Hancock, 1993). However, evidence in the literature does not provide a satisfactory conclusion on which measurement approach is more appropriate. Thus, some of the attention of this thesis has to be diverted to methodological issues on the measurement of affordability.

1.3   THE RESEARCH QUESTIONS

Affordability, if interpreted in a simplistic sense, can be reduced to the problem of a mismatch between the personal aspiration of consuming housing of a quality for which the present resource of the person is inadequate. While this is a problem at the personal level it has far more associations with, and implications for, other areas of social and housing policy. It is therefore the intention of this thesis to also examine the issue from a social and housing policy perspective.

The main concern of this thesis is to inquire into the issue of affordability in England in the late 1980s and early 1990s, so as to capture the position after a decade of rapid changes in housing and social policy. It is an attempt not only to advance the understanding of this issue, but also as a reflection of its impact on wider policy issues. The additional focus on measurement issues forms another equally important area of study. It seeks to offer a thorough study of the measurement issues and aspires to provide a scientific basis from which to reconcile the controversies on such issues.

There are a number of key issues on which an exploration is attempt in this thesis:
O The extent of the affordability problem in the early 1990s and its implications for other areas of housing and social policy.
O The inadequacy of current affordability measurements and the development of a scientific basis for measuring affordability.

In the exploration of such issues, a quantitative oriented approach is favoured. Measurement issues dictates this option for a research approach. Additional concern about the lack of understanding of the extent of the issue at a national level also supports the use of a quantitative approach. The Family Expenditure Survey and General Housing Survey will be used. It is expected that the secondary analysis of these

survey data at the national level could best serve this purpose, apart from the convenience and economy such an approach has.

1.4 THE STRUCTURE OF THE THESIS

Chapter two presents a description of the policy context of the affordability issue. It traces the origin from which the issue attract significant attention in the 1980s despite the fact that it had rarely been discussed, and the term unheard of, before the 1980s. The chapter continues to explore other areas in housing and social policy which are closely related to the issue but which may not yet being perceived as being directly connected.

Chapter Three provides a comprehensive review of the approaches and operational measurement of affordability, not only those used in Britain, but also internationally. The strength and weakness of such approaches and measurement are discussed and new measurement approaches are explored.

An account of the research methods, data sets and samples used is presented in chapter four. There is a description of the definition of the concepts used in the analysis and of the methodological issues encountered by the quantitative analysis.

A profile is presented in chapter five of the distribution of housing costs and housing cost to income ratio, of the households selected for analysis. It serves as a preliminary exploration to guide the analyses in subsequent chapters.

There is an exploration in chapter six explores the use of a residual income approach to measure affordability. This begins with a presentation of the profile of residual income and develop into a comparison of the distribution of households in unaffordable housing as assessed by the three versions of residual income measurement used in this thesis.

An attempt is made in chapter seven to fix a set of threshold housing costs to income ratios. This is achieved by a composite method which combines the ratio approach to affordability with the residual income approach. When a household would be in poverty

has its housing cost to income ratio reached a particular ratio, that ratio would be considered the threshold ratio.

A behavioral approach to the measurement of affordability is used experimentally in chapter eight. The basic principle of this approach is adopted from similar procedure in poverty study, but a new method of implementing the procedure is employed in this chapter.

Chapter nine is a summary of the results of the analysis in the preceding three chapters. It presents a general picture of the extent of the affordability problem, as well as examining the relationship between affordability with the housing and socio-economic characteristics. There is also an investigation of the expenditure pattern of households with an affordability problem, and of the issue of over and under-consumption of housing in relation to affordability.

Chapter ten explores another related issue, which is the access to home ownership, in which the concept of mortgage potential is used as a measurement concept. To provide a fine tuning of the measurement, the preference of the household for home ownership is incorporated. Sensitivity analyses are conducted on the mortgage potential measurement to test its sensitive to changes to the chosen parameters. Finally, chapter eleven provides a summary of the conclusions presented in the thesis on the extent of affordability, and implications of the analyses for the measurement of affordability.

CHAPTER 2
POLICY CONTEXT

2.1 INTRODUCTION

Before mid 1980s, the term 'affordability' was virtually unheard of in the literature of housing in the United Kingdom, but since then it has become newsworthy in the media as well as being a topical issue in both academic and professional discourse. Such unprecedented attention was exemplified, for instance, in the academic arena, by the focus of a number of international conferences held in the late 1980s: "The Affordable Housing: from Participation to Self-help" in Hamburg in 1987, "Affordable Housing Policy in the UK and USA" in London in 1990, and the subsequent collection of conference papers (Friedrichs, 1988; Maclennan and Williams, 1990). At the same time, heated discussions also prevailed among the housing professionals, noticeably the housing association movement, from which a series of research reports was produced (Randolph, 1992).

The discourse on affordability was at first focused mainly around two tenures: owner occupation and housing association tenancy (Maclennan and Williams, 1990; Hancock, 1991). Whilst the initial episodes of affordability, which were described as a crisis by the media, may have passed away subsequently, many of its consequences were more enduring than were once thought (Bramley, 1994). It has also induced repercussions in other areas of housing policy, and it is likely that such discussions will advance robustly well into the mid 1990s.

Whilst the technicality of measuring affordability and characteristics of the incidence of affordability will be described in the chapters that follow, in this chapter an attempt is made to lay out the context within which the issue emerged and developed. There will also be an examination of the repercussions caused by the affordability issue in other areas of housing and social policy. First, the scale of the affordability problem in the mid and late 1980s, which attracted attention, will be examined. This involved the problem of mortgage arrears and property repossessions, access to home ownership and the

related issue of a preference for owner occupation, as well as the introduction of a new financial regime for housing associations. This is followed by a description of the repercussions of the issue of affordability in other areas of housing and social policy: in the public and private rented sectors, the problem of homelessness and issues related to the current housing benefit system. Finally, some general issues concerning affordability which are relevant to policy will also be highlighted. Discussions in this chapter is not intended to be a critical evaluation of the concept but to facilitate discussion in later chapters.

2.2 THE CRISIS OF SUSTAINING HOME OWNERSHIP

Perhaps the rapid increase in house prices in the mid-1980s and the appalling situation of mortgage arrears and property repossessions towards the end of the 1980s are the major events which triggered public concern about affordability in relation to owner occupied housing. Despite an upward trend in both repossessions and mortgage arrears since such statistics were available in the early 1980s, the increase towards the end of the 1980s is still regarded as dramatic (figure 2.1). In 1990, there were over 40,000 cases of repossession and another 150,000 mortgagors had significant arrears in mortgage payment (over 6 months of arrears) (DoE, 1993), which were respectively a 177% and a 97% increase over the previous year. The increase from 1990 onwards, though less dramatic, was equally striking. The first two years of the 1990s produced a 56% increase in repossessions and a 121% in mortgage arrears. Hence, by 1992, there was already a 20 fold increase in repossessions and a 23 fold in significant mortgage arrears over the year 1980.

Reasons for both mortgage arrears and repossessions are complex. At the macro-economic level, arrears can be reasonably modelled by the disposable income, unemployment rate, loan to income ratio of the first time buyers, unwithdrawn equity and the debt service ratio (debt service relative to income) (Brooks et al, 1991). Based on Brooks' model, Breedon and Joyce (1992) also show that there is a lagged effect of some of these factors. Repossessions, on the other hand, can be explained by the rate of arrears, unemployment and marital breakdown (Brooks et al, 1991).

Figure 2.1 Arrears and Repossessions, Britain 1980-1992
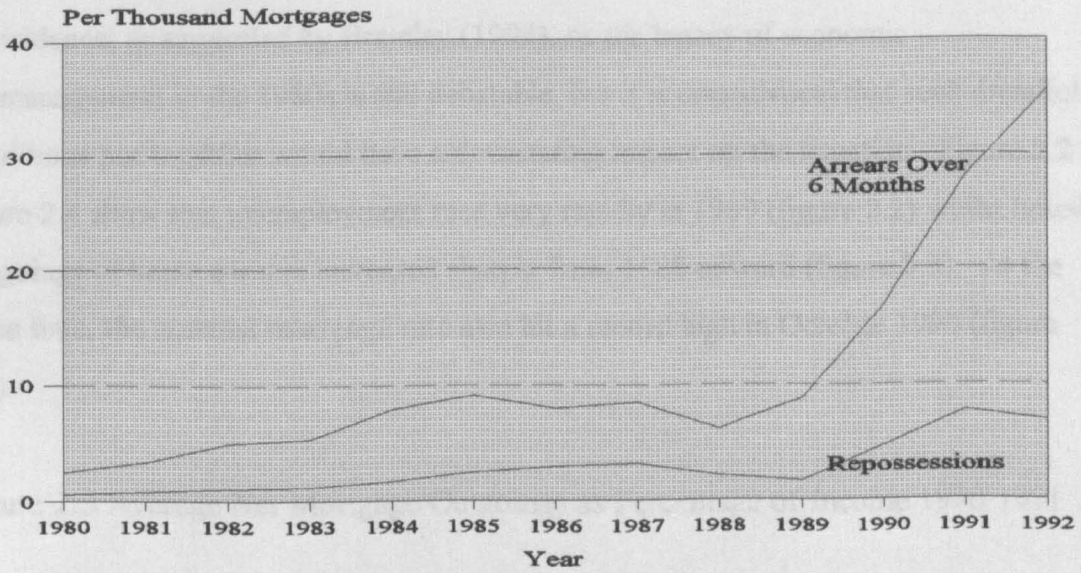
Source: DoE (Various Years) Housing and Construction Statistics

At the micro-level, home owners experiencing arrears or repossession problems and the building society industry both quoted the inability to continue paying mortgages as being attributable to unemployment and the reduction of working hours; to financial mismanagement and relationship breakdown (Ford and Wilcox, 1992; Coles, 1992). It supports many of the economic linkages mentioned above.

Figure 2.2 Seasonal Adjusted Rate of Unemployment, Britain 1978-1992
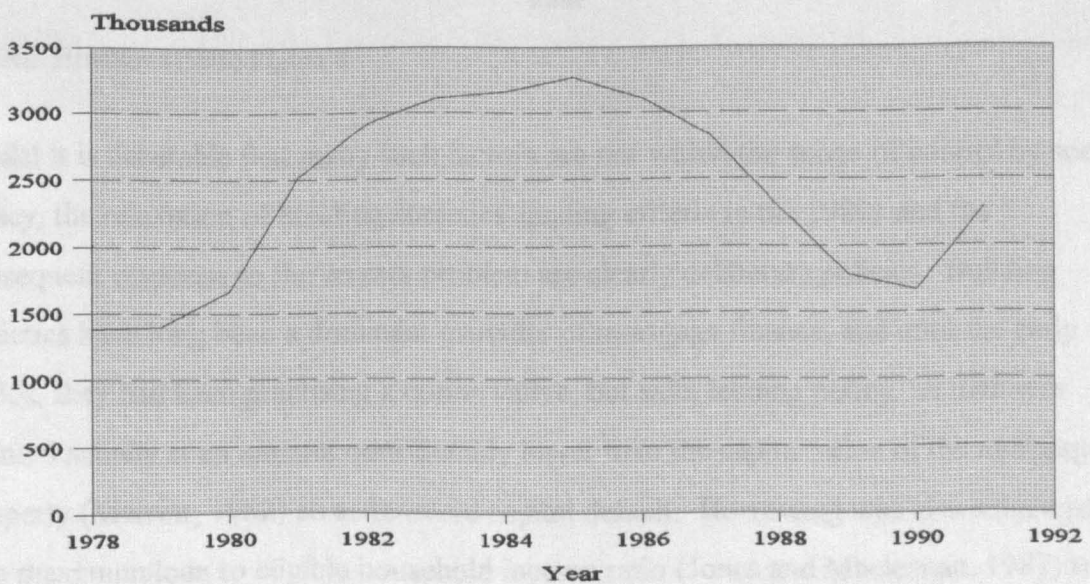
Source: Dept of Employment (Various years) Employment Gazette

These factors which influence both arrears and repossessions all deteriorated very rapidly at the same time towards the end of the 1980s. Whether it was purely a coincidence, as suggested by Bramley (1994), or the legacy of economic mismanagement in the 1980s is still debatable, but it is unequivocal that such dreadful conditions put together would have a devastating impact on the situation. Figure 2.2 to figure 2.4 show that unemployment rose very rapidly in 1989 (figure 2.2) whilst housing outgoings of home owners increased sharply from 1988 onward (figure 2.3). At the same time, the nominal mortgage rate also hit a record high in October 1990 (figure 2.4).

Figure 2.3 Average Net Mortgage Outgoings as Percentage of Income 1970-1991
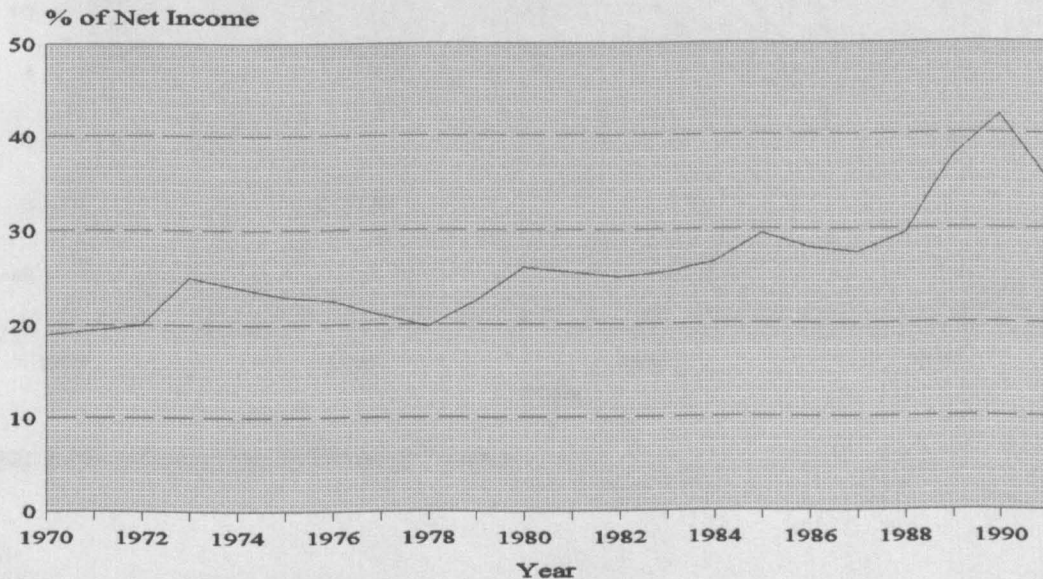
Source: Bramley (1994) Figure 8

Whilst it is debatable that many such factors are not within the scope of control by social policy, the relaxation of building societies' lending criteria in the 1980s and the subsequent response to the arrears problem are clearly deliberate policies. Building societies have long been a dominant provider of mortgage finance, and until the early 1980s, they had been practising a conservative, but safe, lending policy. A loan was granted usually at an amount considerably lower than the capital value of the mortgaged property (Merrett, 1982) so as to avoid capital default. Borrowing was also subjected to a maximum loan to eligible household income ratio (Jones and Maclennan, 1987) to ensure initial repayment would not exert an excessive burden on households' outgoings.

At the same time, building societies enjoyed a special arrangement, the composite tax rate, for setting investors' tax liability enabling them to set a rate at a competitive level. Such competitive advantage was further reinforced by the exemption from credit restraint to which commercial banks were subject, which greatly hampered the banks' ability to expand their market share in the mortgage lending market (Boddy, 1980; Holman, 1979).

Figure 2.4 Nominal and Real Mortgage Rate 1975-1991
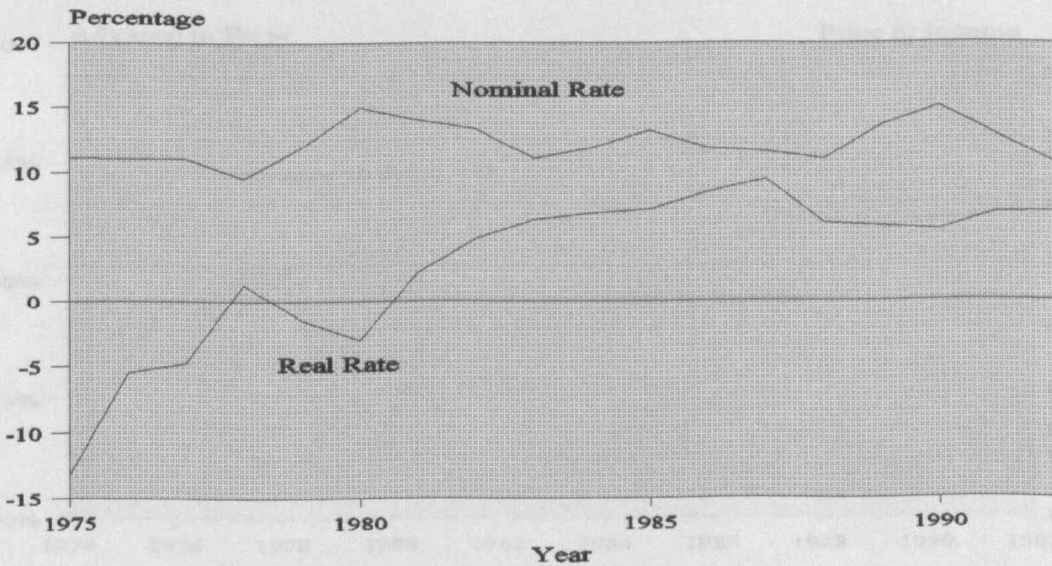
Source: CML (Various years) Housing Finance.

Since the early 1980s, such positions were under threat. Partly because of innovations in banking technology and largely owing to deregulation in the financial sectors, building societies were facing increasing competition on several fronts: the commercial banks on mortgage lending and other financial institutions and the government on the attraction of savings. It is not surprising that building societies had to relax their lending policy to attract borrowing. Despite the upsurge in house prices in the mid-1980s, house price to income ratio to first time buyers continued to increase throughout the 1980s.

However, the increase of housing price to income ratio was not unprecedented. The level of housing costs to income ratio was high in the mid 1970s when there was a house price boom. The difference was that before the 1980s, whenever house price to income

ratio increased above the norm, which increased the risk of repayment default (the mortgagor was unable to repay the debt according to schedule), such risk would be offset by a corresponding decrease of capital default (value of the repossessed property not enough to offset the outstanding debt) by decreasing the price to advance ratio. The 1980s saw an increase in both ratios to a high level (figure 2.5). Thus, it increased both the risk of capital and repayment defaults.

Figure 2.5   Average Advance to Price, Price to Income Ratio, First Time Buyers, Britain 1974-1992
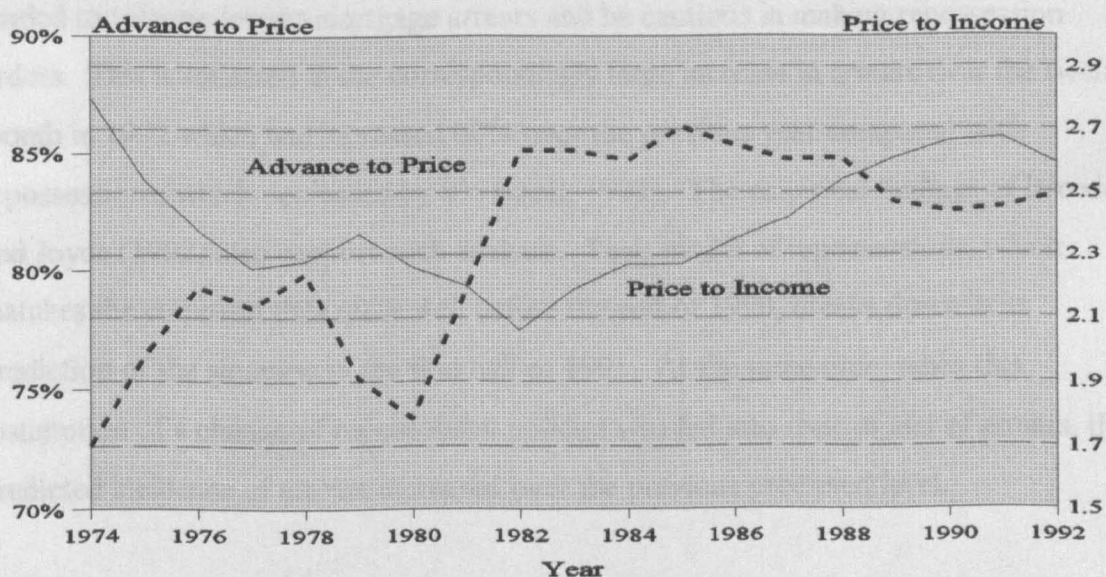
Source: DoE (Various years) Housing and Construction Statistics

In fact, the increase in price to advance ratio was even more spectacular. Although the average level reached its peak in 1985 and has been adjusting downward ever since, many first time buyers could still obtain a mortgage at a large proportion of the capital value of their properties. In 1989, just before the arrears crisis surfaced, nearly 60% of first time buyers could get a mortgage at 95% of the capital value and over a third could even get over 100% (Bank of England, 1992), albeit the average loan to value ratio of first time buyers in that year was only 83% (DoE, 1990). It is argued by some sympathetic commentators that such a relaxed policy was pushed along by the strong competitive pressure of the 1980s, and there was a lack of awareness of the dangers this unprecedented fall in nominal house prices would have on such a lending policy (Bramley, 1994). Nevertheless, such lending policy is still unusual, and would perhaps never have happened in any other part of the world.

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On the contrary, when the phenomenon of mortgage arrears emerged in the late 1980s, without adequate warning, building societies reacted with considerable vigour. Instead of tolerating the arrears whilst working on recovering the debt, many chose to repossess the properties quickly and put them up for sale. In 1989, when the crisis emerged, there was respectively a 79% increase in six to twelve months arrears and a 140% increase in arrears over twelve months, but repossessions increased even faster at 176%. It was not until the subsequent year that there was a clearer understanding of the impact of the repossessed sales on house prices and the continuing deterioration of mortgage arrears, after which the repossessions orders were restrained somewhat (Ford, 1992). Lenders tended to tolerate longer mortgage arrears and be cautious in making repossession orders. This is reflected in the correspondingly large increase in arrears over the twelfth month in 1992 which had increased 60% over the previous year compared with repossessions, which decreased by 9% (DoE, 1993). The empirical findings of Breedon and Joyce (1992) also support such analysis. Their model of repossessions, which matches the empirical data quite well before the end of 1990, breaks down in its prediction of the situation in the first half of 1991. At the same time, when this assumption of a change of repossession policies was fed into their model of arrears, the predicted incidence of arrears increased over the previous predicted level.

2.3   ACCESS TO HOME OWNERSHIP

The last thirty years have seen three boom periods in housing price with peaks in 1973, 1980 and 1989. The most recent price boom was exceptional in its intensity as well as in the down-turn that followed. Not only was the level of real house prices in the 1989 boom considerably higher than the two preceding booms but it was also of longer duration. The most striking effect is that the phenomenon of a downturn in real house prices after the boom turned out to be a fall in nominal house prices, which was unprecedented in previous boom and bust cycles in the post war period (figure 2.6). Although the latest downturn, in terms of the magnitude of the real price fall, was not very different from the earlier cycles, it was the low level of inflation that pushed down the nominal price. Nevertheless, such a nominal fall has a psychological impact on the already fragile confidence in the economy as a whole and the housing market in particular.

In the long run, house prices are determined by incomes, wealth, user costs (mortgage rates and tax rates etc), the general level of prices, financial deregulation, demography and house supply; but in the short term, it is also influenced by the component of wealth and perception of future capital gain (Breedon and Joyce, 1992). It is not surprising when incomes, wealth and general level of prices are all on the increase, that there is a to a general rise in real house prices. It is also not a coincidence that the 'ripples' in the house price cycle coincide largely with the growth of the population aged 25-30 who are the most likely first time buyers (Bank of England, 1992).

Figure 2.6 Change in House Price, First Time Buyers 1969-1992 (Adjusted by RPI)

House Price (Thousands Pounds at 1992 Price)
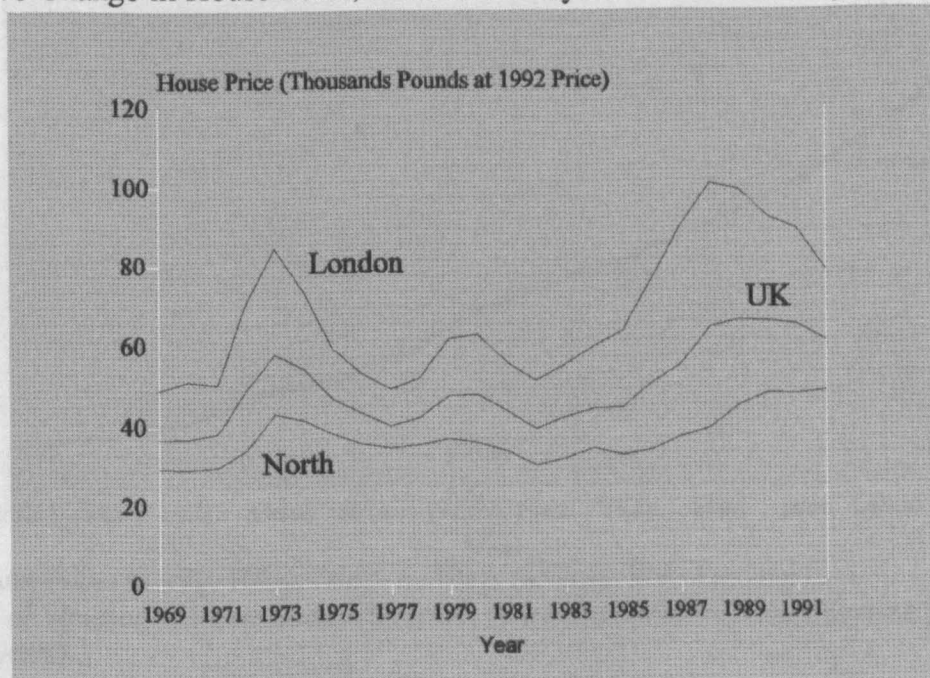
Source : DoE (Various years) Housing and Construction Statistics

Notwithstanding the continuous upsurge in nominal house price, it has largely kept in pace with the rise in real income throughout the 1970s and early 1980s (figure 2.7). The latest boom, towards the later part of the 1990s, put increased house prices well above the increase in wages. This has an immense effect on access to owner occupation for many potential first time buyers.

As a protection against capital default, home buyers are expected to pay a deposit which is the difference between the loan advance and the transaction price of the property. This deposit may pose a formidable barrier to access to home ownership. Take 1980, a year of house price boom, as an illustration of the burden: a first time buyer on the

average income of all first time buyers of that year, granted a loan at the average advance to price ratio towards buying a house at the average price, had to pay a deposit which was equivalent to one and a half years of the household income. If the cost of the transaction, moving house and furnishing were included, the amount was even larger. As house price increases, so does the deposit required and the barrier to owner occupation will be higher.

Figure 2.7 Index of Housing Prices and Earnings, Britain 1970-1992
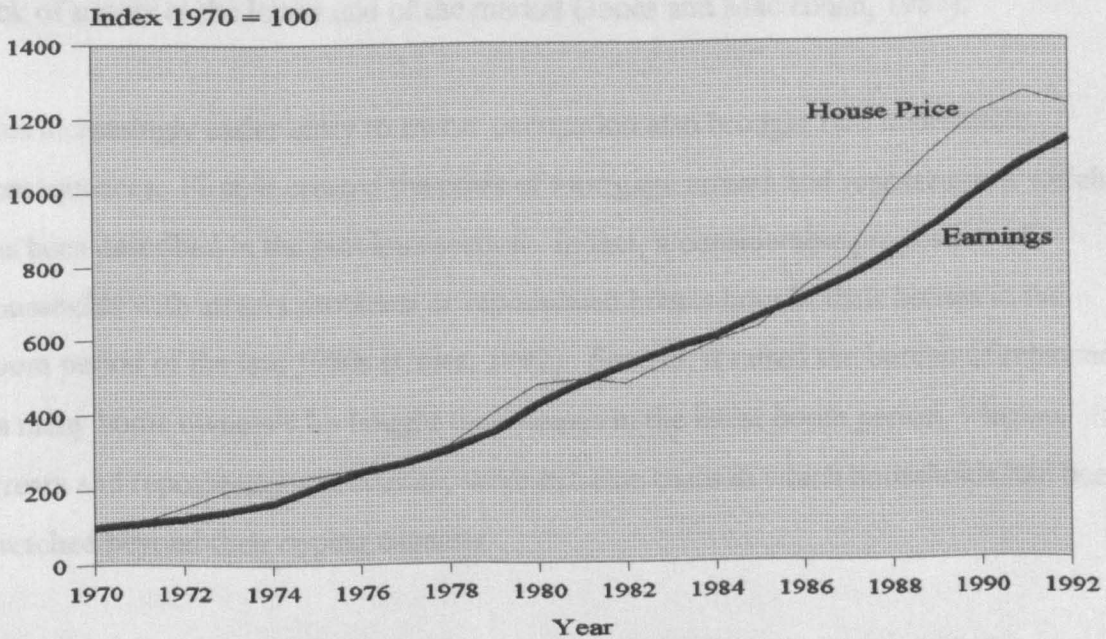
Note: House Price (Average House Price) Earnings (Average Male Earnings)
Source: DoE Housing and Construction Statistics (Various years) OPCS New Earning Survey (various years)

To minimise the risk of repayment default, a maximum household income to price ratio should be set. Again, a higher house price would mean a higher household income in order to be eligible for a loan, which also implies a high hurdle for first time buyers. This was particularly true before the 1980s when mortgage funds were in short supply and mortgage loans were rationed. Mortgage finance created a seller's market and home buyers had little choice. Jones and Maclennan (1987) even discovered that low income was in fact the most common reason for loan refusal.

As a result of the financial deregulation and increased competition, the lending policy of many building societies was relaxed in the late 1980s. Although on the one hand this was one of the causes of the crisis of mortgage arrears and repossessions, on the other

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hand it helped to bring down the barriers of access to owner occupation since building societies were more ready to lend. It pushed up both the advance to price as well as the price to income ratio so that a smaller deposit was required and a large loan could be obtained with a given household income. In 1989-90, during the peak of the price boom, the average advance to income ratio for first time buyers was at its highest (DoE, 1992). At the same time, it virtually put an end to the informal 'redlining' practice of many building societies, in which houses in poor areas were excluded from any loan applications so that choice for low income families was further limited because of the lack of supply at the lower end of the market (Jones and Maclennan, 1987).

This increasingly easier entry to owner occupation also brought two undesirable consequences. First, it created the crisis of mortgage arrears and repossessions which has been described in the previous section. In fact, a considerable proportion of households with arrears problems or repossessed homes bought their houses in the boom period of the late 1980s (Coles, 1992). Second, it raised the burden of repayment on many home owners who bought their homes in the latest boom period, whereas arrears and repossessions previously were extreme cases in which households had been stretched beyond their coping capacity.

The effect of housing prices on housing outgoings for first time buyers is fairly straightforward at a particular moment in time: a higher price means higher outgoings. But making comparison over a period of time is not easy due to changes in both interest rates and lending policies. Suppose a household on the average income of all first time buyers for that year managed to obtain a loan at the current average advance to income ratio from a building society in 1979, which was neither at an ebb nor a peak of the price cycle. The household, with the loan given, was enabled to buy a house at the average price paid by other first time buyers. Assuming it was a repayment mortgage and the interest was charged at the average rate for that year, the household would have paid a deposit equivalent to 30 weeks of its income whilst at the same time having to commit about a quarter (24%) of their income to mortgage interest and principal repayments.

Another household in 1989 on an income equivalent to the previous household in 1979 (adjusted by the index of earnings), which was 6% higher than the average income of

first time buyers, and with the relaxation of lending policy, could have obtained a loan which enabled them to buy a house at 106% of the average house price paid by all first time buyers. The household only had to pay 23 weeks of its income as a deposit. Because both real house prices and mortgage rates were higher in 1989 than a decade age, the outgoings were increased to 29%. Even if the mortgage rate was kept at the 1979 level, the proportion was still 28%[1], an increase of 17% over the level in 1979. This indicates that even at a higher house price level, the relaxation of lending policy still enabled households on a lower income to buy a home because the cost of entry is lower. Nevertheless, such first time buyers had to devote a much higher proportion of their income to housing, thus increasing the risk of an affordability problem.

However, this simplified illustration takes no account of the changing pattern of income distribution over time and the diversity of regional house price distribution as well as the increase in outgoings which simply reflects the improvement in the quality of housing. The former problem was taken up by Bramley (1991) who shows that the affordability situation of first time buyers during the 1980s actually deteriorated, taking into account the distribution of income over time and the cost of provision at the local level. The latter problem is more complicated owing to the lack of a comprehensive index comparing house prices at a fixed quality (such as the quality adjusted house price index suggested by Wilkinson (1976)).

Housing outgoings of current home owners are less dependent on current house prices than on the historical price of the house and the 'front-loading' effect of mortgage finance which would have eased the burden of housing outgoings in subsequent years even at a low level of inflation (DoE, 1977b). Because most mortgages in the UK are on adjustable mortgage interest rates, the housing outgoings of current home owners are more affected by a change in interest rates. Figure 2.3 has shown the movement of housing outgoings as a proportion of household income over the period 1970 to 1991. A general upward trend is apparent and whilst the peaks and ebbs of the cycle coincide mainly with the boom and bust in the housing market, high interest rates in 1985 also had the effect of pushing up housing outgoings. When mortgage rates were increased from the relatively low level of 10.5% in July 1987 to a record level of 15.4% in February 1990, keeping other conditions unchanged, housing outgoings would have

increased by 38%[2]. The increased reliance on the interest rate as a regulation tool in macro-economy and the withdrawal from the ERM implied that there was a possibility of rapid changes in interest rates, especially in a period of economic difficulties. Given the exceptionally high mortgage debt to GNP ratio and home ownership proportion, such fluctuations would affect the budget of many households and was likely to become an increasingly sensitive political issue.

2.4 TENURE PREFERENCE AND HOME OWNERSHIP

Much of the previous research on affordability on prospective home buyers (e.g. Bramley, 1990, 1991) seems to have assumed that owner occupation is the desired form of tenure for the vast majority of households (Whitehead et al, 1993). Households which are not currently home owners would eventually become so provided their income capacity permits it. Such an assumption would over-estimate the demand for home ownership, albeit the main purpose of such research being primarily the estimation of the demand for social housing. First, not all households which could afford to buy actually prefer home ownership. Second, not all households which prefer home ownership can afford to buy. Third, there are some home owners who would prefer to swap to renting instead. Studies on tenure preference would help to estimate households in the first and the third case, and thus assist in the fine tuning of the demand for home ownership.

Research on tenure preference is not in scarce supply. Between 1967 and 1991, surveys on tenure preference on a national basis have been conducted every few years. Amongst the eight surveys at the national level documented during that period (BSA, 1983, 1986, 1989; Coles, 1991; OPCS, 1979, 1989)[3], six of them were commissioned by the Building Societies Association (BSA). The enthusiasm of the BSA is apparent given the immense market value of the survey findings to the industry.

Apart from the few recent surveys commissioned by the BSA, which have a coherent questionnaire structure and sampling frames, where the results could be roughly compatible, surveys are basically not comparable technically. Despite these technical difficulties, such surveys indicate a clear trend in tenure preference over time. From

1967 onwards, there was a growing preference for home ownership. In 1967, two thirds of households would like to be an home owners, increasing to 81% in 1989, at the peak of the price boom. Despite the fact that the rate of owner occupation increased from 48% to 66% during the same period, the gap between the desire to own and being able to do so in 1989 was still as large as it was two decades previously. The market slump in the early 1990s seemed to discourage such desire a little, and the gap be narrowed slightly (figure 2.8).

Conversely, demand for renting diminished despite the fact that private rented property had already been in a long process of decline since early this century and local authority property since the early 1980s. The recent upturn in preference for renting can largely be regraded as a negative response to the preference for home ownership in 1991 (Figure 2.9). Likewise, research at the local level showed evidence of a similar preference pattern in both the preference for home ownership and renting (e.g. Jones, 1982; Harrison and Lamos, 1980; Saunders, 1990).

Despite the inordinate preference for home ownership, such preference was not equally robust in every tenure group or across age groups. Whilst the overwhelming majority of home owners, over 90% in 1991, prefer owner occupation as an ideal form of tenure, only about one third of local authority tenants and less than one half of private tenants shared a similar vision (Coles, 1991). Likewise, less than two thirds of young people aged 16 to 24 would prefer owner occupation. These groups are the main sources of prospective home owners. Hence, the inter-relation between tenure preference and the ability to buy should not be seen as a trivial issue. This issue will be pursued in more detail in chapter ten of this thesis.

Figure 2.8 Preference for Home Ownership 1967-1991
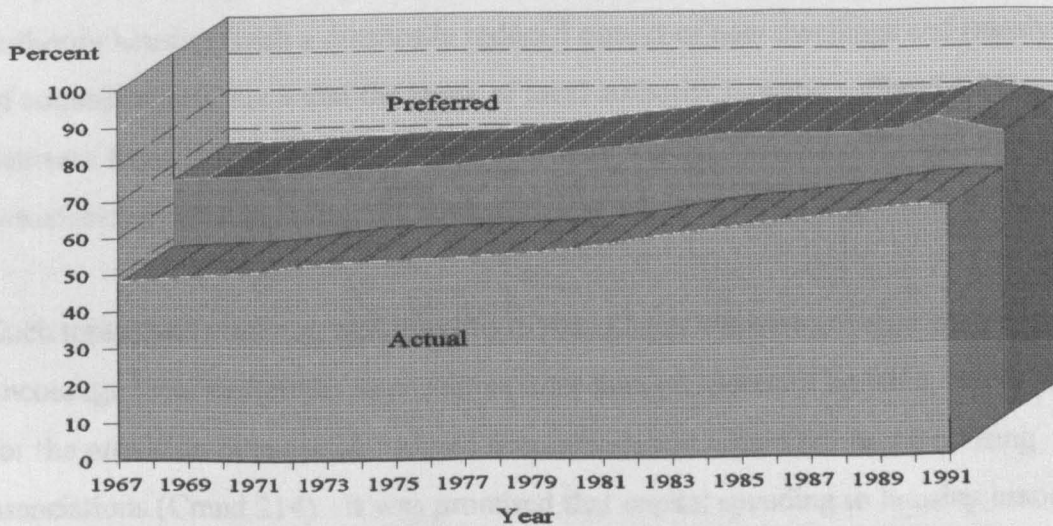
Percent

100
90
80
70
60
50
40
30
20
10
0

Preferred

Actual

1967 1969 1971 1973 1975 1977 1979 1981 1983 1985 1987 1989 1991
Year

Note: Prefer (% Preferring Home Ownership) Actual (Actual % of Owner Occupation)
Source: BSA (1983, 1986, 1989) Coles (1991) OPCS (1979, 1989)

Figure 2.9 Preference for Local Authority Renting 1967-1991
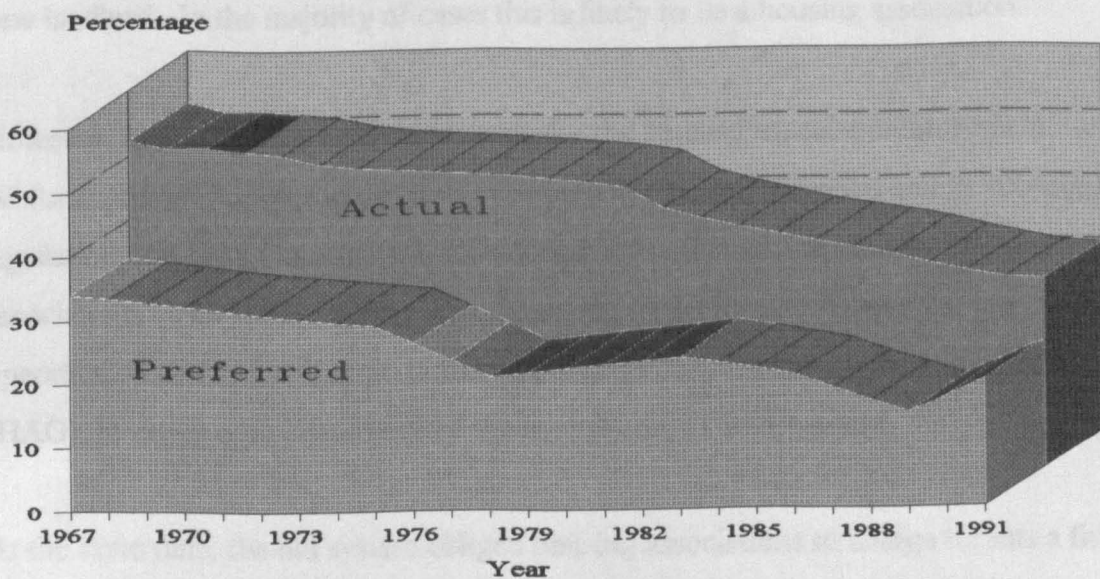
Percentage

60
50
40
30
20
10
0

Actual

Preferred

1967 1970 1973 1976 1979 1982 1985 1988 1991
Year

Note: Prefer (% Preferring Home Ownership) Actual (Actual % of Owner Occupation)
Source: BSA (1983, 1986, 1989) Coles (1991) OPCS (1979, 1989)

2.5 NEW FINANCIAL REGIME FOR HOUSING ASSOCIATIONS

The issue of affordability has emerged as a focus for debate in the housing association

movement since the government disclosed its plan to introduce a new subsidy system for

housing associations in the white paper on housing in 1987. Despite the relatively small

size of the sector, which constituted only 3.3% of total housing stock in 1992 (DoE,

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1993), its importance as a major provider of subsidised housing has grown since the early 1980s. Meanwhile, there has been a reduction in public investment in local authority housing, with a drastically reduced output of new dwellings and massive sales of council houses, such that the stock of local authority housing suffered a 35% decrease from 1981 to 1992. Conversely, there was an increase of 72% in housing association dwellings during the same period (DoE, 1993).

Such trends will continue well into the 1990s. Under the new government policy to encourage local authorities as enablers rather than providers of housing, responsibility for the provision of subsidised rented accommodation would fall to the housing associations (Cmnd 214). It was promised that capital spending to housing associations would increase three fold in cash terms during the first few years of the 1990s (Cmnd 1008, 1990). The growth of housing associations will be further enhanced by the Large Scale Transfer of local authority stocks, which allows local authority tenants to opt for a new landlord. In the majority of cases this is likely to be a housing association.

However, such change is a mixed blessing for the housing association movement. Whilst it provides opportunities for development, the 1987 proposal and its subsequent legislation, the 1988 Housing Act, introduced a new financial regime for housing associations. The 1988 Housing Act put an end to the finance system that has been in operation since 1974, which provided a very generous Housing Association Grant (HAG), to cover over about 90% of the capital cost of development.

At the same time, the old system obliged housing associations to charge tenants a fair rent which was set by the rent officer and was not within the control of the housing association or the Housing Corporation. A complex finance system was also developed to supplement later loss or to claw back subsequent surplus. The major objective of such a mechanism was to ensure that it would be in a financially neutral position and, consequently, housing associations did not have to bear any of the financial risk of development (Hills, 1991).

Whilst the new proposal promises to boost development in the this sector, greater output is achieved not only by the injection of public money but also by the involvement

of private finance. The new funding system also reverses the previous grant setting procedure by fixing HAG first according to a set of Total Costs indicators (TCI), some assumed costs of development, and grant rates, both set by the Housing Corporation. The difference between the actual development costs and the grant is expected to be covered by rent and borrowing from the private sector. Unlike the old system which gave housing associations tighter control but safer financial security, under the new regime associations are given more freedom of development but at the same time have to bear the risk of fluctuation in the costs of development. This gives associations more incentive to expand their lettings and to deliver more cost-effective housing and services (NFHA, 1992). Smaller associations and more risky projects, unattractive to private finance, would be given more financial security or a residual loan but at the same time cannot enjoy the comparable freedom as in the tariff projects (Hills, 1991).

Under the new financial regime, if fair rents were to be continued, future revenue would be beyond the control of the associations and there would be uncertainty in fulfilling future loan servicing. Such a risk would be unattractive to private finance. Thus fair rents were also abolished for new lettings and housing associations are free to set the rent level. In addition, grants for future major repair and maintenance was also to be replaced by a sinking fund provided from the rent income of the association. This policy is intended to encourage associations to build at a higher quality in the first instance and to keep good maintenance practice in order to save major maintenance costs in the future.

The increased risk premium through borrowing from private finance and the need to accumulate funds for future repair and maintenance created increased pressure on housing associations to maximise their rent income. Together with the freedom to set rent, it is not surprising that such financial pressure would push up the level of rent. The Continuous Recording (CORE) system introduce by the National Federation of Housing Associations (NFHA) to monitoring new lettings since 1988 indicates that from the first quarter of 1988 to the second quarter of 1991, the average rent of new lets had increased by 63% whilst that of the relets by only 40% (NFHA, 1992).

Given the economic and household characteristics of housing association tenants, increased rent would push more households into housing benefit. Whilst the percentage of new tenants out of work was quite stable during the period 1988 to 1990-91 at, respectively, 54% and 53% (NFHA, 1993), working households estimated to be eligible for housing benefit increased from 29% to 45% from the first quarter of 1988 to the second quarter of 1992 (NFHA, 1992). It is thus not surprising that the government also has a vested interest in influencing how housing associations set their rents as there is a danger that the intended savings from a reduced HAG rate are to be offset by the increase in housing benefit expenditure.

Whilst housing associations are "expected to maximise rental income on all their properties" (Housing Corporation, 1989), they are also encouraged to observe the principle of rent setting.: rent levels for housing association tenants are "subject to overriding requirement of the Tenants' Guarantee that rent must be set and maintained within the reach of people in low paid employment" (Housing Corporation, 1989). This is where "affordability" enters the rent setting formula. Likewise, it is also in the interest of the associations to keep rent affordable to their tenants - which they regard as their traditional role in providing housing for people on low incomes. Yet trapped in the seemingly irreconcilable demands of keeping rent low and balancing the costs poses a formidable task for many associations.

Notwithstanding constant demand from the housing association movement, the government was initially very reluctant to express explicitly the criterion of affordability. Instead, the responsibility was passed back to the associations :

> affordability is for associations to determine. They should take account of a range of factors, including the housing market and housing needs locally, like rent levels of neighbouring housing associations, the means available to their client groups and the ability to pay without hardship. (Housing Corporation, 1989:2)

Although it is widely reported that David Edmonds, chief executive of the Housing Corporation, mentioned that 33% of income devoted to rent was regarded as affordable at the Joseph Rowntree Memorial Trust conference on 'Affordable Housing' in 1989 (NFHA, 1989; Maclennan et al, 1990)[11], it was denied a week later (Housing Association Weekly, 21 July 1989). It was not until 1993 when Sir George Young, the Housing minister, gave evidence to the Select Committee of the Environment that the

working definition of an affordability ratio at 35% used by the Housing Corporation was disclosed for the first time. (Select Committee of the Environment, 1993).

Without any explicit guidelines from the Housing Corporation, the NFHA has developed a set of indicator rents as a reference for the member associations. The calculation of the indicator rents was mainly based on income data from the CORE surveys and an assumption of the proportion of income which should be spent on housing (the affordability ratio). The affordability ratio is central to the calculation of the indicator rents but since 1989 when the first affordability policy of the NFHA was launched, there have been two further changes to it. Fixing the affordability ratio involved some technical description; the relevant detailed discussion is deferred to chapter three. Nevertheless, it indicates the complexity of fixing affordability ratios.

To strike a balance of keeping rents low on the one hand and to recover the costs of development on the other hand is already a demanding task right from the beginning of the new financial era. It is even more burdensome after a series of cutbacks in housing association grant rates, from over 90% before the start of the new financial system to the proposed rate of 55% for 1995 to 1996. Against the backdrop of a worsening economic position among incoming tenants such a drastic reduction would only exacerbate the problem of affordability among housing association tenants.

2.6 AFFORDABILITY AND COUNCIL TENANTS

Affordability amongst local authority tenants is not yet an issue, partly because rents of local authority lettings are still low compared with other sectors and partly because the proportion of tenants claiming housing benefit is relatively high. In 1992, local authority tenants on an average spent £21 on housing (including rent, rate and poll tax) while home owners with a mortgage had to pay £67 on housing (which includes mortgage interest payment, rate, water charge and poll tax) and private tenants in the unfurnished rented sector had to spend £41 (CSO, 1993).

Although rents are low, so is the income of the majority of council tenants. The average household income of local authority tenants was only £153 in 1992 as against an average

of £390 for mortgagors and £210 for private tenants in the unfurnished sector (CSO, 1993). Thus the majority of council tenants, 52% in 1992, were on full or part housing benefit (DoE, 1993 Table 11.3). The present housing benefit system operates in such a way that it protects low income tenants from high housing costs, and ensures that the problem of affordability in an absolute sense can be avoided, but it also creates undesirable side effects.

However, the seemingly favourable affordability situation amongst council tenants is fragile. First, there is a notable proportion of tenants in rent arrears which may indicate financial vulnerability among many local authority tenants. Second, the new financial regime is exerting upward pressure on rents and may have an adverse effect on affordability for council tenants.

In 1992, over 1.6 million of council tenants were in rent arrears, representing over 40% of tenants who paid rent, with an average arrear amounting to seven weeks of average rent. Although there is already some stabilisation in both the average arrears and the proportion of tenants in arrears in recent years (table 2.1), there was a sharp increase in rent arrears in 1988-1989 (Audit Commission, 1989). However, the true position of rent arrears is masked by two factors: efficiency of the local authority and the operation of the housing benefit system.

Table 2.1 Local Authority Tenants Rent Arrears, England and Wales 1989-1992

Year	Number in Arrears (million)	Percentage	Average Amount of Arrear (£)
1989	1.97	42.3	152
1990	1.78	41.8	193
1991	1.18	40.9	284
1992	1.60	40.3	212

Source: CIPFA (1990-1993) Housing Rent Statistics.

Ill-managed local authorities are particularly vulnerable to rent arrears. In 1983, 22 local authorities amongst the 95 local authorities surveyed by the Audit Commission accounted for half of the total amount of rent arrears. The arrears situations of these local authorities appeared to have worsened in a subsequent survey in 1986. Better management practice, especially a more rational division of responsibility amongst different departments of the local authority, more timely information and designated

staff for arrears management were recommended to improve the arrears situation (Audit Commission, 1986). Yet the cause of arrears in the first place remains unclear.

At the same time, many of the arrears cases are actually tenants on housing benefit or in the process of being assessed for benefit entitlement. The Audit Commission found that in some authorities, only about one third of arrears cases were truly in arrears whilst the others were either awaiting assessment or in the process of arranging bank direct debit (Audit Commission, 1986). On the other hand, even when housing benefit pays the rent in full for tenants on full benefit, many authorities still have to collect a small amount of service or other charges from these tenants, whose chance of falling in arrears was no less than the other tenants.

The delay of housing benefit in the 1983 and 1988 surveys can probably be attributed to administrative problems of the housing benefit system introduced in 1982 and 1983 which lasted for a few years (Kemp, 1984). The new housing benefit system introduced in 1988 incorporated a series of administration arrangements to rectify the problems extant in the old system. The 14 days statutory limit to make housing benefit payment in the new system should prevent the problem of delayed payment, though there is no mechanism to ensure that it is the right amount of payment (Kemp, 1991). Thus, rent arrears caused through delayed housing benefit payments should have improved substantially. The causes of the remaining rent arrears warrant further investigation.

Another recent change that may have an adverse effect on the affordability of local authority tenants is the new financial regime introduced in the 1989 Local Government and Housing Act. Although the changes made in this latest legislation did nothing to change the policy and basic structure of the subsidy system already in place in 1980, it has had the effect of strengthening control from the centre and aiding the advance towards more market like rents.

Since the Conservative government took office in 1979, there has been a policy strand which aims to cut back capital and current spending on housing. Rent increase was one of the instruments used in achieving this aim. Subsidy to the local authority under the 1980 Housing Act depends on the state of the Housing Revenue Account of the

authority as well as the assumed changes in both income and expenditure in each local authority. The assumed changes in both rents and cost of management were fixed by the central government through a series of ministerial determinations which were fixed amounts which applied across all authorities in England (Malpass, 1990).

Such determinations were solely for the purpose of calculating the subsidy. Local authorities still had discretion in setting their own rents and subsidised the deficit through other sources, notably from rate income. However, financial pressure on local finance would make it difficult for local authorities not to follow the determinations in rent increase. As Malpass (1990) commented:

> payment of actual subsidy was to be related to assumed movements in income and expenditure, an approach which combined powerful leverage on rents ......whilst at the same time putting them [local authorities] in a position where a response more or less in line with the centre's aspiration was hard to resist. (Malpass, 1990 138-139)

Ministerial determinations of assumed rent increase throughout the 1980s were consistently higher than the rate of inflation, which pushed up the real level of rent. These increases were particularly high in 1981-82 and 1982-83 (Malpass, 1991 table 7.1), inducing a steep rise in local authority rent in those two years. In general the notional rent increase set by central government had its anticipated effect on the actual level of rent. The level of rents adjusted by the retail price index continued to increased after 1979 (figure 2.10) and the rate of increase was sharper when the assumed rent increase was also steep. In 1983 the steep increase witnessed in the previous two years was lightened, albeit with no indication of a U-turn in policy. There was speculation that the reduction was the result of a compromise between the Department of the Environment, which wanted greater rent increase and lower subsidy on the one hand, and the Treasury and the Department of Health and Social Security on the other hand, which demanded a halt to the sharp increase in housing benefit expenditure (Malpass, 1990).

The impact of the 1980 subsidy system began to lose impetus towards the latter part of the 1980s as more and more local authorities fell below the subsidy floor and out of the subsidy network. In 1981-82, 95% of local authorities in England received a subsidy but by 1986-87, three quarters of local authorities were no longer eligible (Hills, 1991). Such authorities thus had no incentive to follow the guidelines on either rent or

management cost increases. In order to regain some leverage over local authority

housing, the 1989 Local Government and Housing Act was introduced. This

immediately ensured that virtually all local authorities would have complied with the

national policy criteria.

Figure 2.10 Local Authority Rent, England and Wales 1979-1992
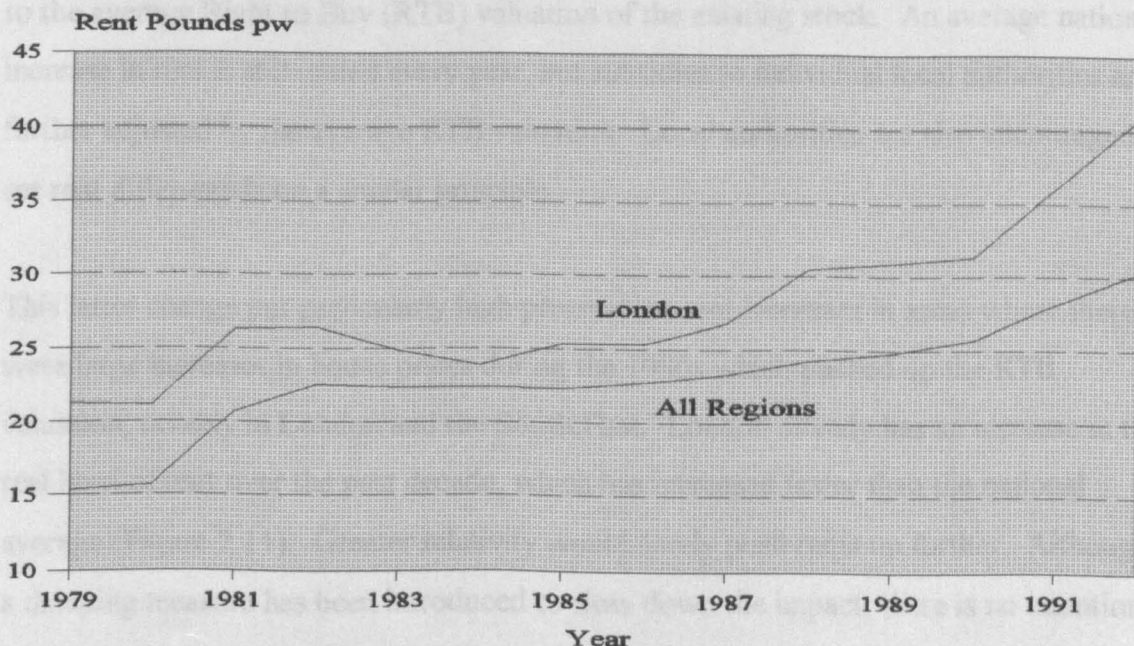
Note: Average Rents Adjusted to 1992 Price by Retail Price Index
Source: CIPFA Housing Rent Statistics (Various Years)

There are two key features in the new financial regime: the 'ring fencing' arrangement of

the HRA, and a major redefinition of housing subsidy (Malpass, 1990; Hills, 1991). The

'ring-fencing' arrangement forbids local authorities to transfer to and from the general

account, thus ensuring that there is no leeway for the local authority to bypass the

financial leverage on the subsidy system. Subsidy to HRA is also redefined to include

subsidy to housing benefit for local authority tenants. Since the majority of council

tenants receive housing benefit, virtually all local authorities have to revert to the

subsidy system. There is practically no future opportunity for any local authority to fall

out of the subsidy system because even if rents rise to a level which would out-balance

expenditure on housing, the aggregate amount of subsidy would still be increasing; this

is because subsidy on housing benefit would increase with the increase in gross rent

(Malpass, 1990).

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The system of a notional rent increase is still in operation under the new system, as is the pressure on real rent increase. In fact, the level of a notional rent increase as fixed by the ministerial determinations was already at a much higher level towards the end of the 1980s than in mid 1980s (Malpass, 1990 table 7.1). At the same time a more diverse rent relativity, both nationally and at the local level, was encouraged. Notional rent increase is no longer a flat rate across all authorities in England and Wales but is relative to the average Right to Buy (RTB) valuation of the existing stock. An average national increase in rent is still issued every year, but subsidies to individual local authorities are further adjusted by the average RTB valuation. Local authorities are also encouraged to set rent differentials on a similar principle.

This latter change put particularly high pressure on rent increases in areas where there were large increases in house prices during the 1980s which pushed up the RTB valuation, notably in London and the South East. London already has an increase in the real level of rent over the past decade, which has increased faster than the national average (Figure 2.11). Greater relativity would surely push rents up further. Although a damping measure has been introduced to slow down the impact, there is no intention within the government to reverse the trend. The anticipated further rise in rents raises the problem of affordability amongst local authority tenants.

There is also a change in rhetoric in government policy on local authority rents. The latest policy statement on rent, revealed by the 1988 consultation paper on new financial regimes for local authority housing (DoE, 1988a), though still reiterating the principle of setting rents which "[do] not exceed levels within the reach of people in low paid employment" ,DoE 1988a p5) also stressed that "[rent] should, however, be set by reference to these two parameters: *what people can pay,* and what the *property is worth.*" (DoE, 1988a p5-6 emphasis added) It represents a subtle departure from previous policy rhetoric that "no one in genuine need would be asked to pay more rent than he can reasonably afford" (MHLG, 1963:16) or "They [local authority tenants] should not have to face high and disruptive increases in costs totally disproportionate to changes in their ability to pay." (DoE, 1977a:7)

Figure 2.11 Change in Local Authority rent, England by Region 1979-1992
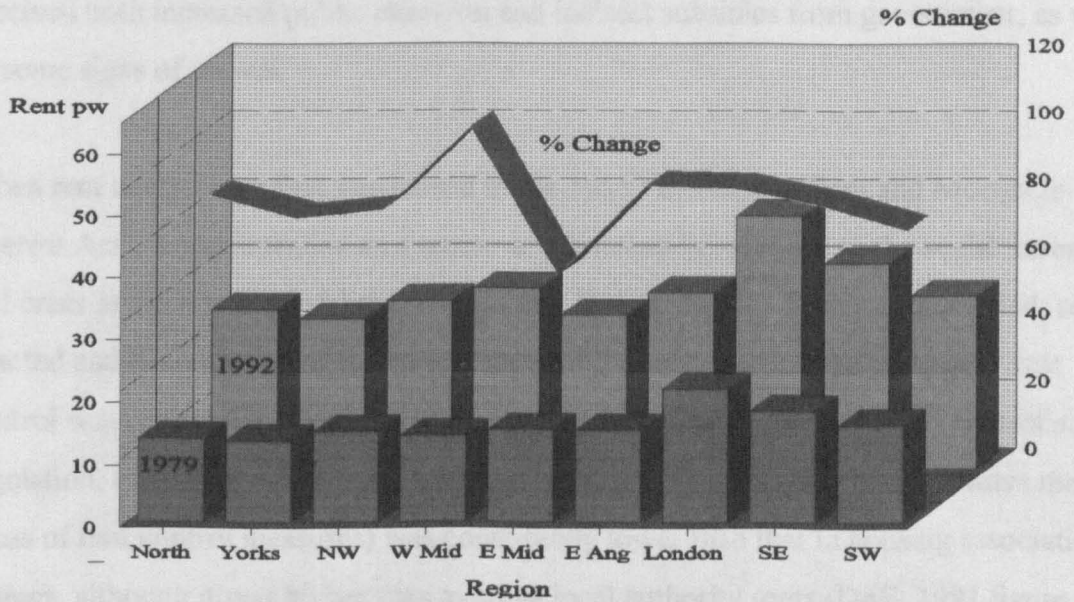
Note: Adjusted to 1992 price by Retail Price Index, Refer to Appendix A3 for
Abbreviations
Source: CIPFA Housing Rent Statistics (Various years)

This new rhetoric involves the issue of affordability (what people can pay) as well as the
issue of equity: "what the property is worth". Traditionally, rent differentials among
local authority lettings largely reflect the historical costs rather than the current
conditions. It remains an issue of "how existing variation on rents can be transformed
into a more equitable pattern, related to current values" (Malpass, 1990:176). The
latter change would inevitably pose a question about affordability for tenants who are
currently paying rents which are more favourable to them than they would have to pay
under a more rational valuable system. Thus "questions remain as to the method of
determining affordability and value, and whether these should be related to incomes
generally or more specifically tied to conditions in each region or locality." (Malpass,
1990:176)

2.7 AFFORDABILITY IN THE PRIVATE RENTED SECTOR

The private rented sector has experienced a process of decline and decay during the past
ninety years. Unlike the public rented sector and most countries on the Continent, the
private rented sector in Britain was not subsidised by public money, but rather was
characterised by seventy years of rent control and regulation (Stafford and Doling,
1981), albeit arguably through indirect subsidies from landlords to tenants

(Cullingworth, 1965). It was not until the latter part of the 1980s that this sector received both increased public attention and indirect subsidies from government, as well as some signs of revival.

When rent control was first introduced in the 1915 "Increase in Rent and Mortgage Interest Act", it was intended as a temporary measure in response to the social unrest and crisis in the housing market (Stafford and Doling, 1981). It was decontrolled, re-enacted and decontrolled again several times in the subsequent sixty years until rent control was replaced by the fair rent system in 1965. During the period of control and regulation, the average rent level in the unfurnished private rented sector (always the focus of rent control measures) was consistently lower than that in housing association lettings, although it was higher than average local authority rents (DoE, 1991 figure 11a).

The 1988 Housing Act, which incorporates and expands new measures introduced in the 1980s, practically put an end to rent regulation in this sector. Whilst tenants who had their rents registered before January 1989 can still be protected by the fair rent system, lettings after January 1989 can only be either assured tenure or shorthold assured tenure, on which market rents will be charged and tenants have only very limited security of tenancy[4]. There are also signs of an upturn, or at least a stabilisation, from the century long decline. The absolute numbers of the stock in the sector (which includes houses tied to a job) have been increasing marginally since January 1989 (DoE, 1993). However, the decay in housing quality in the private rented sector still continues (DoE, 1993a), and whether such an upturn is sustainable remains to be seen.

Perhaps it is rent deregulation in the 1988 Housing Act that has the most important implication for affordability. The average rent in the private rented sector has risen by 43% over the year 1988 to 1990 (DoE, 1991 table 11.5). In the south of the country, where demand for rented housing is believed to be more acute, the increase over the period was nearly 50% (figure 2.12). Such a large increase was mainly attributable to the high rents charged for shorthold assured lettings. This was introduced in the 1988 Act (to be more precise, a modification of an earlier version of tenure form) which stood

at an average of £66 per week (DoE, 1991 table 11.4) - nearly three times the average rent for local authority hosing.

Figure 2.12 Average Rent in Private Rented Sector, England by Region, 1988 and 1990
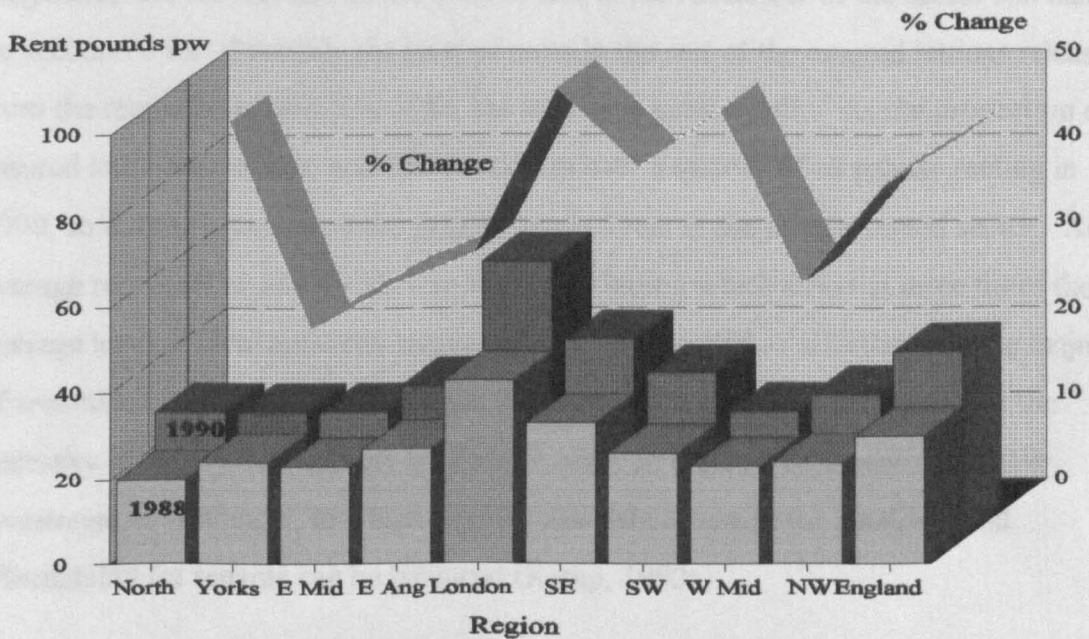
Note: Refer to Appendix A3 for Abbreviation
Source: DoE Housing and Construction Statistics 1991 Table 11.5

However, whether such evidence confirms the anticipated outcome of the deregulation proponents that decontrol would allow rents to rise to a higher level, and allow a more reasonable return for the landlord, is still inconclusive. First, it is argued that before the introduction of the deregulation measures in 1980, there were already a considerable number of regulated lettings which did not have a registered rent. Such lettings already had rents negotiated between the parties concerned, in other words, it was the market rent. Deregulation would have little impact on the rent level of such lettings (Kemp, 1988). In fact lettings in the regulated sector without a registered rent actually have an unchanged level of rent in money terms which implies a fall of rent in real terms (DoE, 1991 table 11.4). Second, new assured lettings created by the Business Expansion Schemes were at the high end of the market and of considerably better quality (Crook et al, 1991). Thus part of the rent increase was attributable to the improvement in housing quality. Third, there is a trend away from unfurnished to furnished lettings (Kemp, 1992a), whereas the proportion of furnished to unfurnished lettings has increased from

1:4 in 1971 to 1:1.3 in 1991 (OPCS, 1972, 1992). The increase in the average level of rent may simply reflect this trend.

Nevertheless, the effect of changes in the BES and the furnished lettings should not be magnified, and the increase in the level of rent in the remainder of the sector still has to be accounted for. Probably the level of rents in the rest of the assured lettings released from the regulated sector after 1988 has increased substantially. As the proportion of assured lettings increases, and these make up over a quarter of all private renting in 1990, so did the pressure on the general level of rent in the private rented sector. An average rent level of £66 for shorthold assured letting which stood at three times the average level of local authority lettings cannot be regarded as affordable by the majority of tenants on medium or low incomes. It is not surprising that the question of the necessity of supply-side subsidy is raised in order to create a commercially viable investment environment, in which a reasonable rate of return for landlords and affordability for tenants can be balanced (Kemp, 1992a).

Concomitant with the increase in rent level in the private rented sector is an increase in the proportion of income devoted to rent. Ratio of average housing cost to average income amongst private tenants in the unfurnished sector 1979 was 9% but in 1992 it was 20% (CSO, 1989, 1993). They rely increasingly on housing benefit. Despite there being several occasions when the generosity of housing benefit has been reduced since 1983, especially the 1988 housing benefit reform in which 77% of current claimants lost out (Kemp, 1992b), the number of private tenants claiming housing benefit is still on the increase (figure 2.13). From 1988 to 1992, over three hundred thousand more private tenants were claiming housing benefit, an increase of 27%.

Such an increase is mainly attributable to the remarkable increase in claimants who were on income support at the same time during the same period (an increase of 51%). Given the design of the current housing benefit system, which offers full protection for tenants on income support (and also tenants whose income level is comparable to those eligible to income support) against high rent and, by default, has shielded such tenants from the problem of affordability. It nevertheless also creates the undesirable problem of a

poverty trap and a disincentive to work when high rent pushes tenants on a relatively high income onto housing benefit.

Figure 2.13 Private Tenants Claiming Housing Benefit, England and Wales 1983-1992
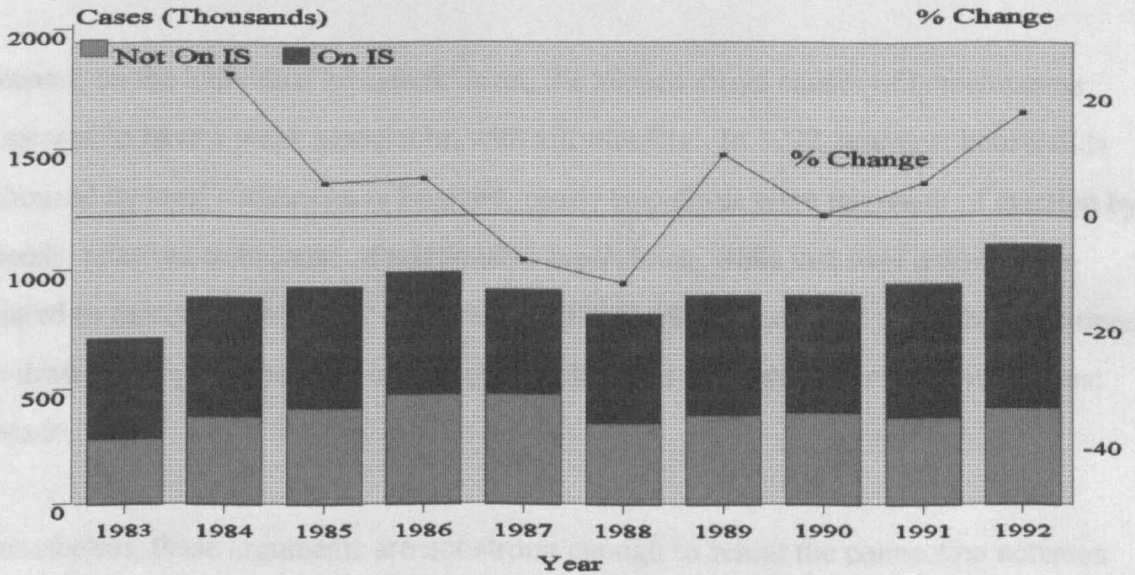
Note: IS (Income Support)
Source: DoE (1993) Housing and Construction Statistics Table 11.3

2.8 AFFORDABILITY AND HOMELESSNESS

There has been an upsurge in the number of households accepted as homeless in the last decade. The magnitude of the increase is alarming: homeless families increased nearly three fold from 1978 to 1990 (figure 2.14). Affordability is also readily perceived as being associated with homelessness: people are without a home because they cannot afford one. People who are vulnerable to homelessness: the poor, the unemployed, a member of an ethnic minority or a lone parent (Greve and Currie, 1990) are also common among those who are likely to have an affordability problem.

However, the direct linkage between homelessness and affordability is not straightforward. First, on an aggregate level, there was already an upsurge in the number of people accepted as homeless before the crisis of affordability began to surface. In fact, the number of homeless people had fallen marginally by the early 1990s, when the problem of affordability is thought to have been more serious. In

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addition, affordability was found to be a weak factor in explaining the aggregate level of homelessness among local authorities, compared with the much stronger factor of ethnicity and other socio-economic characteristics. The effect of affordability on homelessness was also found to be unstable over time, or between rural and metropolitan regions (Bramley, 1993).

Second, on the individual household level, the alleged direct causes of homelessness appeared to have a weak association with affordability. In 1992, amongst households rehoused by local authorities in England, nearly two thirds were the result of eviction by friends, relatives or because of relationship breakdown, while just over a tenth were related to mortgage default or rent arrears (OPCS, 1994 figure 8.13). At the same time, no drastic change in the main causes of homelessness has been observed over the past decade.

Nonetheless, these arguments are not strong enough to refute the connection between the two. Reasons given by those rehoused are too crude to explain fully the real cause, because "often the actual moment of becoming homeless under the [1977 Housing] Act is the latest stage in a chain of events that may be far from straight forward" (Clapham et al, 1990:131). Likewise, official statistics are believed to be an underestimate of the true problem of homelessness. Not only is it simply an administrative classification which depends on the discretion of individual local authority, but also there are many other homeless people, noticeably the young single homeless, who are not eligible to be rehoused within the area. In 1992 less than half of the households applying for homeless status were accepted as homeless, besides the 62,900 households living in temporary accommodation awaiting permanent rehousing (OPCS, 1994).

Hence, despite the lack of conclusive evidence of a direct link between homelessness and affordability, the high level of homelessness still serves as a reminder of the acute problem of both access to housing and the inability to pay for a decent home. Homelessness is believed to be an interplay of demographic, social and economic forces (Greve and Currie, 1990). Affordability may well be an intermediate cause of homelessness, albeit the exact relationship has yet to be explored.

Figure 2.14 Homeless Households Accepted by Local Authority,England 1978-1993
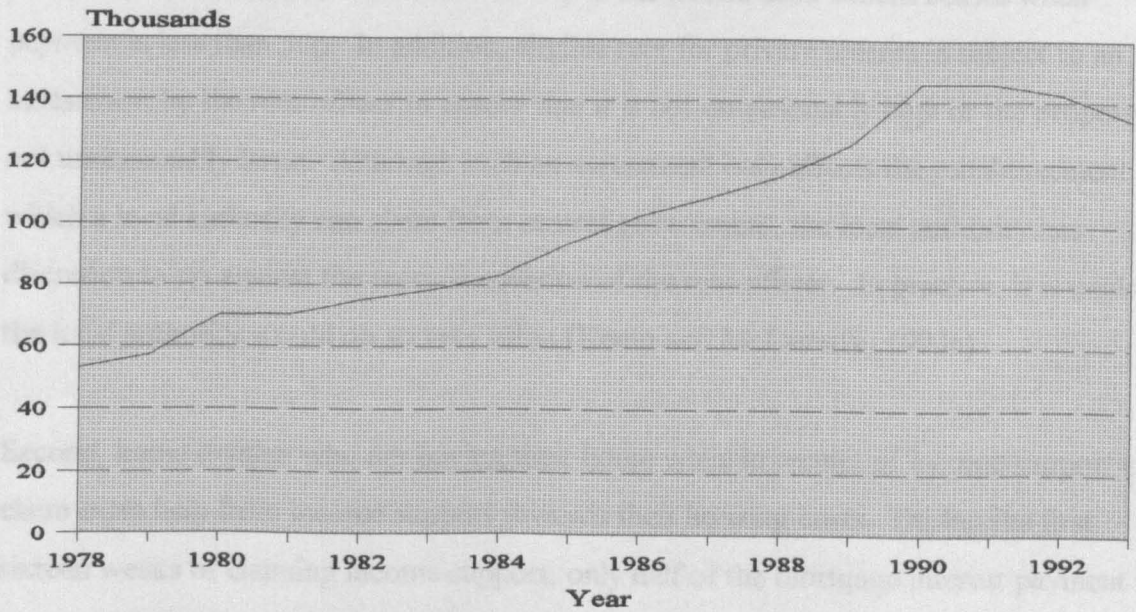
Source: DoE Quarterly Homelessness Returns (Various years)

2.9 ASSISTANCE WITH HOUSING COSTS

In most industrialised countries, it is inevitable that the consumers' costs of housing will be influenced by government intervention in one form or another (Clapham et al, 1990). Such interventions can be classified into two broad types: supply side subsidies and demand side subsidies with the latter type gaining more prominence over the past two decades (Hills et al, 1990; Kemp, 1990). Demand side assistance is more directly linked with affordability.

Demand side intervention takes the form of subsidies to people, often income-related and aiming at enhancing the ability of people to pay for their housing costs (Clapham et al, 1990). However, in practice the distinction between supply and demand side intervention is less clear-cut because of the close relationship between different elements in the housing system. There are roughly four types of demand side subsidies in Britain: housing benefit to renters, help for home owners on income support to repay mortgage interest, tax relief for home owners and council tax benefit.

First, tenants on income support, or those whose income is at or below the income support applicable amount, are eligible for housing benefit which will cover their rent in

full. Whilst tenants whose income is above the applicable amount are still eligible, benefit will be withdrawn at the rate of 65p in the pound until benefit ceases when payment is less than 50p. In addition, eligible rent for private tenants is subject to an assessment by the rent officer to ensure that it is not unreasonably high or the property is not unreasonably large. Although such an assessment only affects the reimbursement which a local authority can claim from central government, the local authority has discretion to go against the recommendation of the rent officer. In practice, it is unlikely the local authority would do so very often (Kemp and McLaverty, 1993a).

Second, home owners who are buying their home while in receipt of income support can claim extra help from income support towards their housing costs. During the first sixteen weeks of claiming income support, only half of the mortgage interest payment is covered by social security, but from the seventeenth week onward the interest payment is covered in full. However, repayment of capital is not covered in either case.

Third, all home owners repaying their mortgages can receive a 25% reduction in interest payment up to a ceiling of a £30,000 loan under the Mortgage Interest Relief at Source (MIRAS) Scheme. Home owners are also considered to have received benefit from the tax exemption of imputed income. The is the income they earn from letting the property to themselves, and exemption from capital gains tax (Enquiry into British Housing, 1990; Hills, 1991). It is argued that which tax exemptions can be regarded as a housing subsidy depends on whether housing is a consumption or an investment good, yet it is more appropriate only to include mortgage tax relief (MIRAS) as a subsidy to home owners (Clapham et al, 1990)

Finally, a new council tax was introduced in April 1993 to replace the notorious poll tax. The new council tax liability is assessed partly on the value of the property and partly on the composition of household. Thus it is regarded as a hybrid of property tax and household tax (Hills and Sutherland, 1991; Giles and Ridge, 1993). It can be regarded as a part of housing costs since at least some of the tax is related to the cost of housing consumption. A new benefit, the council tax benefit, was introduced together with the council tax. It is administered by the local authority and has the same rule of eligibility as housing benefit. Unlike the poll tax benefit which it replaces, council tax benefit

would cover the full tax liability (after adjustment for non-dependents and other deductions), and the rate of withdrawing the benefit is set at 20p in the pound (20% taper)(CPAG, 1994).

With the exception of MIRAS, all the afore mentioned benefits are means-tested. The MIRAS is granted to all home owners whatever their need and level of income. In fact, it is regarded as regressive and many recent studies show that it benefits the rich more than the poor (Clapham et al, 1990; Warburton, 1990; Hills, 1991). Despite a two fold increase in the total cost of MIRAS over the decade 1979 to 1989 (Hills, 1991), the amount each mortgagee receives is too meagre to render any substantial help to those in affordability problem. Conversely, home owners who are in need cannot get any extra help from MIRAS. Since all social security payment towards interest repayment are net of interest relief, any benefit from MIRAS is simply offset by a corresponding deduction in social security benefit.

Means tested benefits, on the other hand, are targeted at those who are in need, at least they are designed to be so. Such benefits, however, suffer from two problems: take-up and the poverty trap (Deacon and Bradshaw, 1983). The problem of take up occurs because people who are entitled to the benefit do not apply for it. In 1987 it was estimated that 88% of eligible tenants took up housing benefit (DSS, 1992). The implication is that more than 10% of tenants in need of help received no housing benefit. The factors affecting take up are rather complex (Kemp, 1992b) but it nevertheless suggests that the benefit system cannot prevent those in need suffering from a problem which benefit is intended to mitigate.

Hence, although both housing benefit and council tax benefit provide full protection against the costs of housing (subject to the test of reasonable rent and space), it is not unusual to find tenants unable, or who find it difficult, to meet their housing costs, because of the problem of take up. For home owners on benefit, even if the take up is 100%, there is no guarantee that this will overcome all difficulties in repaying their mortgages, because new claimants have to pay half the amount of their interest payment and all claimants have to make their capital repayment.

The poverty trap arises from the interplay between the tax and benefit systems. As the gross earning income of a claimant increases, both tax and the withdrawal of benefit entitlement would eat up part of the increase. They may therefore achieve only a small gain in net earning: a small increase in net income may cover a relatively large range of gross income (a plateau in the graph linking net income and gross income). Under a high tax rate or a steep taper, the plateau will be flatter, and under some special interaction of the design of the tax and benefit system, an increase in gross income may even result in a decrease in net income at some point in the income range (an example is the rent rebate system before the 1988 reform). The extent to which the plateau stretches up the income scale depends on the design of the benefit system. The poverty trap has an adverse effect on the incentive to increase earnings, since it is difficult to justify extra effort which results in only a marginal gain in net income.

A taper of 65% in the current housing benefit would have produced a very severe poverty trap. Hills (1991) shows that under the housing benefit, tax, national insurance contribution, poll tax benefit and family credit systems from 1989 to 1990, there could only be an increase in net income of £14 over a range of increase of £131 in gross income. Over some ranges of gross income, there could be a gain of only 4p for every extra earned pound. Changes have been made in the early years of the 1990s: tax rates have been reduced, the new council tax benefit is more generous than the poll tax benefit, but it also has a steeper taper. If this is assessed with the introduction of VAT on fuel (where the cost of heating can be regarded as part of housing costs), higher national insurance contributions and other tax increases in 1994, the situation of the poverty trap has to be re-assessed.

Likewise, home owners on benefit are trapped in the even more severe rule of benefit withdrawal. The taper for income support is 100% and the claimant will end up with no improvement in net income over a very large range of gross income. There is an additional work disincentive for a claimant on income support, particularly for home owners repaying a mortgage. Since a claimant has to be out of full time employment, or in part time work working less than 16 hours a week, in order to be eligible for income support, there is no incentive for a home owner on income support to take a low paid, full time job even if it is available. For a tenant, taking a full time job would not affect

the benefit entitlement very much because he or she can still be eligible for housing benefit and family credit. But for a home owner still repaying a mortgage, switching to family credit means the loss of social security support to pay off the mortgage interest which may be very substantial. This unemployment trap may have prevented many home owners from improving their standard of living by increasing their earned income.

High housing costs have a detrimental effect on both the poverty and the unemployment trap. For a given portfolio of design of the tax and benefit systems, the level of gross income at which housing benefit is withdrawn depends on the cost of housing, since it is the only parameter in the benefit formula which is not fixed. The poverty trap will only cease when the entitlement is withdrawn and it would stretch further up the income scale with the increase of housing costs to the claimant. Thus, even if housing benefit can protect tenants on full benefit from high rent, there is a side effect exacerbating the problem of the poverty trap. Likewise, a home owner paying off a comparatively large mortgage would have to take up a highly paid full time job before the increased earning could compensate for the loss of benefit entitlement.

The present system cannot protect both tenants and home owners who spend a large proportion of their income on housing. Hills (1991) shows that even for a modest level of rent (£30pw), which was at a level in-between the average rent of local authority and the private rented sector, the net rent to net income ratio can be as high as 35% for a single person aged 25 or over. The higher the rent the claimant has to pay, the higher the possible maximum rent to income ratio will be. For a home owner on income support, the net housing cost to net income ratio depends on whether mortgage repayment is regarded as a part of housing cost. If it is not, the net ratio is always zero, but if it does include capital repayment, the ratio would depend on the amount of capital repayment, which may be very substantial.

There are alternative means to rectify, or at least to mitigate, problems within the benefit system (see Enquiry into British Housing, 1990; Hills, 1991; Kemp, 1992b; Wilcox, 1993). Most of them are not designed specifically to mitigate the problem of affordability but would still have an impact on the problem. Hills (1991) proposes a dual taper system for housing benefit under which the maximum net housing cost to income

ratio would be reduced, compared with the present single taper system. Extending housing benefit to home owners was also proposed (Enquiries into British Housing, 1991; Webb and Wilcox, 1991), which would mitigate the problem of affordability for home owners in low paid work.

2.10   SOME GENERAL ISSUES

Apart from the above mentioned issues related to specific tenure and area of social policy, there are also a number of general issues concerning affordability raised in the literature which worth further examination. They are whether affordability is one issue or a manifestation of several issues, whether the issue of affordability is only cyclical or enduring, whether it is myth or reality and whether it is an income or a housing problem. A brief discussion of such issues will be provided in this section and will also be further examined in the concluding chapter in light of the empirical findings in this thesis.

One Issue Or Several ?

Bramley (1994) argues that affordability, at least as far as politicians and the media are concerned, features two separate issues: "One dealing with the mainstream tenure of owner occupation and its relations with the national economy, and the other with financing the social sector" (Bramley, 1994:118), rather than various manifestations of a single underlying issue. Whereas some other phenomenon, notably homelessness, "forms a bridge between these two arenas" (Bramley, 1991:118).

Likewise, SERPLAN (1990) (The London and South-East Regional Planning Conference) also distinguishes two levels of the affordability problem: the primary level at which households are unable to get access to any tenure owing to the lack of resources, and the secondary level of the problem which arises because of short term fluctuations in the housing market.

In addition, Linneman and Megbolugbe (1992) portray a more complex picture of affordability entangled in the interlocking elements of the housing system, and every aspect of the system can be a potential manifestation of affordability.

A counter argument to these is that there is one underlying cause of the affordability problem, namely the increasing reliance on market forces, witnessed by an accelerated shift from supply side subsidy to demand side subsidy. Because of the imperfections of the housing market and underlying maldistribution of income, market forces are not capable of fulfilling the housing requirements of those who are in greatest need (Whitehead, 1991). Analysis the issue of affordability in such a way implies that it is in fact a single issue.

Whether It Is Cyclical Or Enduring ?

Bramley (1994) also argues that despite continual public attention on affordability in the owner occupied sector throughout the past few years, the focus has actually undergone several changes: from the difficulties of access to home ownership in time of house price boom, to the concern of the home owners vulnerable to arrears and repossession, then the repercussion of the market slump on the performance of wider economy. Queries about the integrity of the affordability issue thus arise. Although the present concern can still be regarded as an issue of affordability, but in a broader sense, the cyclical fluctuation of the housing market has already shifted the nature of the issue.

On the other hand, whilst the issue of affordability in the social rented sector still remains a technical one, it has an enduring policy impact. It appears to be developing in a direction favoured by the housing professionals and lobbies: a halt to the expected decrease in the Housing Association Grant and a continuation of injecting public money into the social rented sector. These not only demonstrate "a legacy of recognition that the affordability problems were serious" (Bramley, 1994:122) but also signify affordability as an enduring problem.

A Myth or Reality ?

Whilst traditionally affordability was perceived as a problem of households who are unable to pay their housing costs, the recent focus of the affordability crisis on owner occupiers and the high house prices that triggered the concern, this traditional perception is under challenge. Drawing mainly from experience in the United State,

Linneman and Megbolugbe (1992) suggest that affordability is no longer an "issue solely the province of the very-low-income households; it is now a middle-class issue" (Linneman and Megbolugbe, 1992:370).

Notwithstanding that the affordability issue has been extended into the middle class, Linneman and Megbolugbe (1992) argue that the affordability problem among the middle class is only a myth: "an issue manufactured by middle-class and affluent young adults with ever-growing expectation....much of the perceived affordability crisis simply reflects changes in tastes for housing amenities and unrealistic expectation for house price appreciation" (Linneman and Megbolugbe, 1992:388).

Whilst such a proposition has yet to be validated in a British context, empirical findings suggest evidence in its favour. Ford and Wilcox (1992) reported that in their 1992 survey over two thirds of the households whose homes were repossessed had a net income in excess of £200 per week, a level of income above what is regarded as a low income.

There is an additional dimension to the myth. The wide spread of the preference for home ownership, fuelled by easy borrowing and financial incentives from the government (for example tax incentives and the RTB), may have driven many households into owner occupation, regardless of their long-term prospective affordability. Saunders (1990) quotes "an appreciating asset" as one of the most popular reason why households in his samples bought their homes, an aspiration which goes beyond the real use of the property. Whereas Yip and McLaverty (1993) show that there has always been an excess of demand for home ownership among renters in the past two decades, but in both 1978 and 1988 the majority of tenants who wanted to buy would not be able to sustain home ownership. The recent fall in nominal house prices may have broken the myth of a house as an ever-appreciating asset (Bramley, 1994) and already had an unfavourable effect on the preference for home ownership (Coles, 1991). Those low income households which have been misled should not have been driven into home ownership in the first place.

An Income Problem or a Housing Problem ?

Whilst affordability for low-income households remains a real issue, it is not yet clear whether it is an income problem or a housing problem. Whitehead (1991) argues that the present housing benefit system has little to do with housing policy. Neither does the benefit assume that claimants can change the quality of their housing, nor incorporate the objective of improving quality in its design; the benefit acts simply as an income supplement.

Likewise, the residual income approach, arguably a superior approach to measuring affordability (e.g. Brownill et al, 1990; Bramley, 1994; Hancock, 1991) regards the cost and the quality of housing as unimportant. The ultimate assessment refers to a poverty line which is essentially a measurement of poverty. In fact, an approach similar to that for residual income is used in the DSS Households Below Average Income series (HBAI) (DSS, 1990), but such indicator is used to measure 'poverty' instead of 'affordability'. It also signals the underlying perspective on affordability as an income problem among those who favour this approach.

However, Whitehead (1991) also points out that, contrary to the income supplement program in general, which usually involves cash transfer without reference to any particular kind of consumption, housing benefit is linked to the cost of housing. This is also a common feature of income-related housing allowances in other industrialised countries (Kemp, 1990). It reflects the special characteristics of housing, which cannot be satisfactorily coped with a general income transfer programme. The affordability problem, in this aspect, exhibits the functioning (or malfunctioning) of the housing system as well as warranting a policy response that is distinctive to housing.

2.11   SUMMARY AND CONCLUSIONS

The concern of affordability in the 1980s was initially focused on two tenures: owner occupation and the housing association sector. It was the state of the housing markets and the change of government policy that provoked such concern. A more detailed analysis in this chapter reveals repercussions which go beyond the initial concerns into other tenures and other areas of housing and social policy.

Perhaps the alarm on affordability was first raised when the rate of both property repossessions and mortgage arrears rocketed towards the end of the 1980s. The causes attributed to these problems were complex but it is argued that the relaxation of lending policy by building societies in the 1980s, coincident with the worsening economic and employment conditions, were to blame.

The unprecedented high level of house prices in the late 1980s also aroused concern about the entry to owner occupation. In the climate of a relaxed housing finance regime and high house prices, it was less the barrier of an initial deposit that hampered entry to home owners than the burden of a high amount of initial repayment. Subsequent high interest rates and deteriorating employment markets pushed many new home buyers into financial difficulties. Those in the worst situations were forced to fall behind with their repayments or had their homes repossessed. The luckier ones would have a large proportion of their income sunk into mortgage repayments. The price fall early in 1990 did not ease the burden of the financially stretched, but instead created the problem of negative equity that makes it difficult to sell homes to gain any relief.

Previous studies on the entry to home ownership largely ignore the interplay between the preference for becoming a home owner and the ability to buy. This tends to over-estimate the demand for home ownership. Incorporating preference in the estimation of demand for home ownership would help to fine-tune the accuracy of estimation.

Besides the access to owner occupation, the other initial concern of affordability was among housing association tenants triggered by the introduction of a new financial regime and is still robust. The debate on how housing associations can attract private finance and maximise their rent income on the one hand and keep rents affordable to their tenants on the other hand are continuing. Recent cut backs in the housing association grant rate and the disclosure of the government's working affordability ratio has refuelled the impetus of the debate. Yet there is still no satisfactory method by which affordability can be measured.

Likewise, local authority tenants who were traditionally perceived to be immune from any affordability issue are increasingly jeopardised through problems of affordability.

The new financial regime introduced in 1990 reiterated the government's intention to push up rents. This latest legislation is also equipped with two additional weapons: a redefined subsidy system which pre-empts any future breakaway of local authorities from the subsidy system and escape from central control; and a new system of assessing notional rent increases which are based on the average RTB valuation. The latter measure creates pressure for further rent increases and creates the issue of affordability among council tenants.

If social tenants could not immune form the problem of affordability, their counterparts in the private tenants should be a more obvious group to experience an affordability problem in recent years. Deregulation in the rental markets in the late 1980s has pushed up both rents and the proportion of income tenants have to spend on rent. An absence of any sign of a halt in the increase in rent and the deterioration of economic conditions among private tenants will increase the dependency of private tenants on housing benefit.

Whereas the problem of affordability signifies difficulties in paying for housing, the problem of homelessness indicates a problem of physical access to housing. The number of homeless families in official statistics has shown a three fold increase in the 1990s, not including the concealed homeless people and those not counted in official statistics. Yet, whilst the problems of affordability and homelessness have close links with each other, there may be no direct causal relationship. They both reflect the increasingly difficult access to housing, the diminishing ability to pay for housing costs and defects in the housing system.

Affordability, at least in principle, should not exist under the current housing benefit system since tenants on a low income who are having difficulties in paying for their housing would have full protection against high rent. However, because of the problem of low take up, such protection cannot be extended to all those in need. It also creates a poverty trap which hampers work incentives. Under the present social security system, home owners out of work can get help from social security towards their mortgage interest payment but unlike tenants on housing benefit, they are not offered full protection against high housing costs, and instead the social security system constructs

an unemployment trap on top of the poverty trap. High housing costs exacerbate the magnitude of both poverty and unemployment traps and under the present system there is no guarantee for either tenants or home owners against having to spend a high proportion of their income on housing.

Beside the aforementioned manifestation of affordability in different tenures and different areas of social and housing policy, there are still some general issues on affordability that worth further investigation. It is debatable whether affordability in its various expressions is simply different manifestations of a single underlying issue, or of several phenomenons. Neither is it clear whether the problem is cyclical or enduring. In addition, some commentators regard the issue itself (or issues themselves) as partly a real problem of the poor and partly a reflection of merely an aspiration of the middle class. Finally, whether the issue is an income problem or a housing problem would have direct implications for the policy response it seeks.

One important question remains. Malpass (1990) points out that to implement the new rent setting policy, a method of determining affordability for local authority tenants must be developed. The National Federation of Housing Association (NFHA) has been muddling with this for the past few years and despite a third change in its affordability policy, the task still seems to be continuing. The chapter that follows will examine, in more detail, how attempts to define and measure affordability have been made and to explore the possibility of establishing a more coherent way to determine affordability.

CHAPTER 3
CONCEPT AND MEASUREMENT

3.1 INTRODUCTION

Despite the increasing concern about affordability in the last decade, and given the importance of a clear definition and precise measurement of affordability, there is still no consensus on how affordability should be defined and measured, or even about whether it is a helpful concept. Whilst housing practitioners in the UK embrace the housing cost to income ratio as an indicator of affordability, similar to their counterparts on the continent and across the Atlantic, academic discourses in the UK are still sceptical about the contribution of the concept of affordability regarding housing policy, and about the relevance of the housing cost to income ratio as an effective measurement. Rather than being accepted as a real policy issue (Whitehead 1989) the importance of affordability is either dismissed as mere rhetoric or, at best, is considered to be an extension of the concept of need (Whitehead et al 1993). At the same time, the housing cost to income ratio is often regarded as a second-rate indicator of affordability compared to residual income measurement (Bramley 1990b, Brownill 1990, Hancock 1993).

In other industrialised countries, notably the United States, the use of the housing cost to income ratio has been used exclusively as an indicator of affordability since the 1920s (Lane 1977). However, despite its long history of usage, vigorous examinations of the concept are still uncommon and the choice of the cut-off ratio still remains largely a 'rule of thumb' (Lane 1977). Conversely, discourses on affordability in the UK, although relatively new, are beginning to advance beyond the initial tenure-specific deliberations and involve more sophisticated economic analyses (e.g.Hancock,1991). The purpose of this chapter is to provide a comprehensive review of both the concept of affordability and of past attempts to implement the concept and thus to further contribute to advancing the discourse.

This chapter consists of five sections. First, various definitions of affordability will be reviewed, to extract some basic principles on defining affordability common to those

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definitions. This is followed by an analysis of affordability in relation to the notion of merit good and opportunity cost, two economic concepts which are considered essential in the understanding of affordability. The third and fourth sections will systematically review and critically examine the various approaches and definitions of affordability. The last section is a re-examination of the concept of affordability in which possible alternatives to the present measurements are explored.

3.2 DEFINITION

Many discussions on affordability proceed without a stated definition of the concept; others rely only on an operational definition, notably among academic studies in North America, which is no more than an arbitrary ratio. Even where a definition is provided, it is sometimes not easy to offer a stand-alone definition:

> affordable housing is defined as: that which is accessible to people whose incomes are insufficient to enable them to *afford* adequate housing locally in the open market. (SERPLAN 1990:2 italic added)

Without becoming subject to such entanglement, Howenstine (1983) defines affordability in a concise way by relating household income to housing outgoings:

> the ability of the household to acquire decent accommodation by the payment of a reasonable amount of its income on shelter. (Howenstine 1983:20)

In Howenstine's definition, what a reasonable amount of a household's income should be is not explicit. It could be understood in terms of the distribution of household budget on housing and non-housing expenditures as Fallis (1986) describes it:

> Households can be said to afford their housing cost if those costs do not extract an unreasonable share of the household budget, leaving the household with sufficient income to meet other needs such as food, clothing, transport, medical care, education, etc (Fallis, 1986:144)

Maclennan and Williams (1990), on the other hand, offer a more elaborate definition which expresses 'decent accommodation' and 'reasonable amount' in a more elegant manner:

> Affordability is concerned with securing some given standard of housing (or different standards) at a price or rent which does not impose, in the eyes of some third party (usually government) an unreasonable burden on household incomes (Maclennan and Williams, 1990:9)

Likewise, 'given standard of housing' and 'unreasonable burden', can be interpreted in a more specific way:

> Households should be able to occupy housing that meets well-established (social sector) norms of adequacy (given household type and size) at a net rent which leaves them enough income to live on without falling below some poverty standard. (Bramley, 1990a:16)

Notwithstanding the difference in emphasis of these definitions, they possess several shared common elements. First, affordability deals with the user cost of housing of an individual household. The shift of housing subsidy away from the supply side towards the demand side has contributed to directing increased attention onto affordability (Whitehead and Kleinman, 1993).

Second, the household should be consuming housing to some given lowest standard, albeit it is referred to as 'decent' or 'at some social sector norms'. Third, the opportunity cost of non-housing consumption is an important concern of affordability. Part of the expenditure of the household on non-housing goods and services has to be forgone in order to acquire adequate housing goods and services.

Fourth, affordability also embraces the notion of merit good. It is apparent that non-housing goods and services are regarded as a merit good since a household is expected to have guaranteed sufficient resources left for non-housing consumption. Whether housing is seen as a merit good or not is unclear. Whitehead (1989) argues that recent changes in housing policy in the UK indicate "an apparently important shift in political attitude, away from treating housing as a merit good... towards treating housing more as a private good" (Whitehead, 1989:877). On the other hand, Hancock (1993) opines that "any approach [of affordability] which does not take housing to be a merit good is likely to be unreasonable" (Hancock, 1993:129).

Finally, treating non-housing consumption as a merit good suggests a close relationship between affordability and the concept of poverty. Households should be left with 'sufficient income for other need' (Fallis 1985) which 'does not impose an unreasonable burden on a household's income' (Maclennan and Williams, 1990), or 'without falling into some poverty standard' (Bramley, 1990a). However, affordability should be a

concept distinct from poverty. The discussion of such a distinction will be further deliberated in a later section.

Whilst affordability is related to the concept of poverty, as suggested by Bramley (1990a), the resulting financial burden on the household need not inevitably involve the judgement of a third party. The normative approach to poverty measurement is only one among several approaches to defining poverty. Likewise, it will be argued later in this chapter that other approaches are possible in the measurement of affordability.

What the concept of affordability does not address is the effect on the supply of housing, which is traditionally encompassed by the concept of need, and its implications for the underlying maldistribution of income. Moreover, affordability is also focused on the user cost of housing and treats housing as a private good which would strongly incline towards a market oriented policy prescription.

3.3   THE CONCEPT OF AFFORDABILITY

The definitions of affordability presented in the preceding section link a household's expenditure on housing explicitly with its income and, implicitly, with its expenditure on non-housing goods and services. The housing cost of which a household is prepared to pay relates also to its demand for housing. This demand can in turn be derived from the utility function of a household. Suppose a household's utility (U) depends on its consumption on housing (H) and other goods and services (Y), a utility function can be expressed in terms of the consumption quantity of these two kinds of goods (Formula 3.1). Subject to a budget constraint in which the combined consumption of these two goods cannot exceed the total income of the households (Z) (Formula 3.2), maximising the utility function would yield the demand function of the household as in formula 3.3. The demand for housing can be expressed as a function of the household income and the unit price of housing (Malpezzi and Mayo, 1985, Groodaert and Dulois, 1986):

$$U = U(H, Y)$$

Where   U = Household 's Utility
H = Housing Consumption
Y = Non -Housing Consumption

(3.1)

$$Z = p_H H + p_Y Y$$

Where Z = Household Income
   p_H = Unit Price of Housing
   H = Housing Consumption
   p_Y = Price Index for Non-housing Goods
   Y = Consumption of Non-housing Goods

(3.2)

$$H = h(Z, p_H)$$

Where H = Housing Consumption
   Z = Household Income
   p_H = Unit Price of Housing

(3.3)

This thesis does not intend to go into detailed discussion of economic concepts, but to stimulate discussion later in this chapter, it is helpful to illustrate further the relationship between housing affordability, housing and non-housing consumption. Such an illustration was offered by Hancock (1993) who presented an excellent graphic visualisation of this relationship; it is illuminating to replicate the illustration here.

Hancock (1993) used a simplified dichotomy of the level of consumption of housing (H) and non-housing (Y) goods and services to illustrate the concept of affordability in relation to household consumption. From a normative perspective, there exists levels of the consumption of both housing and non-housing goods and services appropriate to the size and characteristics of the household, below which life is considered to be

Figure 3.1 Minimalist Definition of Affordability
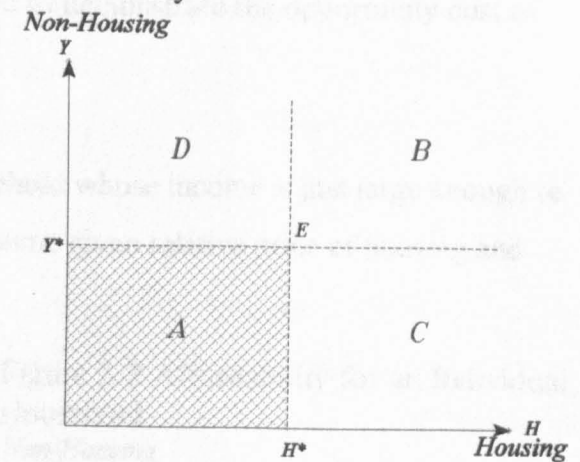
intolerable. These levels are denoted respectively as H^* and Y^*, and are represented by the point E on a graph showing housing (H) and non-housing (Y) consumptions as the axes (figure 3.1). The position of point E on the axes is determined by the relativity of the prices of housing and non-housing goods and services. Evidently both housing and non-housing consumption are regarded as merit good because Y^* and E^* are the level of consumption society regards as the minimally accepted level and by definition, merit good.

Hancock (1993) provides a minimalist definition of affordability. This only regards the consumption possibility in area A of figure 3.1 as an indicator of housing unaffordability

since the household is not able to consume either housing or non-housing goods and services at the minimum accepted level. Region B is an unambiguous indicator of affordability since the household is consuming both housing and non-housing goods and services above the minimum level. The affordability status of both regions C and D is unclear and more information is required to clarify the affordability position of households with consumption combinations in both regions on the preferences and constraints such households face (Hancock, 1993).

The minimalist definition clearly has not taken into account possible consumption combinations imposed by budgetary constraints on a household. The budgetary constraint imposes on the household a limit number of consumption combinations, given the income level and the corresponding relative price of housing and non-housing goods and services. The consumption combinations can be represented by a straight line with negative slope on the graph whose slope would depend on the relative prices of both goods and services. The line can also be used to demonstrate the opportunity cost of housing and non-housing goods (figure 3.2).

Considering the budget constraint on a household whose income is just large enough to allow it to consume at level H^* and Y^*, with some given relative price of housing and non-housing consumption, the line FG would represent all the possible consumption alternatives at that given income level. The consumer with consumption combinations in the shaded areas FY^*E and GH^*E cannot reach the point E because of income constraint. Thus, a household with consumption combinations in the two shaded triangles should also be regarded as being in unaffordable housing (Hancock, 1993).

Figure 3.2 Affordability for an Individual Household
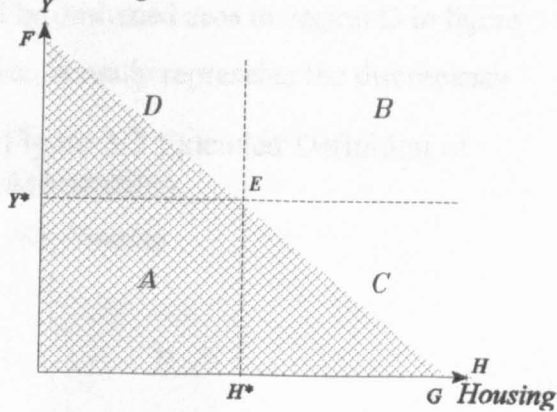
Hancock (1993) also argues that it is important, for the purpose of policy response, to distinguish under-consumption of housing because of perverse choice or under-

consumption of non-housing goods and services through the constraints faced by the household in adjusting to its housing consumption. The former case occurs when an individual's preference does not conform to the judgement of society. The individual household would still choose to consume housing at a level lower than the socially-accepted standards even if it is given, in the first instance, minimum standards of housing through allocation or some other mechanism. Possible policy intervention should be geared towards persuading or inducing households to adjust their housing consumption to socially defined standards.

On the other hand, over-consumption of non-housing goods and services might result from the inability of a household to adjust its housing consumption downwards to a level above the socially defined minimum standards. Such inability may arise because of indivisibility in the consumption of housing or some other non-income constraint on housing consumption. It could be impossible for the household to adjust housing consumption to the optimum point E because that level of housing consumption is either unavailable (because of the functioning of the housing markets) or the household is unwilling to adjust to an alternative level of housing consumption (for example because of the emotional attachment to a house).

The above arguments illustrate the complexity of disentangling reasons leading to the consumption combinations in areas C and D in figure 3.1. Budgetary constraints on households have put those with consumption combinations in the triangles FY^*E and GH^*E in figure 3.2 in unaffordable housing. The unshaded area of region D in figure 3.2, albeit being referred to as a perverse choice, actually represents the discrepancy between social and private preference in housing consumption. Likewise, the unshaded area of region C may arise from non-income constraints on housing consumption or imperfections in the housing market.

Given such complexity and the additional difficulties of determining relative price and

Figure 3.3 Extended Definition of Affordability

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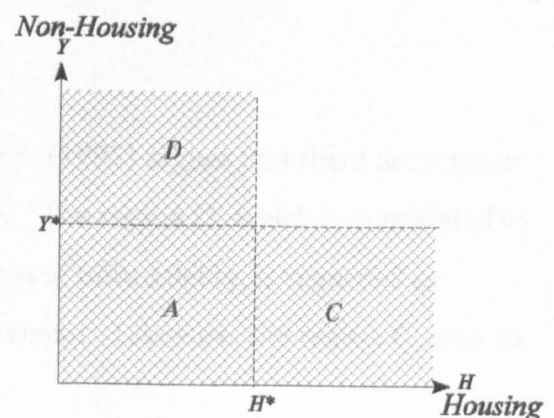
income distributions in different localities, Hancock (1993) argues that it is preferable to adopt a broader definition of affordability. Households with consumption combinations in region B in figure 3.1 which are unambiguously able to consume both housing and non-housing goods and services beyond the socially defined minimum standards should be regarded as affordable. Whilst households with consumption in the regions C and D should be reclassified as unaffordable (shaded areas in figure 3.3). Furthermore, such redefinition would inevitably include households which could afford to consume at both H^* and Y^* but which choose not to. It is suggested that affordability should no longer be regarded as a dichotomous concept but that some grey areas in the definition should be recognised (Hancock, 1993).

Similar analysis can be applied to the two most commonly used measurements of affordability, ratio measurement and residual income measurement. A household is deemed to be in unaffordable housing, measured by the ratio definition of affordability, if the housing costs of the household exceed a threshold ratio. Using the same definitions of both Y and H as in

Figure 3.4 Ratio Measurement of Affordability

previous figures, the ray OJ in figure 3.4 represents combinations of housing and non-housing goods in which the proportion of housing consumption to total household budget is at the target ratio. The slope of the ray depends on the relative price of H and Y as well as the target ratio. It is possible to choose the target ratio so that the ray passes through the point E. The shaded part of the graph represents housing consumption which takes a proportion of the household's income in excess of the target ratio and so is unaffordable.

In a similar debate, in figure 3.1 to 3.3 Hancock (1993) argues that there are logical flaws in the ratio measurement of affordability. The region D, which is considered to require more information to clarify the situation of affordability, is regarded as unambiguously affordable by the ratio measurement. Likewise, the region C, also an

ambiguous area in the previous definition, is clearly classified as unaffordable by ratio measurement.

Perhaps the most forceful illustration of the anomaly of ratio measurement, argued by Hancock (1993), is the comparison between the household in consumption combinations x and y. The household at x clearly consumes both housing and non-housing goods below the socially accepted minimum, yet is considered to be in affordable housing. Conversely, the household at y is classified as experiencing unaffordable housing when it is in fact much better off than the previous household.

Another commonly used measurement, the residual income measurement, can be illustrated in a similar way. Hancock (1993) referred to the 'official definition' of affordability which is based on the operation of the housing benefit system. A household is eligible for housing benefit if its income after housing costs are paid is less than the applicable amount of income support. It is argued that the income

Figure 3.5 Residual Income Measurement of Affordability

Non-Housing

D   B

E

$Y*$

A   C

$H*$ H_{max} Housing

H

Y

support scale rate constitutes an official poverty standard for non-housing goods (Y_*) since the full housing cost is covered by housing benefit for a household having an income below that level. Housing benefit would cease if the cost of housing were considered to be unreasonable through either high unit cost or over-consumption. Thus, according to the official definition households consuming non-housing goods less than Y^* and housing goods less than the maximum permitted level (H_{max}), the shaded region in figure 3.4, experience unaffordable housing (Hancock, 1993).

3.4 THE MEASUREMENT OF AFFORDABILITY

Both definitions of affordability delineated by Maclennan and Williams (1990) and Bramley (1990a) in section 3.2 emphasise the normative judgement of a socially desirable level of housing and non-housing consumption. The two commonly used measurements of affordability, ratio measurement and residual income measurement, operationalise the concept with reference to some normatively defined cut-off level. However, the normative approach to affordability is not the only possible framework.

Like the development of a poverty measurement in its early stage, which was dominated by normative approaches around the issue of human subsistence, it is not surprising that the development of affordability is also overshadowed by a normative approach. Recently, new approaches to affordability measurement have been suggested (e.g. Bramley, 1994) or have already been implemented (e.g. Kearns, 1993). This section attempts to review the various approaches to measuring affordability. However, because of the absence of any framework for classification of the approaches to affordability, and given the close relationship between the concepts of affordability and poverty, this section will draw on the classifications used in poverty measurement to shed light on measurement issues relating to affordability.

The operationalisation of affordability can roughly be classified into three broad approaches: normative, behavioural and subjective. The normative framework is the most developed and embraces a number of different measuring strategies. The two other approaches are either primitive in their method or unsophisticated in their conceptual basis.

Normative Approach

Normative measurement defines the limits or norms of affordability in terms of certain threshold values. The two most commonly used norms are, first: the housing cost of a household should not exceed a certain proportion of the household's income and second: income remaining after housing cost is paid for should not be lower than the poverty

line. The former is referred to as the ratio measurement, and the latter the residual income measurement of affordability.

Ratio Measurement

Measured by the ratio approach, a household is experiencing unaffordable housing if the ratio of housing cost to income, the affordability ratio, exceeds a certain threshold ratio (formula 3.4).

$$Y_H = r \cdot INC$$
$$\text{if } r > r^* \quad \text{Housing is unaffordable}$$
$$\text{Where} \quad Y_H = \text{Housing Cost}$$
$$r = \text{Affordability Ratio}$$
$$r^* = \text{Threshold Ratio}$$
$$INC = \text{Household Income}$$

(3.4)

The use of the housing cost to income ratio has a long history of development in the United States. As early as the 1920s the Public Work Administration used a target rent to income ratio as a guideline to assess the need for public intervention in the housing markets. The 1937 Housing Act also used target ratios for setting eligibility as well as rent for public assisted housing programs (Lane, 1977).

Such measurement continued to be used throughout the 1960s and 1970s in the United States (Sueke et al, 1981) as well as being adopted by the Canadian government (Fallis, 1985). The 1980 Housing Act of the Reagan Administration and the 1990 Housing Affordability Act of the Bush Administration still retained ratio measurement as an indicator of housing affordability (Nelson, 1992). Similarly, the Australian government uses the ratio measurement as an affordability indicator in the planning of housing strategies (The National Housing Strategy, 1991). Many European countries also employ some kinds of housing cost to income ratio as a reference in developing their housing policy (Kearns, 1992).

The use of ratio measurement in the UK was pioneered by the National Federation of Housing Associations in the late 1980s in response to the change in the government subsidy system to housing associations (NFHA, 1989, 1990). In his research on housing association tenants, Kearns (1988, 1992, 1993) employed the ratio approach to

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measuring affordability. The Housing Corporation also uses the housing cost to income ratio as an indicator of affordability among housing association tenants - although the Corporation was reluctant to disclose its target ratio until early 1994 (Housing Corporation, 1992, 1993; Select Committee of the Environment, 1993).

In the late 1980s, the Joseph Rowntree Foundation commissioned one of the largest studies on housing finance in recent years, covering the local housing markets of six cities. The ratio measurement was used as the only indicator of affordability in the summary report (Maclennan et al, 1990) despite the general scepticism of the research team towards the credibility of this measurement in their individual reports.

Quality-based Ratio Measurement

The ratio measurement described in the previous section, which can be referred to as the traditional ratio measurement, does not mention the quality of housing. This is, apparently, not a full operationalisation of the definitions delineated in section 3.1. Lerman and Reeder (1987) modified the ratio measurement to accommodate quality of housing into the affordability measurement. As with the traditional ratio measurement, a household is expected to spend no more than a certain target proportion of its income on housing. This measurement remains distinct from the traditional ratio measurement through making reference to potential consumption, rather than the actual expenditure pattern of the household (formula 3.5).

$$
\begin{aligned}
& Y_H^{\ *} - r \cdot INC \\
& if \ r > r^{\ *} \qquad Housing \ is \ unaffordable \\
& Where \quad Y_H^{\ *} - Cost \ of \ a \quad Minimally \quad Adequate \quad House \\
& \qquad r \ - Affordability \quad Ratio \\
& \qquad r^{\ *} - Threshold \quad Ratio \\
& \qquad INC \ - Household \quad Income
\end{aligned}
\tag{3.5}
$$

A household is deemed to be in unaffordable housing if it must spend above a certain threshold proportion of its income on a minimally adequate house in the locality. If a household is currently spending less than the prescribed proportion but is, at the same time, occupying sub-standard accommodation, housing is still regarded as unaffordable if more than the target ratio would need to be spent in order to raise the standard of housing to the minimally adequate level.

Conversely, even if a household is spending above the target ratio, it is regarded as being in a voluntary affordability problem if the household has only to spend a lower amount than the target proportion of its income on minimally adequate housing, (Lerman and Reeder, 1987).

The quality based ratio measurement is closer to Hancock's concept of affordability under income constraint expressed in figure 3.2, rather than the traditional ratio measurement of affordability. This can be illustrated in figure 3.6. Suppose the cost of acquiring a minimally adequate house is H^*. With reference to a pre-determined target affordability ratio r, the corresponding resource that can be spent on non-housing consumption can be calculated, say Y^*. The point E at (H^*, Y^*) would represent the socially defined minimal standards of housing and non-housing consumption.

The ray OJ represents the consumption combinations in which the quotient of housing expenditure to income equal to the prescribed affordability ratio. The consumption patterns below the ray OJ would be in unaffordable housing according to the traditional ratio measurement (refer to figure 3.4), but because the unshaded region of C is now regarded as being in a voluntary affordability problem, only the triangle OH^*E and the shaded area of region C (H^*EG) is unaffordable.

Figure 3.6 Quality based Measurement of Affordability

Non-Housing

(Figure: axes labelled Non-Housing (Y, with points F on vertical axis) and Housing (H, with points H* and G on horizontal axis). Regions A, B, C, D marked, with point E at the intersection, ray OJ rising diagonally.)
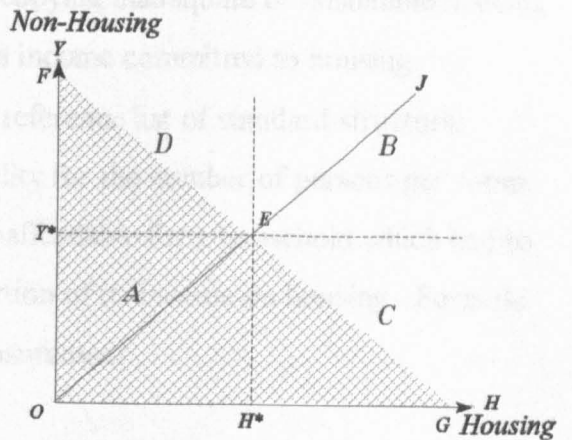
At the same time, consumption patterns in triangle OY^*E and the shaded area of region D (Y^*HE) will now be in unaffordable housing because households with consumption combinations in these areas, which are occupying housing below the minimum defined standard, have to spend more than the prescribed ratio of their income on adequate housing (figure 3.6)

Thus, households experiencing unaffordable housing have consumption combinations in the region A plus the shaded areas of region C and D. This is identical to

Hancock's (1993) description of affordability under income constraint illustrated in figure 3.2.

Core Need Measurement

Another variation of the traditional ratio measurement is the Core Need Measurement developed by Sueke and colleagues (1981) and adopted by the United States and the Canadian Governments. Unlike the Quality Based ratio measurement, which incorporates the dimension of housing quality into the cost of acquisition at the minimally adequate quality, the Core Need measurement retains housing quality as a separate dimension which includes the physical quality of the dwelling as well as over-crowding.

A household is deemed to be in unaffordable housing, or in "core housing need", an alternative term used by proponents, if it is occupying inadequate or unsuitable housing regardless of the proportion of the household's income committed to housing. Adequacy of a dwelling is measured against a reference list of standard structural conditions, facilities and amenities, and suitability for the number of persons per room. Alternatively, housing would be considered unaffordable for a household which had to spend above the threshold affordability proportion of its income on housing. Formula 3.3 represents algebraically the Core need measurement .

The Canadian Federal Government makes use of the aggregate data based on the Core Need Measurement in allocating federal housing assistance to provincial governments. But in addition to the basic criterion of core need measurement, an income test was incorporated. A household is classified as in core need only if it satisfies the conditions set out in formula 3.6 and is, at the same time, in receipt of income lower than the norm income appropriate to the size and composition of the household (Fallis, 1990a).

$$Y_H - r \cdot INC$$

Housing is unaffordable if $P < P^*$ *or* $S > S^*$ *or* $r > r^*$

Where Y_H - *Housing Cost*

INC - *Income*

r - *Affordability Ratio*

r^* - *Threshold Ratio*

P - *Housing Adequacy Measure*

P^* - *Housing Adequacy Standards*

S - *Over-crowding Measure*

S^* - *Over-crowdeding Standards*

(3.6)

Residual Income Measurement

The residual income measurement is another common approach to affordability, which was developed in the UK in the late 1980s, but its use is as yet confined to the academic community in the UK. Residual income refers to that income remaining after the housing costs of a household are paid. Housing is affordable if, after housing is paid for, it "leaves them enough income to live on without falling below the poverty standard" (Bramley, 1990a:16) (formula 3.7):

$$INC_R - INC - Y_H$$

If $INC_R < PL$ *Housing is Unaffordable*

Where INC_R - *Residual Income*

INC - *Household Income*

Y_H - *Housing Cost*

PL - *Poverty Line Income*

(3.7)

Research on affordability using the residual income approach is limited to surveys at local level, the majority of which are produced by researchers involved in the Joseph Rowntree Foundation (JRF) Housing Finance Project. Despite the fact that in the main report of the project only the ratio approach was used as an indication of affordability, four out of the six of the local area reports reject the notion of ratio as an appropriate representation of affordability. Exceptions were the Sheffield report (Crook et al, 1990), which used ratio measurement, and the Newcastle report (Cameron et al, 1990) from which any discussion on affordability was absent.

Partial measurement of affordability using the residual income approach was provided in the JRF Glasgow report (Hancock et al, 1990) in which residual income per equivalent adult was computed but with no explicit classification. Similar treatment was endorsed by Brownill et al (1990) in the JRF London report. Likewise, based on data from the JRF Housing Finance Project of Glasgow, Hancock and Munro (1992), employed a

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similar analysis by expressing the residual income as a percentage of the income support level. This latter method was also adopted in the JRF Bristol report (Bramley et al 1990) and the JRF Birmingham report (Walker et al, 1990) although there was, again, no explicit classification of affordability in these studies.

An assessment of the affordability situation of a household can be achieved by comparing the residual income against a poverty line. The most frequently quoted poverty line is the "income support" level (Bramley et al, 1990; Walker et al, 1990; Kearns et al, 1993), which is often referred to as the "official" poverty line, albeit the government never admits to having established an official poverty line. Kearns and colleagues (1993), on the other hand, used the benefit level: 140% benefit level and a relative poverty line which is set as a percentage of the median income, as the poverty line.

The residual income approach described so far only partially operationalises the definition of affordability described in section 3.2 because it does not include any indication of housing quality. Hancock (1993) supplements this by her minimalist and extended concept of affordability (residual income approach) which has been described fully in section 3.3. The minimalist definition of residual income approach considers only households with consumption of housing and non-housing goods both below the socially defined minimum level as an affordability problem. Further information on preference and constraint is required to determine the affordability position of households which are consuming one component of the consumption portfolio above the minimum level and the other below the minimum level.

An extended definition of the residual income approach would include households with either housing or non-housing consumption under the socially accepted minimum as experiencing unaffordable housing. This is because of the difficulties of disentangling preference from constraint, as well as the inherent and practical problems in the housing system of adjusting for the level of housing consumption which the household prefers.

Hancock (1993) attempted to implement such definitions empirically using survey data from the Glasgow region of the JRF Housing Finance Project. The income support

applicable level was employed, with 140% of that level used as the minimally adequate level of non-housing consumption, whilst the Census definition of over-crowdedness provided a definition for the minimum standard of housing consumption (Hancock, 1993).

Access to Home Ownership

Most first time buyers have to rely on a mortgage to buy their home. In making mortgage lending decisions, building societies and other lenders are typically making decisions about whether an applicant can afford the loan requested. Thus building societies and other lenders employ an affordability notion when making lending decision. To assess whether a prospective buyer can afford home ownership, "the most appropriate approach seems to be to follow the normal custom and practice of the main lending institutions, since they will not lend beyond a certain level most new buyers will not be able to buy beyond that same level" (Bramley, 1990b:6). A similar approach was adopted by Littlewood (1986) who referred to this concept as the "mortgage potential".

Mortgage potential is defined as a multiple of a household's annual income which is assumed to be the maximum loan the household can borrow from a lender. A household is deemed to be in a position to afford to purchase if this maximum loan is larger than the reference house price (Formula 3.8):

$$
\begin{aligned}
& MP = \alpha \cdot INC \\
& \text{If } MP > P^* \quad \text{Home Ownership is Affordable} \\
& \text{where} \quad MP = \text{Mortgage Potential} \\
& \qquad \alpha = \text{Income Multiple} \\
& \qquad INC = \text{Income} \\
& \qquad P^* = \text{Reference House price}
\end{aligned}
\tag{3.8}
$$

This is perhaps the earliest method used to assess affordability in the UK. As early as 1971 the London Research Foundation (1971) used a similar method to estimate the number of households who could afford home ownership at that time. Variations on this method were employed in the UK in the 1980s and early 1990s to assess the situation of access to owner occupation (e.g. Littlewood, 1986; London Research Centre, 1989; SERPLAN, 1990; Bramley, 1990a, 1990b, 1991).

The main differences between various implementations of the method are the choice of parameters in formula 3.8. The choice of the income multiple factor could be influenced by the prevailing practice of the main lenders whilst the choice of the threshold price would reflect the focus of the particular research. Nevertheless, the degree of sophistication of both parameters would vary between studies.

Littlewood (1986) used a multiple of three for the income of the head of household and his partner. The multiple was reduced as the age of the head of household increased to take into account the shorter period of mortgage repayment for an older borrower. The threshold house price employed reflected the transaction price at the middle and lower end of the housing market in the buyers' region. At the same time, data on tenure preference was incorporated to assess the likely demand for home ownership. Yip and McLaverty (1993) employed the same method to investigate the demand for home ownership in the late 1980s and a more detailed analysis will be presented in chapter nine of this thesis.

Likewise, Bramley (1990b, 1991) employed a multiple of 3 for single earner households and 2.5 for double earner households. The threshold prices were not the transaction price but were based on the estimation of the development costs of a range of home sales: market sale, low cost sales and shared ownership. As the author considered investigation at the county level to be a more appropriate representation of the access problem, both the threshold price and household income distribution were adjusted to that level.

The mortgage potential measurement is effectively a variation of the ratio measurement of affordability. It can be shown that with a given interest rate and repayment terms, the ratio of mortgage repayment to household income can be expressed as a function of the income multiple in formula 3.5[5]. If the income multiple is set at 3 and the household is assumed to take up a 25 years repayment mortgage at 8% (after MIRAS), the equivalent affordability ratio will then be 28%, that is the interest and principal repayment together will constitute 28% of the household's income.

The mortgage potential measurement is also close to the quality based ratio measurement discussed in the previous section. If the threshold price is set at the price of acquiring a physically adequate house in the locality, the two measurements are effectively equivalent. Nevertheless, the relation between the ratio measurement and the mortgage potential measurement are more complicated than this description, and a more detailed analysis of their differences will be offered in the next section.

Most research (e.g. Littlewood, 1986; Bramley, 1990b, 1991; Yip and McLaverty, 1993) using the mortgage potential measurement assumed a loan of 100% of the house price. Although this assumption was not far removed from most buyers' situations in the 1980s, given the high advance to price ratio in that period, (refer to section 2.3 for a more detailed discussion), a more general discussion of access to home ownership should reflect the difference between the mortgage loan and the purchase price.

In Australia, the cost of becoming a home owner is considered to be distinct from the ability to meet ongoing repayment. The latter is referred to as affordability, using the same assessment as mortgage potential described earlier in this section, whilst the former is termed accessibility (National Housing Strategy, 1991). Accessibility is measured in terms of the deposit gap which is "the difference between the purchase price of a house and borrowing capacity of a household" (National Housing Strategy, 1991:4).

The Deposit Gap index, established by the National Housing Strategy, is the difference between the median house price and the borrowing capacity of a household on average earnings which is purchasing the house at a median house price. The borrowing capacity is the loan for which the household is eligible, assuming it is to be repaid over 25 years at the current interest rate, with a quarter of the household's income expected to be devoted to the payment of interest and principal. The deposit gap is then expressed as a proportion of the median income. No threshold value is set and the deposit gap index is expected to be used as an indication of the long term trend of accessibility.

Behavioural Approach

Besides evaluating affordability against some normative standards, such a concept can also be appraised by people's behaviour. One way is to "focus on normal housing decisions, looking at what households with given incomes and characteristics, facing given prices, choose to spend" (Bramley, 1994:105). Alternatively, affordability can be viewed as the situation in which the problem of paying for housing begins to emerge. Thus, to "analyze the evidence of housing problems, people who appear to exhibit problems actually paying for their housing" (Bramley, 1994:105), is another way of measuring affordability.

There have been a number of attempts to look at the former aspect of behavioral approach to affordability from the perspective of how much people choose to spend on housing. The National Federation of Housing Associations attempted to fix an affordability ratio for housing association tenants by looking at the proportion of income home owners spent on housing (NFHA, 1990). Fein and colleagues (1977) investigated in some detail the ratio of housing expenditure to income, although no conclusion was drawn regarding the relationship between them, nor was there any discussion on threshold affordability ratio. Maclennan and colleagues (1990), based on the JRF six cities surveys, concluded that the relationship between income and housing outgoings was so weak that further investigation was unlikely to be fruitful. However, based on a similar but more sophisticated method of investigation along lines similar to those of Maclennan et al (1990), a conclusion different from that outlined by them will be argued for in chapter seven of this thesis.

Another behavioural approach to affordability looks at the problems of mortgage arrears and repossessions. These were topical issues in the early 1990s and investigations into mortgage repayment difficulties, both at macro- and micro-economic levels, are available (e.g. Brooks et al, 1991; Bank of England, 1992; Breedon and Joyce, 1992; Bramley et al, 1990; Ford and Wilcox, 1992; Kearns et al, 1993). However, there was little significant contribution to the threshold ratio, or to the general understanding of affordability, from these studies. Largely this is because few addressed affordability as a specific issue, and partly because the available

empirical data was not rich enough to allow a thorough investigation (e.g. Bramley et al, 1990; Kearns et al, 1993).

Unfortunately, in addition to the lack of thorough investigation of the behavioral approach of affordability, there was an absence of theoretical base from which to guide the development of measurement theory in affordability from a behavioural perspective. As a starting point to the development of the behavioural approach to affordability, experience can be borrowed from the behavioural study of poverty. The S-curve method, one of the earliest attempts to investigate poverty from people's behaviour, can be adapted to investigate the feasibility of a behavioural approach to affordability. The S-curve method originated from the attempt to establish a poverty line for the United States by the US Bureau of Labour Statistics (BLS). Mitchell (1985) employed a similar technique in an endeavour to construct a poverty line for the United Kingdom. Results from the latter research were incorporated into the works of Bradshaw and colleagues (1987) as a preliminary work to establishing modern budget standards for the UK.

The basic principle of the S-curve method is to use the quantity of consumption of a particular or a group of goods and services to income elasticity to determine, from household expenditure surveys, standards of the adequacy of those goods and services. It was implemented, by the BLS, by plotting the amount of consumption of the relevant goods and services against household income. The adequate budget level was established at the point where an increase in consumption showed a tendency to decline relative to income. Beyond that adequate budget level, households were deemed to be in poverty (quoted in Mitchell, 1985). In chapter seven of this thesis, a similar method will be used on housing expenditure and household income to determine a cut-off level of affordability.

Subjective Approach

A completely different approach to affordability was pioneered by Kearns and Colleagues (1993) in their study of housing association tenants in Scotland. Respondents in their survey were asked about the subjective evaluation of their own

affordability situation along a Likert scale from "very difficult to afford" to "very easy to afford". Such qualitative assessments were then checked against the information of income, the financial position of the household as well as other quantitative indicators of the respondents for any anomalies between the subjective assessments and objective evaluations of affordability. Their ultimate objective was to make use of the subjective assessment data to determine the threshold level of other quantitative affordability indicators which are more relevant to policy.

Kearns and colleagues (1993) did not put forward any theoretical explanation of this method, which shares many similarities with what is termed the Leyden approach to poverty measurement. The latter approach is based on the assumption that "the individual is the best judge of their situation" (Van Praag et al, 1980:462) and was developed by research workers in Leyden University in the Netherlands in the 1970s and 1980s. Several variations of this method have been used (Hagenaars, 1986; Hagenaars and de Vos, 1988) towards the ultimate aim of converting a set of subjective evaluations of the poverty situations of the respondents into a set for a national poverty line measured by income.

3.5 AFFORDABILITY MEASUREMENT: DISCUSSIONS

Validity of the Ratio Measurement

Notwithstanding the long history of the ratio measurement of affordability in the United States and Australia, it is confronted by housing academics in the UK from three positions. First, the ratio measurement is not an appropriate representation of household burden. Second, the concept of opportunity cost, which is important to the concept of affordability, should not be measured in proportional terms. Finally, a single housing cost to income ratio should not be applied across households of different size, composition and highly varied circumstances.

Since financial burden is an important indicator of affordability, a good measurement of affordability should be able to indicate such a burden. Yet very little information about financial burden can be provided by housing cost to income ratio and financial burden.

As Hancock (1993) noted, there is a possibility that a household consumes very little on both housing and non-housing goods and services but is still regarded as living in affordable housing as long as the ratio between housing cost and income is below the normative level, regardless of the financial pressure on the household because of the meagre resources it can spend on both types of consumption. Another household, which may enjoy a high level of both goods, is considered to be in "unaffordable" housing because its housing cost to income ratio is higher than the norm value (as illustrated in figure 3.4).

Fallis (1985) criticised the use of ratio measurement as a poor indicator of affordability based on the argument of merit good. He speculated that the significance of the ratio measurement is that it represents societies' view on merit good:

> [affordability ratio is] a proxy for the values that food, clothing, and so on are merit goods ... if a low-income household spend more than 25% of its income on housing, then *it will not have enough money left over to buy adequate food, clothing, transportation, medical care, education, and so on:* therefore there is a social problem *because society holds the value that all people are entitled to the necessities listed above*. (Fallis, 1985:144)(Original italics)

However, employing the ratio measurement as a representation of merit good is deceptive because "the italic portions of the sentence are omitted in much writing on housing" (Fallis, 1985:144). He further opined that if affordability is just a proxy for the notion that non-housing consumptions are merit good, this was not a qualified proxy.

> "[affordability ratio] is a poor proxy because it treats the problems of a group of merit goods as a housing problem, and housing policies are a poor way to ensure the adequate consumption of all merit goods" (Fallis, 1985:145)

Fallis (1985) did not suggest any alternative to the ratio measurement. It was academics in the UK, following this line of criticism, who proposed an alternate measurement of affordability:

> ....the notion of affordability is much more logically define in terms of the absolute amount of income remaining after housing costs have been met, rather than in terms of ratios (Hancock et al, 1990:43-44)

The residual income of a household after housing cost is paid for should also be related explicitly to the poverty standard:

.... the most coherent normative concept of affordability is one that links normative judgements about housing needs, standards with judgements about minimum income requirements for non-housing consumption. This implies that housing affordability is closely bound up with the definition of a poverty line, and that the key ratios are likely to be expressed in terms of residual income (after housing costs) relative to that line (Bramley, 1994:104).

Likewise, the concept of opportunity cost, which is regarded as important to the definition of affordability, is considered inappropriate if it is expressed in ratio terms:

......a ratio measurement says nothing about what might be an acceptable opportunity cost of that which is being consumed. Any statement about affordability has essentially to be a statement about opportunity cost... the value of the foregone goods and services is measured in terms of their total cost, and not in terms of the fraction of consumers' incomes absorbed. It therefore makes little sense to define affordability in terms of the ratio of housing costs to incomes if it is believed that opportunity cost is important. (Hancock, 1993:133)

Furthermore, a minor criticism of the use of ratio measurement is the inappropriateness of using a single ratio across tenures and households of varied size and composition. Some such comments are based on the normative judgement that:

A single ratio of [housing] costs to net income is not an ideal way of measuring affordability in all cases (Bramley et al, 1990:83)

Others are supported by empirical study that there are substantial differences in housing cost to income ratio amongst tenure groups as well as households in difference circumstances, so that:

......no single ratio could apply over time to people on varied incomes, in different types of household and tenure (Brownill et al, 1990:47)

Whilst many of these criticism may appear to be qualified, some of them are based on incomplete understanding of ratio measurement, while others are founded on the comparison with the allegedly superior residual income measurement whose superiority has yet to be proven.

Notwithstanding the lack of theoretical deliberation on the concept of ratio measurement and the seemingly arbitrary threshold ratio based only on "rule of thumb", the origin of ratio measurement is unmistakenly empirical. It stems from empirical studies on housing expenditure in household budgets by Ernst Engel and Hermann Schurake dated back to the nineteenth century (Lane, 1977).

The proportional approach to poverty, based on Engel's law which states that the proportion of expenditure on necessities in household budgets decreases as household income increases, is a popular approach to the study of poverty in North America and Australia. For instance, poverty lines in the United States, Canada and Australia are all established from the proportional approach in one form or another. Poverty is unmistakenly the study of the financial burden of a household and if the use of proportional approach in such study is valid, it seems that there is no reason why a ratio approach cannot be adopted in the study of affordability. Nor is it surprising that the study of affordability in North American and Australia inclined towards the proportional tradition.

The inappropriateness of employing a proportion to represent the notion of opportunity cost is also debatable. The opportunity cost of other commodities may be better expressed in terms of the total and absolute values of the commodities concerned, which may be different for the study of income and household budgets. There is evidence showing that the variation in household income and expenditure on many household expenditure items is not linear (e.g. Prais and Houtakker, 1971 and chapter seven of this thesis). In addition, Kearns and colleagues (1993) show that the subjective measurement of affordability has a closer relationship to the percentage change, rather that the absolute change, in equivalised income. These two empirical pieces of evidence both point to the postulate that proportional representation of opportunity cost among household expenditure items may be more appropriate than a linear representation as claimed by Hancock (1993).

The last criticism of the inappropriateness of using a single ratio is in fact based on an incomplete understanding of the use of ratio measurement, probably only based on the proposition of the NFHA. Like the use of a set of poverty lines rather than a single line in poverty study, affordability measurement need not necessarily be based on a single line that applies to households of different characteristics. Threshold affordability ratio can also be a set of ratios for different tenures and types of household.

In fact, right from the early development of ratio measurement in the United States, threshold ratio has never been a single ratio (Lane, 1977). It can very across tenure; for

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instance in Australia the threshold ratio is set at 30% for owners and 25% for tenants (National Housing Strategy, 1991) or be restricted to households within certain income bands, like the HOME programme established under the 1990 Housing Affordability act in the United States which set a threshold ratio of 30% for households whose income is below 75% of the local median (Nelson, 1992).

Moreover, many of the criticisms of ratio measurement are based on the comparative superiority of the residual income measurement. Such relative superiority is less appealing under scrutiny. An exposure of the weaknesses of residual income measurement will be presented in the section that follows.

Inadequacy of the Residual Income Measurement

Besides the contrasting empirical evidence presented in the preceding section, which cast doubt on the alleged superiority of residual income measurement over ratio measurement as the representation of opportunity cost, the choice of poverty line poses another problem for the residual income measurement. Since residual income is only an intermediate measurement, the affordability status of a household has to be determined against a yardstick, the poverty line, that represents financial burden.

However, there is no consensus on how a poverty line could be established. Surveys of poverty measurements show that there are over 10 different measurements which can be grouped into three broad categories (Hagenaars, 1986; Spicker, 1993). Some of them are based on the proportional principle which is opposed by the proponents of the residual income approach. No superiority of residual income measurement can be claimed if the poverty line also uses the proportional approach.

The use of the "official" poverty line as the yardstick, which proponents of residual income approach favour, may free the residual income measurement from a proportional approach to poverty, but may be unable to indicate accurately either the financial burden or the inadequacy in the command of resources as intended. Although the official poverty line has, allegedly, undergone a democratisation process and is thus supposed to represent socially accepted minimum standards of living, it lacks a strong scientific base

from which to demonstrate this capacity (Hagenaars, 1986). In addition, in the case of many continental European countries, it is unable to reflect rising prices owing to its infrequent update (Hagenaars, 1986). Even when it is routinely updated in Britain, with reference to the rate of inflation, it fails to keep up with rising living standards.

Perhaps the most serious weakness of the residual income measurement is its entanglement with the concept of poverty. In fact, the implementation of residual income measurement is identical to the "income after housing costs" measurement used in the Households Below Average Income (HBAI) (DSS, 1990) series. However, "income after housing" in the HBAI series is obviously intended as a poverty indicator. Thus, the same measurement could have a very different interpretation and would have a detrimental effect on the integrity of the concept. Despite the proposition that affordability is bound to have a close relationship with the concept of poverty, the proponents of this approach have yet to explain how a measurement of poverty can be used to measure housing affordability without modification. Otherwise, there is no need to develop a separate measurement of affordability.

Shortcomings of Mortgage Potential Measurement

Bramley (1990b) differentiated the mortgage potential measurement from the traditional ratio measurement, (he had no specific terms for these two measurements) and regarded the latter as less stable with reference to fluctuating interest rates than the former. As interest rates increase or the size of the loan and the income of the household both change, the affordability ratio will also change.

Bramley's differentiation of two measurements of access to home ownership is misleading since it was shown in section 3.4 that the mortgage potential measurement of affordability is in fact a variation of the ratio measurement. The latter criticism of instability, on the other hand, depends on which parameters in the mortgage potential formula are supposed to be fixed. It can be shown that the threshold affordability ratio is directly proportional to the income multiple and interest rate but inversely proportional to the length of the repayment period in the mortgage potential formula[6].

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Bramley's conclusion of instability of the ratio measurement as applied in this context presumed that both the income multiple and the length of repayment are fixed, so the amount of repayment will vary together with the affordability ratio. Whilst this may be the only mortgage repayment arrangement in the UK, in other parts of the world a fixed monthly repayment is possible, either by a fixed interest loan or by allowing the length of repayment to vary with the variation in interest rates. In this case, variations in interest rates do not necessarily lead to fluctuations in repayment amounts and so do not create fluctuations in the affordability ratio.

Nevertheless, Bramley (1990b) points out a weakness in the mortgage potential measurement. Whilst it is effectively a ratio measurement, the associated threshold affordability ratio is not explicitly stated and the ratio is extremely sensitive to the structure of the mortgage loan. If the threshold ratio is made explicit, the traditional ratio measurement can be an alternative to the mortgage potential measurement. This alternative puts the measurement of access to home ownership more in line with similar indicators in other industrialised countries, such as the United States and Australia.

In addition, the potential of a prospective home owner to afford to buy is sensitive to the threshold house price chosen. It is a disadvantage if house prices in different localities are dispersed over a large range as this would make the error of estimation very large. This is why price distribution over a smaller area is preferable to distribution over large regions. For example, Bramley (1990b, 1991) preferred county level data to the more conveniently available regional level data [7].

However, there are still reasons for retaining the use of mortgage potential in its present form. First, comparison with earlier research is easier if the same measurement is used. Second, it is more convenient to compare the lending practice of mortgage loans using mortgage potential measurement, since they use similar parameters in their assessment. Retaining the mortgage potential measurement would not pose any problem for comparison with research using the traditional ratio measurement providing the parameters in the mortgage potential measurement can be easily converted to the traditional ratio measurement.

Moreover, there are limitations in the use of mortgage potential and the accessibility measurement as indicators of affordability, such as the deposit gap. Deposit Gap can only assess the potential of a prospective buyer to overcome the barrier of becoming a home buyer, while mortgage potential can be used to indicate the ability of a home owner to sustain home ownership at the beginning of repayment. Whether such potential indicators are effective depends on other factors.

First, for the potential to be realised depends on the preference of the prospective buyer to become a buyer. Thus, if the majority of prospective buyers deemed to be in an affordable situation do not realise their potential, the initial estimation will be misleading. This is one reason why the estimation of preference for home ownership is essential.

Second, the notion of unaffordability in the mortgage potential measurement is a redundant concept. Households considered to be in an unaffordable position for home ownership may not have attempted to buy and thus affordability regarding home ownership is irrelevant. Those who are in an unaffordable position but who proceed to buy, may have overcome the problem employing alternative methods, such as buying a house in a lower price range, or with an inheritance, gift or savings.

Third, there are practical difficulties in estimating the demand for home ownership from new households, which constitute a major source of prospective buyers. There is overdependence on the projection of household formation, income estimation of the new households and speculation on the likely preference for home ownership of these households.

Thus, mortgage potential and accessibility measurements are best used only to compare the trend of access to home ownership and should not be used to assess affordability of individual prospective owners. In addition, the importance of the deposit gap should not be understated. This is an important barrier to access to home ownership and although the requirement of a deposit to buy a home was not a problem in the UK in the 1980s, this could change. The accessibility measurement should be combined with mortgage potential in assessing the affordability of prospective owners.

Housing Cost and Housing Quality

The traditional form of both ratio and residual income measurements of affordability take no account of the quality of housing being occupied. In commenting on the limitation of ratio measurement to affordability, Sueke and colleagues note :

> It [ratio measurement] fails to reflect the total magnitude of housing need, since it does not reveal whether the accommodation occupied is physically adequate. Households often keep housing costs within reasonable limit by living in physically inadequate housing as an alternative to paying higher rent for adequate housing (Sueke et al, 1980:8).

At the same time, it also fails to differentiate households which choose to consume a higher quantity of housing than they would otherwise be able to afford because of preference or taste (Sueke et al, 1990; Fallis, 1985; Lerman and Reeder, 1987). These contentions apply also to residual income measurement.

The analysis of Hancock (1993) on the relationship of housing under-consumption as well as over-consumption described in section 3.3 is illuminating in these aspects. Her minimalist and extended residual income measurement regards households which are under-consuming housing as having an affordability problem, regardless of their affordability position by the respective measurement. At the same time, the American version of core need measurement has a similar effect.

The problem of over-consumption is rectified by a number of alternatives: the quality based ratio measurement, which only considers households' potential for housing consumption rather than real consumption; the Canadian version of core need measurement which sets a ceiling on household income; and the official residual income definition proposed by Hancock (1993) which adopts the maximum housing expenditure allowed by the housing benefit system as a ceiling for housing consumption. On the other hand, Hancock (1993) argues that there may not be a clear cut solution to the problem of housing over-consumption. It is best regarded as a grey area in affordability measurement which requires more information on preference and constraint within a household.

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Despite the various solutions to the problem, measurement of housing quality remains a formidable task: the relationship between housing cost and housing quality; the lack of accurate, convenient and comprehensive data; the difficulties of assessing quality and so forth, all contribute to the complications. Discussion of the methodological problems involved will be further elaborated in the next chapter.

Alternatives to Normative Measurement

Most of the measurements of affordability developed so far fall into the category of a normative perspective, which presumes the existence of norms, or some socially accepted standards which may be an optimal proportion of housing cost to household income or the minimum level of non-housing consumption. However, there is little consensus on what the optimum ratio should be for housing cost to income. The use of ratio measurement as a representation of affordability continues to be controversial.

The residual income measurement suffers from similar problems. The British Government never admits to the existence of an official poverty line; nonetheless, the level of income support, which is often referred to as the official poverty line, is criticised as being inadequate. Inevitably, there is ongoing heated debate on how poverty should be defined and measured. With no consensus on the poverty line, there is no yardstick against which residual income can be measured. The lack of consensus on norms of judgement poses a serious problem for the implementation of normative affordability measurements, since "normative need-type statements lose much of their force if they do not reflect consensus" (Bramley, 1994:104).

As in the early development of poverty measurement in which the normative approach dominated, it is not surprising that the normative approach over-shadows other approaches to affordability measurement. Normative need-type statements, which tend to approach the problem from some form of expert or authoritative opinion, are more comprehensible.

However, there is a trend in the development of poverty measurement toward a more diversified approach based on the behavioural and subjective perspectives. Poverty

studies and official statistics in the EC, OECD and UK increasingly adopt a poverty line which is relative to the national average income. Budget standards in poverty measurement used to be a typical normative approach, but a modernised budget approach developed by Bradshaw and colleagues (the work of the Family Budget Unit FBU, 1990 and Bradshaw and Ernst, 1990) embraced a composite approach incorporating elements of the behavioral approach. This suggests a possibility of measuring affordability by alternative approaches. Some of these alternatives will be explored in the next section and further elaborated in later chapters.

3.6 AFFORDABILITY MEASUREMENT: A RE-EXAMINATION

It is argued in the previous section that the residual income measurement is not superior to the ratio measurement, and the normative approach to affordability is just one of several perspectives in affordability measurement. Therefore a definition of affordability should be general enough to embrace different approaches to implementing affordability. It is apparent that not all the definitions explicated in section 3.2 can fulfil this criterion. Most of them apparently incline toward a particular approach. For instance, Bramley's definition (1990a) reflects only the residual income approach, whilst that of Fallis (1985) appears to incline toward ratio measurement, whereas the delineation of Maclennan and Williams (1990) represents only the normative approach.

However, Howenstine's (1983) definition, though it appears to be over-simplified, has the potential to be used as an all-embracing definition of affordability which can encompass different approaches to implementation. Nonetheless, what constitutes a "reasonable amount" in his definition needs further elaboration, whereas the interpretation of Maclennan and Williams (1990): "an amount not causing unreasonable burden on household incomes", can be borrowed as an appropriate alternative in this context. Thus a modified version of Howenstine's provides an alternative definition of affordability encompassing different approaches for implementation.

"Affordability is the ability of a household to acquire decent accommodation by the payment of a reasonable amount of its income on shelter without causing an unreasonable burden on household incomes".

It is fundamental to the concept of affordability in the acquisition of decent accommodation that its quality should be, at least, at a socially defined minimum. As an element of housing policy, affordability should entail housing quality and embrace housing as a merit good. Thus, households living in dwellings below certain pre-defined standards should be regarded as experiencing unaffordable housing. Such standards can be defined normatively or subjectively, and be absolute or relative. However, a normative definition of minimally accepted housing quality is considered appropriate and simpler to manipulate given the current conditions of the housing stock, of which a substantial minority of dwellings need major improvement.

The problem of pervasive choice described by Hancock (1993) will still exist, where the preference of individual households does not coincide with what is favoured by society. However, households occupying housing below the socially defined minimum but which should have the capacity, judged by an affordability standard, to acquire housing above that standard should still be regarded as being in an unaffordable situation. This is due in part to a housing policy which aims to improve housing quality to a socially acceptable level, and in part to the grey area involving available choice and imposed constraint.

A household may be unable to adjust the quality of consumption to any degree as the quality of dwelling appropriate to the type and size of the household may be unavailable in the locality (Hancock, 1993). The capital cost needed to improve the quality of housing to a favourable standard may be beyond the capability of the household.

This latter argument can also be applied to over-consumption of housing. As Hancock (1993) argued, in the extended version of residual income measurement, it may not be appropriate to classify households as being in a voluntary unaffordability situation when they are deemed to be unable to afford housing but are, at the same time, over-consuming housing services. It may not be possible for a household to adjust its housing consumption to the appropriate level required to avoid an affordability problem. This would more properly be regarded as a grey area in affordability measurement and such a household would be classified as experiencing unaffordable housing.

The measurement of the financial burden on a household should not be restricted to the normative approach; either a normative, a behavioural or a subjective perspective can be adopted. A subjective evaluation of affordability can be implemented by the self assessment of a household on its affordability situation. This can be conducted by more divergent and sophisticated means than the pioneer work of Kearns and colleagues (1993). Such subjective assessment may then be used to fine tune or validate measurement results acquired by other methods, and produce a subjective assessment which is closer to the current discourse on affordability.

From a behavioural perspective, affordability can be measured using the S-curve technique. The point where a household begins to experience unaffordable housing is where the increase in housing cost shows a qualitatively different pattern in its relationship with household income. This is similar to the method used by Townsend (1979, 1991, 1993) in his poverty research where a household is regarded as being in poverty as the index of relative deprivation increases disproportionately as income decreases.

Unlike the concept of relative deprivation in poverty research, there is an absence of comparable theoretical basis in the study of affordability. A second best alternative is to resort to empirical experimentation where experience of previous research on Engel's curve (e.g. Leser, 1961; Prais and Houthakker, 1971) can be drawn upon. A more detailed description of this will be presented in chapter six.

Nonetheless, the normative perspective may provide a popular approach to affordability owing to it being a well established concept which provides easy visualisation of the measurement. Whilst the ratio and the residual income measurements will continue to be used in parallel with each other, disputes over threshold or target values remain. Such threshold or reference values can either be defined "officially", by taking the income support level as the official poverty line, or by adopting the "official" housing cost to the income ratio used by the Housing Corporation. Alternatively, it is possible to fine tune the normative approach by referencing the threshold values established by alternative methods of measurement, from either a behavioural or a subjective perspective, or a combination of the two.

Threshold ratios can also be established by a composite method combining the normative and the behavioural approaches. Then housing cost to income ratio can be interpreted as an indication of high housing cost whilst the residual income is an indication of household financial burden. Employing empirical findings that housing cost to income ratio decreases as household income increases (e.g. Maclennan et al, 1990), when the income of a household decreases, the housing cost to income ratio would increase. A threshold ratio can then be established where the housing cost to income ratio would correspond with a high probability of the household being in poverty. Detailed implementation of this method will be elaborated further in chapter six.

In the residual income approach, besides using the official poverty line, poverty lines established by other means can be also be exploited, be they normative, behavioural or subjective. Nonetheless, regardless of which poverty line is used, the concept of affordability using residual income measurement in such a way is, effectively, a measurement only of poverty. To retain the integrity of the concept of affordability, it is essential to differentiate poverty from affordability.

Within the framework of residual income measurement, one way of differentiating is to define poverty as the result of a lack of resources, so that the household is unable to consume both the housing and non-housing goods and services above the minimum levels. Unaffordable housing is a consequence of high housing cost which imposes a financial burden on a household.

One way to implement the above differentiation is to use total household income as a representation of total household resources, and non-housing expenditure as a proxy for financial burden. Together with the expenditure on housing, these three parameters are classified into the simple dichotomous categories of "High" and "Low" against a set of socially defined minimum levels. Low level of non-housing expenditure will denote financial burden on a household because there are not enough resources left for non-housing consumption.

Likewise, a high level of household income indicates the ability of the household to consume both housing and non-housing goods and services above the minimum level.

Assuming there is no saving/non-saving effect, these three parameters will combine to create six scenarios as in table 3.1 (note that the combinations HHL and LLH are not possible) :

Table 3.1 Affordability Classification: Household Income, Housing and Non-housing Consumption

	Housing Expenditure	Non-housing Expenditure	Household Income	Classification
1	High	High	High	Affordable
2	Low	Low	Low	Poverty
3	High	Low	Low	Poverty
4	High	Low	High	Unaffordable
5	Low	High	Low	Unclassified
6	Low	High	High	Affordable

In scenario 1, there is no financial burden on the household and the income allows expenditure both on housing and non-housing consumption above the minimum standards: housing is apparently affordable. In Scenario 2 there is financial burden on the household, not as a result of high housing cost but rather because there is inadequate income available for both consumption items to a level higher than the minimum standards: this represents a case of poverty.

Although housing cost in Scenario 3 is high there are insufficient resources for both housing and non-housing consumption, therefore this also represents a case of poverty. In scenario 4, the household has the potential to consume both housing and non-housing goods and services at above the minimum level, but because housing cost is high, the household is left without adequate resources for non-housing consumption. Therefore it is a case of housing unaffordability.

Situations in scenario 5 and 6 are unclear. A low level of housing consumption may be an indication of inadequate housing, in which case the households in scenarios 5 and 6 are in unaffordable housing, as argued at the beginning of this section. However, households in scenario 6 will be in affordable housing because there is no indication of financial burden, as measured by the level of non-housing consumption. More information needs to known about households in scenario 5. They may be classified as being in poverty because the total resources do not enable them to have both housing and non-housing consumption above the minimum level, and it may be a case of

deliberately under-consuming housing in order to release more resources for non-housing expenditure.

On the other hand, it may be the result of some special housing arrangement, such as rent free accommodation, which makes housing costs low. Thus a low household income may not result in hardship in either housing or non-housing consumption. Scenario 5 must be termed unclassified. Re-arranging table 3.1, the parameters of housing consumption can be absorbed by other parameters (table 3.2):

Table 3.2 Affordability Classification: Household Income and Non-housing Consumption

	Household Income	Non-housing Expenditure	Classification
1	High	High	Affordable
2	Low	Low	Poverty
3	High	Low	Unaffordable
4	Low	High	Unclassified

To employ terminology commonly used in the current literature of poverty (e.g. HBAI series), total household income used in table 3.1 and 3.2 can also be renamed as income before housing and non-housing consumption can be re-termed income after housing. Whereas minimum standards apparently refers to the poverty line, households at an income level below the minimum standard are regarded as poor. A new classification may then be formulated in table 3.3. This later classification is easier to implement by either a normative or a relative approach to poverty. If a normative, or absolute approach, is used housing cost is then compared in absolute terms, and in relative terms if a relative approach to poverty is used. Detailed implementation of this classification will be presented in chapter five.

Table 3.3 Affordability Classification: Poverty Before And After Housing Costs

Poverty Before Housing Costs	Poverty After Housing Costs	
	Poor	Not Poor
Poor	Poverty	Unclassified
Not Poor	Unaffordability	Affordability

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3.7 SUMMARY AND CONCLUSIONS

Despite the importance of clear and explicit definitions as well as clear measurement of affordability, there is no consensus on either aspect. Amongst the various definitions delineated in affordability literature, several common elements can be identified. First, affordability deals with the user-cost of housing; second, the notion of merit good and opportunity cost are pivotal to the concept; third, affordability presumes a minimum standard of housing consumption and the concept of affordability maintains a close relationship with the concept of poverty.

However, in the literature on affordability, both definitions are delineated and the popular methods of implementation, the ratio and the residual income measurement, incline strongly toward the normative perspective. The traditional ratio measurement refers to the housing cost to income ratio against a threshold ratio above which the household is considered to be in unaffordable housing. On the other hand, the residual income approach, which was advocated mainly as an alternative to the ratio measurement, measures affordability according to the amount of income remaining after housing is paid for. If it is below the poverty line, then housing is unaffordable.

A modified version of the traditional measurements has been developed to include the quality of housing in affordability measurement. The quality based ratio measurement relates the ability of the household to acquire housing at a minimally adequate condition instead of the actual consumption on housing. Likewise, the core need measurement also takes into account the quality of the housing in terms of the standard of occupancy as well as physical adequacy. Hancock (1993) proposed extensions of the residual income measurement, the minimalist and extended measurement of affordability, to incorporate quality of housing into the concept.

The potential of prospective buyers to acquire their home is measured by their mortgage potential. It is effectively a variation of the ratio measurement. A more general measurement of access to home ownership should also incorporate the accessibility measurement which indicates the barrier to paying a deposit.

Beside the normative approach, the behavioral and the subjective approaches to affordability are also feasible. The S-curve method adopted from poverty research can be used to explore the behavioural aspect of affordability. A subjective evaluation of affordability is a viable alternative in which experience from poverty research can be relied on. However, these two methods lack the appropriate theoretical base and are likely, at best, to be a complement to the normative approach.

Although ratio measurement has a long history and is widely adapted, it has been challenged in various aspects. One accusation is that it is not an appropriate representation of both household burden and opportunity cost, and that a single ratio should not be applied across households in different tenures and of various sizes and characteristics.

While many of the comments on ratio measurement are valid, there is contrasting evidence that supports the use of ratio measurement. Its basis, in Engel's Law, makes use of ratio as a representation of household burden more robustly than opponents suggest. Empirical evidence also supports the proportional property of opportunity cost. Moreover, different ratios can be established for households in different tenures and with different characteristics to overcome the shortcomings of using a single ratio.

On the other hand, the implementation of the residual income approach is less straightforward than is claimed. Its dependency on poverty measurement exposes it to criticism similar to ratio measurement, since many of the poverty lines are in fact established from proportional, behavioural or subjective perspectives. However, the most serious weakness of residual income measurement may be its entanglement with poverty measurement since residual income is apparently nothing more than a poverty measurement. Although housing affordability can be regarded as a form of poverty, yet, the discrete use of the concept of affordability has to be demonstrated.

The main weakness of mortgage potential measurement is its lack of explicitly stated threshold ratio and its sensitivity to both the choice of threshold house price and the change in interest rates. Although it is a variation of the ratio measurement, it is not a good indicator of prospective buyers' ability to sustain home ownership nor can it stand

alone as a measurement to assess the difficulties facing prospective buyers. It needs to be used in conjunction with measurements of accessibility. Nevertheless, its power to indicate a change in prospective buyers' ability to purchase over time is valuable.

In order to allow the concept of affordability to embrace different methods of measurement, only two elements of the definition should be specified: the acquisition of adequate housing and the burden on household income caused by high housing cost. Households living in accommodation below minimum standards should be considered to be in unaffordable housing, whereas the burden on household resources can be assessed by methods based on either the behavioural, subjective or normative approaches.

Methods based on the normative approach will continue to be the mainstream form of measurement, whereas the ratio and the residual income methods can be used to complement each other. The normative standards used in the measurement may either be based on some kind of official definition, which is assumed to be a result of democratisation, or by seeking a socially acceptable level of standards.

Alternatively, some composite method may be employed based on empirical data. One method is to combine ratio measurement with residual income measurement so that the housing cost to income ratio, as an indicator of relative level of housing cost, is used to predict the status of financial burden on the household which is measured by residual income.

If residual income measurement is to be used alone, differentiating the concept from poverty measurement is essential. One method is to compare the poverty status before and after housing cost, where households would be considered to be in unaffordable housing only if they are not poor before housing cost, but are poor after housing cost.

Detailed methods of implementation will be developed further in subsequent chapters. In this chapter it is argued that affordability is a complex and diverse concept, in which scientific and empirical exploration of the concept is as important as conceptual discourse.

CHAPTER 4
METHODS

4.1 INTRODUCTION

It is argued in chapter three that scientific and empirical exploration of affordability is as important as theoretical discussion of the concept, since many of the new measurement methods have to be validated empirically. Considering the importance of empirical investigation, it is surprising that there is so little research on this topic.

The few empirical works which exist are either focused on a particular tenure, notably housing association tenants (Best, 1990 ; Bramley, 1990a, 1990b, 1991; Kearns et al, 1993), or based only on local area surveys, such as the JRF Housing Finance Project in six cities (e.g. Maclennan et al, 1990). An empirical investigation of affordability which covers all tenures and regions would provide valuable information on the issue. It is the intention of this thesis to achieve this. The methods used for the empirical investigation will be described in detail in this chapter.

The research questions, and the chapters which relate to each, will be described in the first section. This is followed by a description of the data sets on which the analysis is based, and the samples that will be selected for further analysis. The third section addresses the methodological issues involved in such an empirical investigation, and definitions of the measurement concepts used in the analysis. A brief discussion of the limitations of the data sets used will be presented in the fourth section.

4.2 RESEARCH QUESTIONS

The research will focus around five main areas. Analyses in subsequent chapters will attempt to answer questions encompassing these areas, which are:

1. A modified definition of the residual income approach to affordability: To preserve the integrity of residual income measurement, the concept of affordability has to be differentiated from poverty. What will be the methodological issues involved in such

a differentiation, and their possible effects on residual income measurement? These questions will be examined in chapter six.

2. A composite approach to normative measurement of affordability: Is it possible to determine a threshold affordability ratio using a composite method combining the ratio measurement and the residual income measurement? What methodological issues are involved? These questions will be investigated in chapter seven.

3. The behavioural approach to affordability: Is it feasible to adopt the S-curve method to explore the threshold affordability ratio? What problems of operationalisation are involved? What is the most appropriate strategy for operationalisation ? Results of this analysis will be presented in chapter eight.

4. A comparison of affordability measurements using different measurement approaches and the extent of affordability measured by these approaches: What are the differences and similarities in classifying affordability using different measurement approaches? Is it possible to combine some of the measurement approaches? What are the merits and drawbacks of different measurement approaches? These questions will be examined in chapter nine.

5. Extent of the affordability problem: What is the extent of affordability in England in 1990 and what are the household and housing characteristics of households experiencing unaffordable housing? Is there a life cycle effect on affordability? Will there be differences in the household expenditure patterns among households with different affordability statuses? What will be the effect on different measurement approaches if the quality of housing is incorporated as one of the measurement parameters? These problems will be examined in chapter nine.

6. Access to home ownership: How many tenants in 1988 could afford to buy? Who are they? How many tenants who would prefer to be home owners could afford to buy? What is the relationship between a preference to own and the ability to buy ? How sensitive is mortgage potential upon the choice of parameters ? Chapter ten will examine these questions.

4.3   THE DATA SETS AND SAMPLES

The Choice of Data Sets

This thesis is an attempt to conduct an empirical investigation of affordability at the national level and across all tenures. Given the constraint on both time and resources, a secondary analysis of national surveys is the most productive as well as the most cost-efficient means of achieving this. Data sets suitable for such an analysis should have a national sample frame and contain detailed information on income and housing costs, as well as a reasonable amount of data on the households' housing and socio-economic characteristics. The Household Resources Survey commissioned by the Department of Social Security is an excellent source which contains all the relevant information, but unfortunately data from this research was not available for secondary analysis at the start of this study.

The Family Expenditure Survey is another fruitful source. It is a national survey that contains information on both income and expenditure, including details of housing related expenditure. There are also data available on household characteristics, economic status, durable goods and tenure. It is considered more suitable than other national surveys such as the New Earnings Survey, which collects detailed information on income but lacks information on expenditure. Likewise, the 1988 Labour Force Survey, with its housing trailer, provides rich information on housing. However, the information is considered to be out of date, and it lacks information on expenditure. The 1991 English Housing Condition Survey supplies an excellent assessment of the physical quality of housing, but lacks the necessary information on household characteristics and reliable income data for detailed analysis. Hence, the 1991 Family Expenditure Survey, the latest round of this survey available at the time the research commenced, is used for analysis.

However, the Family Expenditure Survey does not provide essential information for the analysis of affordability and tenure preference in chapter ten. This is instead provided by the 1988 General Household Survey, which also contains income information, thus enabling the investigation of access to home ownership for prospective buyers. Indeed,

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information on housing is better provided for in the General Household Survey than in the Family Expenditure Survey. Data on tenure preference and affordability in the 1988 General Household Survey also allows comparison with the situation in 1978, when the same set of questions on tenure preference was asked.

Although housing policies in the UK are formulated by central government, there are substantial differences in housing legislation between the four countries in the UK owing to the different constitutional status of each. Furthermore, although England and Wales generally share the same legislation on housing, some of the policy implementation mechanisms are different, notably the subsidy system for housing associations and the administration of such subsidies by different agencies. To facilitate a more coherent discussion of affordability within the current policy context, only households in England will be selected for analysis.

Family Expenditure Survey

The Family Expenditure Survey is a continuous survey carried out by the Office of Population Census and Surveys (OPCS) with samples carefully selected to ensure they are representative of the population in the UK. The survey covers only private households and excludes people living in institutions. Fieldwork is carried out by interviewers from the OPCS; information is collected by face to face interviews and each individual in the household is also asked to keep a diary record of expenditure over a period of two weeks.

The 1991 Family Expenditure Survey covers the period from January to December 1991, with successful responses from 7056 households, which represents a success rate of about 70%. Anonymised data of the 1991 Family Expenditure Survey is supplied by the ESRC Data Archive at Essex University. Owing to the necessity of preserving anonymity, information on local authority districts and poll tax were withheld. The embargo on the poll tax data was later relaxed, yet the actual poll tax amount was still withheld. Instead, an estimate was supplied based on the average poll tax levied by neighbouring authorities. Information on poll tax benefit was unavailable.

There are a total of 7056 households in the UK sample for the 1991 FES; of these, 5019 were in England. However, not all households in England are considered suitable to be included in the analysis. "Non-Paying" households are considered to be inappropriate for inclusion. There are 1465 home owners who have paid off their mortgage who would thus have incurred an insignificant amount of current housing outgoings. It is therefore results of their past investment which is reflected rather than their current outgoings as these are not suitable for comparison with households in other tenures where current housing outgoings are the focus of concern. Also excluded were 115 households whose accommodation was tied to their job or business, and was thus not normally open to the market.

There were another three households which did not provide information on income and a further two for whom there was no information on mortgage payments. The absence of such information would hamper most of the subsequent analysis and these households were thus excluded. Also excluded were two households whose housing cost to income ratio was negative and 51 households with a ratio of over 100%. Households experienced such extremes of housing cost to income ratio either because, during the period of survey, they received a large sum of rebate or refund in rent or payment of utility, or they were on a very low income or had very high housing costs. These cases are obviously unusual and cannot be taken as the normal condition of the household.

In addition, the inclusion of such households distorted the distribution of housing cost to income ratio. It is shown in Appendix A1 that excluding these 53 household would greatly reduce the deviation and the skewness of the distributions of both income and housing cost to income ratio and thus the distortion caused by these extreme cases is reduced (Appendix A1 table A1.1). In total, 4272 households were retained in the sample for the main analysis.

Most of the excluded households were outright owners who were most likely to be single and elderly. This influences the household and socio-economic characteristics of the sample selected for analysis so that they skew towards families, who are relatively young and in full time employment. A breakdown of household and economic characteristics of both the selected sample and the excluded households is shown in

Appendix A1.

It can be seen that heads of households aged under 50 and in full time employment are over-represented in the selected sample. There are also more married couple households in the sample, but the regional distribution of the sample is more even, with only households from London and the North slightly over-represented (table A1.2, A1.3). Households selected have a higher than average income as well as higher housing costs. Not surprisingly, the housing cost to income ratio is on average higher among the selected households, apart from those which were excluded because of unreasonably high ratios (Appendix A1 table A1.4).

General Household Survey

The analysis of access to home ownership and tenure preference is based on data from the 1988 General Household Survey. The General Household Survey is also a continuous survey on representative samples from Great Britain covering individuals in private households. Information on the respondents' housing, household, education, income and health is recorded in every survey, with different additional topics being included each year. In 1988, respondents were asked about their tenure preference, preference for type of dwelling and satisfaction regarding their current accommodation.

The 1988 General Household Survey was conducted between April 1988 and March 1989 covering a sample of 19,716 individuals from 10,242 households, who were interviewed either in person or by proxy. The anonymised data set was also supplied by the ESRC Data Archive in Essex University.

A sample of 8,603 households in England was drawn on for analysis by tenure preference. The evaluation of mortgage potential, a key concept in the analysis of tenure preference, did not assume any mortgage potential for householders over the age of 60. Thus only households with a head of household aged under 60 were included. Since the evaluation of mortgage potential requires information on income, age, and region households for whom there was no such information were not included for analysis. Tenure preference is a focus of this thesis, therefore households with no

definitive tenure preference were also excluded. Housing association tenants were also excluded, mainly on technical grounds [8]. The exclusion of households which did not provide income information is believed to generate no significant bias in the quality of the sub-sample (Appendix A1). Hence, the size of the final sample after all exclusions is 1,117 households.

4.4 METHODOLOGICAL ISSUES

Unit of Analysis

The selection of the unit of analysis is neither simple nor straightforward. An individual person is unlikely to be the best choice where housing issues are concerned because it is apparent that the sharing of resources on housing among individuals in a household is high. This poses particular problems in assessing the share of housing cost for each individual in a household.

The nuclear family, or benefit unit, is another frequent selection. It is particularly relevant in the study of benefit issues or income transfer because of the relatively safe assumption that intra-familial resources are shared, and thus it is compatible with the benefit system. However, the expenditure pattern of a nuclear family living with other adult members is likely to be influenced by the resources, both consumed or contributed, by other adult members (Whiteford, 1985). For example, a seemingly poor young adult living with his or her well off parents may not be poor because of the presumed contribution from his family (DHSS, 1988). Furthermore, changes in the 1988 Social Security reform, which assumed a familial responsibility for young adults in benefit calculations, makes using the nuclear family as the unit of analysis problematic.

As a compromise, the concept "housing group" was proposed by Hancock (1993) in analysing problems of affordability. The housing group is basically a nuclear family, but it includes adult children who are either in full time education or unemployed. It is argued that "the analytical usefulness of housing group concept is that it is the core housing group making the long run housing investment decisions" (Hancock, 1993:136). Yet no convincing analysis was provided to illustrate that it is the housing

group which is making decisions on housing investment nor why the housing group should be defined in such a way; the concept thus seems to be arbitrary. Furthermore, education and employment status, key parameters in the definition of a housing group, are unlikely to be permanent. The stability, and thus the usefulness, of the concept is in doubt.

This thesis will adopt the household as the unit of analysis as a less than perfect but acceptable alternative. Using the household as the unit of analysis has been criticised as undermining the complexity of shared intra-household resources in the light of the growing diversity of household formations (Hancock, 1993). However, it is equally difficult to argue for a total absence of resource sharing within the household, especially in relation to housing consumption. Moreover, analysis is less complex if both income and housing consumption are assumed to be shared equally among all the individuals in a household. This assumption is also adopted in the analysis of household resources in the DSS Household Below Average Income series.

Household Income

The measurement of household income is crucial to the measurement of affordability, but measuring income involves controversy. Income can include both cash and benefits in kind, and even income from the appreciation of assets. However, the latter two sources of income pose considerable measurement difficulties. There may not be a market for benefit in kind and thus no cash equivalent of the benefit is available whilst income from the appreciation of assets may only be an expected amount that cannot be easily realisable for consumption.

The other argument involves the debate on permanent income and transitory income. The former represents the average expected income earned over a lifetime, and the latter the current income over a particular period of time. It is argued that permanent income is the major determinant of consumption, and especially those consumption decisions which have a longlasting effect, such as housing (Goodman, 1988).

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Despite the apparent usefulness of the concept of permanent income, its measurement is not straightforward. A number of methods have been suggested, among them the lagged income model and the human capital model (Goodman, 1988); perhaps the most popular approach is the use of consumption expenditure as a proxy for permanent income. It is based on the argument that since permanent income is the total lifelong income, it should be the same as lifelong consumption. Since consumption can be represented by expenditure, current expenditure can then be used as a proxy for permanent income (Hancock, 1993).

On the other hand, opponents of the use of permanent income argue not only against its methodological imprecision, but also on the ground that it is the inadequacy in current income that creates an affordability problem. Thus, current income should be the focus of concern in the study of affordability (Linneman and Megbolugbe, 1992). Hancock (1993) argues that if permanent income is used to indicate resources, "the problems of myopia, difficulties created by unfulfilled expectations and access to capital markets on unfavourable terms are more likely to be experienced by those for whom housing affordability is most problematic" (Hancock, 1993:137). When permanent income is closely associated with a 'housing groups' (the unit of analysis used by Hancock (1993)) expected future income, those on low incomes with, possibly, erroneous expectations would suffer the most.

The handling of earned income, benefit and tax in the calculation of income also creates substantial debates. Net disposable income, which is the cash income from all sources with housing benefit, tax and national insurance contribution deducted, is the most favoured definition of income. For example it is used by Best (1990), Hills (1991), Kearns (1992), Hancock (1993), the Housing Corporation (1993) and in the revised affordability policy of NFHA (HA Weekly, 17 Dec 1993). It is argued that tax and national insurance contributions are usually deducted at source and do not form part of the disposable income.

Whether housing benefit is part of disposable income depends on whether the housing costs of households on housing benefit are easily adjustable. It is argued that housing benefit which is tied to housing, at least where rent rebate to local authority tenants is

concerned, cannot be used for other consumption and housing benefit could at best cover the cost of housing but provides no additional spending power for the household. It is thus better regarded as a housing subsidy and should not be included as a source of income (Hancock, 1993). Furthermore, it enables easy comparison with the level of income support where the full cost of housing is covered (DHSS, 1988).

Conversely, it is argued that housing benefit is actually tied to the household (benefit unit) and not to a physical dwelling and it is possible for the household to adjust housing consumption in the medium to long term. Thus, the level of housing benefit, like other sources of income, can influence the level of housing consumption (DHSS, 1988). Hence, housing benefit should be included as part of income, whilst simply discarding housing benefit in both income and housing cost calculations would be misleading where the effect of housing benefit on housing consumption is concerned. Empirical evidence demonstrates that gross income is equally as powerful as net income in explaining housing expenditure (Maclennan et al, 1990). Consequently, there are still a number of studies on affordability that use gross income, which is the cash income from all sources including housing benefit, as the numerator in calculating the affordability ratio (for example, Maclennan et al, 1990, NFHA, 1992).

In this thesis cash income from all sources will be used as the definition of income. The reasons for this are partly pragmatic, owing to difficulties in identifying and quantifying benefit in kind, but are also due to the fact that benefit in kind cannot be realised to pay for the cost of housing. It is thus irrelevant to the problem of affordability. Likewise, the notion of permanent income is of little relevance to the issue of affordability because of the relative importance of current income to financial burden.

Owing to the lack of definitive evidence on whether gross or net income provides a superior measurement, both definitions of income will be used. Gross household income is defined as the total cash income of all household members from all sources, which includes housing benefit and assistance from income support to home owners to pay for their mortgage interest repayment. Net income is the disposable income of the household with housing benefit, tax and national insurance contributions deducted.

Unfortunately, unlike housing benefit for tenants, the mortgage interest element of the income support payment was not separately coded in the Family Expenditure Survey 1991 data file. It has to be estimated from information on income support payments. Home owners receiving income support for less than seventeen weeks are assumed to have half of their mortgage interest payment included in their income support payment and the full amount if the period exceeds seventeen weeks. However, such estimates result in 46 out of 151 home owners on income support whose interest payment element would be greater than their actual total income support payment. Some special circumstances of such home owners is believed to have led to the deduction of assistance. Yet the absence of information on such special condition made it difficult to assess the exact amount of such assistance. Thus it is safer to assume that these households were not eligible for any assistance towards their housing costs rather than to over-estimate the amount.

In the 1991 Family Expenditure Survey data, the amounts of both current income and normal income were recorded. Current income is the actual amount received in the last payment whilst normal income is basically equivalent to the current income if the individual is in work; if the respondent is unemployed or has been sick for less that thirteen weeks, his or her normal pay will be considered instead of the actual earning replacement social security benefits. When the period out of work exceeds thirteen weeks, the relevant social security benefits will be considered. In this thesis, normal income will be considered.

Two further modifications will be made to the data available from the Family Expenditure Survey. First, because of the lack of information on the poll tax and poll tax benefit, household income will not include poll tax benefit. This is an unsatisfactory method for examining income but it is the best available. Second, income for home owners in the Family Expenditure Survey incorporates a notional amount of imputed income from renting one's own home to oneself. This is regarded as a benefit in kind and will be deducted from the income of home owners.

The definition of income in the General Household Survey is less sophisticated. Only the current gross income is available, which is the sum of gross current earnings from all

sources, plus state benefits and income from other sources, or usual income if the last payment is unusual (OPCS, 1991). Because of the absence of information on social security benefit, calculation of net income is not possible.

Housing Costs

There are considerable complexities in determining the cost of housing. Two definitions of the cost of housing, the cash-flow definition and the economic definition, are proposed (Hancock et al, 1990). The cash flow definition represents cash outgoings as payment for the cost of housing. The economic cost should include not only current cash expenditure on housing, but also the cost of depreciation, of physical upkeep, the opportunity cost of capital tied up with the dwelling and the capital gain that is associated with the appreciation of housing value.

Yet the economic definition of housing cost in a study of affordability may not be appropriate. First, it is commonly accepted that current rent, rather than the economic rent (which have similar definitions as the economic cost described above), may be more relevant in the current policy context (except where the economic return of renting or the level of economic subsidy are concerned). It is thus not proper to use different definitions of housing cost for home owners and tenants. Second, if economic cost is used, there should be an equivalent approach to permanent income. However, the use of permanent income was rejected in the previous section on the ground that current income better represents the immediate burden of affordability. Similar arguments apply to housing cost. Hence, a cash flow approach to housing cost will be adopted in this thesis.

Nevertheless, determining the cash flow cost of housing may be complex owing to the nature of housing. Housing is not simply the acquisition of a physical dwelling, but is also the consumption of housing goods and services: shelter, living space, access to some facility, and even a place for entertainment, provision of a sense of security or a symbol of status. Different mixes of such attributes imply different costs of acquisition.

A statistical procedure, the hedonic analysis pioneered by Rosen (1974), has been developed to standardise the cost of housing according to different mixes of attributes. However, this procedure is not completely satisfactory in solving the problem of cost diversity. This is partly because it is not easy to identify all relevant and significant attributes, and also because dwellings with similar attributes may have various costs of acquisition even in the same locality. For example, the hedonic price model of Maclennan and colleagues (1990) can only 'explain' (in a statistical sense) about two thirds of the variations in the housing cost of dwellings in the owner occupied sector and only one third in the public rented sector among households in their six city surveys. The model developed by Hills (1990) can explain only slightly more than half of the variations in the prices of dwellings sold in 1988.

Furthermore, it is not always possible to derive the standardised cost based on the hedonic procedure owing to the absence of relevant data. A hedonic model, developed by this author on data from the 1991 Five Percent Sample Survey on Building Society Mortgages[9] and using attributes common to FES 1991, can explain only approximately half of the variation in the data. As a compromise, the unstandardised housing cost will be used but the cost of some attributes will be included in the current outgoings.

Hence, housing cost will include gross rent for tenants which includes service charges (but not meal charges) or mortgage interest repayment for home owners, together with the cost of acquiring the mix of attributes associated with the use value of the dwelling: the cost of repair and maintenance, water and sewerage charges, fuel and power and structural insurance.

Whether the cost of commuting should be included as part of housing cost is controversial. A high cost of commuting may be a result of the remoteness of the dwelling or the inconvenience for access to shops, entertainment or work areas, and thus may be reflected in a lower housing cost. But the actual expenditure may relate only to the mode of transport the household uses or the relative costs of public and private transport in the area. In view of such complexity and the difficulty in differentiating between commuting costs which are associated with the location of the dwelling and

those that are not, it is considered more appropriate to exclude such costs in the calculation of housing cost.

Repayment of the principal of mortgage loans, which is apparently part of current housing outgoings, is discarded from the calculation of housing cost. Instead, it is regarded as the cost of acquiring an asset. Meanwhile, poll tax, unlike domestic rates before 1989 or the council tax after 1994, is unrelated to the consumption of housing and thus should not be counted as part of housing cost. Hancock and colleagues (1990) treated it simply as a form of tax in the calculation of net income. Nevertheless, unavailability of the amount of poll tax in the present data set does not allow any manipulation involving poll tax and poll tax benefit. The absence of such information does affect the level of housing cost, but the effect on the level of net household income for most of the households may be slight.

Information available in the 1991 FES poses difficulties in the calculation of housing costs for some home owners. There were 272 home owners buying their homes who gave no information on the amount of mortgage interest payment. Because they constitute 10% of mortgagors, to simply recode these cases as missing data would jeopardise the accuracy of the analysis. Instead, the imputed rent was used as a proxy for the mortgage interest payment for these owners. Despite the fact that this will be an underestimate of the housing cost to income ratio of these mortgagees[10], it is nevertheless the closest available estimate, given the limitation of the current data set.

For reasons discussed in the previous section, both gross and net income will be used in this analysis. To be compatible with the income definition used, gross and net housing costs are also used in calculating the corresponding housing cost to income ratios. Gross housing cost is the current outgoings whilst net housing cost will have both the amount of housing benefit and the mortgage interest element of income support deducted from the gross household cost.

On the other hand, it is not apparent which definition of housing cost should be employed in the analysis of access to home ownership. Only the cost of purchase is included in the mortgage potential formula. However, chapter three of this thesis shows

that the concept of mortgage potential, a measurement of access to home ownership, is implicitly a ratio approach to affordability, albeit the threshold ratio is not spelled out. It indicates the ability of the prospective buyer to afford the burden of mortgage repayment at the initial stage of repayment. In this sense, it refers to current housing outgoings which include both the repayment of mortgage interest and principal, but exclude any other housing related expenditure, unlike definitions in the earlier part of this section. Moreover, whether gross or net housing cost should be used is irrelevant in this context because the access measurement should have considered prospective buyers who have to rely on social security benefit to sustain home ownership as being in a position of unaffordability.

Household Size and Equivalence Scale

It is apparent that the size and composition of a household will make varying demands on resources; a larger household requires more resources to achieve the same standard of living as a smaller household. A household with more adults will also need more resources to maintain the same standard of living as another household of the same size but with more children. At the same time, larger households can share facilities or equipment, such as a car or the kitchen, enjoying economy of scale in joint consumption, for example the preparation of food. Consequently, fewer resources than expected are required to maintain the standard of living than if there were no shared consumption.

To accommodate the complex relationships of size, composition and the degree of joint consumption of household resources, several procedures have been developed to standardise these elements. One method of standardising is to employ regression analysis which incorporates household size and composition as explanatory variables so that, with the help of the regression equation, the effect of size and household composition can be identified (e.g. Maclennan et al, 1990). This has the advantage of making no prior assumption on the effect of either size or composition on a household's resource sharing, but suffers from the serious drawback of being too complicated and inflexible to have a wider application.

Another common alternative is to employ an equivalence scale to standardise the effects of size and composition on a household in the calculation of resources. A large number of equivalence scales has been developed based on different assumptions of the needs of household members at different ages, and the effect of joint consumption and the resulting economies of scale (Whiteford, 1985). A major advantage of employing an equivalence scale is its simplicity, it compares the "equivalised" resources of households with different sizes and composition. Nevertheless, because of the lack of consensus on which is the best equivalence scale, comparison between analyses based on different equivalence scales is not easy. It is noteworthy that the equivalised household resources generated from different equivalence scales is sensitive to the choice of scale (Whiteford, 1985).

This thesis will employ the McClements' scale, which is used by the DSS in its Households Below Average Income Series, in which there are separate scales for income both before and after housing costs. Both scales are presented in table 4.1. They will be applied to residual income (income after housing cost) and gross income in the evaluation of affordability using the residual income approach. Unequivalised residual income will also be used to enable a comparison of residual income with the income support level, which has its own implicit equivalence scale embedded within it.

It is also desirable to use equivalised housing cost in the investigation of housing cost to income ratio, yet most equivalence scales are developed for household income or total expenditure. Although the HBAI series provide equivalence scales for total household expenditure both before and after housing cost which implied an implicit equivalence scale for housing cost, inferring an explicit equivalence scale for the cost of housing requires additional time and effort which this thesis may not be able to afford, in addition to the difficulty of validating such a scale. Thus, as a compromise, only unequivalised housing cost and income are used in evaluating the housing cost to income ratio.

Table 4.1 McClements' Scale

Households Member	Equivalence Scale	
	Before Housing Costs	After Housing Costs
Household Head	0.61	0.55
Spouse of Head	0.39	0.45
Other Second Adult	0.46	0.45
Third Adult	0.42	0.45
Subsequent Adult	0.36	0.40
Dependent Child Aged 0-1	0.09	0.07
Dependent Child Aged 2-4	0.18	0.18
Dependent Child Aged 5-7	0.21	0.21
Dependent Child Aged 8-10	0.23	0.23
Dependent Child Aged 11-12	0.25	0.26
Dependent Child Aged 13-15	0.27	0.28
Dependent Child Aged Over 16	0.36	0.38

Source: DSS 1993 Table 4.1

Housing quality

It was argued in chapter three that quality of housing is an integral part of the concept of affordability. Information on housing under- and over-consumption is essential to an assessment of the affordability status of a household. Thus the standard of housing consumption is crucial to the measurement of affordability.

Official standards of minimum physical adequacy of a dwelling can be used as a yardstick for the assessment of housing under-consumption. Such standards exist in the United States where a thirteen item checklist developed by the Congressional Budget Office provides a practical and easily comprehensible instrument for assessment (Yazar, 1981). In the UK, Section 83 of the Local Government and Housing Act 1989 sets out conditions in which a dwelling is unfit for human inhabitation (Whitehead et al, 1993). In Canada, such information has to rely on survey data from households' self assessment of the need for major repair (Fallis, 1990a).

These standards, if incorporated into the empirical measurement of affordability in the UK, have to rely on survey data which provides information on both the physical condition of the dwellings and other relevant social and economic data about the households. Unfortunately, it is almost impossible to obtain high quality information on both aspects in a single survey. For example, the English Housing Condition Survey supplies high quality information on the physical conditions of dwellings, but lacks

relevant information on other aspects of the household. Whilst the Family Expenditure Survey presents rich information on household social and economic conditions, there is no information on the physical condition of the dwellings.

It is equally difficult to achieve this with specially designed surveys. The JRF Housing Finance Project, conducted between 1986 and 1988, collected information on both household income and housing conditions, but only information on banded income could be acquired, whilst the physical condition of the dwellings was either based on self-assessment by the respondents or was assessed by the interviewers against a rough checklist of physical conditions.

Another commonly used indicator of physical adequacy is the availability of facilities in the dwelling, such as a bathroom, a sink in the kitchen, inside toilet, hot and cold water. Such information is available in detail in the English House Conditions Survey and the General Household Surveys. However, no such information is available in the Family Expenditure Survey.

Since information on physical conditions and facilities is often not supplied by social surveys, overcrowding is frequently used as a proxy for housing under-consumption. A Household is considered to be under-consuming housing if the household is living in overcrowded conditions, measured against some socially defined standard or norm. In Canada, overcrowding is part of the definition of core need measurement and is assessed against an official standard, the National Occupancy Standard (Fallis, 1990a). In the UK, Section 326 of the Housing Act 1985 provides a table of rooms and square footage per person as a statutory over-crowding standard (Whitehead et al, 1993). Yet this latter standard is difficult to implement using information from survey data.

Instead, Hancock (1993) uses room density as an indicator of overcrowding in which a density of over 1.5 persons per room is regarded as overcrowded, allegedly described as the standard for overcrowding used in the Population Census. In fact, this ceased to be used in the Census in 1991 as a standard since there were only 0.3% households having a room density of over 1.5 persons per room in 1991 (OPCS, 1993b).

Another indicator, the occupancy norm, is used by the Census to assess overcrowding in Scotland. The rule set out in the Census Occupancy Norm assumes that a single person household needs only one room whilst for households with more than one member, a living room and one bedroom is needed for each of the following combinations of household members (OPCS, 1993b:20):

* Each married couple
* Each single person aged 21 and over
* Each pair aged 10-20 of the same sex
* Each pair formed from a remaining child aged 10-20 with a child aged under 10 of the same sex
* each pair of children aged under 10 remaining
* Each child unable to form a pair

Given the limitation in the Family Expenditure Survey, it is only possible to assess housing under-consumption with reference to overcrowding and the occupancy norm is considered the most appropriate measure of assessment. In addition to the use of the Occupancy Norm, the results of room density of a household will also be displayed as a reference.

The assessment of housing over-consumption is not straightforward. Whilst there is a standard for physically adequate dwellings, there is no consensus on what constitutes a luxurious dwelling. Nor does any standard exist for over-provision of facilities. Hancock (1993) suggests the use of the official maximum level of housing consumption in housing benefit application where it refers to the number of rooms allowed for by rent officers in assessing whether the size of the property associated with the application is unreasonably large.

There exists a maximum level of housing consumption above which rent officers are required to regard consumption as unreasonable, either in terms of space occupied or unit cost paid. The rent officer is obliged to recommend such a rent level as inappropriate. However, to assess a definitive level of such a standard from empirical data may be difficult. First, it is only the recommendation of the rent officer and the recommendation only affects the amount of housing benefit with which local authorities were reimbursed; not necessarily the actual amount of housing benefit granted. Thus, information on housing benefit does not necessarily reflect the decision of the rent officers. Second, such assessments, admittedly based on some explicit standards, are

sensitive to the special conditions of the applicant as well as to the availability of alternative accommodation of appropriate size or unit price in the locality (Kemp and McLaverty, 1993a).

It is probable that housing benefit above that normally allowed would be granted owing to the special conditions mentioned, and this would affect the maximum size so inferred. Thus, using these methods to assess housing over-consumption could underestimate the number of households which are over-consuming.

Instead, it is revealed that in the assessment of reasonable size associated with housing benefit applications, there is a set of explicit size criteria to which rent officers must adhere (Kemp and McLaverty, 1993b). The terms of such size criteria are similar to the Occupancy Norm described in the previous paragraph, and will be used to assess housing over-consumption in this thesis. However, owing to the practical consideration of availability of one all-purpose room in a house or a flat, a single person occupying a house or flat with one living room together with a bedroom will not be considered to be over-consuming housing services.

Nonetheless, the assessment of over-consumption using the Occupancy Norm will over-estimate the number of households over-consuming housing, since the occupancy norm fails to include households with special needs. Households with special housing need usually require extra space for special purposes and are thus considered to be over-consuming housing services. There is no ready solution to rectify such shortcomings in the data and thus the interpretation of over-consumption should be made with caution.

4.5 LIMITATION OF THE DATA SETS

There are many advantages in employing the method of secondary analysis in empirical investigations. Besides being economic in both time and resources spent on data collection, the quality of survey data is also considered to be stable and reliable, especially when large scale national level surveys are used. The Family Expenditure Survey and the General Household Survey have nearly thirty years of experience of implementation; methods of data collection, accuracy of the data collected, as well as

the representativeness of the sample, have improved substantially over the years. Although the Family Expenditure Survey is still accused of under-representing households on very high incomes (DSS, 1993), such defects do not affect the analysis of affordability in the present thesis when this problem is likely to be concentrated in households on median to low incomes.

However, whilst the Family Expenditure Survey has rich data on income and expenditure, it lacks important information on the quality of housing and on the house value to be evaluated using the hedonic technique. The quality of information on mortgage repayment is also poor. Not only are there too many missing cases of mortgage interest repayment, but even less information is available on term of mortgage loan. Information on the majority of mortgagees' length of current mortgage loan is missing and it is thus impossible to locate the position of a mortgagee in the course of repayment.

On the other hand, the General Household Survey has sufficient information on both amenities and relevant information in assessing house value. Information on income is inadequate, apart from the complete absence of expenditure information. Both these data sets lack information on debt and housing payment arrears, so that housing-associated stress cannot be investigated.

These defects illustrate the main shortcomings of secondary analysis, namely the absence of control over the information being collected and the sample frame used. The data collected may not necessarily be exactly suited to the secondary analyst's research questions as the original survey will have been designed for a different task. Thus, beside difficulties in the operationalisation of research concept, this research has also to work within the limitations imposed by the information available in the data sets.

4.6 SUMMARY

This chapter describes the method used in the research, which is an empirical investigation of affordability based on surveys at a national level. The research

questions focus mainly on issues surrounding the implementation of different approaches to affordability measurement and access to home ownership.

The investigation is based on the 1991 Family Expenditure Survey and the 1988 General Household Survey. The latter data set has been used to examine access to home ownership and the former for the remaining topics. Only households in England are included in the analysis; in the FES, non-paying households are excluded, whereas in the GHS a sub-sample of tenants in local authority housing and the private rented sector who were under the age of 60 have been selected for further analysis.

The household has been employed as the unit of analysis. Normalised current income was used, which has been adjusted to take into account short absences from work. Meanwhile, gross and net income were used in parallel in the empirical investigation. Gross income includes current cash income from all sources, in addition to housing benefit to tenants as well as help towards mortgage interest payment from Income Support. Where net income excludes tax, national insurance payments and assistance from social security were put towards housing costs.

Housing cost is defined to include rent or mortgage interest payment, in addition to the cost of repair and maintenance, fuel and power, structural insurance, water and sewerage charges. Mortgage principal repayment is regarded as the cost of acquiring an asset and is excluded from housing cost. Poll tax is considered to be unrelated to housing and so is excluded as part of housing cost. However, the embargo on actual poll tax charges and poll tax benefit has not allowed for fine adjustment of the amount of such benefit on either gross or net income.

The McClements' scale is used to equivalise the income of households to adjust for the differences in needs of households of different size and characteristics, as well as to reflect the effect of economies of scale and sharing of resources. Meanwhile, quality of housing cannot be measured directly using the present data sets and only the dimension of overcrowding can be inferred indirectly by using the Occupancy Norm.

CHAPTER 5
HOUSING COST AND HOUSING COST TO INCOME RATIO: A GENERAL PROFILE

5.1 INTRODUCTION

The analysis of the housing cost and housing cost to income ratio will form the core part of subsequent investigations. A general profile of both variables will be described in this chapter before starting a detailed analysis. This will provide a background of the distribution of both variables in relation to the households' socio-economic characteristics that are relevant in this thesis, and will also enhance the formulation of the structure of future analysis. Subsequent analyses will proceed with the gross and net quantity of both housing cost and housing cost to income ratio; therefore this chapter will be focused on these four variables.

This chapter will proceed with the analysis of housing cost followed by an examination of the housing cost to income ratio. Whilst the main objective of this chapter is to describe the distribution of these variables in relation to households' housing and socio-economic characteristics, a contrast between the gross and net quality will also be highlighted. This latter analysis may shed some light on how subsequent analysis should be formulated. Gross housing cost used in this thesis includes the gross rent or mortgage interest repayment, together with expenditure on fuel and power, utilities, repair and maintenance and structural insurance. Gross income is defined as the total income of all member of the household from all sources which includes earned income and income from state benefits. Where net housing cost and net income exclude, respectively, gross housing cost and gross income, housing benefit and help from social security to pay off mortgage interest repayment

5.2 HOUSING COST

It was shown in chapter three that the demand for housing can be expressed as a function of household income and the unit price of housing (formula 3.3). Yet empirical investigation of housing demand is hampered by the difficulty in observing directly the

quantity as well as the unit price of housing consumption. Instead, housing price and quantity can be jointly observed as the household expenditure on housing which can be expressed as a function of household income, household size and other demographic characteristics as shown in formula 5.1 (Groodaert and Dubois, 1986; Malpezzi and Mayo, 1985)..

$$H = h(Z, P_H)$$
$$R = r(Z, P)$$
Where H = Housing Consumption
$\quad\quad Z$ = Household Income
$\quad\quad P_H$ = Unit Price of Housing
$\quad\quad R$ = Expenditure on Housing
$\quad\quad P$ = Household Size and Other Demographic Variables

(5.1)

Housing cost can then be examined in more detail in relation to household income and other household and demographic variables. This will be explicated in this section, in which a general profile of the relationship will be explored, while a more elaborate investigation, involving a more exact specification of the functional form of the equation will be pursued in subsequent chapters.

It is not uncommon for the analysis of housing demand or housing cost be conducted separately for households in the market and non-market sectors because of the difference in the underlying operation of these two sectors. This may be valid in England where over a quarter of the housing stock is in the social rented sector, where the market mechanism does not apply in general.

Whilst the distinction between market and non-market provision of housing is noted and there may be advantages in separating the analyses for the market and non-market sectors of housing provision, yet conducting the analyses in such a way may generate other complications. First, a choice between owning and renting in the market provision of housing would have different implications for the cost of housing. Second, the furnished and the unfurnished private rental markets are quite distinct market sectors.

Third, owner occupation in the UK does not operate in a perfect market, but is distorted by tax benefit to home buyers, which alters the relative costs of owning and renting. Fourth, the fair rent system, a form of rent control which would have a serious distortion on the operation of the market, still applies to a considerable minority of tenancies in the

private rented sector. In addition, claimants' housing consumption decisions would not be the result of market operational factors in the private rented sector, but of the provision of housing benefit.

Fifth, since the social rented sector is beginning to adopt a more market like policy of rent setting, the difference in the underlying mechanism which influence housing costs between market and non-market provision may be smaller than before.

To cater for such complications, a more complicated division of market provision than a simple dichotomy must be used. For example, the distinction between renting and owning, as well as between furnished renting and unfurnished renting, is required, so as to fully distinguish between the market and non-market provision of housing, This would greatly increase the burden of analysis in this chapter, which aims to provide a simple profile of housing cost in relation to households' socio-economic characteristics. Thus, there will be no attempt to run separate analyses for different modes of housing provision in this chapter. Rather, it is expected that the tenure variable will capture many of the variations in different modes of housing provision, and could be used as a proxy for the market and non-market provision of housing.

In 1991, the average level of gross housing cost, at £72 per week, was significantly higher than net housing cost, which was £67 per week. This reflects the mediation of housing benefit which led to a more even distribution of net housing cost where it reduced the level of housing cost of households on low incomes. On the other hand, because housing benefit reduced housing costs for the poor, it widened the gap between the net housing cost paid by poor and wealthy households. This is captured by the increased standard deviation of net housing cost over gross housing cost (table 5.1).

The difference in the distribution of gross and net housing cost is also shown in figure 5.1. The distribution of both forms of housing cost was uneven with more households concentrated at the lower end of the distribution, which reflects the uneven distribution of income. Without help from housing benefit, the gross and net housing costs of the medium and high income households were identical. The mediation of housing benefit reduced the net housing costs of many poor households and thus biased its distribution

more towards the lower end. Yet a bimodal distribution of net housing cost is apparent. The higher mode reflects the reduction of housing cost for households around the peak of the distribution of gross housing cost, the lower mode was probably the effect of the portion of housing cost not covered by housing benefit, partly owing to the failure of the households to get full support and partly due to the amount included in the definition of housing cost besides rent and mortgage interest payment, which housing benefit to tenants and social security benefit to home owners are not supposed to support. The amount of the housing cost of such households, relative to their households income, exerted a considerable financial burden on them.

Table 5.1 Housing Cost : Descriptive Statistics

Statistics	Gross Cost £pw	Net Cost £pw
Mean	72.2	66.5
Standard deviation	53.1	56.3
Median	55.2	51.4
Skewness	3.7	3.2

Source: Analysis of FES 1991

Figure 5.1 Distribution of Housing Cost
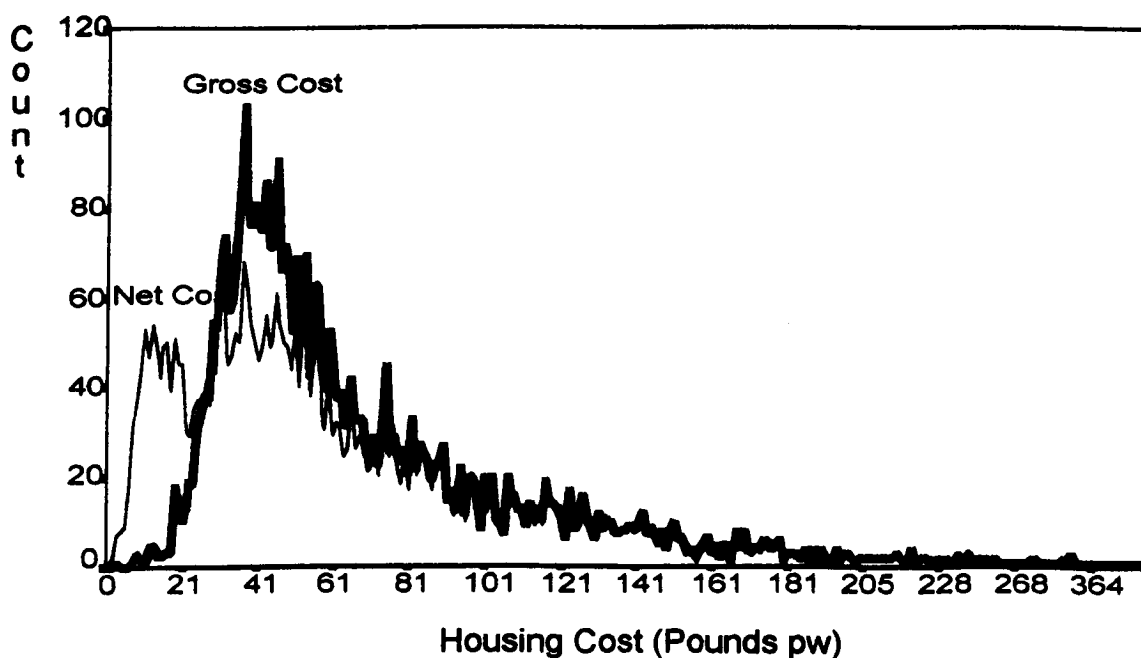
Source: Analysis of FES 1991

Meanwhile, there was a large difference in housing costs between tenure groups. This largely reflects the effect of market and non-market provision of housing on housing cost mentioned earlier in this section. Mortgagees had the highest level of both gross and net cost and they benefited least from social security benefit on housing; there was

practically no difference between the level of gross and net housing cost. Tenants in the social rented sector and those in rented private unfurnished accommodation had a much lower level of both gross and net housing cost, whilst the housing costs of tenants in the private furnished sector were at a level between the two former groups.

Housing costs paid by tenants in the social rented sector and the private unfurnished sector varied much less than costs paid by home owners or tenants in the private furnished sector. This represents the range of variation in the level of rent in the public and the regulated private sector against the open market. A more market-like rent structure in the social sector and continued deregulation in the private rental market would surely have the effect of widening the range of housing costs.

The mediation of housing benefit not only reduced the level of housing cost paid by tenants, especially those in the social sector, but also widened the range of variation in housing cost amongst tenants. This was probably a result of the widened gap between tenants on full benefit whose housing cost was supported in full by housing benefit, and those whose income was just above the level eligible for benefit. The high taper of housing benefit withdrawal would make this difference (figure 5.2)(refer to Appendix A2 for the interpretation of the box plots).

Regional variation of housing cost was less apparent, but London and the South East were obvious exceptions. The level of both gross and net housing costs in these two regions were significantly higher, while there was no difference in the average housing cost between other regions in the country (F test at 5% confidence level). Housing cost in the South West, because of the relatively larger standard deviation, showed no definite relationship with the rest of the country. Although housing costs showed less variation among regions, the magnitude of variation within regions was large. Thus the statistically identical level of average housing costs between regions in the North and Midlands might only reflect this relatively large within-region variation which over-shadowed the between-regions variation (figure 5.3).

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Figure 5.2 Housing Cost by Tenure
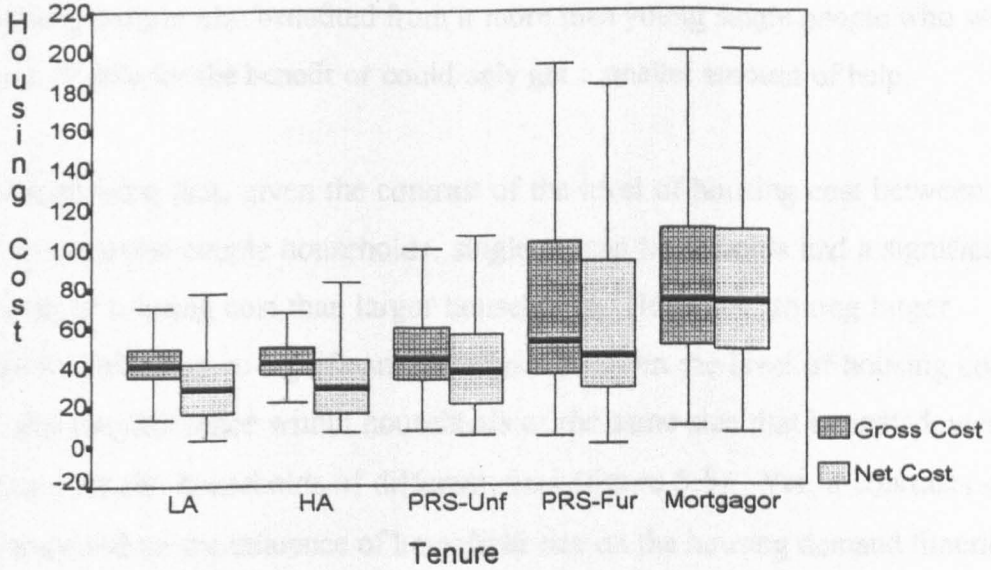
Source: Analysis of FES 1991

Figure 5.3 Housing Cost by Region
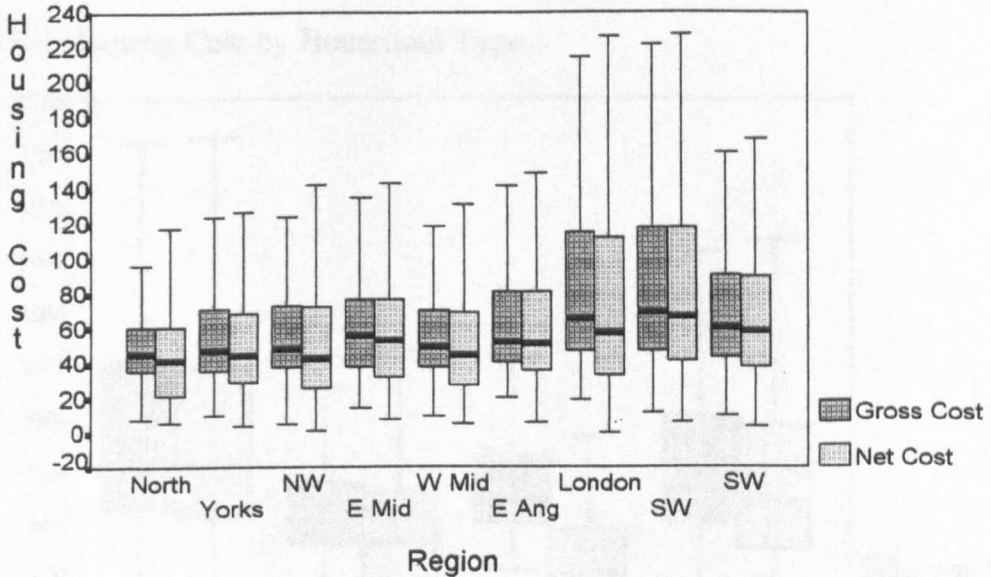
Source: Analysis of FES 1991

Married couple households had the highest level of both gross and net housing cost, but they also had the largest variation of both types of housing cost. This is because of the high concentration of home owners in married couple households and this pattern largely reflects the situation of home owners. At the same time, housing costs paid by single person and lone parent households were significantly lower than costs paid by married couple households. Lone parent households benefited most from housing benefit where the reduction of gross housing cost was greatest. On the other hand, variation in housing costs among single person households increased after the mediation

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of housing benefit (figure 5.4). It reveals the differential effect of housing benefit on single elderly people who benefited from it more than young single people who were either not eligible for the benefit or could only get a smaller amount of help.

It is not surprising that, given the contrast of the level of housing cost between single person and married couple households, single person households had a significantly lower level of housing cost than larger households. However, among larger households, there was no significant difference between the level of housing cost. In fact, it was the difference within households of the same size that overshadowed the difference between households of different sizes (figure 5.5). Yet, it contrasts with what is expected on the influence of household size on the housing demand function found in other empirical studies of housing demand and housing cost. This may suggest the effect of income and other household characteristics was larger than expected..

Figure 5.4 Housing Cost by Household Type
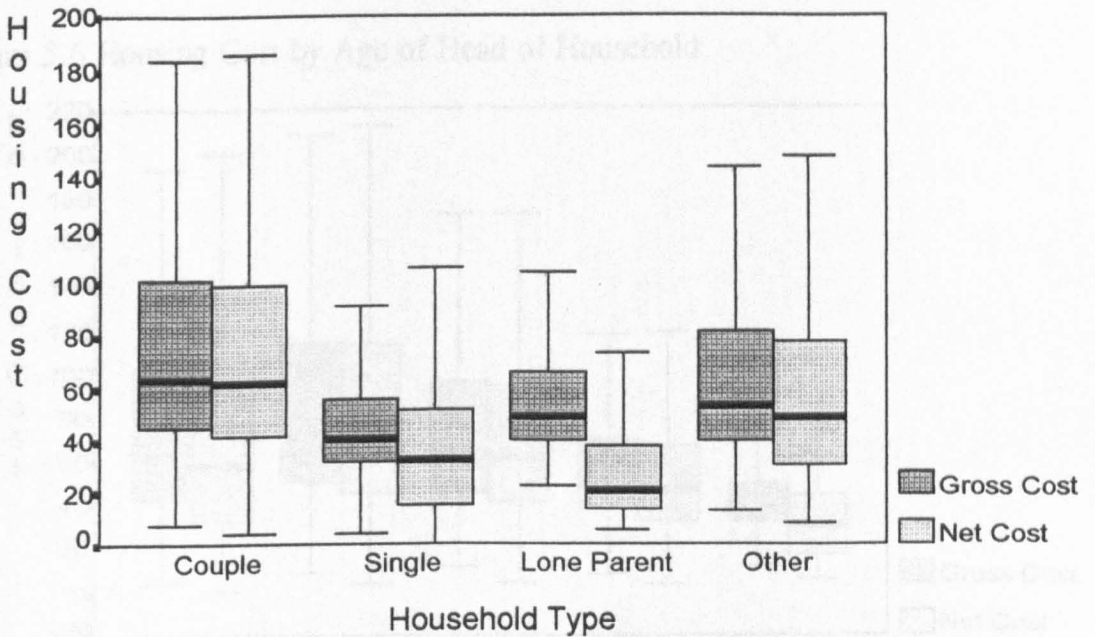
Source: Analysis of FES 1991

The age of the householder had a close association with the average level of housing cost. Householders of retirement age and over paid the lowest level of housing cost, followed by householders approaching the age of retirement, whilst middle aged householders paid the highest level. At the same time, variation of housing cost within

households for older householders was considerably lower than for younger householders (figure 5.6).

Figure 5.5 Housing Cost by Household Size
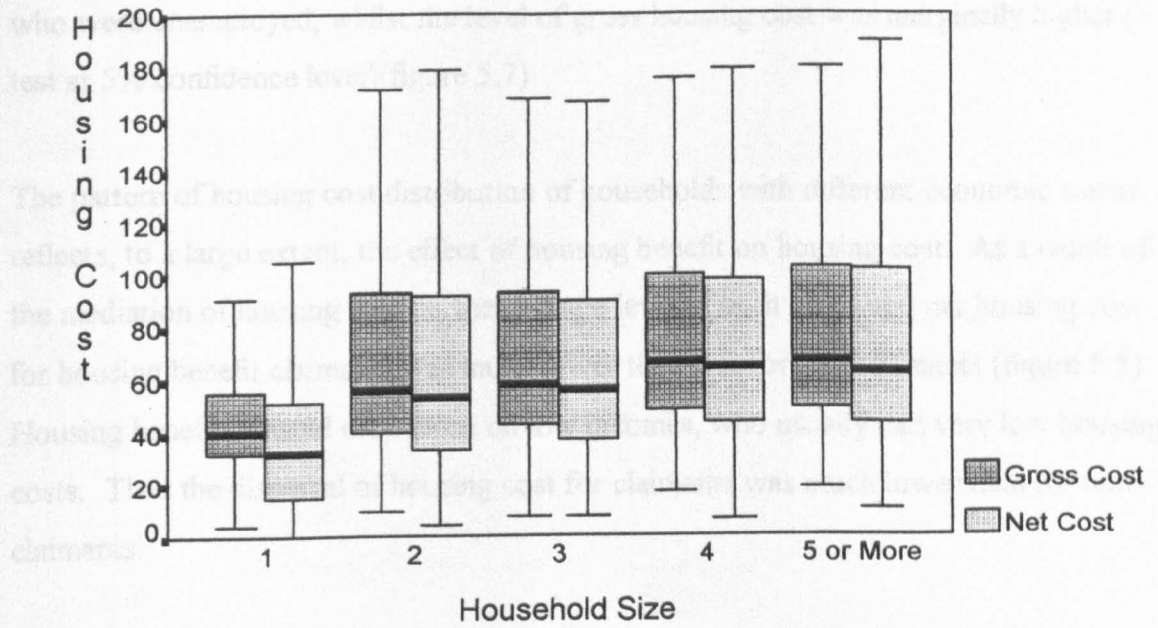
Source: Analysis of FES 1991

Figure 5.6 Housing Cost by Age of Head of Household
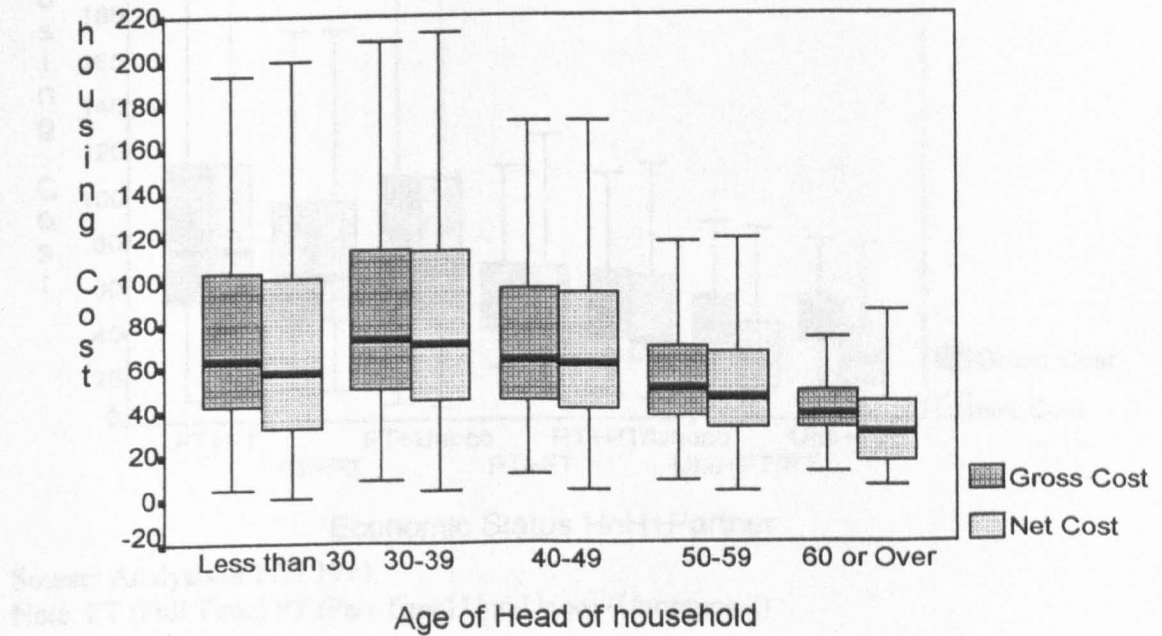
Source: Analysis of FES 1991

Where housing cost and employment status is concerned, the most obvious observation in figure 5.7 was the high level of both gross and net housing costs among households where the householder was in full time employment (FT+FT) as well as the substantial dispersion of housing cost within such groups. At the same time, there was no

difference in the level of housing cost regardless of the employment status of his partner for an employed householder. When the householder was working part time, the level of net housing cost paid by a household was, statistically, at the same level as for those who were unemployed, whilst the level of gross housing cost was marginally higher (F test at 5% confidence level)(figure 5.7)

The pattern of housing cost distribution of households with different economic status reflects, to a large extent, the effect of housing benefit on housing cost. As a result of the mediation of housing benefit, the average level of both gross and net housing cost for housing benefit claimants was much lower than that for non-claimants (figure 5.8). Housing benefit assisted only those on low incomes, who usually had very low housing costs. Thus the dispersal of housing cost for claimants was much lower than for non-claimants.

Figure 5.7 Housing Cost by Economic Status of Head of Household and Partner

Economic Status HoH+Partner
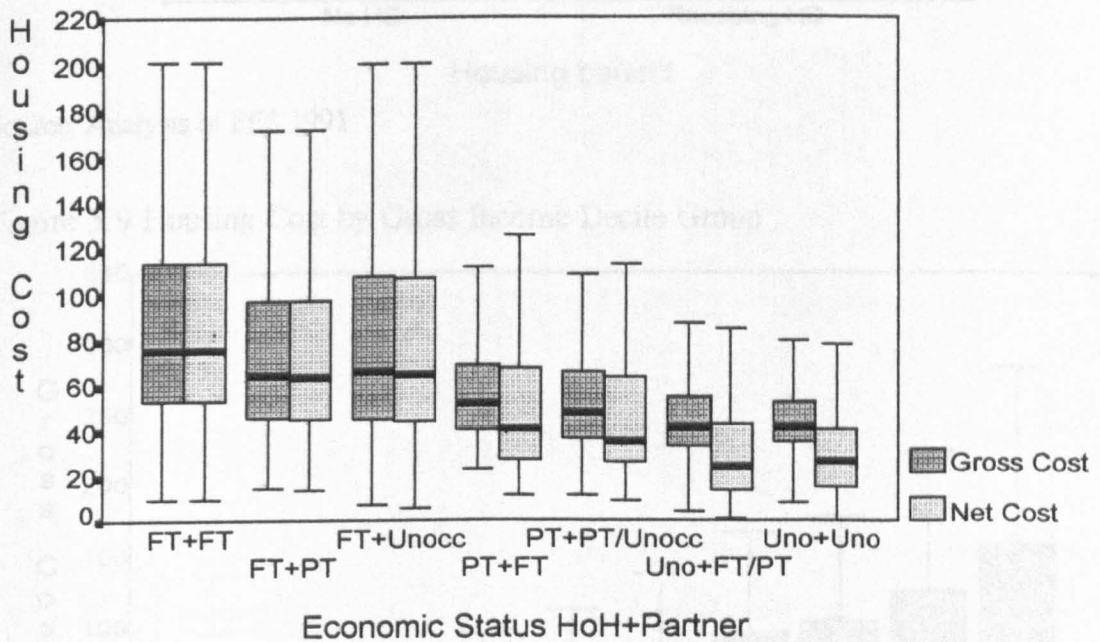
Source: Analysis of FES 1991
Note: FT (Full Time) PT (Part Time) Uno/Unocc (Unoccupied)

It is apparent from figures 5.9 and 5.10 that an increase in income was strongly associated with an increase in housing cost. This matches what is expected from formula 5.1 that household income bears a close relations with housing costs. The direction of moving also agrees with the sign of the income elasticity of housing demand found in other empirical studies (Maclennan, 1982). This is not surprising, given that

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households on higher incomes were more capable of paying a higher housing cost. What is noteworthy is the increased dispersal of housing cost among high income households. It suggests that wealthy households had a wider choice in their level of housing consumption whilst the freedom of choice of poor households was much limit.

Figure 5.8 Housing Cost by Housing Benefit
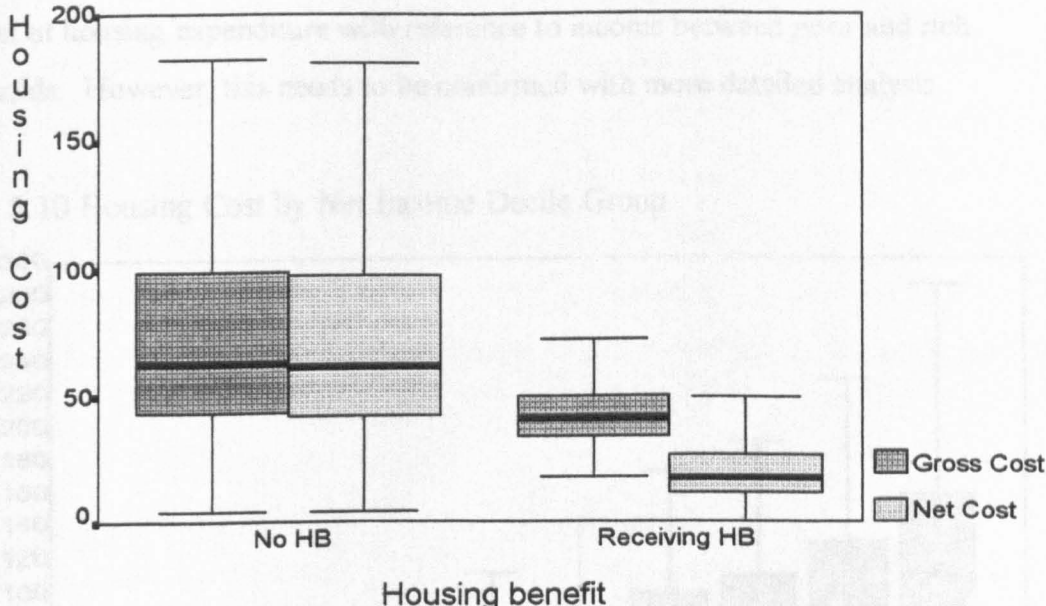
Source: Analysis of FES 1991

Figure 5.9 Housing Cost by Gross Income Decile Group

Source: Analysis of FES 1991

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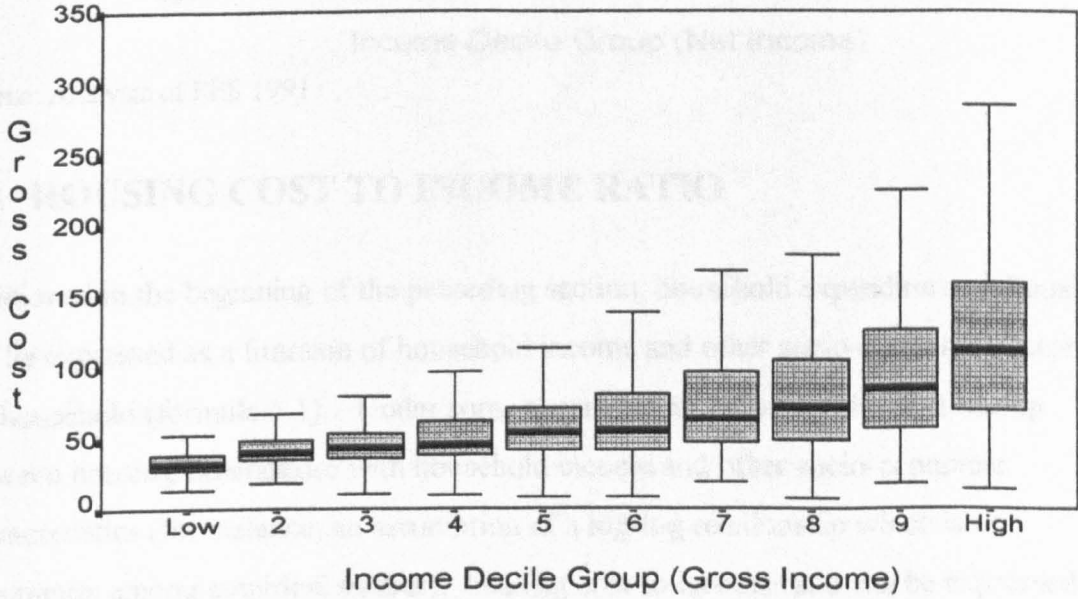
Detailed analysis (oneway ANOVA test and Scheffé procedure at 5% confidence level) also indicates that the level of gross housing cost among the bottom three decile groups and net housing cost among the bottom two decile groups waer statistically identical. The levels of the rest of the decile groups were significantly different from each other (with the exception of the seventh and eighth decile groups). This observation has implications for the threshold affordability level since it suggests a different relationship for level of housing expenditure with reference to income between poor and rich households. However, this needs to be confirmed with more detailed analysis.

Figure 5.10 Housing Cost by Net Income Decile Group
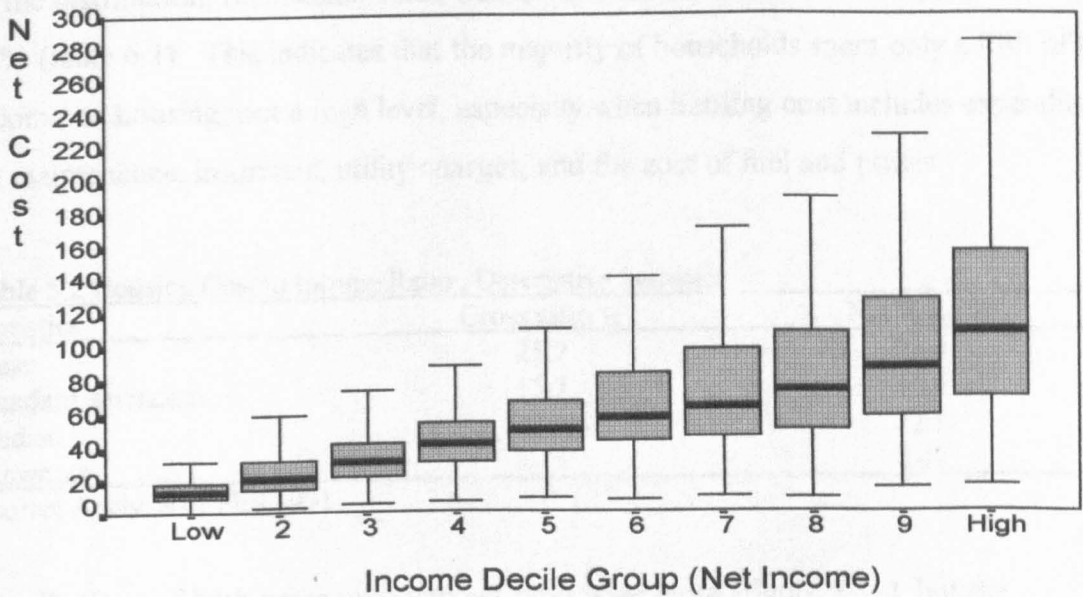
Source: Analysis of FES 1991

5.3 HOUSING COST TO INCOME RATIO

Mentioned in the beginning of the preceding section, household expenditure on housing can be expressed as a function of household income and other socio-economic factors of the household (formula 5.1). Under some specific assumptions of the relationship between housing expenditure with household income and other socio-economic characteristics (for instance, an assumption of a log-log relationship which is not uncommon among empirical studies), housing cost to income ratio can be expressed as a function of the households' socio-economic characteristics (formula 5.2). This allows a preliminary investigation of housing cost to income ratio in relation to the socio-economic characteristics of the households while more detailed examination of the

housing cost to income ratio will be pursued in subsequent chapters..

R - $r(Z,P)$
Q - $q(P)$
Where H - *Housing Cost*   (5.2)
                 Z - *Household Income*
                 R - *Expenditure on Housing*
                 P - *Household Size and Other Demographic Variables*
                 Q - *Housing Cost to Income Ratio*

In 1991, households in England spent, on average, around a quarter of their income on housing. This mean value does not vary regardless of whether gross or net housing cost to income ratio is used. Because both gross and net ratios skew towards the lower end of the distribution, the median value was lower than the mean value at approximately 22% (table 6.1). This indicates that the majority of households spent only a fifth of their income on housing; not a high level, especially when housing cost includes expenditure on maintenance, insurance, utility charges, and the cost of fuel and power.

Table 5.2 Housing Cost to Income Ratio : Descriptive Statistics

Statistics	Gross ratio %	Net Ratio %
Mean	25.7	25.4
Standard deviation	15.7	14.4
Median	22.0	22.1
Skewness	1.15	1.48

Source: Analysis of FES 1991

Distributions of both gross ratio and net ratio were close (figure 5.11), but the dispersion of the net ratio was more uniform than that of the gross ratio. This reflects the effect of housing benefit, which helps to reduce the housing burden on tenants on low incomes. At the higher end of the income distribution, the tax system reduced the net income of such households and thus raised their corresponding net housing burden.

The definition of housing cost used in this thesis, though not common in the literature on affordability, has the advantage of avoiding too many households which have no net housing payments as a result of receiving full housing benefit. Nil Housing cost poses computational difficulties on many statistical procedures and thus hampers empirical examination of the housing cost to income ratio. Furthermore, the distribution of both gross and net ratio are roughly log-normal, i.e. the logarithm of the ratios are normally distributed. This distribution pattern will have implications for subsequent statistical analyses.

distributed. This distribution pattern will have implications for subsequent statistical analyses.

Patterns of distribution of both gross and net ratios exhibited a substantial contrast between tenure groups. The average level of gross housing cost to income ratio among social tenants was the highest, while among mortgagees it was the lowest. The difference of gross ratios between owners and tenants was statistically significant, but within tenants there was no significant difference in mean gross ratios between private and social tenants (figure 5.12). At the same time, the dispersion of gross housing cost to income ratio was large among both private and social tenants.

Figure 5.11 Distribution of Housing Cost to Income Ratio
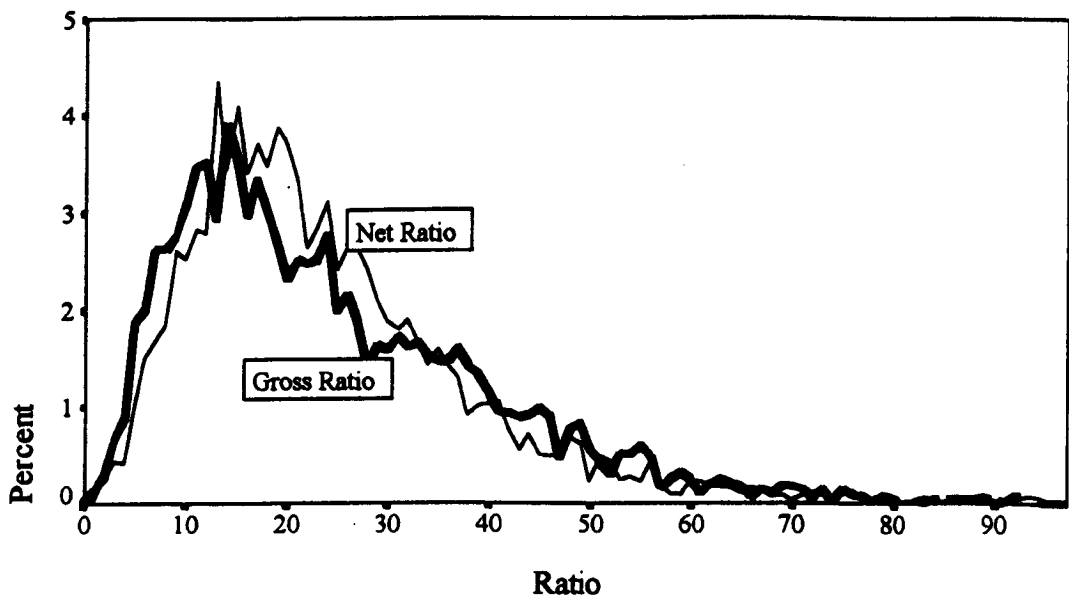
Source: Analysis of FES 1991

The distribution of housing cost to income ratio was different after the mediation of housing benefit and the tax system. Mortgagees on the average had to spend a higher proportion of their net income on housing because of the effect of the tax system. Despite social tenants having lower mean net ratios, there was no significant difference in the mean level of private tenants or mortgagees because of the large variations of net ratio within mortgagees. On the other hand, in contrast to the large variation of gross ratio within social tenants, the variation of net ratio was smaller owing to the effect of housing benefit.

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Figure 5.12 Housing Cost to Income Ratio by Tenure
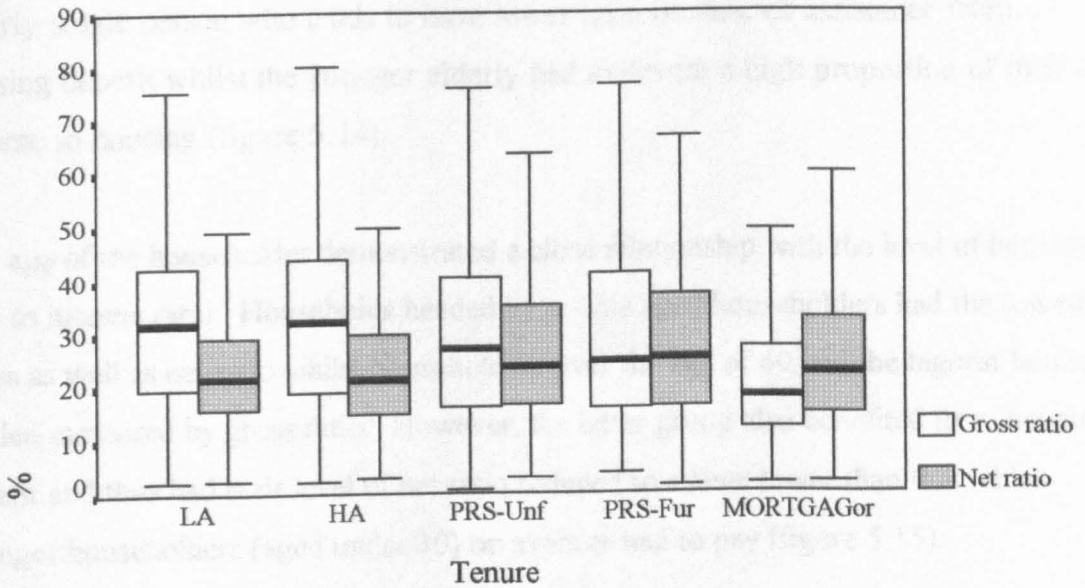
Note: Refer to Appendix A3 for the meaning of the abbreviations)
Source: Analysis of FES 1991

Regional differences in both gross and net ratio were insignificant, with London as the exception, whereas both the mean gross and net ratios were significantly higher. The lack of significant difference in the mean ratio between regions does not imply uniformity of housing cost and income across regions. It is the comparatively larger variation within regions which overshadowed the regional difference. Furthermore, the effects of housing benefit and the tax system were quite uniform across regions and produced no significant contrast between net and gross ratio (figure 5.13)

Housing cost to income ratio varies substantially between different types of households. Both single person and lone parent households had a significantly higher gross ratio than that of married couple households. Mediation of the housing benefit and tax systems reduced the variation of housing cost to income ratio among lone parents and single persons whilst it increased that of married couples. This can be explained by the tenure composition within the household types: there was a higher concentration of social tenants among single people whilst more married couple households were home owners.

Still, the average level of net ratio was higher among single person households. At the same time, the within group variation was also greatest compared with other

household types. It probably reflects the gap between the affordability situation of an elderly single person who tends to have lower ratio because of assistance from housing benefit whilst the younger elderly had to devote a high proportion of their net income to housing (figure 5.14).

The age of the householder demonstrated a close relationship with the level of housing cost to income ratio. Households headed by middle aged householders had the lowest gross as well as net ratio whilst householders over the age of 60 had the highest housing burden measured by gross ratio. However, the latter group also benefited from housing benefit and thus had their level of net ratio reduced to a level lower than that which younger householders (aged under 30) on average had to pay (figure 5.15).

Figure 5.13 Housing Cost to Income Ratio by Region
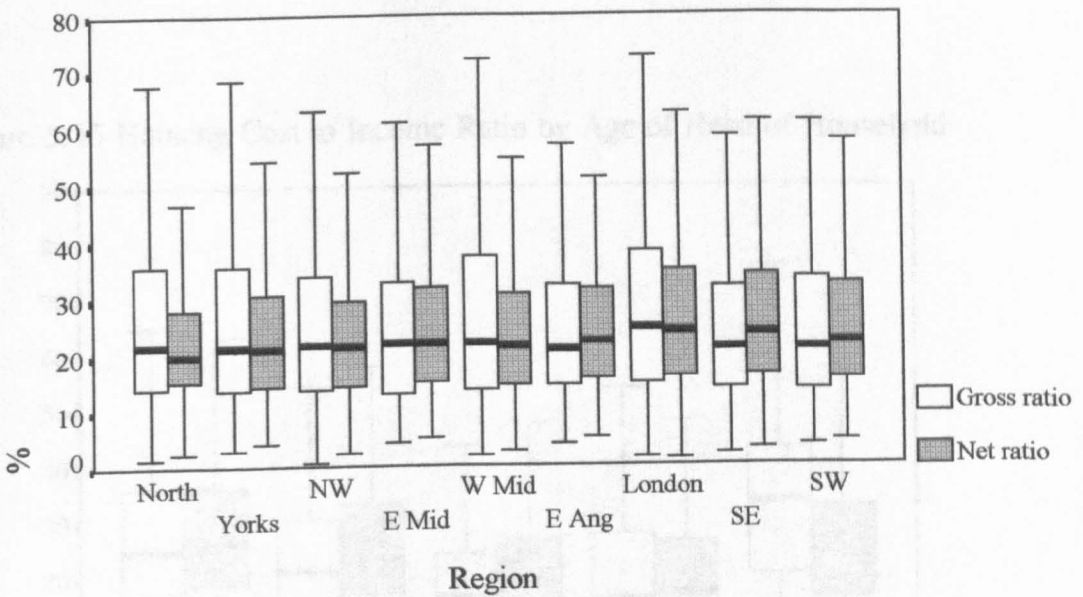
Note: Refer to Appendix A3 for meaning of the abbreviations)
Source: Analysis of FES 1991

Household size was related to both gross and net ratio. The Pearson correlation coefficients between gross and net ratio of household size were, respectively, -0.3 and -0.18 ($p < 0.01$). Although the correlation is not strong, the negative magnitude of the correlation coefficients indicate that large households tend to have low housing cost to income ratios.

Figure 5.14 Housing Cost to Income Ratio by Household Type
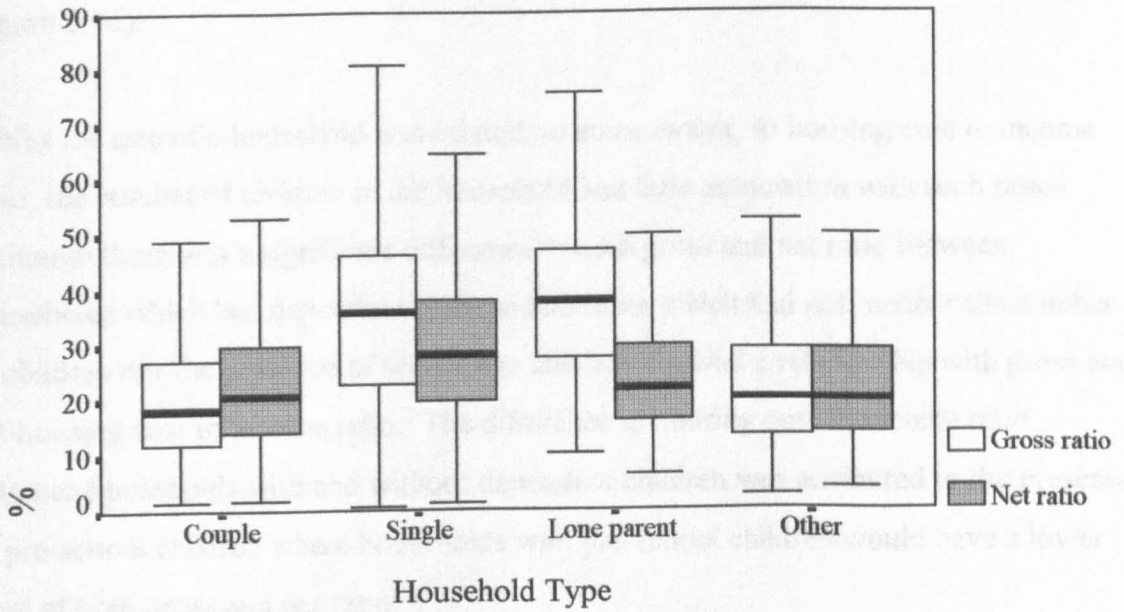
Figure 5.15 Housing Cost to Income Ratio by Age of Head of Household
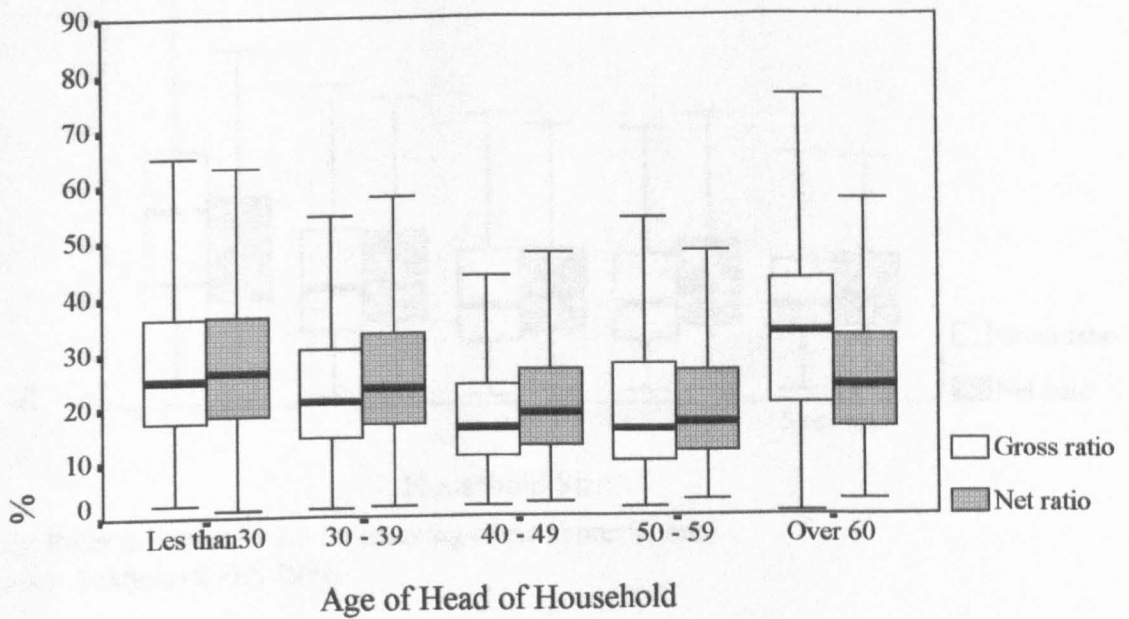
However, a closer scrutiny reveals a more complicated pattern. It was single person households which had a substantially higher mean value of both gross and net ratio than larger households. The mean ratios of two person households, although the second highest, were only marginally higher than larger households. Household size bore no

relationship to either gross or net ratio for households with three persons or more (figure 5.16).

Whilst the size of a household was related, to some extent, to housing cost to income ratio, the number of children in the household had little association with such ratios. Although there was a significant difference in both gross and net ratio between households which had dependent children and those which had not, neither the number of children nor the presence of school age children showed a relationship with gross and net housing cost to income ratio. The difference in housing cost to income ratio between households with and without dependent children was attributed to the presence of pre-school children where households with pre-school children would have a lower level of both gross and net ratio.

Figure 5.16 Housing Cost to Income Ratio by Household Size
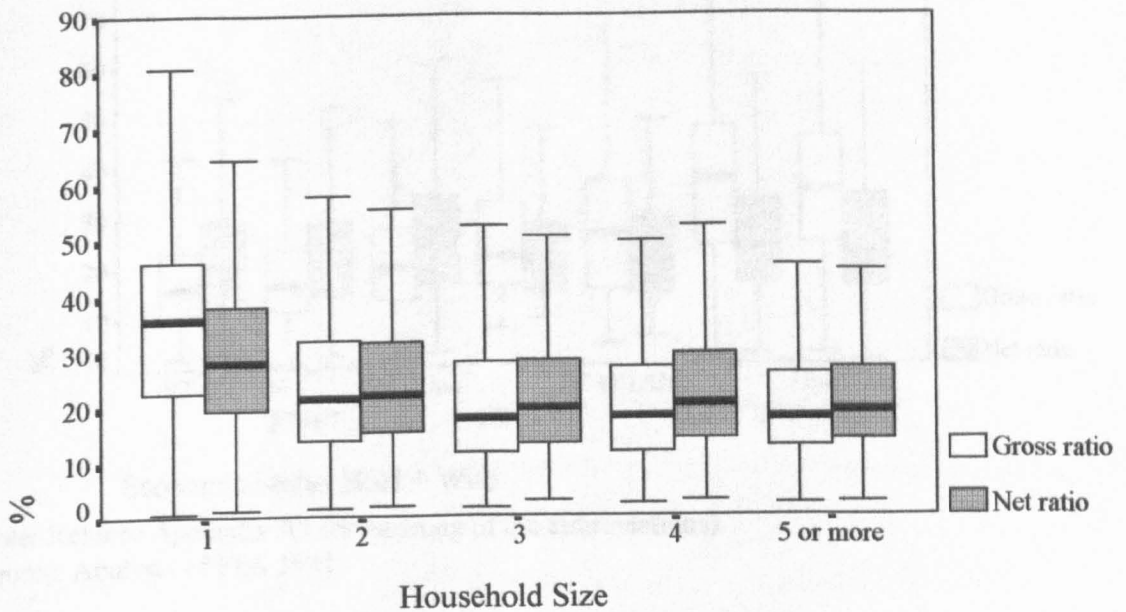
Household Size

Note: Refer to Appendix A3 for meaning of the abbreviations)
Source: Analysis of FES 1991

The economic status of the head of household and his partner displays a noticeable relationship with the level of gross ratio. When both the head of household and his partner were in full time employment, the average gross ratio was the lowest. The gross ratio would increase with a decrease in the householder's degree of involvement in the labour market. When the householder switched from full time employment to part time,

and then unemployment, whilst the employment status of his partner remained
unchanged, the average gross ratio would increase by, respectively, five percentage
points and ten percentage points. Contribution from a second earner, on the other hand,
did not produce a significant improvement in the level of gross ratio.

Unlike the gross ratio, there was no simple pattern relating the level of net ratio to
economic status. Only households with both the head of household and his partner in
employment had the lowest level of net ratio, but the difference was very small.
Meanwhile, the average levels of net ratio for the rest of the households were
statistically identical (figure 5.17).

Figure 5.17 Housing Cost to Income Ratio by Economic Status of Head of
Household and Partner
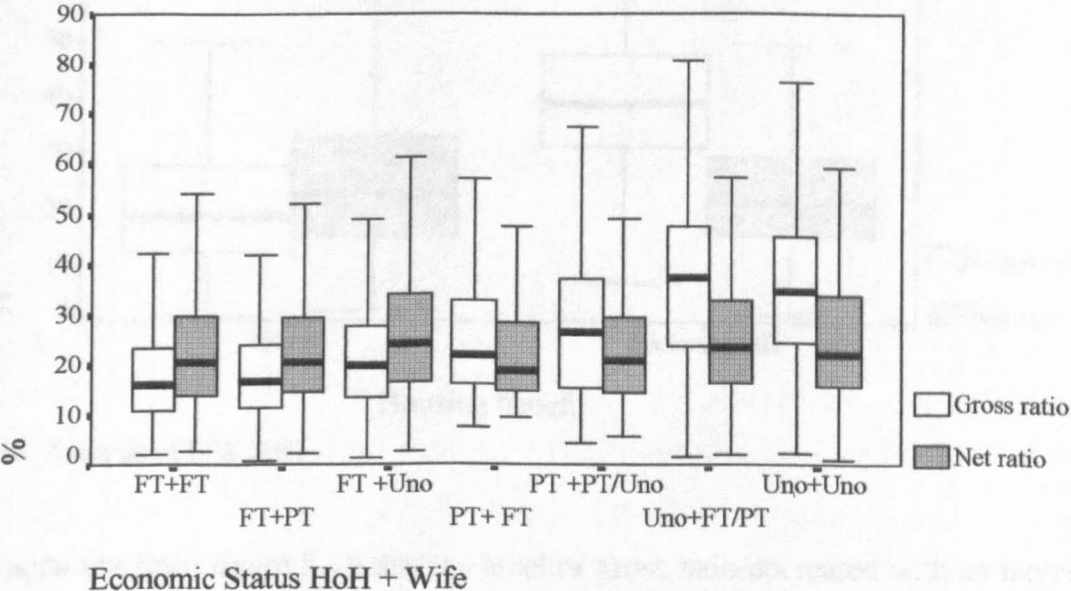
Economic Status HoH + Wife

Note: Refer to Appendix A3 for meaning of the abbreviations)
Source: Analysis of FES 1991

These distribution patterns between employment status and housing cost to income ratio
were reflected in the distribution of housing cost to income ratio among housing benefit
claimants and non-claimants. Households which were in receipt of housing benefit had
an eighteen percentage points higher gross housing cost to income ratio than households
which were not; on the other hand, they had a two percentage points lower net ratio
(figure 5.18).

As housing benefit bears a close relationship with the employment status of the head of household and his partner, it is not surprising that households which were more likely to be housing benefit claimants had householders who were unemployed, retired or working part time. They were likely to have a higher gross ratio. On the other hand, housing benefit would have a relatively larger effect on the reduction of housing cost among claimants than its effect on net income; thus there was a considerably greater reduction of net ratio among claimants than non-claimants.

Figure 5.18 Housing Cost to Income Ratio by Housing Benefit
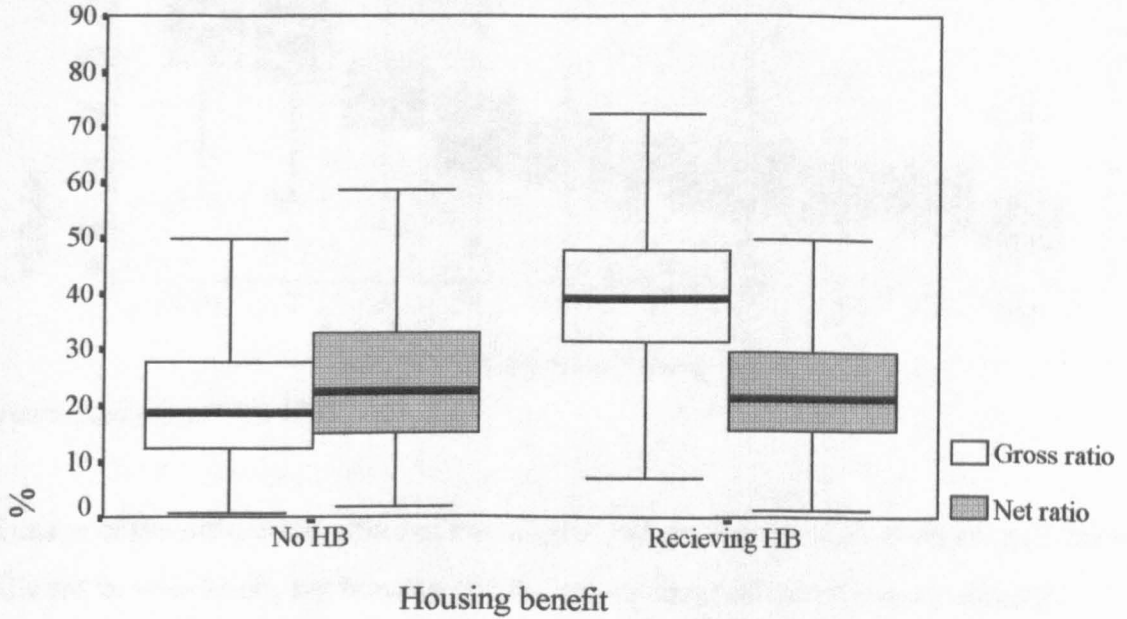
Source: Analysis of FES 1991

It is apparent from figure 5.19 that the level of gross ratio decreased with an increase in gross household income. Every gross income decile group had a significantly different level of gross ratio, with the exception of the top three decile groups. Whilst the three top income decile groups all had significantly lower mean ratios than the remaining households, their average gross incomes were statistically identical. This indicates a trend of decrease in housing burden relative to income as the household income increases, but this relationship did not hold among the top income households. It is suspected that the relationship between housing cost to income ratio and household income in the top three income decile groups was different from that of the rest of the households. Furthermore, it is noteworthy that the bottom two decile groups had the largest variation of gross ratio within the group (figure 5.19).

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This signifies that the mean gross ratio may not be a fair representation of the housing burden of households on a low income. Other statistical analysis which also takes into account the variation between households should be employed.

Figure 5.19 Gross Housing Cost to Income Ratio by Gross Income Decile Group

Income Decile Group (Gross Income)
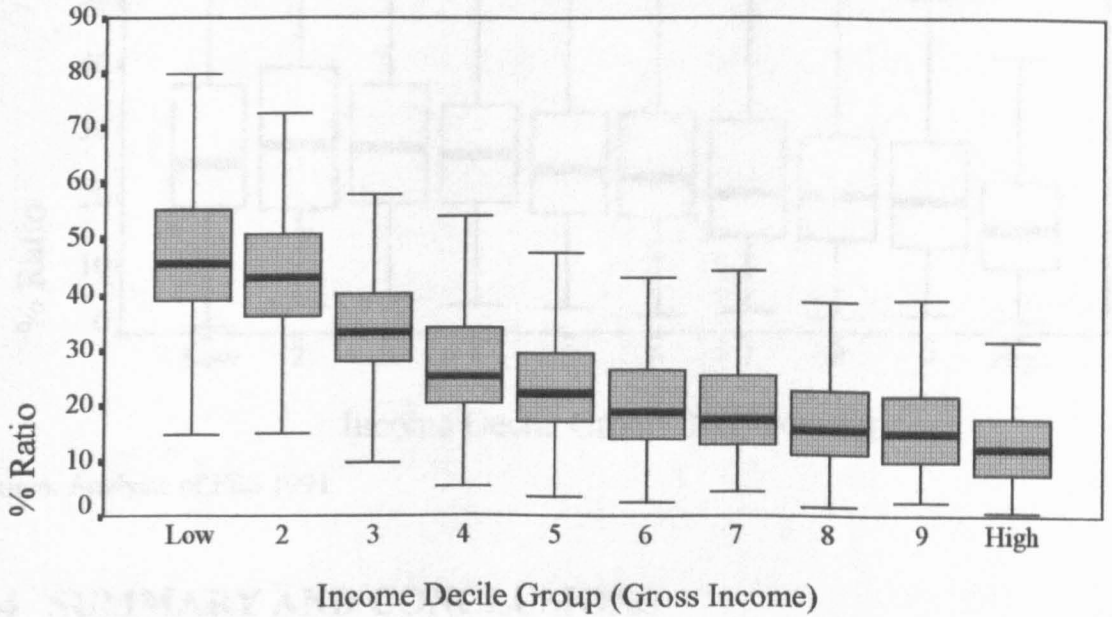
Source: Analysis of FES 1991

Because of the differential effect of housing benefit and the tax system on households at different income levels, net housing cost to income ratio exhibited a more complex pattern in relation to net income. Although the general pattern found in gross ratio still held where the topmost decile group had the lowest net ratio and the bottom group had the highest, the comparison would be different if assessed by the median net ratio of the net income decile groups instead of the mean net ratio. It is the second, third and fourth decile groups which had the highest median net ratio (figure 5.20).

Such a pattern emerged because of the operation of the housing benefit system which gives claimants on full benefit protection from high housing cost. Because claimants on full benefit were also likely to be in the lowest income decile group, their net housing cost might be lower than another household in an upper income decile group but who received only partial help, or no help at all, from housing benefit. This problem is particularly important regarding households in the third and fourth decile group where housing benefit begins to be withdrawn.

Figure 5.20 Net Housing Cost to Income Ratio by Net Income Decile Group

Income Decile Group (Net Income)
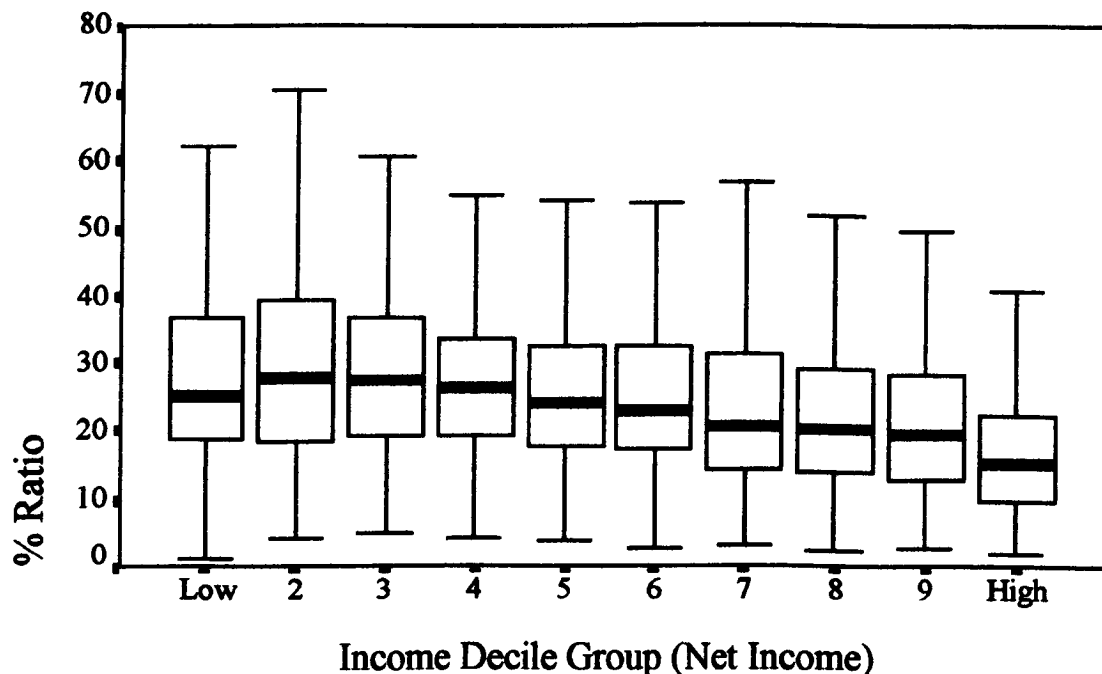
Source: Analysis of FES 1991

5.4 SUMMARY AND CONCLUSIONS

Distribution of both gross and net housing cost in England in 1991 was uneven and this uneven distribution appears to be associated with a number of housing and socio-economic characteristics of the households. The effect of income was particularly apparent. Both gross and net expenditure on housing increased with the rise in household income. On the aggregate level, households which were buying their own home, couple family households, households with a middle aged householder or a householder in full time employment and households which were not in receipt of housing benefit (or help from social security in paying for their mortgage interest) were those which would be more likely to be spending more on housing. The average level of net housing cost for these groups was very close to the corresponding average gross housing cost and both costs spread over the same range.

On the contrary, social tenants, the elderly, single person and lone parent households, those with an unemployed or unoccupied householder and households in receipt of housing benefit or help from social security to pay their housing costs, were more likely

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to spend the least on housing. The aggregate level of net housing cost was even lower than the gross housing cost of these households.

There are several factors attributed to this observation. First, housing is basically an elastic commodity and it is not surprising that households on a high income could spend more on housing while the reverse holds for low income households. Second, the level of spending is distorted by the differential supply side subsidy in housing where social tenants are enjoying a comparatively low rent level compared with their counterparts in the private rented sector or home owners who are repaying their mortgages. Third, the housing benefit system further favoured tenants as they get help towards their housing cost but home owners not on income support do not. Housing benefit may reduce the level of net housing cost relative to the amount of gross housing cost. Fourth, the residualisation and marginalisation process results in a concentration of the young and the single elderly as well as households which lose out in the labour market. They are likely to be poorer and to have to rely on state benefit. The effect of such factors will be further examined with reference to the problem of affordability in later chapters.

In addition, there are two observations which should be mentioned. First, groups of households which had a high level of housing cost also exhibited a much larger range of variety in housing expenditure within the group. It suggests that many such households, whilst being able to spend more on housing, actually chose to spend less. This reflects the range of choice such households enjoyed which was not shared by households who had to restrict their housing consumption. Second, regional differences in housing cost were not apparent. Yet this may be attributed to the fact that intra-region variation in housing cost was so great that it overshadowed the difference between regions.

Whilst there was a sharp difference in housing cost between households with different characteristics, the difference in housing cost to income ratio was relatively blurred. The pattern of distribution of gross housing cost to income ratio still displayed an observable pattern of difference, yet there was no obvious pattern for net housing cost to income ratio. It suggests that the gross housing cost to income ratio may be a better indicator in the pursuit of affordability study.

Households on the lowest income on average spent the least on housing, their average level of gross housing cost to income ratio was, conversely, the highest. Social tenants, the elderly, single person and lone parent households, households with unemployed or unoccupied householders and households which were on housing benefit were more likely to have to spend a higher proportion of their gross income on housing. Yet, they were also likely to spend the least, in absolute terms, on housing. Households which were on a higher income were likely to have a lower level of housing cost to income ratio and the characteristics of households which had a low ratio were very close to those who were able to spend, in absolute terms, more on housing.

The gap in net housing cost to income ratio between households narrowed considerably. Poorer households, which had a higher level of gross ratio, had their level of net ratio reduced and the level of net ratio for better-off households went the other way. Such a pattern was largely retained when breaking the households into different socio-economic characteristics. Thus, a difference in net housing cost to income ratio between households with different characteristics, was blurred and far from obvious.

The relationship between gross housing cost and income and the current housing benefit system is believed to underpin the pattern of housing cost to income ratio distribution. It was noted earlier in this chapter that expenditure on housing increased with an increase in household income. Thus it is not surprising that housing cost varied in a systematic way with household income and was evident in the relationship between housing cost to income ratio and household income.

At the same time, it was also observed that households on a higher income had more freedom regarding the level of housing expenditure which allowed them to adjust to a level of housing consumption they thought to be optimum for their level of income. Whereas at the lower end of the income distribution, a high proportion of households were on housing benefit. The amount of housing benefit entered both in the numerator and the denominator of the formula for gross housing cost to income ratio resulted in an apparently more systematic relationship. However, it is suspected that the observed systematic relation between housing cost and income only applied at the aggregate level

and this is why a less obvious pattern could be observed between gross housing cost to income ratio and gross income.

In the case of net housing cost to income ratio, the relationship between net housing cost and net income is far from systematic. For households on low income and in receipt of housing benefit, while their eligibility for benefit was dependent on their level of net income, the amount of actual benefit received related largely to the level of rent charged. On the other hand, households on medium or high incomes, who were unlikely to receive any help from housing benefit, would have a level of net income dependent on the level of tax deducted which bore no relationship with the level of housing cost. Thus, it is not surprising that there was no systematic relationship between net housing cost to income ratio and net income.

CHAPTER 6
RESIDUAL INCOME MEASUREMENT

6.1 INTRODUCTION

Despite the short history of the residual income approach to affordability, this form of measurement has been depicted as superior to alternative methods (Hancock, 1993; Bramley, 1994). Nevertheless, in chapter three of this thesis, doubt is expressed regarding the superiority of the residual income approach over other measurement approaches. There are intrinsic problems associated with the residual income approach, and in particular its confusion with the concept of poverty. A modified version of the residual income approach has been suggested in chapter three to disentangle this confusion.

The purpose of this chapter is to examine the methodological issues involved in operationalising the traditional and modified versions of residual income measurement, as well as the implications of these different classifications for the measurement of affordability. This chapter consists of five sections. It begins with an examination of residual income measurement and details of the implementation of the two versions of the measurement. This is followed by a discussion of the choice of a poverty line, which is crucial to the classification. A general profile of residual income in relation to household and socio-economic characteristics will also be presented. Then follows an examination of the housing and socio-economic characteristics of households in unaffordable housing classified by the traditional and the modified versions of residual income measurement.

6.2 A REVIEW OF RESIDUAL INCOME MEASUREMENT

As described in chapter three of this thesis, the residual income measurement of affordability has been depicted as being a more appropriate indicator of opportunity cost as well as providing a preferable representation of the financial burden on a household, especially for those on low income (Bramley et al, 1990; Brownill et al, 1990; Hancock,

1993). Both concepts are regarded as crucial elements of the notion of affordability. Thus, residual income measurement is regarded as a superior indicator of affordability.

On the other hand, the use of ratio as an indicator of affordability is denounced as deceptive (Fallis, 1986; Hancock, 1993). A classic illustration is a well-off household which spends a large proportion of its income on luxurious accommodation, yet still has enough income remaining to live a comfortable life. Conversely, a poor household, although spending very little of its income on housing, would be forced to live in poverty, because of a meagre total income (Hancock, 1993).

However, it is argued in chapter three that there is doubt about whether opportunity cost should best be represented by an absolute value of income. There is evidence showing that a proportional relationship between income and housing expenditure can be equally valid. Meanwhile, using a ratio to indicate a household's financial burden stems from Engel's Law in household expenditure research, which also supports the use of the ratio measurement in relation to affordability.

Nonetheless, the essential weakness of the traditional residual income measurement is its confusion with poverty measurement. The definition of residual income measurement used in the literature on affordability is similar to the poverty measurement used in the DSS HBAI series and other poverty research, which bears little relation to housing affordability. The residual income measurement, in the form expressed by its original proponents (e.g. Bramley et al, 1990; Hancock and Munro, 1992), is in fact merely one form of normative measurement of absolute poverty. Using a poverty measurement to assess housing affordability creates considerable confusion, apart from the consideration of the poverty measurement used being a notional measurement of absolute poverty, which is increasingly challenged by other more recently developed approaches.

One method for unravelling the measurement of affordability from poverty, as suggested in chapter three, is to consider only those households which are not poor before housing cost which become poor after housing cost as experiencing an affordibility problem. Households which are poor both before and after housing are in poverty rather than unaffordability (refer to chapter three for a more detailed discussion).

This chapter will advance arguments around these two versions of residual income measurement. The former is referred to as the traditional version of residual income measurement which is described in formula 6.1. Whilst the latter is referred to as the modified residual income measurement which can be summarised in table 6.1.

$$INC_R - INC - Y_H$$
$$If \ INC_R < PL \quad Housing \ is \ Unaffordable$$
$$Where \ INC_R - Residual \ Income$$
$$INC - Household \ Income$$
$$Y_H - Housing \ Cost$$
$$PL - Poverty \ Line \ Income$$

(6.1)

Table 6.1 Modified Residual Income Measurement

Poverty Before Housing Costs	Poverty After Housing Costs	
	Poor	Not Poor
Poor	Poverty	Unclassified
Not Poor	Unaffordability	Affordability

Given the importance of the poverty line to both versions of residual income, the selection of a poverty line should not be taken lightly. However, there is no consensus in the literature on poverty as to which definition is preferable. Thus, the choice of a poverty line is complex and contestable. A summary of the various approaches to poverty measurement will be made in the next section before any decision on the selection of a poverty line is made.

6.3 THE CHOICE OF POVERTY LINE

Modern studies of poverty began with the works of Booth in London and Rowntree in York at the turn of the century. At that time, a normative approach was taken towards the issue of poverty, which focused on problems surrounding human subsistence. Since then, a number of approaches to the study of poverty have been developed which reflect the different views on the nature of the problem. Various measurement strategies have emerged based on the different approaches to poverty.

Hagenaars (1986) summarised three approaches to the measurement of poverty

1. [Poverty is] having less than an objectively defined absolute minimum
2. [Poverty is] having less than others in society.
3. [Poverty is] feeling you do not have enough get along   (Hagenaars, 1986:37):

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Such categorisation largely matches the classification of Piachaud (1987), who classified poverty measurements into budget standards, relative deprivation and the social consensus approach.

The budget standards approach defines poverty as consuming necessities or having an income less than some standards defined by some experts (or governments). There are several approaches to poverty measurement which can be considered to fall into the budget standards approach. Earlier attempts include the classification of 'primary' and 'secondary' poverty as defined by Rowntree (1901), the US poverty line described by Orshansky (1965), the cost of food to income ratio (Watt, 1967) and the cost of necessities to income ratio (Love and Oja, 1967).

More recently the Family Budget Unit has attempted to develop a modern budget standard for the UK (FBU, 1990; Bradshaw and Ernst, 1990). This is described as a composite budget standard approach (Piachaud, 1987). Another measurement, the official definition, refers to state benefit levels as poverty lines. Such an approach was pioneered by Abel-Smith and Townsend (1965), and this is also classified as the budget approach because it is believed that the earliest development of the benefit rates were heavily influenced by the work of Rowntree in the 1930s (Cooke and Baldwin, 1984; Spicker, 1993).

Unlike a budget standard approach to poverty, which is essentially a perspective based on the notion of an objectively defined absolute minimum, the behavioural approach considers poverty as a relative concept which stems from the actual behaviour of people in the community. The relative deprivation concept and its corresponding measurement approach, pioneered by Townsend (1979) and refined by Desai and Shah (1988) and Townsend (1991), is an eminent example of this approach. Other attempts include the S-curve technique established by the US Bureau of Labour Statistics (quoted in Mitchell, 1985) in the United States, Mitchell (1985) and Bradshaw and colleagues (1987) in the UK.

Fixing the poverty line as a percentage of mean or median income is another measurement approach which explains poverty by the behaviour of people. It was used

by Abel-Smith and Townsend (1969) and the OECD (Mitchell, 1991; Johnson and Webb, 1991). The DSS reports on Low Income Families also changed from using the benefit level as a reference line to using half of the mean national income in the new Household Below Average Income series after 1988.

The social consensus approach, on the other hand, rejects the notion of an objectively defined poverty line which the two approaches mentioned in this section adopt. This approach relies on the subjective evaluation of people according to the extent of their poverty against the perceived poverty line of society. It was developed by Geodhart (1977) in Leyden University in the Netherlands and expanded by colleagues at the University (Hagenaars, 1986; Hagenaars and de Vos, 1988).

A similar approach, termed 'consensual', was pioneered by Mack and Lansley (1985) who attempted to develop an acceptable list of essential items which would be congruent with the minimum income society is prepared to provide. However, there is no direct relationship between measurement regulated in accordance with the consensual approach and the setting of a poverty line. The socially accepted list of necessities was described only as a complement to the relative deprivation approach, while the perceived minimum income level was a 'financeable poverty level' (Piachaud, 1987).

Given the information available in the FES, upon which the residual income measurement is based, the choice of a poverty line in this research is limited. There are no poverty lines derived from food or other necessities in relation to income for the UK. The S-curve technique by Mitchell (1985) and Bradshaw and colleagues (1987) was not completed (although it was continued in the work of composite budget standards). It is thus not possible to employ poverty lines that are based on these approaches.

Meanwhile, the FES data lacks essential items employed by Townsend (1979) in constructing a deprivation index. Although the use of secondary analysis from national surveys, which combine the FES and the GHS to construct a similar index, has been attempted (Hutton, 1991), the results are unsatisfactory. Research on the social consensus approach in a UK context remains in a vacuum, and information in the FES does not aid the development of a poverty measurement based on such an approach.

Hence the official definition, the composite budget standard and a percentage of mean income are the only choices possible.

The "official" definition of poverty refers to the current income support scale as the poverty line. However, current benefit levels are criticised as being too low to sustain a modest but adequate standard of living (Bradshaw and Holes, 1989; Bradshaw, 1993). Instead, the figure of 140% of the benefit level is preferred. A poverty line at 140% of income support level is also roughly equal to the poverty line derived from the relative deprivation approach, where there is a disproportionate withdrawal from social participation owing to the lack of resources (Townsend, 1979; Desai and Shah, 1988; Townsend, 1991). For these reasons 140% of Income Support level will be used as a poverty line in this chapter. Since there is an implicit equivalence scale already incorporated in the benefit level, equivalisation is not necessary.

The second poverty line which is employed is income level at half the national average income. The choice of 50% is arbitrary, but has been popular in recent official poverty statistics. It is used by the DSS in the HBAI series and the European Community in its Second European Poverty Programme (EC, 1991). In using half the average income measurement equivalisation is necessary; the McClements' scale, which is described in chapter four, will be used.

Poverty lines which apply to income both before and after housing are required for the modified version of residual income measurement. However, the Income Support level only refers to income after housing and lacks a corresponding scale for income before housing. Thus only the 50% average income measurement can be employed. The income of a household both before and after housing are equivalised in the corresponding McClements scale.

6.4 RESIDUAL INCOME MEASUREMENT: A GENERAL PROFILE

In 1991, there was a substantial variation in residual income among "paying" households in England. The highest residual income (unadjusted for household size

and characteristics) was over £2500 per week whereas the lowest was virtually none. Similar patterns were found in equivalised residual income and equivalised income before housing (table 6.2). The wide spread of residual income is also reflected in the large values of the standard deviation in all income measurements. Such distributions were highly skewed toward the lower end of the scale, as indicated in the difference between the mean value and the median value in table 6.2 and the distribution curve in figure 6.1. In fact, around 60% of households had one or the other residual income below the corresponding mean value.

Table 6.2 Residual Income: Descriptive Statistics

£ pw	Residual Income		Equivalised Income Before Housing
	Equivalised	Unequivalised	
Mean	207	230	333
Median	172	187	274
Standard Deviation	159	196	146
Maximum	2579	2579	3347
Minimum	0.3	0.2	32.8

Source: Analysis of FES 1991

Figure 6.1 Distribution of Residual Income
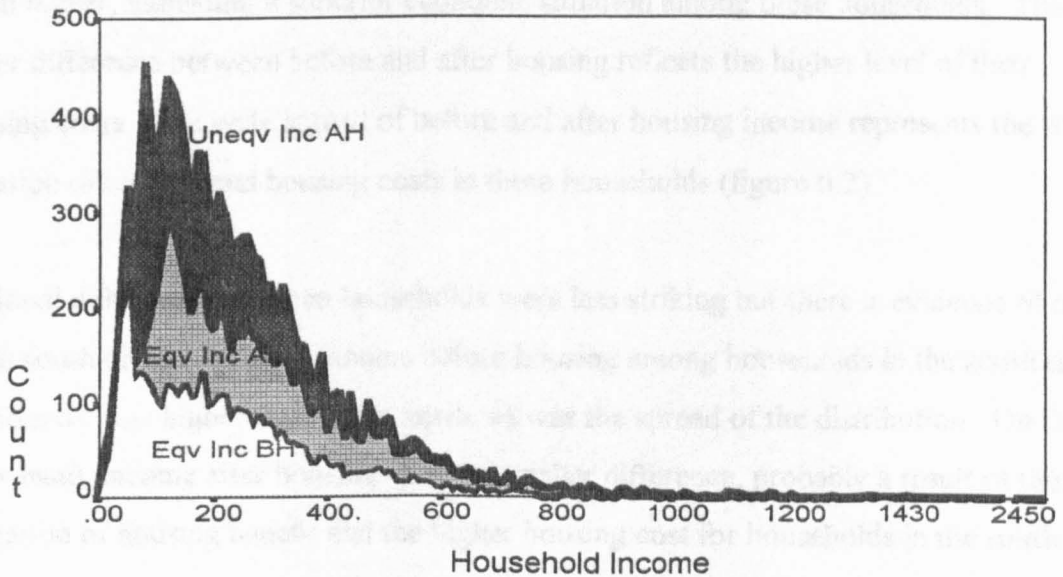
Note: UERINC (Unequivalised Residual Income) EBH (Equivalised Income Before Housing)
       EAH (Equivalised Income After Housing)
Source: Analysis of FES 1991

The standardised unequivalised residual income (UERINC)[11] is heavily skewed toward the lower income end. In part this reflects the uneven distribution of income, and in part it is due to the concentration of single person households in this group. After equivalisation, the residual income after housing (EAH) spreads more evenly toward both ends of the distribution. At the same time, there are more households with low

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equivalised income before housing than after housing. This indicates the mediating effect of housing benefit which furnishes a more equitable distribution of income after housing as well as the higher housing cost of households on higher income.

Figures 6.2 to 6.6 show the distribution of household income before and after housing broken down into tenure and household characteristics. Social tenants had the lowest level of both equivalised and unequivalised income after housing. But housing association tenants have a marginally higher median as well as a wider spread of equivalised income before housing, probably because housing association tenants enjoy higher income, although this is eroded by paying higher rent. At the same time, it may also reflect the higher housing benefit to enable payment of the higher rent, thus boosting their before housing income.

The income of private tenants in the furnished sector and mortgagors were apparently much higher, indicating a superior economic situation among these households. The larger difference between before and after housing reflects the higher level of their housing costs. The wide spread of before and after housing income represents the wide variation of income and housing costs in these households (figure 6.2).

Regional differences between households were less striking but there is evidence of a north south divide. Median income before housing among households in the south of the country was higher than in the north, as was the spread of the distribution. On the other hand, income after housing shows a smaller difference, probably a result of the mediation of housing benefit and the higher housing cost for households in the south (figure 6.3).

The worst situation of residual income were those whose head of household was aged over 60. They have a much lower level of both equivalised and unequivalised income before and after housing. These households also showed little difference in the level of income among themselves, indicating a relatively homogeneous situation with regard to residual income. The distribution of income among other groups was similar, with middle aged householders being in a slightly better position (figure 6.4).

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Figure 6.2 Residual Income and Equivalised Income Before Housing by Tenure
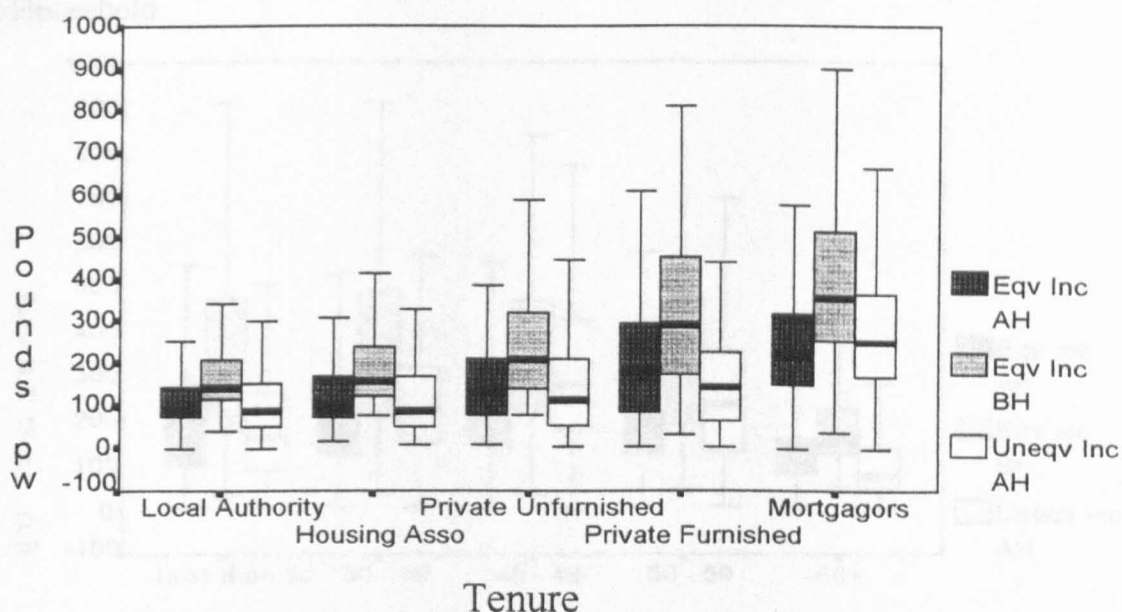
Tenure

Figure 6.3 Residual Income and Equivalised Income Before Housing by Region
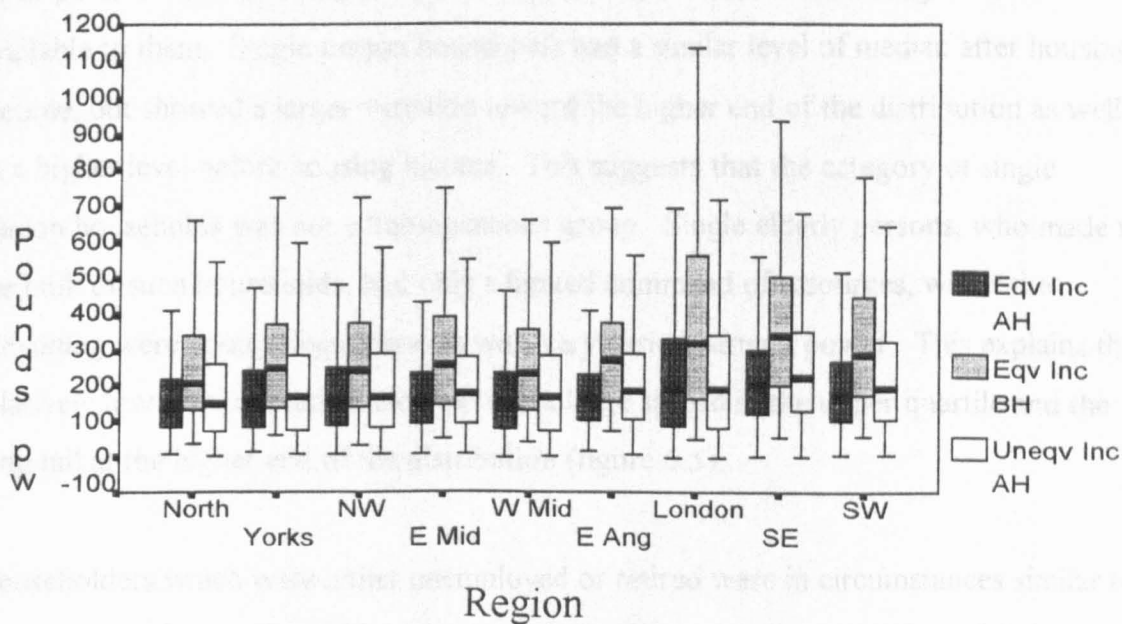
Region

Figure 6.4 Residual Income and Equivalised Income Before Housing by Age of Head of Household
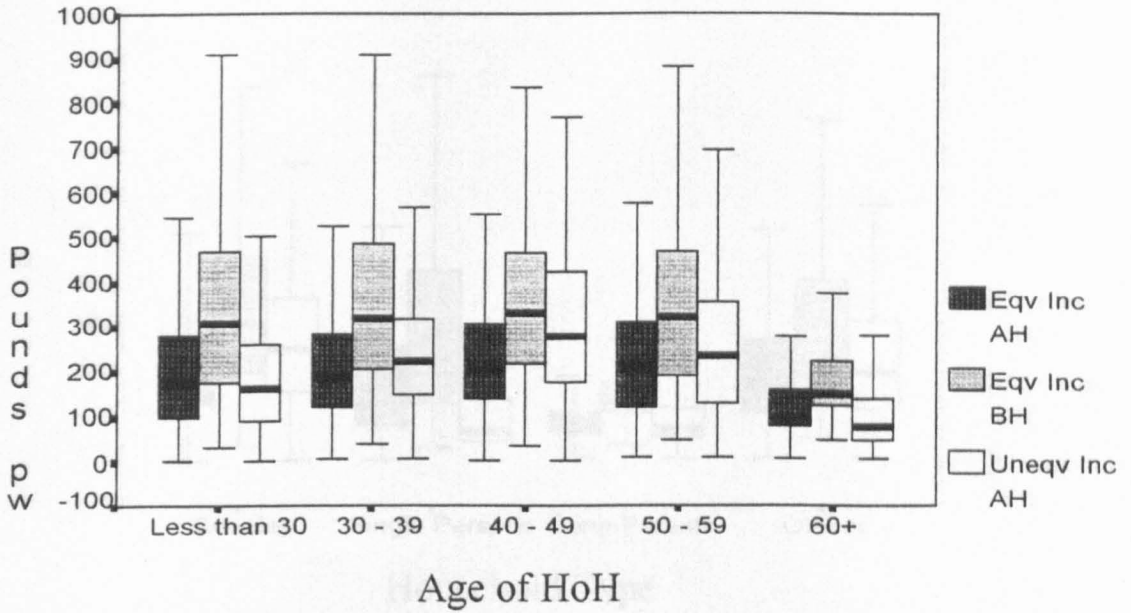
Age of HoH

Note : Eqv (Equivalised Income) Uneqv (Unequivalised Income)
Refer to Appendix A3 for meaning of abbreviations
Source: Analysis of FES 1991

Lone parents had the lowest level of all, apparently because of the meagre income available to them. Single person households had a similar level of median after housing income, but showed a larger variation toward the higher end of the distribution as well as a higher level before housing income. This suggests that the category of single person households was not a homogeneous group. Single elderly persons, who made up the bulk of such households, had only a limited command of resources, whilst the remaining were young single persons with very varied earning power. This explains the relatively low level of median income with a large spread in the upper quartile and the long tail at the higher end of the distribution (figure 6.5).

Householders which were either unemployed or retired were in circumstances similar to lone parents. It is not surprising that households whose head was working full time were in a much better economic position and enjoyed a higher level of both before and after housing income (figure 6.6).

Figure 6.5 Residual Income and Equivalised Income Before Housing by Type of Household
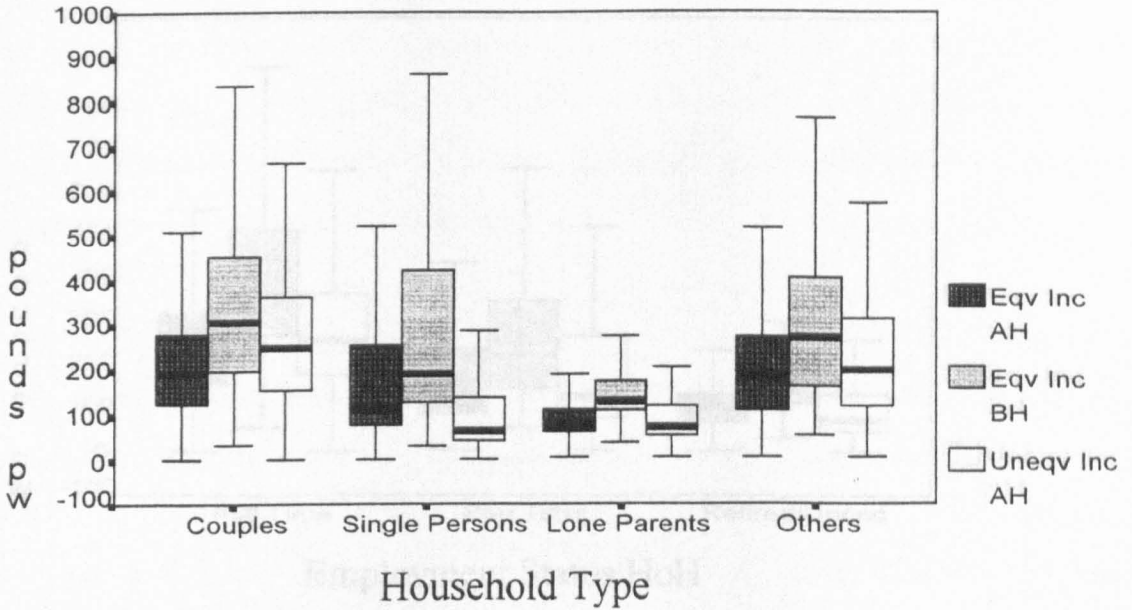
Preliminary results which emerged from the analysis in this section suggest that households with a lower level of residual income which were likely to have an affordability problem were social tenants, single elderly persons, lone parents, and those who were either unemployed or retired. Married couples who were working full time, young to middle aged, and buying a home with a mortgage or renting furnished accommodation from a private landlord were characteristics associated with households having a higher level of residual income. More detailed confirmatory analysis is not necessary in this section since qualitative classification is the main focus of the chapter and will be advanced in the next section.

Figure 6.6 Residual Income and Equivalised Income Before Housing by Economic Status of Head of Household
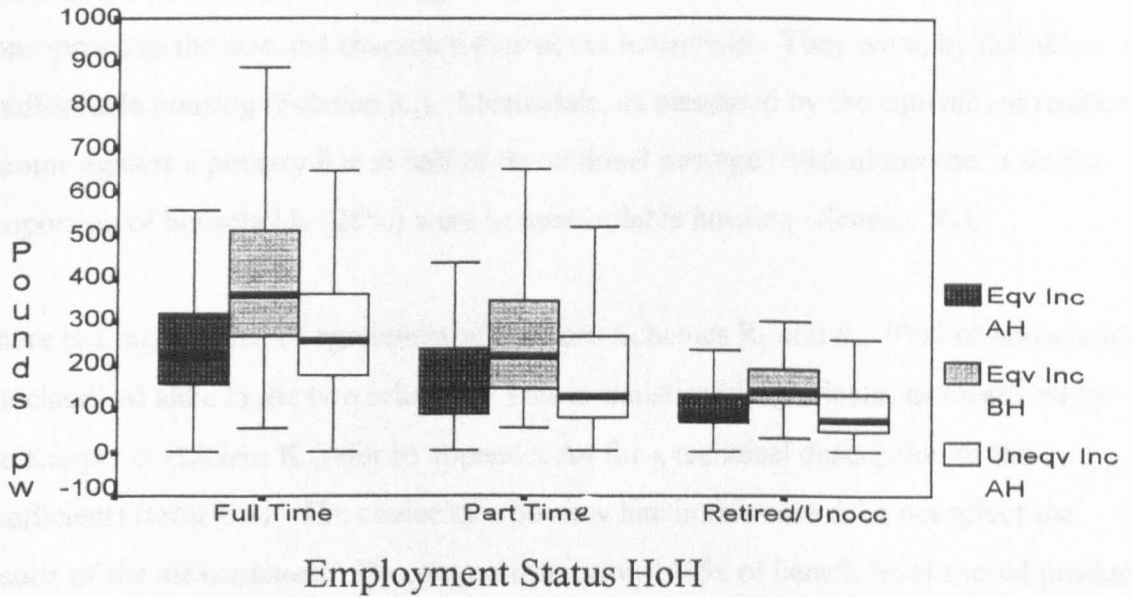
Note : Eqv (Equivalised Income) Uneqv (Unequivalised Income)
Refer to Appendix A3 for meaning of abbreviations
Source: Analysis of FES 1991

6.5 HOUSEHOLDS IN UNAFFORDABLE HOUSING

As mentioned in section 6.2 of this chapter, three schemes of residual income classification of affordability will be used (table 6.3): two are based on the traditional residual income approach. The first scheme uses 140% income support level as the poverty line, which is referred to as Scheme R_1, and the second scheme, Scheme R_2, employs half the average equivalised income after housing as the poverty line. Thirdly in the modified version of residual income approach, Scheme R_3, only households which are not poor before housing but are poor after housing are considered in relation to unaffordable housing. Half of average income is used as a poverty line in the modified residual income measurement. In subsequent analysis, the poverty category in Scheme R_3 (poor both before and after housing) is included for reference.

Table 6.3 Residual Income Approach to Affordability: Classification

Scheme	Definition
Scheme R_1	Traditional residual income approach with 140% Income Support Level as Poverty Line
Scheme R_2	Traditional residual income approach with 50% Average Equivalised Residual Income as Poverty Line
Scheme R_3	Not Poor Before Housing; Poor After Housing

In 1991, among the "paying" households in England, slightly less than one third (29%) had a level of income, after housing cost, less than 140% of the income support level appropriate to the size and characteristics of the household. They were, by definition, in unaffordable housing (Scheme R_1). Meanwhile, as measured by the equivalised residual income against a poverty line at half of the national average residual income, a similar proportion of households (28%) were in unaffordable housing (Scheme R_2).

There is a high degree of agreement of between Schemes R_1 and R_2: 97% of households are classified alike in the two schemes. This is statistically significant, as measured by the Kapper coefficient K (refer to appendix A4 for a technical description of the coefficient) (table 6.4). The choice of a poverty line in this case does not affect the results of the measurement. By comparison, using 140% of benefit level should produce an overestimate of the number of households in unaffordable housing, if 100% benefit level had been otherwise employed. Yet, if such "overestimation" was at the same level as that derived from another independent poverty line, it suggests that such "overestimation" was in fact a genuine representation of the affordability situation. It implies that using 100% benefit level as the poverty line in assessing affordability would, on the contrary, "underestimate" the problem of affordability.

Hence agreement, when using 140% of income support level as a poverty line with another independent poverty line at half national average income, suggests indirectly an inadequacy in using income support as a poverty line (as used by much research on affordability) because it would underestimate the proportion of households in unaffordable housing.

Table 6.4 Agreement of Scheme R_1 and Scheme R_2

Scheme R_1 (%)	Scheme R_2 (%)		Kapper	t Vale
	Affordable	Unaffordable		
Affordable	70	1	0.91	79.8
Unaffordable	2	27		

Source : Analysis of FES 1991

If measurement were made by the modified version of residual income measurement (Scheme R_3), around 60% (16% of the total) of unaffordable households classified by the traditional measurement would be re-classified as being in poverty, while the remaining 40% (11% of the total) would be considered to be in unaffordable housing

(Figure 6.7). Thus the traditional measurement would include the majority of households in the "unaffordable" category which lack adequate resources for both housing and non-housing consumption.

Figure 6.7 Households in Unaffordable Housing: Residual Income Approach
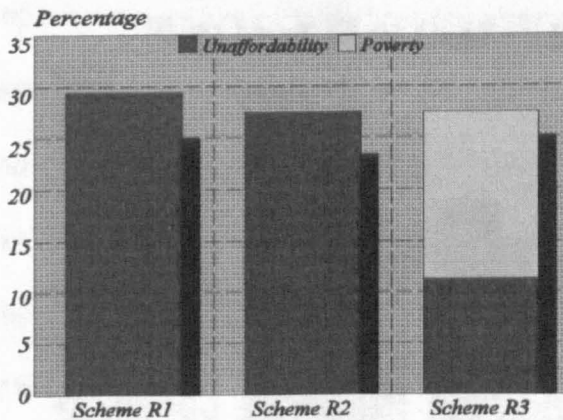
Source: Analysis of FES 1991

Although only less than a third of households were classified as being in unaffordable housing by the traditional residual income measurements (Scheme R_1 and R_2), it was not evenly distributed across tenure. Whilst about a tenth of mortgagors were in unaffordable housing, the majority of tenants in the social rented sector were assessed as being in unaffordable housing. The proportion of such households among private tenants was around 30% to 45%. Classifications made by the two schemes R_1 and R_2 were in agreement in the majority of tenure groups.

Conversely, whilst there was still a sharp contrast in the proportion of households in unaffordable housing between tenants and mortgagees, as measured by the modified residual income measurement scheme R_3, the difference between private and social tenants was small. Many households in unaffordable housing in schemes R_1 and R_2 were re-classified as being in poverty by the modified version, scheme R_3 (figure 6.8).

Whilst households unaffordable to housing were concentrated in the social rented sector, regional differences in the proportion of households which could not afford housing were less marked than for tenure. The highest proportion was 36% in the North and

West Midlands (Scheme R_1) as against 19% in the South East (Scheme R_2). It is in general, higher in the north and lower in the south; London is an exception with 50% more households in unaffordable housing than the South East Region.

Figure 6.8 Households in Unaffordable Housing by Tenure: Residual Income Approach
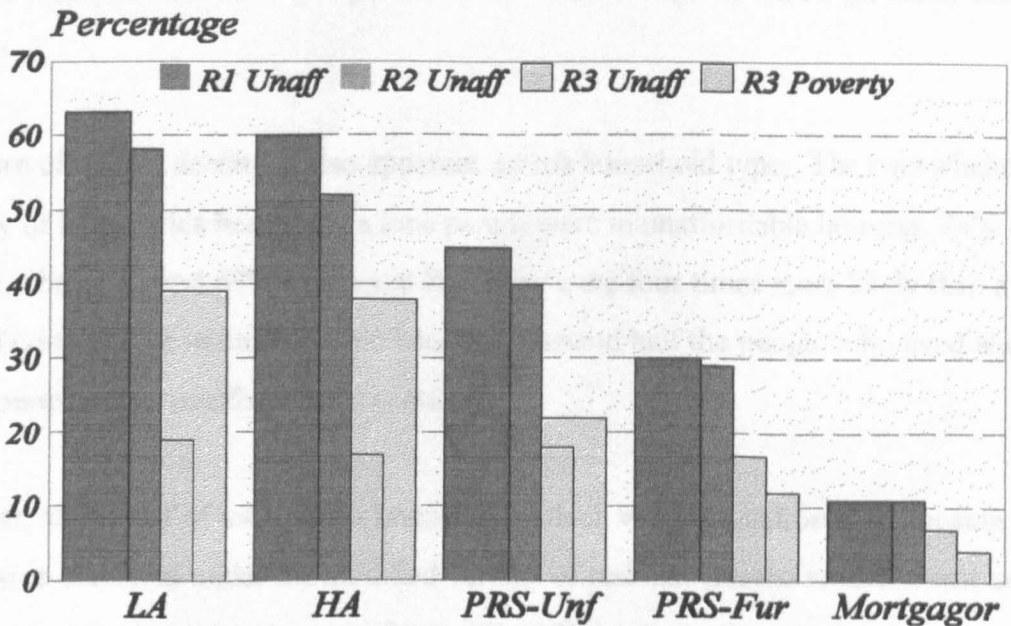
Note: Refer to Appendix A3 for meaning of the abbreviations
Source: Analysis of FES 1991

Figure 6.9 Households in Unaffordable Housing by Region: Residual Income Approach
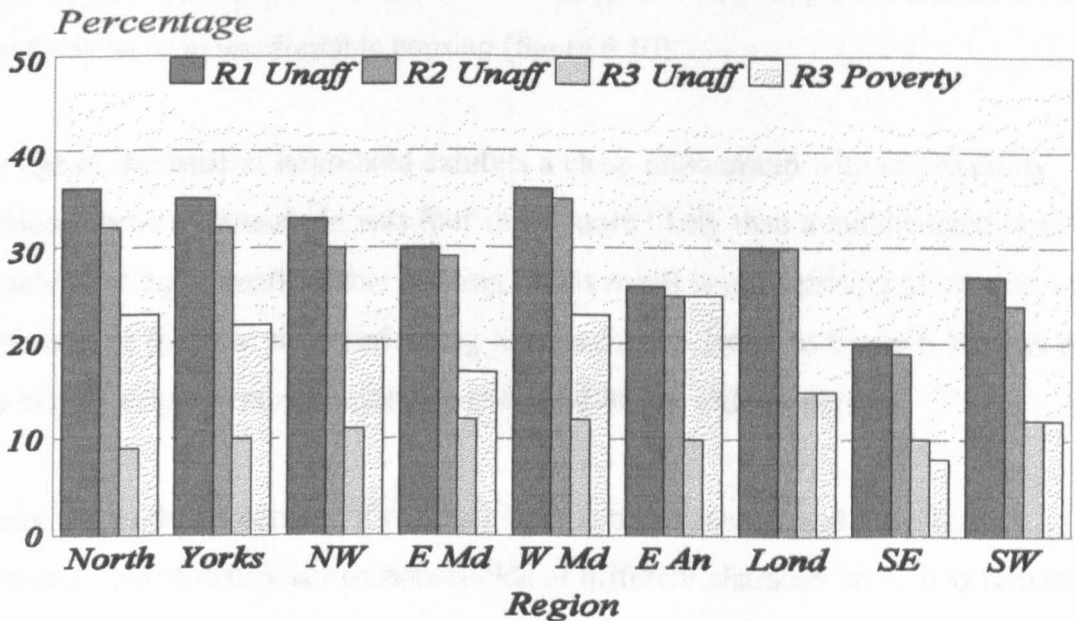
Note: Refer to Appendix A3 for meaning of the abbreviations
Source: Analysis of FES 1991

Distribution of households in unaffordable housing by the modified residual income measurement was similar to the pattern amongst tenure groups and varied across regions at 9% to 12%. London was an apparent exception with 15% of households in unaffordable housing (figure 6.9). It is clear that the regions with the least affordability problems (Scheme R_3) were those with the lowest housing costs, for example the North, Yorkshire and Humberside. The pattern is reversed for regions with high costs, such as London.

A pattern of unaffordability is also apparent across household type. The overwhelming majority of households headed by a lone parent were in unaffordable housing, 74% of them in scheme R_1 and 69% in scheme R_2. They were four times more likely than a married couple to be in unaffordable housing. Around half the people who lived alone also experienced an unaffordability problem.

However, about half of lone parent households which were in unaffordable housing could be re-classified under the modified version of residual income measurement as being in poverty, leaving only around one fifth (19%) apparently experiencing unaffordable housing. The corresponding reduction in single person households was comparatively small. Twenty two percent of single persons were in unaffordable housing according to the modified residual income measurement (47% of those originally classified as unaffordable in scheme R_2). Married couple households are the least likely to be in unaffordable housing (figure 6.10).

The age of the head of household exhibits a close relationship with affordability. A pensioner head of household was four times more likely than a middle-aged head of household to be in unaffordable housing. This result is unsurprising given that single persons were likely to be experiencing unaffordability (refer to figure 6.10) and the majority of single person households consisted of one elderly person.

Whilst the modified version of residual income measurement had the effect of reclassifying differently across households of different characteristics, it is remarkable that such an effect was constant across age groups. Elderly households were still the

most likely, and households with middle aged householders the least likely, to be in
unaffordable housing (figure 6.11).

Figure 6.10 Households in Unaffordable Housing by Types of Household: Residual
Income approach
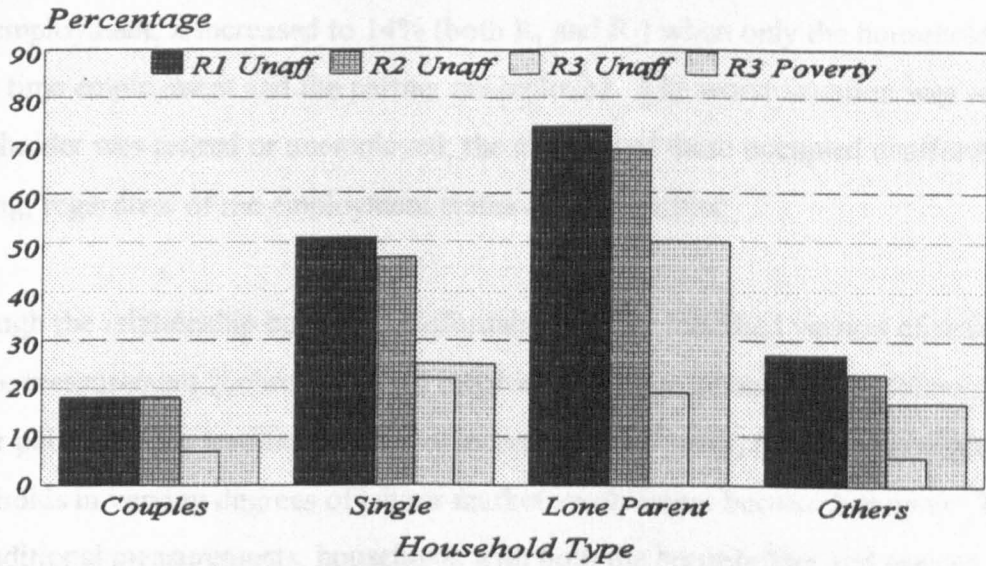
Percentage

Legend: ■ R1 Unaff ▨ R2 Unaff ▤ R3 Unaff ▢ R3 Poverty

Household Type: Couples, Single, Lone Parent, Others

Note: Refer to Appendix A3 for meaning of the abbreviations
Source: Analysis of FES 1991

Figure 6.11 Households in Unaffordable Housing by Age of Head of Household:
Residual Income Approach

Percentage

Legend: ■ R1 Unaff ▨ R2 Unaff ▤ R3 Unaff ▢ R3 Poverty

Age of head of Household: Under 30, 30 - 39, 40 - 49, 50 - 59, Over 60
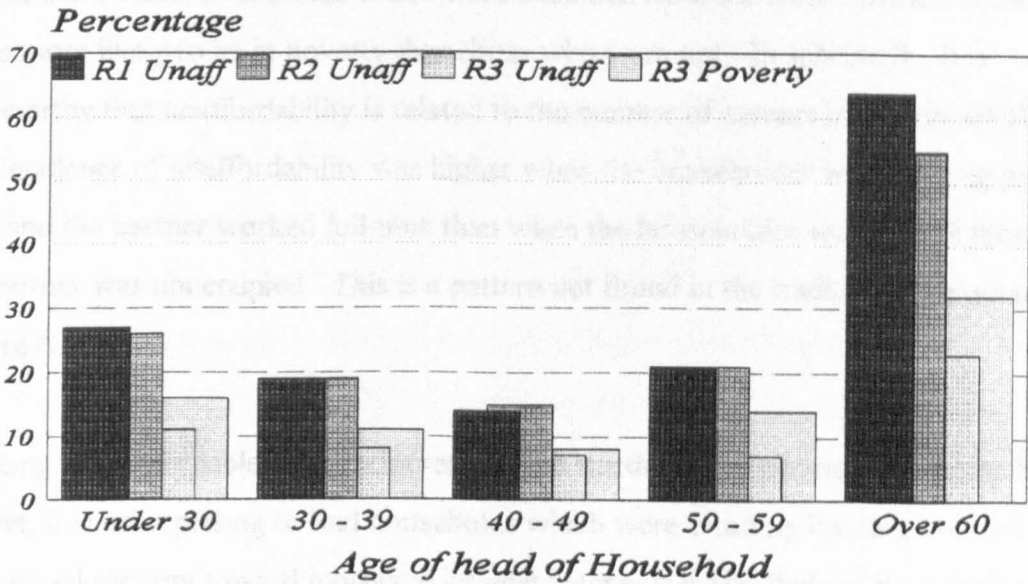
Note: Refer to Appendix A3 for meaning of the abbreviations
Source: Analysis of FES 1991

Perhaps the characteristic associated most strongly with unaffordability is the situation of the household with regard to the labour market and the benefit system. The proportion of households in unaffordable housing increased with a decreasing involvement in the labour market. Whilst only 4% of households were in unaffordable housing (both Scheme R_1 and R_2) when both the householder and partner were in full time employment, it increased to 14% (both R_1 and R_2) when only the householder was in full time employment and the partner unemployed. The worst situation was when the householder was retired or unemployed; the majority of these occupied unaffordable housing, regardless of the employment status of their partner.

Although the relationship between unaffordability in the modified version of residual income measurement (Scheme R_3) and involvement in the labour market follows a similar pattern to the traditional residual income measurement, the difference between households in varying degrees of labour market involvement became narrower. Using the traditional measurements, households with both the householder and partner excluded from the labour market were 18 times more likely to be in unaffordable housing than households with both the householder and partner employed full time. In the modified version Scheme R_3, it was only six times more likely.

On the other hand, households which were excluded from the labour market were 46 times more likely to be in poverty than those who were not. In scheme R_3, it is noteworthy that unaffordability is related to the number of earners in the household. The incidence of unaffordability was higher when the householder was working part time and the partner worked full time than when the householder worked full time but the partner was unoccupied. This is a pattern not found in the traditional measurements (figure 6.12).

As being in unaffordable housing increases with the degree of exclusion from the labour market, it is unsurprising to find households which were claiming housing benefit or help from social security toward mortgage interest payments more likely to be experiencing unaffordable housing than households that did not, given the increased reliance on benefit with increased marginalisation from the labour market. In fact, claimants of housing benefit (or help from social security towards housing costs) were six times more

likely to be in unaffordable housing than non-claimants (figure 6.13). Surprisingly, the proportion of households with unaffordability problems did not vary between those which were on full benefit and those whose housing costs were partly covered by benefit. It is because households which only received housing benefit for part of their housing cost had to top up the difference in their income from other sources. The high taper of housing benefit withdrawal would not allow such recipients to experience an appreciably better situation than if their housing costs were the same and they were in receipt of full benefit (whereas their housing costs would be covered in full).

Figure 6.12 Households in Unaffordable Housing by Economic Status of Head of Household and Partner: Residual Income Approach
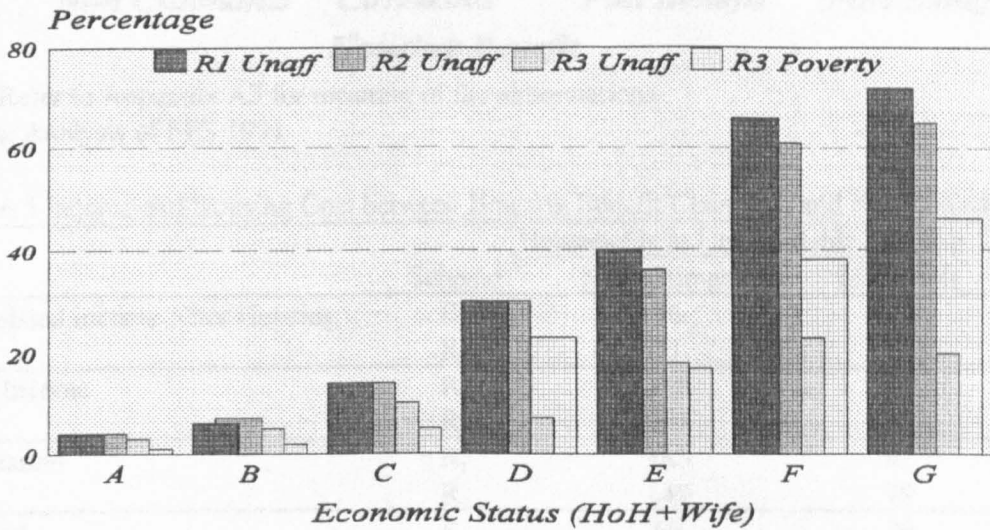
Note: A (Both FT) B (HoH FT Wife PT) C (HoH FT Wife Unoccupied)
        D (HoH PT Wife FT) E (HoH PT Wife Unoccupied) F (HoH Unoccupied Wife FT/PT) G (Both Unoccupied)
Source: Analysis of FES 1991

Among households in unaffordable housing (traditional measurement), those which did not claim housing benefit had a higher average gross and net income, but had to spend more on housing. Consequently, their equivalised residual income was marginally higher than for those who claimed benefit (table 6.5). Households which did not claim housing related benefit, but which were in an unaffordability situation, were likely be mortgagees or private tenants who were in full or part time employment.

Figure 6.13 Households in Unaffordable Housing by Housing Benefit: Residual Income Approach
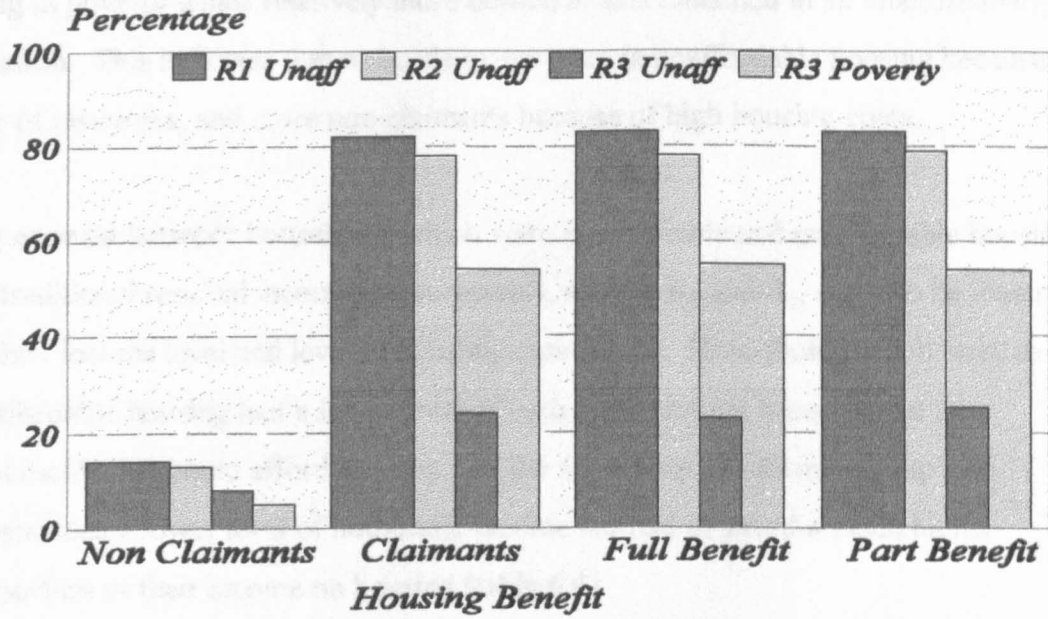
Note: Refer to Appendix A3 for meaning of the abbreviations
Source: Analysis of FES 1991

Table 6.5 Income and Housing Cost between Housing Benefit Claimants and Non-claimants

£ pw		Households in Unaffordable Housing		
	Scheme	Non-claimants	Claimants	F Value
Equivalised Income After Housing	R_1	76	72	6.5*
	R_2	71	70	0.9ns
Gross Income	R_1	168	107	250**
	R_2	175	105	302**
Net Income	R_1	145	82	470**
	R_2	149	79	519**
Net Cost	R_1	66	20	641**
	R_2	70	20	670**
Gross Cost	R_1	66	44	125**
	R_2	70	45	254**

Note : * $p<0.05$ ** $p<0.01$ ns Not Significant
Source: Analysis of FES 1991

It is argued that the design of the current housing benefit should have protected households from affordability problems, especially under the residual income measurement, since it guarantees a socially minimum level of non-housing consumption (Hancock, 1993). On the contrary, as shown by analysis in this section, the majority of housing benefit claimants experience housing unaffordability, suggesting an inadequacy of housing benefit in protecting households from an unaffordability problem. This will be taken up again in chapter nine when different affordability measurements are considered.

In the modified residual income measurement (Scheme R_3), more housing benefit claimants who were in unaffordable housing in Schemes R_1 and R_2 were reclassified as being in poverty whilst relatively more non-claimants remained in an unaffordability situation. This indicates that more claimants were in unaffordable housing because of a lack of resources, and more non-claimants because of high housing costs.

The contrast between households which were in affordable and unaffordable housing in the traditional residual income measurements, scheme R_1 and R_2, can also be illustrated by their income level and level of housing expenditure. Households which were in unaffordable housing had a lower level of both gross and net housing cost than households that could afford housing. At the same time, the former group also experienced a lower level of household income but had to spend a much higher proportion of their income on housing (table 6.6).

Table 6.6 Affordability, Income and Housing Costs (Scheme R_1 and R_2)

Mean Value	Scheme R_1			Scheme R_2		
	Aff	Unaff	F	Aff	Unaff	F
Gross housing cost £pw	80.4	52.5	260**	79.3	53.6	208**
Gross income £pw	477.1	129.3	208**	468.0	129.9	1465**
Net housing cost £pw	78.9	36.8	560**	77.5	37.6	560**
Net income £pw	375.9	104.6	1825**	369.1	104.4	1613**
Gross Housing Cost to Income Ratio %	18	42	3823**	19	43	3826**
Net Housing Cost to Income Ratio %	22	33	537**	22	33	563**

Note: Aff (Affordable) Unaff (unaffordable)
Source: Analysis of FES 1991

When households in unaffordable housing were differentiated into unaffordability and poverty in the modified measurement of residual income (scheme R_3), it was observed that households in poverty, with the lowest level of both gross and net housing cost also experienced the lowest level of gross and net income. Households which were defined as unaffordable had a level of housing cost closer to the "affordable" group but their income level was closer to the "poverty" group. Thus, they had to spend the highest proportion of their income on housing (table 6.7). This illustrates the modified version of the residual income measurement scheme R_3 has achieved its intended objective of differentiating those who had low income and low housing cost (the poverty group) and households which had high housing cost but low income (the unaffordable group).

Table 6.7 Affordability, Income and Housing Costs (Scheme R₃)

Mean Value	Scheme R₃			
	Aff	Unaff	Poverty	F Value
gross housing cost £pw	79.4	70.3	41.9	747**
Net Housing cost £pw	77.7	54.9	25.4	288**
Net income £pw	369.7	127.3	88.3	817**
Gross Income £pw	469.3	163.5	106.4	259**
Gross Housing Cost to Income Ratio %	19	45	42	1940**
Net Housing Cost to Income Ratio %	22	38	30	333**

Note : AFF (Affordable) Unaff (Unaffordable) ** p<0.01
Source: Analysis of FES 1991

Furthermore, the distribution of housing cost of households in unaffordable housing (Scheme R₃) exhibited a pattern of relationship with household income very different from households in affordable housing or in poverty. It is shown in the Lowess curves (a technique which produces a fitted regression curve without any prior assumption of the form of functional relation, refer to appendix A7 for details) in figure 6.14 to 6.17 that although both gross and net housing cost in general increased with the increase in household income among all three groups, households in affordable housing and in poverty showed surprisingly quite similar pattern of relationship.

On the other hand, households in unaffordable housing exhibited a steeper increase of housing cost with respect to household income. It suggests that the relationship between housing cost and household income showed a more systematic relationship with household income among the "unaffordable" group. At the same time, signs of a change of course in the smooth curve were apparent. It occurred at the range around gross income of £200 and net income £100, roughly the range of income within which households were more likely to get partial housing benefit than full housing benefit.

Figure 6.14 Gross Housing Cost by Gross Income (Affordable Group Scheme R₃)
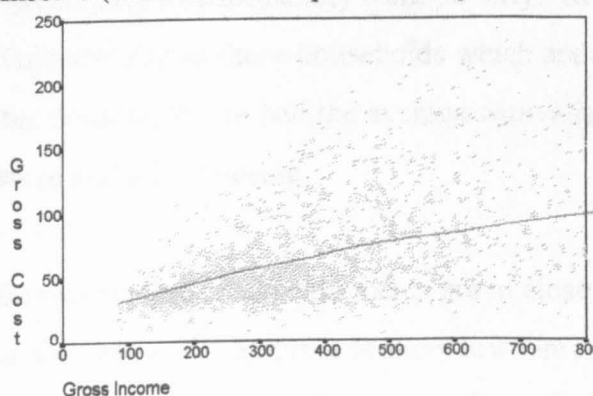
Figure 6.15 Gross Income By Gross Housing Cost (Unaffordable Group Scheme R₃)
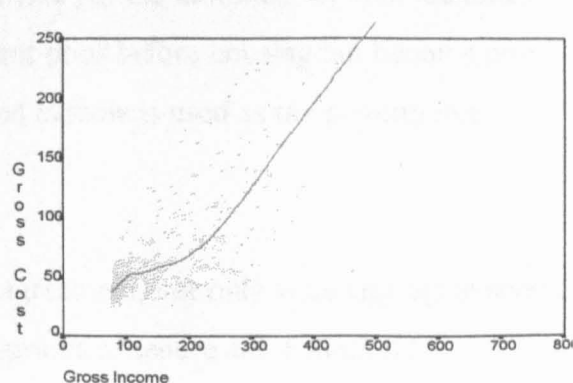
Figure 6.16 Gross Income By Gross Housing Cost (Poverty Group Scheme R_3)
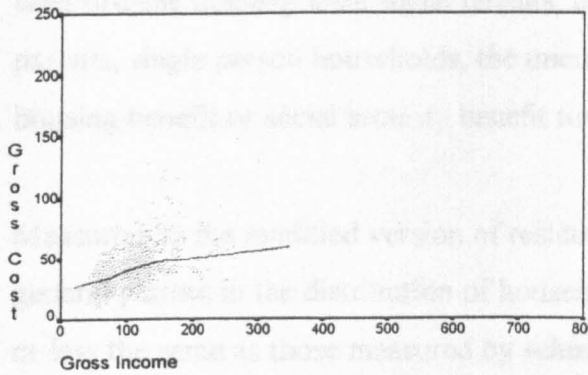
Figure 6.17 Net Income By Net Housing Cost (Affordable Group Scheme R_3)
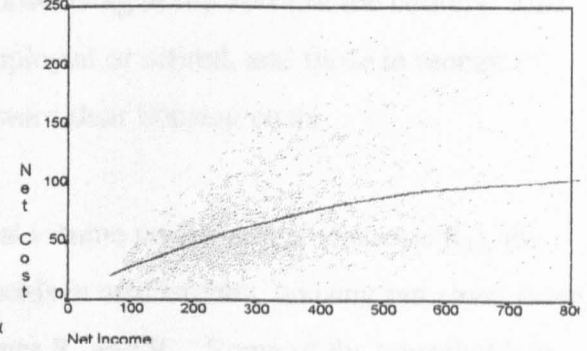
Figure 6.18 Net Income By Net Housing Cost (Unaffordable Group Scheme R_3)
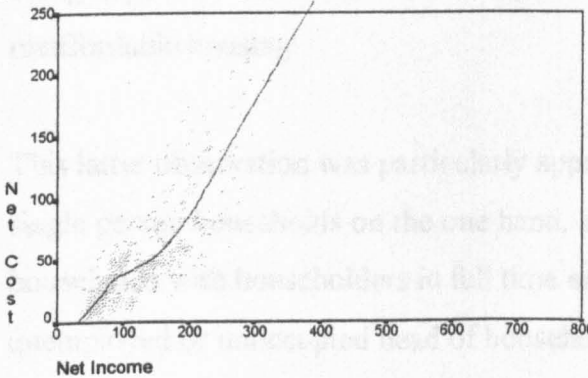
Figure 6.19 Net Income By Net Housing Cost (Poverty Group Scheme R_3)
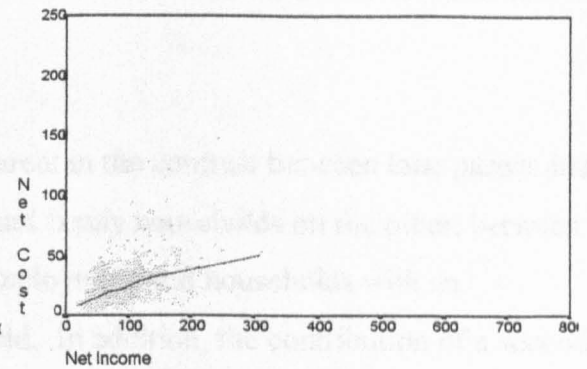
Source: Analysis of FES 1991

6.6 SUMMARY AND CONCLUSIONS

There are three definitions of residual income measurement used in this chapter: Scheme R_1 compares the unequivalised residual income with 140% of the appropriate income support level; Scheme R_2 matches the equivalised residual income with the poverty line at half the national average equivalised residual income. These two schemes are referred to as the traditional residual income, in contrast to the modified version which differentiates unaffordability from poverty. Scheme R_3, the modified version, identifies unaffordability as those households which are not poor before housing but become poor after housing, where half the average equivalised income is used as the poverty line before and after housing.

The two traditional measurements are in close agreement, not only at an aggregate level but also when the sample is broken down into groups of tenure and household characteristics. Measured by the traditional schemes (R_1 and R_1), nearly one third of

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households experienced an unaffordability problem. Households most likely to be in unaffordable housing were social tenants, those living in the north of the country, lone parents, single person households, the unemployed or retired, and those in receipt of housing benefit or social security benefit toward their housing costs.

Measured by the modified version of residual income measurement (Scheme R_3), the general pattern in the distribution of households in unaffordable housing remained more or less the same as those measured by schemes R_1 and R_2. Some of the households in unaffordable housing under the traditional measurement schemes were reclassified as being in poverty which narrowed the difference between households in affordable and unaffordable housing.

This latter observation was particularly apparent in the contrast between lone parent and single person households on the one hand, and family households on the other; between households with householders in full time employment and households with an unemployed or unoccupied head of household. In addition, the contribution of a second earner was observed to be related to whether the household was in unaffordable housing under the traditional schemes R_1 and R_2, but it was no longer significant in scheme R_3. However, the most apparent change was between social and private tenants. Whilst under schemes R_1 and R_2 social tenants were more likely to be experiencing unaffordable housing, under the modified version, scheme R_3, their chance of being in unaffordable housing was virtually the same.

The modified version, scheme R_3, also shown to be successful in achieving its intended purpose of identifying households which had a high housing cost but, at the same time, had a low level of income. It is also shown that the "unaffordable" group in scheme R_3 exhibits a different pattern of relationship between the amount such households spent on housing and the level of their household income.

Several implications can be drawn from the analysis of this chapter which could help in the further understanding of affordability, especially with reference to the residual income measurement. First, there was evidence pointing to the inadequacy of housing benefit as a strong associated factor of the affordability problem. Notwithstanding the

housing benefit system is designed so as to protect recipients from high housing cost, evidences in this thesis suggests its failure to achieve this goal. The reasons for this are complex and require further investigation. Second, social tenants, despite the high level of subsidy which brings down the level of rent, were equally as vulnerable to unaffordability as private tenants, the majority of whom had to pay market rents. Third, the residual measurement of affordability in its traditional form is not sensitive to the choice of poverty line between 140% of income support level and half average national household income. Whether this applies to other poverty lines has yet to be explored. Fourth, the modified version of residual income measurement was successful in identifying the group of households which had to pay high housing cost but possessed little resources in terms of income. This group also exhibited a marked difference in the pattern of consumption on housing relative to their income level from other households which were in affordable housing and households which were poor. This differentiation would help in the fine tuning of policy on affordability.

CHAPTER 7
RATIO MEASUREMENT

7.1 INTRODUCTION

Housing cost to income ratio is the preferred measurement indicator of affordability in many of the industrial countries. With a long history of development, it has been widely adopted because it is simple to both comprehend and implement. However, this property attracts censure: it is criticised as an inappropriate indicator of the financial burden of a household, and as too simple to provide a precise representation of affordability among households of varied size and characteristics.

Despite these criticisms, there are merits underpinning the use of the ratio measurement, which is still widely used. It has roots in the empirical tradition, especially Engel's Law on household expenditure research, which gives the ratio approach strong support among housing academics and practitioners. Compared with an alternative measurement, the residual income approach, it is free from entanglement with the concept of poverty and associates the notion of affordability more closely with the cost of housing, which is a more immediate concern in housing policy than the notion of poverty.

Nonetheless, detailed empirical studies of ratio measurement in the UK are sporadic and superficial, probably owing to preconceptions among many housing academics against this measurement. Thus, to fill the gap in understanding on the ratio measurement against a backdrop of changing housing markets and policy on social housing, this chapter attempts to provide an objective empirical examination of ratio measurement of affordability. A new approach to fixing a cut-off reference ratio (or ratios) will also be explored.

This chapter is divided into nine sections. The first section provides a review of the development of ratio measurement of affordability, and of past attempts to fix reference ratios. The second section delineates the details of a composite method of establishing the cut-off ratio. As a preliminary exploration, regression analysis linking residual

income and housing cost to income ratio will be examined in the third section. Whilst the distribution of housing cost to income ratio between the "poor" and the "non-poor" group will be examined in section four, the results of the logistic regression models linking housing cost to income ratio and poverty status which form the base of the establishment of cut-off ratios are described in the section that follows. The seventh section will evaluate the actual level of the cut-off ratios and section eight will explore the need to establish separate ratios for households with different characteristics. Finally, the last section examines the household and housing characteristics of households in unaffordable housing as evaluated by the cut-off ratios generated in the preceding sections.

7.2 RATIO MEASUREMENT: A REVIEW

The use of the proportional approach to the study of housing expenditure can be traced back to the nineteenth century, to Ernst Engel and Hermann Schurake (Lane, 1977). This has had an influence on the early use of affordability measurement. As early as the 1920s, the US Federal Government used housing cost to income ratio as an indicator of affordability in housing policy and legislation (Lane, 1977; Nelson, 1993). This approach was also adopted by the Canadian government (Fallis, 1985), the Australian government (National Housing Strategy, 1991) and most countries in the European Union (Kearns, 1992). The ratio measurement defined a household as being in unaffordable housing if the ratio of housing cost to household income exceeded the threshold ratio (Equation 7.1):

$$
\begin{aligned}
&Y_H = r \cdot INC \\
&\text{if } r > r^* \quad \text{Housing is unaffordable} \\
&\text{Where} \quad Y_H = \text{Housing Cost} \\
&\qquad\quad r = \text{Affordability Ratio} \\
&\qquad\quad r^* = \text{Threshold Ratio} \\
&\qquad\quad INC = \text{Household Income}
\end{aligned}
\tag{7.1}
$$

However, this simple quotient of housing cost to income, referred to in this thesis as the traditional ratio measurement, has been criticised as ignoring the effect of housing cost on affordability. A household may try to avoid an affordability problem by living in a substandard dwelling which costs less than good housing. Conversely, well-off households may be misclassified as being in unaffordable housing because they are

consuming housing services at a level well above the socially accepted level (Sueke et al, 1981; Fallis, 1985; Lerman and Reeder, 1987). Thus, two modified versions of ratio measurement have been developed: the quality based ratio measurement (Lerman and Reeder, 1987) and the core need measurement (Sueke et al, 1981) take into account the quality of housing in the measurement of affordability (refer to chapter three for a more detailed discussion of the measurements).

More critical comments on ratio measurement have been made by commentators in the UK. The ratio measurement is portrayed as an inappropriate indicator of the notion of opportunity cost and merit good, as well as a misleading expression of financial burden on a household, all these being pivotal concepts in the definition of affordability (Hancock, 1993; Bramley, 1994).

Nevertheless, the use of ratio measurement remains robust. First, it is easy to comprehend and simple to implement, unlike the residual income measurement which involves a complicated process of locating the appropriate poverty line before affordability status can be assessed. Second, the basis of the ratio measurement rests on the empirical tradition, and its close association with Engel's law gives ratio measurement status as a valid indicator.

Notwithstanding the robustness of ratio measurement, fixing the threshold ratio remains arbitrary and subjective. The origin of the commonly used 25% is unknown. It is speculated that this norm ratio probably stemmed from survey results in the nineteenth century (Lane, 1977). The ratio became well established as a reference for mortgage loan applications by the end of the 1930s (mortgage potential is discussed in chapter ten). The United States Federal government in the 1920s and 1930s used a rent to income ratio of 20% to 25% as a guideline in housing related legislation for housing assistance. In 1967, consultants to the Presidential committee on Urban Housing in the United States suggested a ratio of 20% rent to income ratio as a reference for housing assistance to low income families (Lane, 1977).

However, there were reservations regarding its objectivity, and the recommended ratio was only regarded by the said committee, as "a convenient ratio rather than a value

statement" (quoted in Lane, 1977). The use of these threshold ratios in discussions of United States housing policy, as commented by Lane (1977), were merely a "rule of thumb" rather than having a base in solid theoretical argument or empirical evidence.

The process of setting a reference ratio, without a sound theoretical or empirical foundation, has not changed even in the 1980s. In the United States, the Reagan administration raised the threshold ratio from 25% to 30% but, again, with no solid justification. The succeeding Bush administration retained the ratio in the new housing legislation in 1990 without modification. Likewise in Australia and Canada, where ratio measurement predominates, the choice of threshold ratio in the discussion of housing policy, 30% in Canada (Fallis, 1987), and 25% for tenants and 30% for owners in Australia (National Housing Strategy, 1991), remains subjective and arbitrary.

The importation of ratio measurement to the UK began in the mid 1980s when the government proposed a change in the subsidy system to housing associations. It required the associations to charge tenants rents that could, on the one hand, compensate for the reduced government grants, and on the other hand, be "affordable" to low income tenants. The National Federation of Housing Associations (NFHA) opined that affordable rents for housing association tenants should be not more than 20% of their net income (Best, 1990).

This figure was derived by looking at the amount people were actually paying for housing. The NFHA found that housing association tenants in 1986 on average spent 18% of their net income on rent, whilst first time buyers spent 21% on mortgage repayments. At the same time, mortgage lenders would assume that mortgage outgoings did not absorb more than 25% of a household's income. An international comparison also revealed that rent payment in most European countries represented 14% to 19% of income (Best, 1990). The final threshold ratio adopted by the NFHA, though admittedly it had considered ratios in other tenures and countries, still lacked convincing arguments for the selection of this particular measurement.

The establishment of the threshold ratio has not settled the debate within the housing association movement. There is still argument as to whether the use of gross or net

income would be more appropriate, and also whether a single ratio should be applied to tenants both on housing benefit and in employment. Because of such debates, the NFHA threshold ratio was once changed, and was based on 22% of gross income. It was described merely as a technical alternation, but it nevertheless could not conceal the diversified arguments within the movement. Soon after this, another compromise was reached which set the threshold ratio at 25% of net income (HA Weekly, 17 Dec 1993). This latest figure only applied to "working" households. Nevertheless, as argued by the NFHA, an "affordable" rent should, at the same time, not force tenants on housing benefit into the poverty trap (Housing Association Weekly, 17 Dec 1993). Again, no convincing arguments justifying the choice of this latest threshold ratio have been offered.

Other proposals for threshold ratio are not in short supply. In a single conference in 1988, several ratios were suggested. Clive Betts, a practice defender of council housing proposed 10%; Alan Cherry, a private housing developer suggested 25%, whilst David Edmond, the Chief Executive of the Housing Corporation advocated 35%[12] (quoted in Maclennan and Williams, 1990). These ratios were criticised as being "offered without definition or much justification" (Maclennan and Williams, 1990:11).

The ratio suggested by David Edmond, as head of the Housing Corporation, attracted particular attention. It is believed that the Housing Corporation has an implicit affordability ratio in calculating the Housing Association Grant rates, albeit the Corporation continually refused to disclose its precise figure. It instead asks the housing associations to set their own affordability criteria (Housing Corporation, 1989). Even the disclosure of a ratio by its Chief Executive in the conference was denied a week later (Housing Association Weekly, 21 July 1989). It was not until early 1993 that Sir George Young, the Housing Minister, when giving evidence to the Environment Select Committee, admitted that the Housing Corporation is using 35% as the working definition of affordability (Select Committee of the Environment, 1993). Still no detailed justification of using such a ratio was given.

Yet, it is equally unsatisfactory to accept a particular threshold ratio without query. It is urgent therefore to develop methods which establish a scientifically based threshold

ratio. This chapter will explore the possibility of using a composite method of fixing threshold ratios which is based on households' actual expenditure on housing and what society would regard as a household's financial burden.

7.3 CUT-OFF RATIO: A COMPOSITE APPROACH

In chapter six of this thesis, a modified version of residual income measurement is developed which defines unaffordability as those households which were in financial difficulties because of the high housing cost they paid. Because there is no direct indication of housing cost using residual income, an indirect inference has to be adopted instead: households which are in financial difficulty because of high housing cost are households which are not poor with reference to their income before housing cost, but poor if income after housing is a concern.

Based on the same definition, a more direct implementation of affordability measurement will be explored in this chapter, combining the ratio and residual income approaches. The level of housing cost can be represented by the housing cost to income ratio while the financial difficulties of the household can be measured with reference to whether the household is in poverty or not. Poverty status is in turn measured by comparing the household's residual income with the poverty line. If a high housing cost to income ratio can be shown to be associated with the poverty status of a household, a cut off affordability ratio can be fixed at the point where crossing that ratio, the household changed from a "not-poor" to a "poor" status.

Technically, this composite approach can be implemented by constructing a model which uses housing cost to income ratio to predict the incidence of poverty in a household. Since the incidence of poverty is a dichotomous state - either poor or not poor - it is more convenient in quantitative analysis to predict the probability of occurrence of the incidence rather than the actual state of the incidence. If housing cost to income ratio is a satisfactory vehicle for classifying the incidence of poverty, the shape of the predicted probability function with reference to the explanatory variable should ideally be a step shaped curve[13] where the state of incidence changes completely once it passes through the cut-off value.

However, some criteria would have to be fulfilled for this composite approach to be effective. First, it should be demonstrated that there is a reasonably close relationship between residual income and housing cost to income ratio so that it is justifiable to use housing cost to income ratio to predict the incidence of poverty.

Second, if housing cost to income ratio were to be used as a predictor for the incidence of poverty, there should be a marked difference in the distribution of housing cost to income ratio between different states of poverty. Only when there is a distinctive distribution is the differentiation by housing cost to income ratio possible.

Third, the cut-off ratio is reliable only if the distribution of the predicted probability is close to a step shaped curve. It implies that the sensitivity of classification around the cut-off ratio should be reasonably high.

The fulfilment of these conditions will be tested in the following three sections. As there is no definitive conclusion on whether the gross housing cost to income ratio or the net ratio is superior, both ratios will be employed in the model (referred to by the corresponding suffixes G and N). Meanwhile, two poverty lines, which have been used in chapter six, will be used in this analysis: Model T_1, which makes reference to the poverty line at 140% of the income support level, and Model T_2, taking half the average equivalised income after housing as the poverty line. Hence, four models will be constructed: T_{1G}, T_{2G}, T_{1N} and T_{2N}.

7.4 HOUSING COST TO INCOME RATIO: REGRESSION ANALYSIS

This section will examine whether there is a close relationship between housing cost to income ratio and residual income where regression analysis is used to indicate the proximity of the relationship. It was shown in previous research that income did not relate to household expenditure in a linear way (e.g. Prais and Housthakker, 1971). This may also apply to the relationship between residual income and housing cost. Thus, beside the linear relationship, some other functional forms relating the two variables should be considered.

Regression analysis involving non-linear functions may be complicated. It is a common practice in regression analysis to look for a suitable transformation of either the independent or explanatory variable, or sometimes both, so that the Ordinary Least Square (OLS) method can applied. This process of linearisation requires the transformed dependent variable to be expressed as a linear combination of the transformed explanatory variables while, at the same time, the assumption of OLS is adhered to (SPSS, 1990; Fox, 1991; Gujarati, 1992). The search for an appropriate functional form for linearisation is largely a matter of trial and error, but a similar operation was suggested by Prais and Housthakker (1971) and Gujarati (1992) which will also be used in this section (table 7.1).

Table 7.1 Definition of Functional Form

Label	Functional Form
Linear	$RINC = a * (IND) + b$
Double Log	$Log (RINC) = a * Log(IND) + b$
Semi Log	$RINC = a * Log (IND) + b$
Log Inverse	$Log (RINC) = a * (1 / IND) + b$
Hyperbolic	$RINC = a * (1 / IND) + b$

Note: RINC (Residual Income) IND (Independent Variable) Log (Natural Logarithm)

Two criteria were used to select the best models: models with the highest explanatory that have the fulfill the assumptions of OLS will be chosen. Yet, because of the functional form of the regression equations were not the same, the R sqaure values, which is used to compare the explanatory of the models, could not be compared directly. Instead, the R square statistics have to be transformed so that the dependent variables have the same functional form (Gujarati, 1992). Results of the regression analysis are presented in table 7.2 (with the R sqaure statistics already transformed so that they were comparable). Among the various models, the double log transformation yields the highest explanatory power measured by the R square statistic which assesses the proportion of variation explained (in a statistical sense) by the fitted equation (SPSS, 1990a). The linear models relating the unequivalised and equivalised residual income and gross housing cost to income ratio can only "explain" (in a statistical sense) about 40% of the variation in the data, but a double log transformation can achieve, respectively, approximately two thirds and half of the variation. Models for the net ratio in general explain less of the variation than gross ratio, whereas only a third of the variation can be explained by the double-log models.

Table 7.2 Regression Models: Unequivalised Residual Income by Housing Cost to Income Ratios

Dependent variable	Unequivalised Residual Income*			
Explanatory variable	Gross Ratio*		Net Ratio*	
Functional Form	R Sq	B	R Sq	B
Linear	0.45	-7.4	0.18	-5.7
Double Log	0.62	-1.1	0.27	-0.82
Semi-log	0.56	-201	0.25	-166
Log Inverse	0.32	10.2	0.16	9.3
Hyperbolic	0.38	2222	0.12	2206
Dependent Variable	Equivalised Residual Income			
Linear	0.38	-5.5	0.17	-4.1
Double Log	0.52	-0.82	0.23	-0.62
Semi-log	0.47	-147	0.20	-114
Log Inverse	0.28	7.9	0.13	7
Hyperbolic	0.31	1664	0.11	1547

Note :* Refer to Table 7.1 for the exact form of independent and dependent Variables
R Sq (Adjusted R square, transformed to a form that can be comparable)
B (Unstandardised Regression Coefficient)
Source: Analysis of FES 1991

It is not surprising that a logarithmic transformation is more appropriate, given that both variables have a roughly log-normal distribution. Nevertheless, it is not common in regression analysis to include independent variables that are derived from the dependent variable because it will produce undesirable effects which may violate the assumptions of regression. In the case of housing cost to income ratio and residual income, though strictly speaking the former is not derived directly from the latter, these two variables are derived from the income of a household and there may still be some chance that systematic but undesirable effects would be produced that violate regression analysis assumptions.

Thus, inspection of violation of OLS regression assumptions is necessary before the double-log models can be accepted. An examination of the distribution of the regression residual terms and the degree of heteroscedasticity of all the fitted models in Appendix A8 suggest that the double-log models are not only models that offer the most explanatory power, but they also best comply with the regression assumptions. The regression residuals of the double log models have a normal distribution; no systematic relation exists between the residuals and the expected value of the fitted equation, which is an indication of homoscedasticity (refer to Appendix A8 for a description of OLS assumptions). Hence, the first condition set up in section 7.3, of a close relationship between housing cost to income ratio and residual income, is fulfilled.

7.5 HOUSING COST TO INCOME RATIO BY INCIDENCE OF POVERTY

In order that housing cost to income ratio can be used as an effective predictor of the incidence of poverty, the distribution of housing cost to income ratio between households in poverty and those not in poverty should be relatively distinctive. It is shown in table 7.3 that the mean value of gross and net ratio between households that were classified as poor and those that were not, in both Model T1 and Model T2, were statistically different (p<0.01).

Table 7.3 Mean Values of Housing Cost To Income Ratio and Poverty

		Mean Gross Ratio %	Mean Net Ratio %
Model T₁	Not poor	19	22
	Poor	42	33
	F Value	3823**	537**
Model T₂	Not Poor	19	22
	Poor	43	33
	F Value	3825**	563**

Note: Refer to Text for meaning of Models, ** p<0.01
Source: Analysis of FES 1991

However, significantly different mean values is a necessary but not a sufficient condition to test whether a variable in the classification model will be effective. The distribution of the observed incidence in relation to the predictor is equally important. A closer inspection of the distribution of the housing cost to income ratios with reference to incidence of poverty revealed that net ratio would not be an appropriate predictor of classification. Figures 7.3 and 7.4 show that net ratio of both the "poor" and the "not-poor" groups in the two models clustered in more or less the same range and it is impossible to identify the incidence of poverty based on net housing cost to income ratio. A large error margin would have been produced if classification had been by net housing cost to income ratio.

On the contrary, although there were overlapping areas of gross housing cost to income ratio for both the "poor" and the "not poor" groups, the degree of overlap was acceptable (figure 7.1, figure 7.2). The accuracy of prediction using gross housing cost to income ratio is expected to be superior to models using net ratio. The second condition set out in sections 7.3 and 7.4, that housing cost to income ratio should be

able to classify the incidence of poverty reasonably well, is partially fulfilled. It is

expected that gross ratio will create a more superior classification model.

Figure 7.1 Distribution of Gross Housing Cost To Income Ratio by Poverty Group (Model T_{1G})
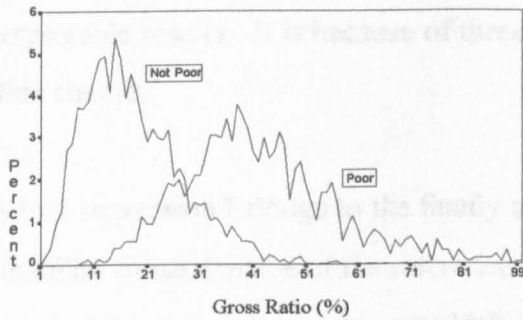
Figure 7.2 Distribution of Gross Housing Cost To Income Ratio by Poverty Group (Model T_{2G})
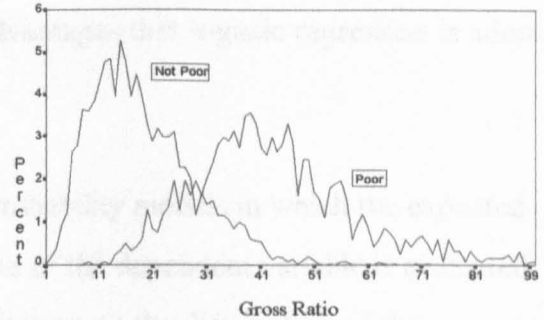
Figure 7.3 Distribution of Net Housing Cost To Income Ratio by Poverty Group (Model T_{1N})
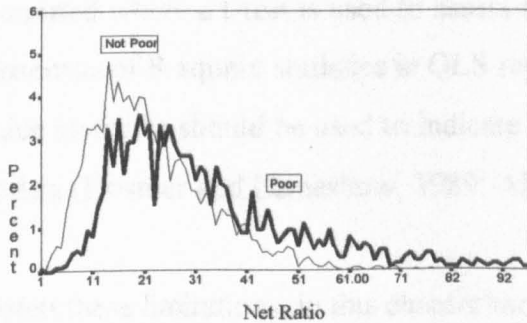
Figure 7.4 Distribution of Net Housing Cost To Income Ratio by Poverty Group (Model T_{2N})
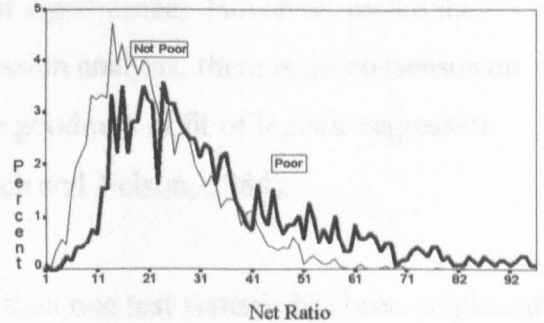
Source: Analysis of FES 1991

7.6 HOUSING COST TO INCOME RATIO: LOGISTIC REGRESSION ANALYSIS

Having shown in the previous section that gross housing cost to income ratio could be

reasonably good predictor of the poverty status of a household, the next step is to

specify the exact relationship between these two variables. Regression analysis, using

OLS, is a popular choice when constructing such a predictive model. However, using

the OLS method requires the dependent variable to be a numeric continuous variable. If

the dependent variable is a limited dependent variable which can only take a limited

number of values (states), similar to the incidence of poverty in the present context,

evaluation of the OLS model square would no longer produce the best estimate

(Gujarati, 1992).

Alternative methods of constructing predictive models involving a limited dependent variable have been developed; logistic regression, probit model and discriminant analysis are examples of such models. Logistic regression is perhaps the most popular method of this kind as it imposes the least restrictions on the distribution of the explanatory variables (Kennedy 1991). It provides relative ease of computation and more readily interpretable results. It is because of these advantages that logistic regression is adopted in this chapter.

Logistic regression belongs to the family of probability models in which the expected probability of occurrence of the reference state of the dependent variable is evaluated instead of the actual states. It poses little limitation on the distribution of the explanatory variable. Parameters of logistic regression models are evaluated using the maximum likelihood logarithm and confidence intervals of the parameters can be computed where a t-test is used to assess their significance. However, unlike the consensus of R square statistics in OLS regression analysis, there is no consensus on which statistics should be used to indicate the goodness of fit of logistic regression models (Hosmer and Lemeshow, 1989; Aldrich and Nelson, 1984).

Within these limitations, in this chapter more than one test statistic has been employed in order to safeguard a more reliable representation of the goodness of fit. However, although a number of such test statistics are developed, not all of them are available in popular statistical programmes. To choose a more appropriate test statistic, evaluation of the logistic regression was converted from SPSS to SAS where the Akaike Information criterion (AIC), the Log Likelihood Ratio Test and the Table of Prediction are available. Technical details of logistic regression are presented in appendix A9.

The results of the logistic regression analysis are presented in table 7.4, which indicates that both the gross and net housing cost to income ratios were significant in predicting the poverty status of a household (the reference status is whether the household is in poverty). Although the regression coefficient in logistic regression is not so readily interpretable as in OLS regression analysis, generally the larger the absolute magnitude of the coefficient is, the more powerful is the explanatory variable as a predictor. Thus, gross ratio is a more powerful predictor of poverty status than net ratio.

However, in the case where there is only one explanatory variable, the statistics for assessing the goodness of fit of the model can be a more reliable indicator of the predictive power of the explanatory variable. Both the AIC and the log Likelihood ratio indicate a better performance of models T_{1G} and T_{2G} than models T_{1N} and T_{2N} (for both statistics, the smaller the better). Furthermore, using 0.5 as the cut-off probability (the event is deemed to have occurred if the probability of occurrence is more than 0.5; less than 0.5 for an non-occurrence), Models T_{1G} and T_{2G} could predict over 86% of the cases correctly, whilst for T_{1N} and T_{2N}, it was three quarters.

Notwithstanding that the overall predictive power of Models T_{1N} and T_{2N} was reasonably accurate, it is a poor model for predicting households in poverty. Less than a quarter of households in poverty can be predicted correctly by Models T_{1N} and T_{2N}, (the equivalent figure for Models T_{1G} and T_{2G}, is 70%).. This is merely a reiteration of the weak relationship between residual income and net housing cost to income ratio and the poor performance of net ratio as a variable of classification presented in earlier sections.

Table 7.4 Logistic Regression: Predicting Poverty Status

N = 4272	Dependent Variable: Household in Poverty			
	Gross Ratio		Net Ratio	
	Model T_{1G}	Model T_{2G}	Model T_{1N}	Model T_{2N}
Gross/Net Ratio	0.16**	0.16**	0.05**	0.05**
Intercept	-5.5	-5.7	-2.3	-2.4
AIC	0.62	0.56	1.1	1.07
-2 LogLikelihood	2759	2659	4708	4548
Correctly Predicted as Poor	70%	69%	22%	22%
Correctly Predicted as Not Poor	93%	93%	95%	96%
Correct Prediction	86%	87%	74%	76%

Note: AIC Akaike Information Criterion   ** $p<0.01$
Source: FES 1991

To check the accuracy of prediction of the models, distribution of the predicted probability can be plotted against the actual occurrence of the event. A clear cut distribution towards the respective extreme ends rather than clustering in the centre would indicate a model of better predictive power in which the alleged accuracy of prediction would not be sensitive to the choice of cut-off value. If many households had a predicted probability around this cut-off probability point, a small change of cut-off probability value would lead to a classification of the opposite state. Figures 7.5 to 7.8 show the distribution of predicted probability for the models. It indicates that the

predicted probabilities in Models T_{1G} and T_{2G} matched well with the observed poverty status of the household, where the classification would not be sensitive to the choice of cut-off point of 0.5. On the contrary, Models T_{1N} and T_{2N} could not be considered good models as it is apparent that they failed to produce an accurate prediction of households in poverty.

Figure 7.5 Logistic Regression: Distribution of Predicted Probability, Gross Ratio (Model T_{1G})
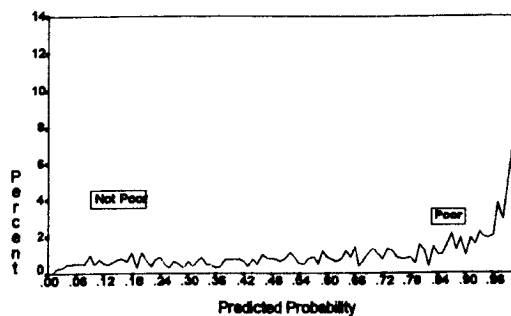
Figure 7.6 Logistic Regression: Distribution of Predicted Probability, Gross Ratio (Model T_{2G})
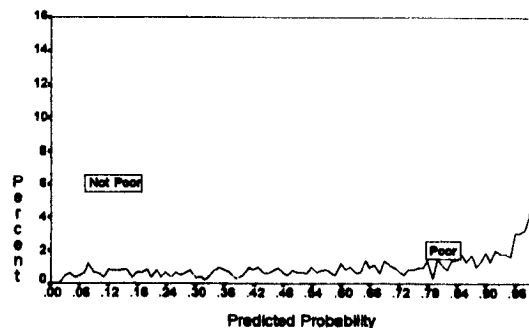
Figure 7.7 Logistic Regression: Distribution of Predicted Probability, Net Ratio (Model T_{1N})
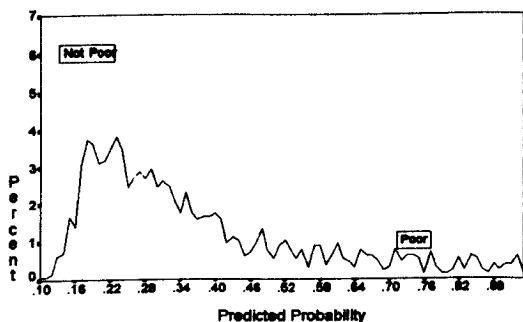
Figure 7.8 Logistic Regression: Distribution of Predicted Probability, Net Ratio (Model T_{2N})
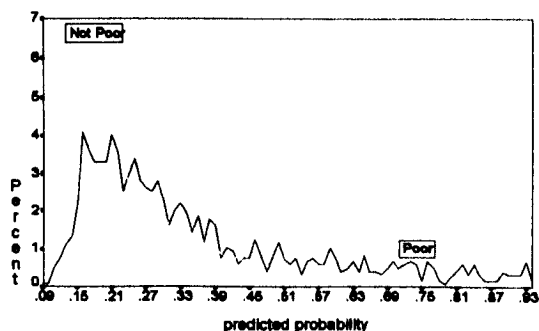
Source: Analysis of FES 1991

7.7 CUT OFF HOUSING COST TO INCOME RATIO

As described in section 7.3, a cut-off point can be located where the probability of being in poverty is greater than the probability of not being in poverty, or when the predicted probability is 0.5. Alternatively, this point can also be located where the change in predicted probability is greatest. Demonstrably, the cut-off ratio evaluated by both methods did arrive at the same result for all models. For Model T_{1G} the cut-off ratio was 34% and for Model T_{2G} was 35%. The corresponding values for Models T_{1N} and T_{2N} were 44% and 45%.

In addition, it was argued in section 7.3, that the cut-off ratio would be more effective if the curve relating the explanatory variable and the predicted probability were close to a step shaped curve. Figure 7.9 shows the predicted probability of the four models in relation to both gross and net housing cost to income ratios. it is apparent that Models T_{IG} and T_{2G} (gross ratio) generate curves closer to a step shaped curve whilst Models T_{1N} and T_{2N} do not.

In fact, at the cut-off points, the rate of change of predicted probability is 0.04 for both Models T_{IG} and T_{2G}, an equivalent of a change of 4 percentage points of predicted probability for a one percentage point change in gross ratio. Increasing the gross ratio from one percentage point below the cut-off point to one percentage point above the cut-off point would have produced a change of predicted probability from 0.45 to 0.53. For Models T_{1N} and T_{2N}, the rate of change of predicted probability at the cut-off point was only 0.001, which is a comparatively low value.

This suggests that net housing cost to income ratio is not a good predictor of the incidence of poverty and thus the cut-off net ratio is not a reliable cut-off for affordability. This conclusion is supported by evidence from the earlier analyses. Hence, it is more appropriate to use only those models involving gross housing cost to income ratio in subsequent analyses.

Figure 7.9 Logistic Regression: Predicted Probability, All Models
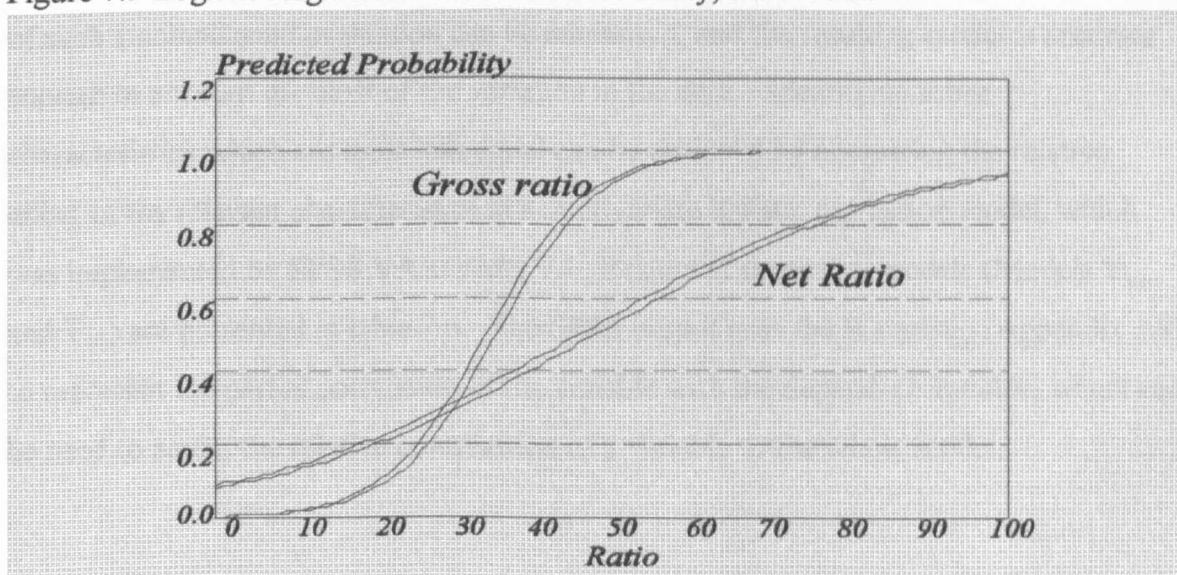
Source: Analysis of FES 1991

7.8 CUT-OFF RATIO AND HOUSEHOLD CHARACTERISTICS

It is argued that a single cut-off ratio should not be applied across households with varied composition and characteristics (Brownill et al, 1990; Bramley et al, 1990). Empirical results in chapter five also show that there were significant differences in gross ratio among households with different socio-economic characteristics. Thus, it appears to be necessary to explore whether different cut-off ratios should be applied to households with different characteristics.

Logistic regression models involving the gross housing cost to income ratio were run for some selected characteristics of the household and the results of the cut-off ratios for each of the characteristics selected are summarised in table 7.5. It indicates that the cut-off ratios amongst households of different characteristics vary substantially and the use of a single cut-off ratio for all households would appear to be inappropriate.

However, it is impractical to set a separate cut-off ratio for each of the characteristics because it will make the process of evaluating affordability exceedingly complicated. To compromise in the search for a simple process, which nevertheless retains the precision of evaluation, it should be possible to identify the household characteristics which exert the strongest influence on the prediction of the incidence of poverty, and to establish a separate cut-off ratio for each of the subgroups in the category. In doing so, the burden of such a complicated evaluation can be minimised, and the resulting model is accurate enough to account for most of the variation in the data. Identifying those characteristics which are most influential can be achieved by comparing the relative effect of the relevant characteristics in a multivariate logistic regression model, which was implemented on SPSS VAX/VMS V4. Results of these two models (Models T_{3G} and T_{4G}) are presented in table 7.6. The SPSS output uses the R statistic (Appendix A8) to represent the partial correlation of the variable with the dependent variable, which can be used to assess the relative contribution of a variable to the whole model.

Table 7.5 Cut-off Ratio by Household Characteristics

Characteristics	Model T_{1a} %	Model T_{2a} %
All households	34	35
Tenure		
Local Authority Tenants	26	28
Housing Association Tenants	27	31
Private Tenants (Unfurnished)	31	34
Private Tenants (Furnished)	41	42
Mortgagors	45	45
Region		
North	30	33
Yorkshire and Humberside	31	33
North West	33	33
East Midlands	32	34
West Midlands	31	32
East Anglia	34	34
London	38	38
South East	40	41
South West	35	36
Household Type		
married Couple	37	37
Single Person	35	37
Lone Parent	28	29
Others	32	33
Size of Household		
1 Person	29	35
2 Persons	51	51
3 Persons	48	48
4 Persons	47	47
5 Persons or More	45	42
Housing Benefit		
Claimant	24	26
Non-claimant	41	42

Source: Analysis of FES 1991

This indicates that gross housing cost to income ratio makes the greatest contribution. Its contribution to the goodness of fit of the whole model was far higher than that of the sum of the other variables. Comparing the accuracy of prediction in table 7.4, gross ratio alone would predict around 70% of poor households as poor, while adding the other variables improved the accuracy of this prediction to around 80%. The second greatest contributing variable was tenure, while the effect of household type was not significant, and that of region and housing benefit were only moderate. Size of household made a substantial contribution, although this was smaller than the effect of tenure.

Table 7.6 Multi-variate Logistic Regression Models: Housing Cost To Income Ratio and Household Characteristics

Characteristics	Model T_{3G}		Model T_{4G}	
	R	Exp B	R	Exp B
Gross Ratio	0.36	1.19**	0.36	1.19**
Tenure	0.2		0.17	
Local Authority Tenants	0.11	3.64**	0.1	2.48**
Housing Association Tenants	0.05	2.30**	0.02	1.58**
Private Tenants (Unfurnished)	0.02	1.56*	0.01	1.43**
Private Tenants (Furnished)	0.05	0.42**	-0.02	0.56ns
Mortgagors	r	0.25	r	0.31
Region	0.08		0.07	
North	0	1.11ns	0	0.99ns
Yorkshire and Humberside	0.03	1.58*	0.02	1.40ns
North West	0	1.20ns	0	1.11**
East Midlands	0.02	1.47*	0.03	1.60*
West Midlands	0	1.25ns	0.01	1.35*
East Anglia	0	0.89ns	0	1.02**
London	-0.06	0.50**	-0.03	0.65*
South East	-0.06	0.55**	-0.06	0.53ns
South West	r	1.05	r	0.88
Size of Household	0.11		0.15	
1 Person	-0.08	0.48**	-0.12	0.33**
2 Persons	-0.06	0.64**	-0.07	0.58**
3 Persons	0	0.88ns	0	0.87**
4 Persons	0.02	1.28*	0.04	1.44*
5 Persons or More	r	2.88	r	4.16
Housing Benefit				
Claimant	-0.09	0.58**	-0.09	0.59**
Non-claimant	r	1.7	r	1.68
-2LogLL (Base Model)	5173		5028	
-2LogLL (Ratio Only Model)	2413		2368	
-2LogLL (Full Model)	1967		1976	
N	4253		4253	
Correctly Predicted Not Poor	0.96		0.95	
Correctly Predicted Poor	0.81		0.8	

Note: ** P<0.01 * P<0.1 N Not significant r Reference group
Source: Analysis of FES 1991

Thus, to establish a different cut-off ratio for each of the tenure groups will, on the one hand, improve the accuracy of prediction while, on the other hand, it will improve the efficiency of evaluation and reserve a single method for assessing affordability.

A check for the sensitivity of the cut-off ratios for each of the tenure groups for both models T_{1G} and T_{2G} is presented in figure 7.10. It illustrates that the ten distributions of predicted probability deviated little from the pattern of overall distribution shown in figure 7.6. Thus, it is appropriate to employ the ratio at a predicted probability of 0.5 as the cut-off ratio for each of the tenure groups.

However, having two cut-off ratios for each of the tenure groups is clumsy to implement. For most of the tenure groups, the cut-off ratios for the two models were either identical or very close to each other, with the exception of housing association tenants. Hence, as a compromise for the sake of simplicity and precision of prediction, the arithmetic mean of the two cut-off ratios for each of the tenure groups will be taken as the final cut-off ratio. A list of the final cut-off ratios employed for subsequent analysis are presented in table 7.7

Figure 7.10 Logistic Regression: Predicted Probability, Gross Housing Cost To Income Ratio by Tenure
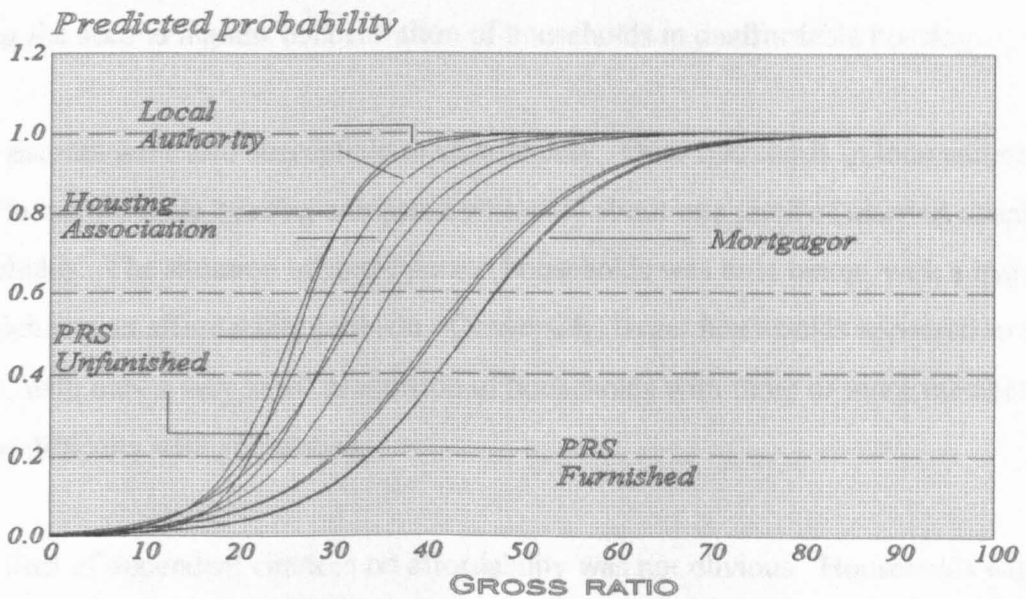
Note: PRS Private Rented Sector
Source: Analysis of FES 1991

Table 7.7 Cut Off Housing Cost To Income Ratio

Tenure	Cut-off Gross Ratio %
Local Authority Tenants	27
Housing Association Tenants	29
Private Tenants (Unfurnished)	32.5
Private Tenants (Furnished)	41.5
Mortgagors	45

Source: Analysis of FES 1991

7.9 HOUSEHOLDS IN UNAFFORDABLE HOUSING

With the cut-off ratios established in the preceding section, the characteristics of households in unaffordable housing can be examined. The results of this examination are shown in table 7.8. Social tenants were apparently very likely to be experiencing unaffordable housing, to a factor of eight when compared with mortgagees. The

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situation of private tenants was between these two extremes, but private tenants in rented furnished accommodation were nevertheless in a preferable situation to their counterparts in the unfurnished sector.

Regional differences in unaffordability were less distinct than the variation amongst tenure groups. However, a north south divide was observed. Yet households in the south of the country were not in more unaffordable housing than their counterparts in the north because of the high housing cost in the south. On the contrary, the South East and South West had a lower proportion of households in unaffordable housing than the northern regions. London, with a very high level of housing cost, was an exception, having the second highest concentration of households in unaffordable housing.

Lone parents were also susceptible to affordability. Over two thirds of lone parents were in unaffordable housing compared with only about one tenth of married couple households. The situation of single person households was little better, with a majority experiencing an affordability problem. Conversely, larger households appeared to fare better, with only a very small proportion of households with three or more members having difficulty with affordability.

The effect of dependent children on affordability was not obvious. Households with no dependent child were slightly more likely to be in unaffordable housing, but this effect was strongly influenced by the poor affordability situation of single person households rather than as an effect of dependent children. Having school age children appeared to reduce the likelihood of experiencing an affordability problem, but the difference was minor.

The age of the householder was related to affordability, and the affordability situation of elderly households were extremely poor. The youngest householders had an average affordability situation, whilst their middle aged counterparts appeared to be much better off.

Employment status had a clear effect on affordability. It is apparent from table 7.8 that the greater the households' involvement in the labour market, the less likely the

household was to be in unaffordable housing. When the householder was out of employment, the likelihood of being in unaffordable housing was fifteen times more likely than for a household whose head was in full time employment. The employment status of the partner of the head of household was also significant. When the householder was in full time employment, the likelihood of being in unaffordable housing would double if the partner was unemployed.

Because claiming housing benefit was closely related to participation in the labour market, it is not surprising that, given the unfavourable affordability situation of people out of work, housing benefit claimants experienced a worse affordability situation. In fact, the largest difference in the level of unaffordability was between housing benefit claimants and non-claimants. Households on housing benefit or a related social security benefit were seven and a half times more likely to be in unaffordable housing than those which did not have to depend on housing benefit.

Table 7.8 Household in Unaffordable Housing by Household Characteristics (Ratio Measurement)

Characteristics	%
All Household	25
Tenure	
Local Authority Tenants	58
Housing Association Tenants	56
Private Tenants (Unfurnished)	43
Private Tenants (Furnished)	25
Mortgagors	7
Region	
North	31
Yorkshire and Humberside	28
North West	26
East Midlands	24
West Midlands	30
East Anglia	20
London	29
South East	18
South West	23
Household Type	
married Couple	12
Single Person	53
Lone Parent	67
Others	19
Size of Household	
1 Person	53
2 Persons	22
3 Persons	14

Table 7.8 Household in Unaffordable Housing by Household
Characteristics (Ratio Measurement)

Characteristics	%
4 Persons	11
5 Persons or More	12
Dependent children	
No dependent Child	28
have Child aged Under 5 , No 5 to 15	25
No child Under 5, Have Child 5 to 15	16
Have Children under 5 and 5 to 15	17
Age of Householder	
Under 30	25
30 - 39	14
40 - 49	10
50 - 59	19
Over 60	57
Economic Status of Householder and Partner	
Both Full Time	4
HoH Full Time Partner Part Time	4
HoH Full Time Partner Unoccupied	9
HoH Part Time partner Full Time	28
HoH Part Time partner Part Time / Unoccupied	38
HoH Unoccupied Partner Full Time / Part Time	60
Both Unoccupied	61
Housing Benefit	
Claimant	10
Non-claimant	75

Note: **P<0.01 *P<0.1 N Not significant r Reference group
Source: Analysis of FES 1991

7.10   SUMMARY AND CONCLUSIONS

Despite a long history of the use of ratio measurement for affordability it was imported
to the United Kingdom only as recently as the 1980s. Although it is widely used in
many industrial countries, it was received in the UK with much scepticism, especially
among the academic community. It is criticised as being unrepresentative of household
financial burden, and as an inappropriate indicator of opportunity cost, and hence a
misleading measurement instrument. Nevertheless, the origin of a proportional
approach to affordability measurement has strong empirical support and the use of ratio
measurement is still robust. Moreover, its simplicity increases its attractiveness and
popularity among housing practitioners.

Despite the popularity of the ratio measurement, the cut-off ratio was only established as
a "rule of thumb". Whilst it creates few problems in other industrial countries where

there is some consensus on the level of the threshold ratio, the situation in the UK is somewhat chaotic. Although a number of threshold ratios have been proposed, none can gain authoritative status because of the lack of solid theoretical, empirical or argumentative backing. Refusal by the government to disclose officially its own threshold ratio only increased contention around the dispute. In this chapter, an empirical investigation of housing cost to income ratio has been conducted in an attempt to establish empirically cut-off ratios based on a composite approach to affordability.

A composite approach to establishing a cut-off point for housing cost to income ratio was attempted which combined the ratio approach and the residual income approach. Housing cost to income ratio was used to indicate the relative level of housing cost whilst residual income was employed as an indicator of household financial burden. Thus, as a derivative from the definition of affordability, a household would be in unaffordable housing if it reached a particular ratio, and it was likely the household would be in financial difficulty. Half of average equivalised residual income and 140% of income support level were used as the poverty levels in the residual income approach mentioned above.

Several steps to check the feasibility of the composite approach were undertaken. First, it was shown that there was a close relationship between both gross and net housing cost to income ratio and residual income where the double log regression models provided the greatest explanatory power. This close relationship between residual income and housing cost to income ratio suggests a similar relationship between housing cost to income ratio and the incidence of poverty.

Second, mean values of both gross and net housing cost to income ratio between households who were poor were significantly different from those which were not. However, the distribution of the two ratios with reference to the poverty status of the household suggests that only the gross ratio is appropriate for the purpose of classification. Distribution of gross ratio between households who were poor and those who were not was distinct, allowing poverty status to be clearly classified by the gross ratio. In contrast, the distribution of net ratio between these two groups clustered in the

same range and classification using the net ratio would produce a very large margin of error.

Third, logistic regression models were constructed employing both gross and net ratio as predictors of the incidence of poverty. The models generated, using respectively 140% income support level and half average income as the poverty line, all had a satisfactory level of goodness of fit. But net ratio could only produce a model with a low degree of prediction accuracy. Thus, only gross ratio was considered appropriate to be used as a predictor of the status of poverty.

Finally, the cut-off ratio was fixed at the point where the predicted probability was 0.5, above which the chance of being "poor" was higher than the chance of being "not poor". It was also the point where the change of predicted probability with respect to the change in gross ratio was greatest.

However, there were considerable differences between subgroups of households having different characteristics. It is thus not appropriate to apply a single ratio across all households but, nonetheless, it is impractical to furnish each subgroup with a different ratio. As a compromise, it seemed appropriate to apply a separate cut-off ratio to household characteristics which most influenced the prediction of poverty incidence, together with gross housing cost to income ratio.

Based on the multi-variate logistic regression models including gross ratio and other relevant socio-economic characteristics, tenure was found to be the most influential characteristic, next to gross ratio. Thus, a list of cut-off ratios was generated for each tenure group by taking the arithmetic mean of the corresponding cut-off ratio of the two models using, respectively, 140% of income support level and half average income as the poverty line. With reference on the cut-off ratios established, social tenants, people living in London and the northern regions, single persons, lone parents, households with the householder unemployed or retired and housing benefit claimants were found to be more likely to be experiencing unaffordable housing.

CHAPTER 8
BEHAVIOURAL APPROACH TO AFFORDABILITY

8.1 INTRODUCTION

Measurement of affordability has been dominated by the normative approach, in which the ratio measurement and the residual income measurement are the two most popular methods. However, it was argued in chapter three that other measurement approaches to affordability, for instance the behavioral or the subjective approach, are also plausible. It was shown in chapter seven that a behavioural perspective can be incorporated into the normative approach to determine threshold affordability ratios. This chapter will explore the feasibility of a purely behavioural perspective on affordability measurement.

This chapter consists of nine sections. The first section presents a review on the behavioural approach to affordability measurement. It is followed by an examination of the lesson learned from the behavioural approach to poverty measurement. The third section will describe the methods of investigation that will be used in this chapter. An exploration of an appropriate functional form for the non-linear regression model will be reported in the section that follows. Non-linear regression models are evaluated in section 8.6, based on information provided by the preceding section. To examine whether cut-off ratios have been established in households with different socio-economic characteristics, multivariate regression analysis is employed in section 8.7. This regression analysis is also used to contrast results of earlier research on affordability. Finally, cut-off ratios for each sub-group of the important socio-economic parameters are then estimated.

8.2 A REVIEW ON THE BEHAVIOURAL APPROACH TO AFFORDABILITY MEASUREMENT

The normative approach has been the dominating, perhaps the only, approach to affordability measurement since the early development of the concept. The two most popular methods in implementing this approach, the residual income and the ratio method, have to rely on benchmark values for assessing the affordability status of a

household. Notwithstanding the authoritative stamp these benchmark values bear and their adoption with few challenges, they are less authoritative than they are claimed to be. It is argued in chapter seven that the commonly used affordability ratio is little better than a "rule of thumb", which may have been based on arbitrary choice; nor were later modifications grounded on solid scientific or argumentative justification (see Lane, 1977; Maclennan et al, 1990).

The residual income approach, on the other hand, is based on the poverty line as a benchmark value. This is less arbitrary than the threshold affordability ratio. Yet the establishment of poverty lines on which the judgement of affordability is based is complicated. A poverty line can be established using a variety of approaches, of which the normative approach to poverty is one among many. Thus, whether the residual income approach is normative depends on the approach used in the reference poverty line, rather than the use of residual income per se. In fact, many of the poverty lines commonly used in the literature of poverty are not based on the normative approach.

In addition, contrary to the argument of Maclennan and Williams (1990), affordability measurement need not involve the judgement of a third party. This is particularly the case if the allegedly authoritative judgement of the third party does not have the necessary scientific or argumentative justification. Besides measuring affordability from a normative perspective, approaching the problem from the actual behaviour of people is a viable alternative. It can be based on what people are actually prepared to spend on housing, given the socio-economic characteristics of the household. Alternatively, difficulties in paying for housing are an indicator of unaffordability and approaching affordability measurement from this direction should also be feasible.

The former approach has been incorporated in research by NFHA (1990), Fein and colleagues (1977) and Maclennan and colleagues (1990) whilst Bramley (1990), Ford (1992), Ford and Wilcox (1992), Coles (1992) and Kearns and colleagues (1993) have conducted a thorough investigation of households which experience difficulties in paying their housing costs.

In an attempt to establish a threshold affordability ratio for housing association tenants, which in turn acts as a reference for fixing affordable rents in new housing association lettings, the NFHA looked at the amount home owners spent on housing. However, it was the average proportion of home owners' income that was devoted to housing that interested the NFHA, not the systematic relationship between housing outgoings with income and socio-economic characteristics. This ignores the difference in both the level of income and socio-economic characteristics between home owners and housing association tenants.

Fein and colleagues (1977) conducted a thorough and detailed examination of the housing expenditure of American households in the 1960s and 1970s. Where housing expenditure was analyzed systematically with socio-economic characteristics, the main focus of the research was on the historical trend of housing costs. There was no attempt to uncover any relationship between housing cost on the one hand and household income and socio-economic characteristics on the other.

Households in financial difficulty form the second line of investigation, especially those in arrears with rent or mortgage repayment or facing repossession. Ford and Wilcox (1992) analyzed home owners, in the early 1990s, who were in repayment arrears from a national sample survey. Ford (1992) studied the characteristics of households whose homes were repossessed, selecting a sample from the lenders' records, whilst Coles (1992) examined the characteristics of households in similar conditions based on information supplied by building societies. However, the focus of these researches were to describe the characteristics of the arrears or repossessions and the characteristics of the households in difficulty. Little emphasis has been placed on the relationship of household socio-economic characteristics or the level of housing expenditure to affordability problems, nor the affordability situation of such households. In addition, such research concentrates on the problems of home owners but does not focus on households in financial difficulties in general.

In contrast, research by Bramley et al (1989) and Kearns et al (1993) on household financial stress inclines more explicitly toward the understanding of the affordability problem. Bramley and colleagues (1989), using survey data from the JRF Housing

Finance Survey in the Bristol area, analyzed the problem of meeting housing costs employing arrears as an indicator. Kearns and colleagues (1993), on the other hand, examined the problem of financial stress among housing association tenants in Scotland employing the subjective assessment of the respondents on their states of financial stress as an indicator. Because of the limitation of sample size, where the number of households in the samples with financial difficulties was small, it is impossible to evaluate beyond simple description.

A detailed examination of housing costs in relation to household income and socio-economic characteristics was conducted by Maclennan and colleagues (1990) in "Paying for British Housing", the first volume of the final report of the JRF Housing Finance Survey. Apparently, the thrust of the analysis was to argue, explicitly, against the use of a single ratio of affordability and implicitly against the use of an affordability ratio per se. It has nevertheless provided valuable empirical evidence for the examination of housing cost, household income and household socio-economic characteristics.

In their analysis, Maclennan and colleagues (1990) found that other factors besides income had an influence on the level of housing cost and it was not appropriate to consider income alone:

> A 'crude' ratio which sought to influence rent or subsidy levels solely with regard to income would disregard other influences of household expenditure or housing needs. As income, age, ethnicity, family composition etc can be inter-related then it is not good statistical practice to examine housing spending separately for each 'explanatory' variable. They should be examined simultaneously. (Maclennan et al, 1990:92)

Four regression models were then constructed relating housing expenditure with household composition, ethnicity, income, location of the household and housing quality, with each of the four models further broken down into sub-models by housing tenure. Several findings were highlighted by the authors:

1. Explanatory power of all the models was small

2. Models for the whole sample could explain the variation in the data more than the individual sub-models in individual tenure groups. This indicated "the correlation of socio-economic variable and tenure rather than spending contribute to the overall explanation level" (Maclennan et al 1990:92).

3. Variables in the models could only explain a very small proportion of the level of gross rent in the social sector, and the authors conclude that "existing rents in Britain could neither be used as a guide to housing demand nor spending needs" (Maclennan et al 1990:92).

4. Models explaining net housing expenditure can explain more of the variation than models explaining gross housing expenditure, whereas "the explanation of this shift... is the operation of the housing benefit system - socio-economic parameters determine benefit eligibility and payment which reduce net ratio" (Maclennan et al 1990:92).

Whilst the empirical aspect of the analysis was a significant piece of work on affordability, there were a number of inadequacies in both the statistical process and the conclusions drawn from the analysis. First, point four of Maclennan and colleagues' comment on housing benefit and the level of housing expenditure is a poorly supported conclusion. It is true that the housing benefit system would have a significant influence on the level of net outgoings on housing, but socio-economic parameters are not the major determining factor of housing benefit eligibility. It is the level of net income that is more influential. Thus, the effect of socio-economic characteristics could not be a proxy for housing benefit.

Second, their comment on the level of social sector rent as a reliable guide to housing demand or needs was based on an inappropriate interpretation of the results. The observation that income and socio-economic characteristics explained very little variation in rent in the social sector does not warrant a causal relationship between housing need and social sector rent. If household composition and other socio-economic characteristics were used as a proxy for housing need, as Maclennan and colleagues apparently intended to do, then it is housing need that could not explain the variation of housing cost rather than the converse causal relationship. Moreover, it is not legitimate to extend the results, from samples of arbitrarily selected six cities, to the whole of Britain. As a minor footnote, the sub-models in the analysis did not include the same set of parameters because the author had excluded the "eliminated" parameters in some of the sub-models (with unspecified elimination criteria). Thus, many of the alleged proxies of housing need were not in the model.

Third, the second point of their comment on tenure, socio-economic characteristics and spending on housing is totally misleading. The unstandardised regression coefficient did not provide information sufficient to compare the relative contribution of different explanatory variables to the model because it depends also on the standard error of that coefficient, the unit of measurement and the presence of other variables (Guijarti 1992, Hardy 1993). In addition, the effect of tenure could not be inferred from the goodness of fit of submodels on different tenure groups. Such models only reflect the effect of the explanatory variables on the dependent variable within each tenure group but not the effect of tenure on the dependent variable. The only valid method of producing evidence is to include tenure as an explanatory variable so that the significance as well as its contribution relative to other variables can be assessed (refer to Hardy (1993) for a detailed discussion of regression involving dummy variables).

Finally, the low explanatory power of much of the model could be possibly explained by: first, the sample size of some of the tenure groups was small: 120 housing association tenants and 308 private tenants. The error margins of the models for these two groups may be very large which leads to low explanatory power. In addition, there were many sub-models that included many "eliminated" variable. The explanatory power of regression with fewer explanatory variables is generally lower. Second, and perhaps the more likely explanation, is that statistics in a regression model are valid only if the assumptions for ordinary least square regression are fulfilled (Fox 1991, Hardy 1993). Since it is shown in this thesis that both housing cost and income follow a log-normal distribution, it is unlikely that the distribution of these two variables in the sample would follow a normal distribution. It is thus very unlikely that a linear model involving these two variables would not violate the regression assumptions, especially the conditions of homoscedasticity and normal distribution of the residuals, albeit the authors provide no information on this independent validation.

The work of Maclennan and colleagues (1990) is a pioneer work in the investigation of affordability, but it did not go far enough to develop a behavioural approach to affordability measurement. In fact, no previous attempts in measuring affordability were based on the behavioural approach. To develop a behavioural approach to affordability, lessons should be taken from elsewhere.

8.3 LESSONS FROM THE BEHAVIORAL APPROACH TO POVERTY MEASUREMENT

There are a number of attempts to develop a behavioural approach of poverty in the literature on poverty. Given the close relationship between poverty and affordability, it is acceptable to adapt methods used in poverty measurement to develop a behavioural approach to affordability measurement. Several methods in determining the poverty line can be termed behavioural: the S-curve method developed by the American Bureau of Labour Statistics, the relative deprivation approach pioneered by Townsend and, to a lesser extent, the percentage of national average income. Amongst these approaches, the S-curve can best be modified and adopted as a method with which to establish a threshold affordability level.

The S-curve method was developed from the "quantity to income elasticity" technique which was first used by the American Bureau of labour Statistics (BLS) in the 1930s. The "quantity to income elasticity" technique considers households as poor if their consumption level is below a certain overall budget standard. Such standards are established with reference to the "standards of adequacy" of the consumption of some selected goods and services,

The "standards of adequacy" are in turn determined by plotting the quantity of consumption of the selected groups of goods and services, the point where the increase in the quantity of consumption shows a tendency to decline relative to income is the level of adequacy. This technique was founded on Engel's Law which states that the consumption of food (or other daily necessities) increases with increases in household income. As income increases, the quantity of consumption will increase among households on low incomes but for higher income households, it is the quality and variety of consumption that is associated with the increase. Hence, there is a cross-over point where the concern for quantity, which is associated with poverty, will give way to the concern of quality and variety, an indication of affluence. This cross-over point can then be regarded as a transition from poverty to affluence and thus is the poverty line (quoted in Mitchell 1985).

A modified version of the "quantity to income elasticity" method, the S-curve method, was used in Mitchell (1985) in an attempt to establish a poverty line for the UK and the results were later incorporated into the works of Bradshaw and colleagues (1987) as a preliminary work in establishing a modern budget standard for the UK. Instead of using the quantity of consumption, which is inconvenient to measure from social surveys, the level of expenditure is used as a proxy for the quantity of consumption. Expenditure of a selected good and service is then plotted against household income, an inflection point in the curve thus indicates a qualitative change in the consumption pattern. The shape of the curve with an inflection point looks like the letter S, which is the reason it is so named.

However, because the method was originally founded on the relationship between income and the quantity of consumption, a change from quantity of consumption to level of expenditure would affect the integrity of the method. Despite this weakness, the inflection point on the curve relating expenditure and income could still be an indication of a change "where expenditure on a commodity gives way to a preference to save or spend on the less necessary commodities" (Bradshaw et al 1987:174) and by and large can be a valid proxy for the level of adequacy.

A similar logic for determining the poverty line was adopted by Townsend (1979). He used a relative deprivation index to represent the participation of individuals in society which increases with the decrease in participation. Townsend observed that the resources commanded by an individual are positively correlated with the level of social participation. A poverty line can then be defined at a point where there is a disproportionate increase in the relative deprivation index with respect to a change in household income (Townsend 1979).

In this chapter, the S-curve technique will be adopted to determine the affordability level. It is derived from arguments delineated by Mitchell (1985), Bradshaw and colleagues (1987) and Townsend (1979) in their attempts to determine a poverty line. The point of assumed qualitative change is established by locating the inflection point in the curve relating the relevant variables: expenditure on a particular commodity and household income in the case of Mitchell's study, or relative deprivation index and

household income in Townsend's research. In the context of affordability measurement, the cut-off affordability level is located at the point where housing consumption shows a qualitatively different relationship with respect to household income.

Technical details of locating the inflection point vary in the studies mentioned in the preceding paragraphs. Mitchell (1985) and Bradshaw and colleagues (1987) plot a line linking the mean values of banded expenditure (expenditure values were grouped into bands, but not of equal range, and mean value for each band was calculated) and mean banded income. Then the inflection point is located by eye inspection where the curve appears to indicate a change of course. Likewise, a similar eye inspection method was employed by Townsend (1979) with reference to a banded deprivation index and banded income. The work of Townsend was later improved by Desai (1986) who showed that when two regression lines were fitted to Townsend's data set to, respectively, two subsamples divided by Townsend's poverty line, the two curves provide a better fit than a single curve for the whole sample. Townsend's conjecture that there were two qualitatively different relationships between the two variables in the two different income ranges was thus confirmed statistically.

More recently, Townsend (1993) elaborated his own method by the use of discriminant analysis and cluster analysis. He confirmed that, based on the items of deprivation measurement and using the technique of cluster analysis, it was optimal to divide the sample into two clusters. Experimenting with cut-off points at various income levels, he successfully located the income level where the deprivation items could best discriminate between the two groups divided by the cut-off income, which was then taken as the poverty line.

Townsend (1979), Mitchell (1985), Bradshaw et al (1987) and Desai (1986) all used banded values instead of the actual values, mainly to take advantage of the reduction in computational complexity. It is difficult to identify an inflection point within a large number of data given the complexity of fitting several regression curves accurately. Taking the average of the grouped data greatly reduces the number of points to be handled and thus allows regression lines to be drawn by hand. Inflection points can then be identified by eye inspection. However, establishing the inflection point in this way

lacks the necessary confirmative power which would be conferred by a statistical procedure.

Desai's method of fitting two regression lines and comparing the degree of fit is an improvement over the previous piece of work by Townsend because it offers more confirmatory power to the model. However, it is only valid if the regression lines plotted with mean banded values are representative of the whole sample. However, like the studies of Townsend (1979), Mitchell (1985) and Bradshaw et al (1987), aggregation greatly reduces the information provided by the much larger number of individual cases. It affects the representativeness of the subsequent regression lines evaluated from the aggregated data points and would in turn jeopardises the accuracy of location of the inflection point. In addition, the cut-off point has to be located manually which makes the fine-tuning of such cut-off value a tedious task.

Despite the justification of aggregation that this method can avoid sources of error "both in sampling error and the accuracy of any equation derived to describe the S-Curve" (Bradshaw et al, 1987:167), it could not be demonstrated that this method was immune from sampling error; nor was there any gain in not specifying a regression equation for the curve. On the contrary, information of sample error and the fitted equation can provide details that are necessary to assess the degree of accuracy of the evaluation.

8.4 METHODS OF INVESTIGATION

It was shown in chapter three and chapter five that the demand for housing can be expressed as a function of household income and the unit price of housing (formula 3.3) and housing price and quantity can be jointly observed as the household expenditure on housing. This can then be expressed as a function of household income, household size and other demographic characteristics (formula 5.1)

First assuming the effect of household size and other demographic characteristics are constant or have a lesser influence than the effect of household income (the effect of such variables will be examined in a later section), Housing expenditure can then be expressed as a function of household income (formula 8.1):

$$H = h(Z, p_H)$$
$$R = r(Z, P)$$
Assuming P to be constant
$$R = r(Z)$$
Where H = *Housing Consumption* \hfill (8.1)
Z = *Household Income*
p_H = *Unit Price of Housing*
R = *Expenditure on Housing*
P = *Household Size and Other Demographic Variables*

If an explicit function can be established, which links the cost of housing to household income, it would be possible to employ the S-curve method mentioned in the previous section. Based on principles similar to those used by Mitchell (1985), Bradshaw et al (1987), Desai (1986), and Townsend (1993), as outlined in the previous section, a threshold affordability level could be located where the relationship between the cost of housing and household income changes qualitatively.

Other than the methods of implementing the S-curve technique used by the aforementioned researches which were described in the preceding section, another technical method of implementation, the non- linear regression method, can be used as an alternate method of implementation. This later method will be used in this chapter. Before going into the technical details of this method of investigation, the distinction between market and non-market provision of housing should be reiterated. As mentioned in section 5.2 in chapter five, because of the difference in the operation between the market and non-market provision of housing, the functional relationship between housing cost and household income between these two sectors may be different. Yet, on examination, the difference between these two modes of provision, at least in the context of the English housing system, goes beyond a simple dichotomy of market and non-market distinction. Thus, advancing the investigation in this way would have resulted in the creation of several models rather than just two (section 5.2 of this thesis). Because both gross and net housing cost were used in this thesis, there would be an over-complicated array of non- linear models which are difficult to comprehend. The decision was therefore made that no distinction between the market and non-market provision would be considered at this stage, until an appropriate functional form of the equation has been identified. Further investigation will be conducted for households with different socio-economic characteristics. It is expected, as argued in section 5.2, that

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the distinction between the market and non-market provision of housing can largely be captured by the tenure variable.

The S-curve method, adopted by Mitchell (1985) and Bradshaw et al (1987) in their research on poverty in the UK, will be employed here to examine housing affordability in England. The main task is to locate an inflection point where there is a qualitative change in the relationship between housing cost and household income. If the proportion of housing outgoings, relative to household income for households with income below the inflection, increased at a faster rate than households whose income was above the inflection point, the former group could be regarded as being in unaffordable housing. Such households are obviously pressed harder by the housing costs they have to pay.

It is argued in the previous section that identifying the inflection by including data in only their aggregate form would greatly reduce the richness of the information provided by the data. Thus, to utilise fully the information provided by the data, the average values of the banded variables are not used in this chapter. Instead, regression analysis is applied to the whole sample. This is termed a "two phase regression" model if there is only one inflection point. Such a regression model cannot be satisfactorily evaluated by the ordinary least square method. A non-linear regression logarithm is a more appropriate analytic tool for such models. In non-linear regression (NLR) models, different functional forms (regression equations) can be specified over a range of the independent variable, where the parameters of the equations, together with the "joint points" (the points that separate different part of the curve), can be evaluated simultaneously in a single procedure.

Since more than one set of joint points and equations can be specified in a single model, the specification can be very complicated. To facilitate evaluation, several simplifications have to be made: first, it is assumed that there is one joint point in the model and thus only one "cut- off" point is allowed. The two regression equations will share the same functional form but with different parameters below and above the joint point. Evaluation of the non- linear regression model is implemented on SPSS for

VAX/VMS V4.0. (technical details of non-linear regression analysis are presented in Appendix A10).

Several types of information must be supplied by the investigator before any NLR models can be evaluated. Two important pieces of information are the functional specification of the model and the initial value of the parameters. The importance of the functional form of the model is obvious but it is also vital for the appropriate initial value of the parameters to be specified. Otherwise, no significant parameter estimates can be evaluated.

In order to offer an appropriate functional form as well as the initial parameter values of the model, several steps were taken:

1. In order to provide a rough picture of which functional form of the equation best fits the data, a smooth line based on the Lowess technique (Appendix A9 provides technical details of the technique) is fitted to a scatter plot of housing cost and income. This helps to identify the appropriate functional form of the regression equation.

2. To identify an exact functional form of the regression equation and the initial parameter values, an indirect step must be taken. First, probable functional forms identified in step one would be "linearized" so that regression by the OLS method can be employed. The advantage of this method is thus exploited without the need to supply an initial parameter estimate Models that fit best would be used in the evaluation of the NLR models by restoring the linearized functional form to its original form, and the functional form of such a model is adopted for the non- linear regression The use of this procedure assumes that a better fit "linearised" model is also a better fit NLR model.

3. To estimate the initial parameters is more complicated, especially for the joint point because the OLS regression is unable to supply such a value. A second step of indirect estimation must be taken. A non-linear two-phase regression model is evaluated with the functional form and initial value of the parameters supplied by the parameters of the best fitted model in step two, whilst the initial value of the inflection point is identified by eye inspection from the smooth curve. Instead of using the actual functional form, the linearised functional form will be retained, since

the evaluation of a linear two phase model is easier than a non-linear model. This exercise aims to provide fine-tuned initial values for parameter estimation in the next step.

4. With more "reliable" initial values of the parameters and the joint point provided by the parameters estimated from step three, non-linear equation taking the actual functional form (the original form of the linearisation) and the back-transformed parameter estimates, the evaluation of the NLR will be advanced. Estimating the parameters in this step, and the relevant statistics, will be taken as the final result.

Whether an inflection point or a two phase regression model exists will be tested by the confidence intervals of the regression parameters and the parameters of the inflection point. The housing cost to income ratio at the inflection point will then be taken as the threshold ratio, to place the results of this empirical research in line with the current debate on affordability.

The same exercise will then be repeated with selected socio- economic characteristics of the household to check whether the cut-off ratio differs significantly across such characteristics. As in the situation in chapter seven, whether a single ratio or different ratios for different households has to be applied depends on whether significant differences exist across households. It is crucial to check whether there is a dominating characteristic which influences housing cost besides income. Then, applying a set of ratios to the different subgroups in that category would simplify the situation. The latter hypothesis will be tested by multivariate regression analysis involving all the relevant characteristics.

8.5 INITIAL ANALYSIS: LINEAR REGRESSION MODELS

To proceed with the investigation of the behavioural approach to affordability measurement, the functional form of the regression equation has to be assessed. Following the outline described in section 8.4, this section will explore the functional form most suitable for subsequent non-linear regression analysis. This will be achieved in two steps. First, smooth curves will be fitted to the scatterplots relating income and housing cost using the Lowess method, in order to determine a regression curve that is

most probable for the given data set (a technical description of the Lowess method is presented in Appendix A7).

Second, likely functional forms of the regression equation will be derived based on information from the fitted smooth curves. If the functional form is non-linear and more than one probable functional forms are derived; only the model with the greatest explanatory power will be chosen for further analysis. To simplify the selection, the regression equations will be linearised and OLS regression will be conducted to assess the explanatory power. The linearised regression equations will also be examined to assess whether they pass the OLS assumptions (a discussion of a similar method was presented in section 7.4 of chapter seven).

Figure 8.1 and figure 8.2 show the scatterplots of gross and net income with the corresponding housing cost and the smooth curve fitted by the Lowess method. It is apparent that the smooth fitted curves for net income and net housing cost are not linear. Although the curves for gross income and gross housing cost were closer to a straight line, it is still safer to proceed using non-linear functional forms.

Figure 8.1 Scatterplot: Gross Income by Gross Housing Cost
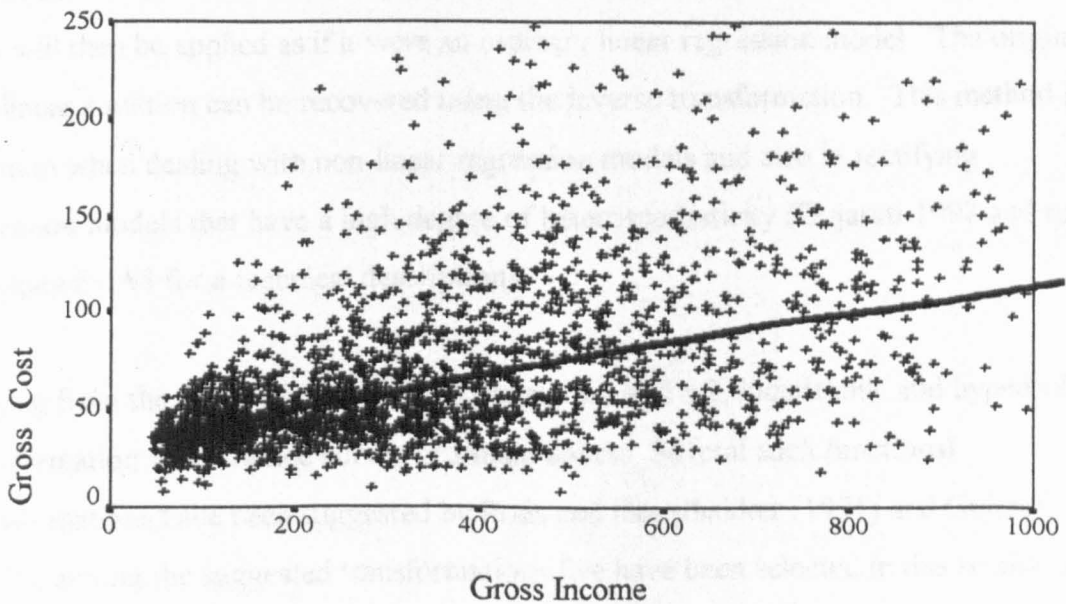
Source: Analysis of FES 1991.

Figure 8.2 Scatter Plot: Net Income by Net Housing Cost
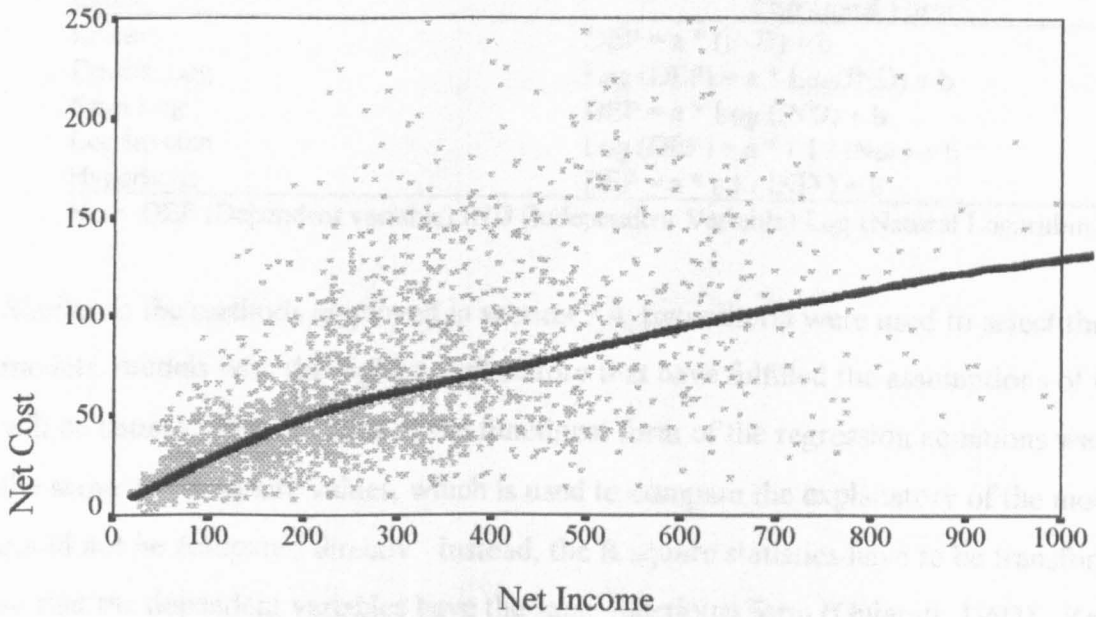
Source: Analysis of FES 1991.

As used in section 7.4 of chapter seven and outlined earlier in this section, regression analysis will be applied to the "linearised" form allowing for the use of the Ordinary Least Square (OLS) Method in the analysis. Linearisation is the process of transforming the dependent or the independent variables, or both, in a non-linear regression equation, so that the transformed variables can be expressed as a linear combination of each other. OLS will then be applied as if it were an ordinary linear regression model. The original non-linear equation can be recovered using the inverse transformation. This method is common when dealing with non-linear regression models and also in rectifying regression models that have a high degree of heteroscedasticity (Gujarati 1992 and refer to Appendix A8 for a technical description).

Judging from the shape of the curves in figures 8.1 and 8.2, logarithmic and hyperbolic transformation will produce curves of similar shape. Several such functional transformations have been suggested by Prais and Housthakker (1971) and Gujarati (1992); among the suggested transformations five have been selected in this section and they are presented in table 8.1:

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Table 8.1 Definition of Functional Form

Label	Functional Form
Linear	DEP = a * (IND) + b
Double Log	Log (DEP) = a * Log(IND) + b
Semi Log	DEP = a * Log (IND) + b
Log Inverse	Log (DEP) = a * (1 / IND) + b
Hyperbolic	DEP = a * (1 / IND) + b

Note: DEP (Dependent variable) IND (Independent Variable) Log (Natural Logarithm)

Similar to the methods employed in section 7.4, two criteria were used to select the best models: models with the highest explanatory that have fulfilled the assumptions of OLS will be chosen. Yet, because of the functional form of the regression equations were not the same, the R sqaure values, which is used to compare the explanatory of the models, could not be compared directly. Instead, the R square statistics have to be transformed so that the dependent variables have the same functional form (Gujarati, 1992). Results of the regression analysis are presented in table 8.1 (with the R sqaure statistics already transformed so that they were comparable). The aim of this exercise is to identify the functional form of a regression model that fit the data most so that it can be used for the analysis in subsequent non-linear regression model. The double log models produced the highest fit in both gross and net income to housing cost in which about a third of the variation of the data relating gross income and gross housing cost and more than half the variation in net income and net housing cost could be "explained" (in a statistical sense) by the respective models.

These are not surprising results given the log-normal distribution of both income and housing cost. Thus the double log model can be considered for further analysis. It is also noteworthy that models involving net income and net housing cost in general explained more of the variation than the corresponding models relating gross income and gross cost. It suggests that net income is a better determinant of net income than gross income to gross housing cost. This is contrary to the higher explanatory power of gross housing cost to income ratio in chapter seven where gross ratio is a better determinant than net ratio of the poverty status of a household.

Table 8.2 Regression Models: Household Income and Housing Cost

Dependent Variable	Gross Cost		Net Cost	
Independent Variable	Gross Income		Net Income	
Functional Form	R Sq	Beta	R Sq	beta
Linear	0.34	0.55	0.51	0.62
Double Log	0.35	0.59	0.55	0.74
Semi Log	0.21	0.52	0.43	0.60
Log Inverse	0.28	-0.53	0.50	-0.71
Hyperbolic	0.34	-0.42	0.26	-0.48

Note: Refer to Table 8.1 for the exact functional form of the regression equation,
R sq (R Square, have been transfromed to comparable forms),
Beta (Standardised regression coefficient)
All regression coefficients were significant at 5% confident level, N = 4272
Source: Analysis of FES 1991

Whilst R square is a commonly used reference of the goodness of the fit of a regression model and can be used to compare the explanatory power between models, the R square statistic is easily distorted by the existence of extreme values and deviations from OLS assumptions. Thus, an inspection of the distribution of residuals and the violation of OLS assumption is necessary. Detailed analysis of the plots of residuals of regression against income suggested that there existed extreme outliers for most of the models, but none was serious enough to exert a significant distortion on the R square value. On the other hand, many models exhibited evidence of heteroscedasticity in which the variance of the residuals were not constant throughout the range of the explanatory variable (see Appendix A8). The double log models were the exceptions whereas the sign of heteroscedasticity was the least (Figure 8.3, figure 8.4) and the distribution of the residuals were relatively random with reference to income.

The test of normality of the residual, which is vital to the validity of the inference statistics, was conducted by the normal probability plots of residuals, in which the distribution of the residual normal distribution. If the distribution is normal, the expected cumulative probability is close to the expected cumulative probability. Amongst the various models, only the double log models passed the test (figure 8.5, figure 8.6). Hence, the double log models will be chosen for further analysis in the subsequent sections. A description of the assumptions of OLS, together with the test for residual distribution and normal probability plots are presented in appendix A8.

Figure 8.3 Scatterplot: Standardised
Residuals by Gross Income
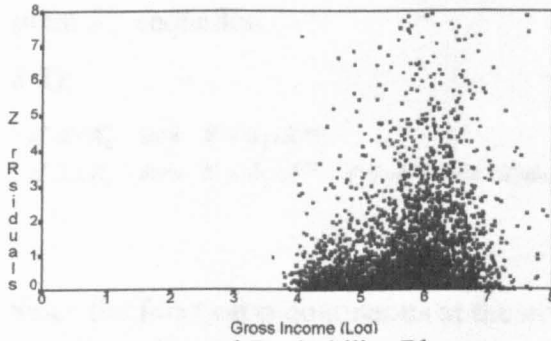
Figure 8.4 Scatterplot: Standardised
Residuals by Net Income
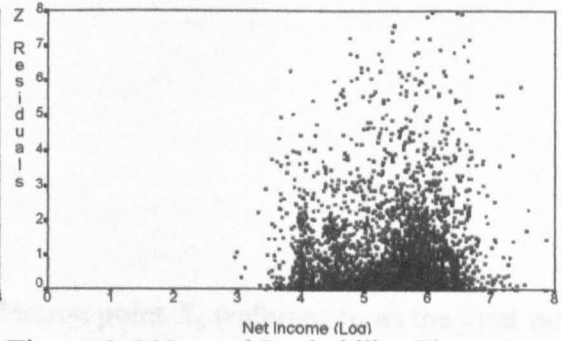
Figure 8.5 Normal Probability Plot:
Gross Income by Gross Housing Cost
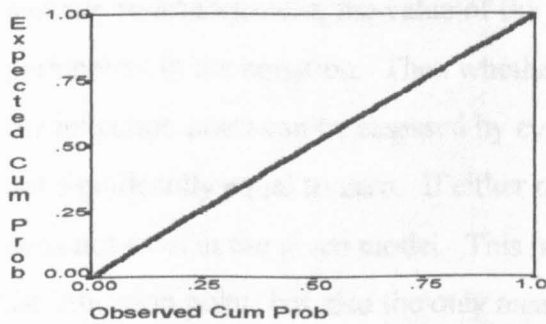
Figure 8.6 Normal Probability Plot: Net
Income by Net Housing Cost
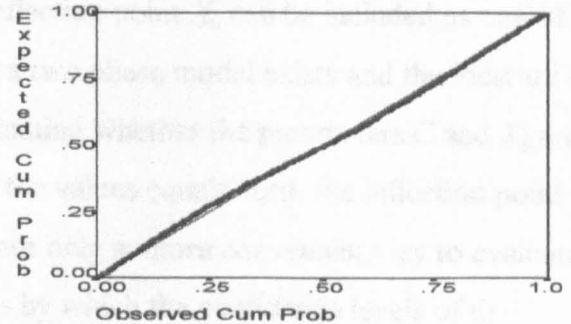
Note: Z Residual (Standardised Residuals) Cum Prob (Cumulative Probability)
Source: Analysis of FES 1991.

8.6 DETAILED ANALYSIS: NON-LINEAR REGRESSION MODELS

As revealed in the section 8.5, the double log models were considered to be the most

appropriate function form relating income to housing cost. These models produced the

highest explanatory power as well as the least extent of deviation from OLS

assumptions. To examine whether there exists an inflection point in the regression

function, the variables (housing cost and income) have to be restored to their original

form. This is done by reversing the process of linearisation in section 8.5. A double log

function could then be backwardly transformed to a power function relating income and

housing cost in their original forms (equation 8.1):

$Log\ Y = aLog\ X + b$ (*Double Log Model*)
$Log\ Y = Log\ (b' * X^a)$ (*Rearranging*)   8.1
$Y = b' * X^a$ (*Anti-log*)

Based on the assumptions outlined in section 8.4, an inflection point is presumed to have

divided the data into two portions. To reduce the burden of complex computation, the

regression models fitting these two portions are also assumed to be having the same

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functional form but with different parameters. The power function is then re-arranged to allow for the expression of the two phase regression function divided by the inflection point X_0. (equation 8.2):

$$\text{If } X < X_0 \quad \text{then} \quad Y = b_1 \cdot X^{a1}$$
$$\text{If } X \geq X_0 \quad \text{then} \quad Y = b_2 \cdot X^{a2} \quad (\textit{Two Phase Model})$$

8.2

Since the function is continuous at the inflection point X_0 (referred to as the joint point), this property can be incorporated into the two phase regression model so that upon a suitable re-arrangement, the value of the inflection point X_0 can be included as one of the parameters in the equation. Then whether a two phase model exists and the location of the inflection point can be assessed by evaluating whether the parameters C and X_0 are not significantly equal to zero. If either of the values equals zero, the inflection point does not exist in the given model. This is not only a more convenient way to evaluate the inflection point, but also the only means by which the confidence levels of the inflection point, i.e. the significance of the parameter, can be assessed directly from the model (equation 8.3).

$$b_1 \cdot X_0^{a1} = b_2 \cdot X_0^{a2} \qquad (\textit{At the Joint Point } X_0)$$
$$b_2 = b_1 \cdot (X_0)^{(a1-a2)} \qquad (\textit{Rearranging})$$
$$Y = b_1 \cdot (X_0)^{(a1-a2)} \cdot X^{a2} \qquad (\textit{Rearranging})$$
$$Y = b_1 \cdot (\frac{X^{a1}}{X^{a1}}) \cdot X^{a2} \cdot (\frac{1}{X_0^{a2-a1}}) \qquad (\textit{Rearranging})$$
$$Y = b_1 \cdot X^{a1} \cdot (\frac{X}{X_0})^{a2-a1} \qquad (\textit{Rearranging})$$
$$\text{If } X < X_0 \quad Y = B \cdot X^A$$
$$\text{If } X \geq X_0 \quad Y = B \cdot X^A \cdot (\frac{X}{X_0})^C \qquad (\textit{Substituting New Parameters})$$
$$\text{Where} \quad A = a_2$$
$$B = b_1$$
$$C = a_2 - a_1$$

8.3

Non-linear regression (NLR) procedure in SPSS VAX/VMS V4.0 was used to evaluate the model in equation 8.3. In NLR procedure, unlike regression with OLS, the initial value of the parameters, which should be reasonably close to the actual value, have to be supplied by the investigator and these initial values are vital to the final evaluation. The initial values were obtained from two preliminary exercises which are described in more detail in Appendix A11 together with the technical details of Non-linear Regression analysis.

In NLR, there are no corresponding inference statistics similar to the t-test and F test in OLS regression for testing, respectively, the significance level of individual parameters and the joint hypothesis that all parameters except the intercept are zero. Only the confidence intervals of the parameters can be estimated (not the exact interval but only an estimate). The parameter is regarded as being significantly different from zero at 5% confidence level, in other words, it is a "significant" explanatory variable, if zero is not included in the 95% confidence intervals of the parameter. In addition, evaluation of the NLR parameters relies on iteration alogarithm and it is common that no definite value can be reached, especially when a poor initial value is supplied. Thus, a fitted model may fail to be established because of the non-convergence of the parameters.

Model N_1

If $GRSINC < X_0$ $GRSCOST = B \cdot (GRSINC)^A$

If $X \geq X_0$ $GRSCOST = B \cdot (GRSINC)^A \cdot (\dfrac{GRSINC}{X_0})^C$ .8.4

Where $GRSINC$ = Gross Income
$GRSCOST$ = Gross Housing Cost

Model N_2

If $NETINC < X_0$ $NETCOST = B \cdot (NETINC)^A$

If $X \geq X_0$ $NETCOST = B \cdot (NETINC)^A \cdot (\dfrac{NETINC}{X_0})^C$ 8.5

Where $NETINC$ = Net Income
$NETCOST$ = Net Housing Cost

Results of the parameter estimation of the NLR models, Model N_1 (equation 8.4) and Model N_2 (equation 8.5) with reference respectively to gross and net housing cost in relation to their corresponding income definitions are presented in table 8.3. The two models can converge and confidence intervals of all the parameters can be estimated (i.e. all parameters were significant at 5% confidence level).

Table 8.3 Non-linear Regression: Housing Cost by Income

Model	Model N_1	Model N_2
Dependent Variable	Gross Housing Cost	Net Housing Cost
Explanatory Variable	Gross Income	Net Income
A	6.07*	0.56*
B	0.42*	0.87*
C	0.20*	-0.19*
X_0	335	196
Ratio at X_0	20.6%	27.6%
R Square About Mean	0.30	0.38

Note: * $p < 0.05$ N = 4272 X_0 Inflection Point
Source: Analysis of FES 1991

The inflection point for Model N_1 was located where gross income equals £334 per week with a corresponding gross housing cost of £69 per week whilst the corresponding figures for Model N_2 were £196 per week and £54 per week. Figure 8.7 shows the predicted values of housing cost in relation to household income. It can be seen that gross cost rose more rapidly than net cost before the inflection point was reached, whilst beyond the inflection point, it was net income that rose more quickly. This description seems to match what would happen in a real situation. Because housing benefit helps mainly the poor, it thus assists in boosting the gross housing cost of poor households relative to gross income but has little effect on net housing cost or net income until housing benefit begins to be withdrawn.

Under a progressive tax system, the higher the income level, the greater the difference between gross income and net income. Wealthier households with income beyond the inflection point should not be benefiting from housing benefit and thus their gross and net housing costs should be the same. For such households, with a reduced net income, net housing costs would appear to be increasing faster, relative to net income, than the increase of gross housing cost relative to gross income.

Figure 8.7 Predicted values: NLR analysis of Gross and Net Housing Cost
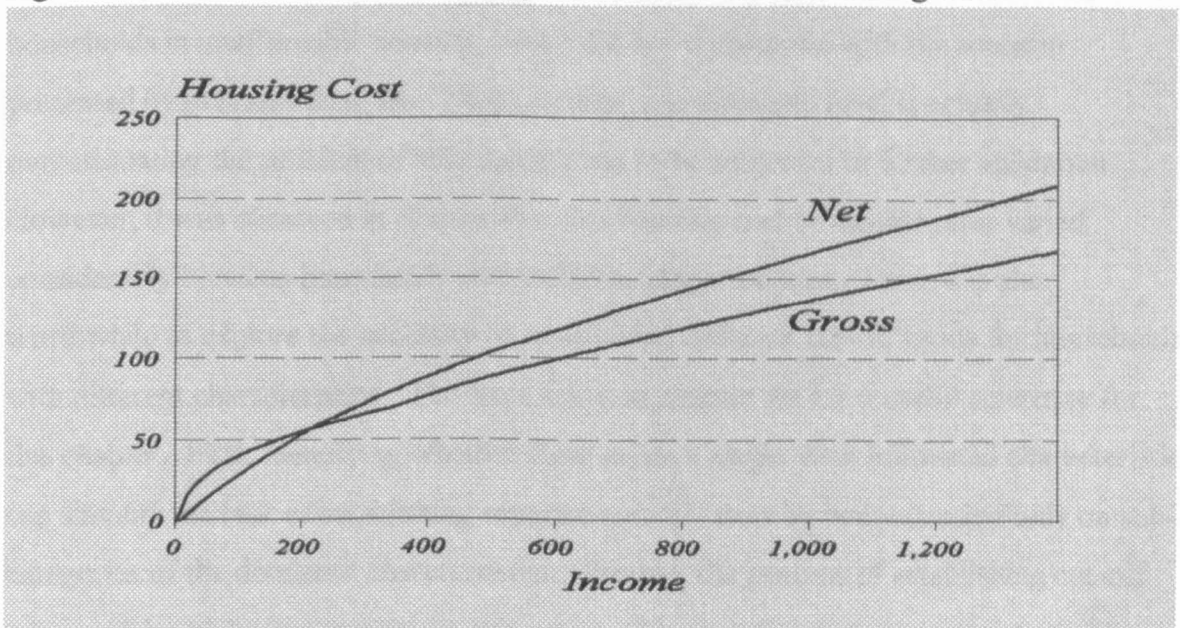
Source: Analysis of FES 1991

To keep in line with current debates on affordability, it is more appropriate to express the threshold value in terms of a housing cost to income ratio. It is fixed as the housing

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cost to income ratio at the inflection points. Hence, the cut-off gross housing cost to income ratio was 20.6% and the net ratio 27.6%. The level of these two cut-off ratios seems to be counter-intuitive, nor did they match with results of previous analysis. First, all previous analysis showed that the level of gross ratio for a household was in general higher than the net ratio, but in this analysis, the cut-off for gross ratio is lower than the net ratio. Second, these cut-off ratios would have included more households in unaffordable housing than is regarded as reasonable.

Twenty nine percent of households were classified as being in unaffordable housing when assessed by residual income measurement in chapter six whilst in chapter seven, 25% of households were deemed to be in unaffordable housing with reference to their gross housing cost to income ratio and the threshold ratio established by the composite ratio measurement. In this chapter the threshold ratios established by the behavioural approach would put over half (54%) of the households in unaffordable housing, if measured by their gross ratio. The corresponding figure for net ratio was at the lower level of 35%. If half of all households were in unaffordable housing, the level of public concern should have been high.

Apparently, these two threshold ratios were considered to have included too many households in unaffordable housing, which did not correspond with the scenario presented by previous analyses. Thus, whether this threshold level is actually overestimating the problem of affordability has to be subjected to further validation. However, it was observed in chapter five that housing cost to income ratio varied considerably between households with different characteristics. Thus, it is also worthwhile to explore the necessity of establishing different cut-off ratios for households with different characteristics. The steps taken in chapter six are a useful reference for this chapter. First, identifying whether there exists a single most influential characteristic can simplify the task of establishing separate cut-off ratios by concentrating only on sub-categories of the dominant characteristics. Second, the process of establishing cut-off ratios will be replicated among the sub-group with the influential characteristics, The final set of cut-off ratios will then depend on the results of these steps.

8.7 HOUSING COST AND INCOME: MULTIVARIATE REGRESSION ANALYSIS

To examine the relative effect of the socio-economic characteristics on housing cost, it is necessary to conduct a multivariate regression analysis. However, evaluating a NLR model involving many parameters is a painstaking process because of the complexity involved in fixing and fine-tuning the initial value of the parameters. To simplify the investigation, the "linearised" model was used for the multivariate regression analysis.

In section 8.5, the double log models were those with the highest explanatory power as well as with the least violation of OLS assumptions; this functional form was also used in the multivariate analysis. Models were constructed using OLS method and the stepwise procedure was used for model selection with the criterion of inclusion at 0.05 and exclusion at 0.1. Parameters of the two models, relating respectively gross and net housing cost with their corresponding income definitions and the selective socio-economic characteristics, are presented in table 8.4.

Household income, tenure, region, housing benefit, employment status of head of household, age of head of household, household size and dependent children were all significant determinants of housing cost. Type of household was significant in determining net housing cost but was insignificant for gross cost.

Although housing cost relate to an array of household and housing characteristics, income was by far the most influential. Gross income alone could account for over one third of the variation in the data whilst the rest of the characteristics in the model could only improve the explanatory power of the model by another ten percent. The contribution of net income was even more dominating. It alone accounted for over half of the variation in the model whilst the rest of the significant factors only accounted for a further nine percent. This indicates that the contribution of the other characteristics was limited.

Next to income, tenure was the most important variable in the determination of gross housing cost; however, regarding net housing cost housing benefit was more important.

Nevertheless, tenure was the third most influential factor for net housing cost. Age of the head of household, household size and the numbers of dependent children were also important for both models. This suggests that both the effect of life cycle and household composition are important to housing cost. On the contrary, type of household was insignificant for gross housing cost. This is because other factors, such as household composition, represent variation of household type. Type of household was significant in net housing cost, probably because of the large contrast between the net cost of housing for lone parents compared with other types of household.

Employment status of head of household was significant in both models, but the influence was larger for gross housing cost than for net cost. This is in part because of the relatively influential effect of housing benefit which could represent variations in employment status.

Regional variation was only marginally significant in both models. Its effect was particularly weak for net housing cost because housing benefit had already levelled out many of the differences in housing cost between regions.

Table 8.4 Multivariate Regression: Housing Cost by Income and Socio-economic characteristics

Dependent Variable	Gross Housing Cost	Net Housing Cost
Parameter	Beta	Beta
Income (Gross/Net) (Log)	0.54**	0.50**
Tenure		
Local Authority Tenants	-0.23**	-0.11**
Housing Association Tenants	-0.10**	-0.05**
Private Tenants (Unfurnished)	-0.09**	-0.04**
Private Tenants (Furnished)	-0.06**	-0.05**
Mortgagors	0.00r	0.00r
Region		
North	-0.05**	elim
Yorkshire and Humberside	-0.03**	elim
North West	-0.04**	elim
East Midlands	elim	elim
West Midlands	elim	elim
East Anglia	elim	elim
London	0.10**	0.07**
South East	0.09**	0.08**
South West	0.00r	0.00r
Household Type		
married Couple	elim	elim
Single Person	elim	0.03*
Lone Parent	elim	-0.05**

Table 8.4 Multivariate Regression: Housing Cost by Income and Socio-economic characteristics

Dependent Variable	Gross Housing Cost	Net Housing Cost
Others	elim	0.00r
Size of Household	-0.07*	-0.10**
Employment Status		
Full Time	-0.08**	0.04**
Part Time	-0.03*	elim
Unemployed/Retired	0.00r	0.00r
Age of HoH		
Under 30	0.14**	0.08**
30 - 39	0.16**	0.08**
40 - 49	0.05*	elim
50 - 59	-0.04*	-0.06**
60 and Over	0.00r	0.00r
Child 0 - 4	0.05**	0.04*
child 5 - 15	0.04**	0.04*
Housing Benefit Claimant	-0.15**	-0.21**
Adjusted R Square	0.44	0.64
F Statistics	168**	443**

Note: Beta (Standardised Regression Coefficient) ** $p<0.01$ * $p<0.05$ r (reference group) elim (eliminated)
Source: Analysis of FES 1991

In order to contrast the results with those of Maclennan and colleagues (1990), the multivariate models were applied to tenure groups; results of the analysis are presented in tables 8.5 and 8.6. When these two models were applied to different tenure groups, there were fewer significant variables in the submodels for tenure groups than for the whole sample. The number of significant variables also decreased with the size of the subsample. There were nearly equal numbers of significant factors for mortgagees compared with the whole sample, but among housing association tenants there were only two significant factors. Because the number of significant factors were greatly reduced in the submodel for housing association tenants, the level of R square was also lower.

The smaller sample size and fewer significant variables were not unrelated. Forced entry of all variables indicates that there were a number of unselected variables (which failed to reach the criteria of inclusion or exclusion) with magnitude of the regression coefficient comparable to the selected variable. But at the same time, they had a larger standard error and were therefore excluded from the model selected by the stepwise method. Since standard error increases as the size of the sample decreases, more variables in models of smaller samples would be more likely to fail the inclusion test.

Table 8.5 Multivariate Regression: Gross Housing Cost by Gross Income and Socio-economic Characteristics by Tenure

Dependent Variable	Gross Housing Cost				
Tenure / Beta	LA	HA	PRSU	PRSF	MORTG
Gross Income (Log)	0.41**	elim	0.39**	0.54**	0.41**
Region					
North	elim	elim	-0.14*	elim	-0.06**
Yorkshire and Humberside	elim	elim	elim	elim	-0.05**
North West	elim	elim	elim	elim	0.04*
East Midlands	elim	elim	elim	elim	elim
West Midlands	0.06*	elim	elim	elim	elim
East Anglia	elim	elim	elim	elim	elim
London	0.23**	elim	elim	-0.17**	0.11**
South East	0.14**	elim	elim	elim	0.12**
South West	r	r	r	r	r
Household Type					
married Couple	elim	elim	elim	-0.17*	elim
Single Person	elim	elim	elim	-0.34**	elim
Lone Parent	0.13**	elim	elim	elim	elim
Others	r	r	r	r	r
Size of Household	0.19**	0.25**	elim	elim	
Employment Status					
Full Time	elim	elim	elim	elim	-0.06**
Part Time	elim	elim	elim	elim	elim
Unemployed/Retired	r	r	r	r	r
Age of HoH					
Under 30	-0.09**	elim	0.24**	elim	0.29**
30 - 39	-0.06**	elim	0.21**	elim	0.29**
40 - 49	elim	elim	elim	elim	0.14**
50 - 59	elim	elim	elim	elim	elim
60 and Over	r	r	r	r	r
Child 0 - 4	elim	elim	elim	elim	0.06**
child 5 - 15	elim	0.25**	elim	elim	elim
Housing Benefit Claimant	0.18**	elim	0.19*	0.22**	elim
Adjusted R Square	0.31	0.19	0.24	0.52	0.31
F Statistics	57**	20**	14**	43**	105**

Note: Beta (Standardised Regression Coefficient) ** $p < 0.01$ * $p < 0.05$ r (reference group) elim (eliminated) LA (Local Authority) HA (Housing Association) PRSU (Private Renting Unfurnished) PRSF (Private Renting Furnished) MORTG (Mortgagor)
Source: Analysis of FES 1991

Table 8.6 Multivariate Regression: Net Housing Cost by Net Income and Socio-economic Characteristics by Tenure

Dependent Variable	Net Housing Cost				
Tenure/Beta	LA	HA	PRSU	PRSF	MORTG
Net Income (Log)	0.36**	0.27**	0.42**	0.66**	0.48**
Region					
North	elim	elim	-0.16**	elim	-0.37*
Yorkshire and Humberside	elim	elim	elim	elim	elim
North West	elim	elim	elim	elim	elim
East Midlands	elim	elim	elim	elim	elim
West Midlands	elim	elim	elim	elim	elim
East Anglia	elim	elim	elim	elim	elim

Table 8.6 Multivariate Regression: Net Housing Cost by Net Income and Socio-economic Characteristics by Tenure

Dependent Variable	Net Housing Cost				
Tenure/Beta	LA	HA	PRSU	PRSF	MORTG
London	0.07**	elim	elim	elim	0.11**
South East	0.07**	elim	elim	elim	0.13**
South West	elim	elim	elim	elim	elim
Household Type					
married Couple	elim	elim	elim	elim	elim
Single Person	-0.13**	elim	elim	elim	elim
Lone Parent	elim	elim	elim	0.11*	-0.6**
Others	elim	elim	elim	elim	elim
Size of Household	elim	elim	elim	elim	-0.15**
Employment Status					
Full Time	elim	elim	elim	elim	elim
Part Time	elim	elim	elim	elim	elim
Unemployed/Retired	elim	elim	elim	elim	elim
Age of HoH					
Under 30	-0.04*	elim	elim	elim	0.25**
30 - 39	-0.05**	elim	elim	elim	0.25**
40 - 49	elim	elim	elim	elim	0.11**
50 - 59	elim	elim	elim	elim	elim
60 and Over	elim	elim	elim	elim	elim
Child 0 - 4	elim	elim	elim	elim	0.10**
child 5 - 15	elim	elim	elim	elim	0.09**
Housing Benefit Claimant	-0.44**	-0.53**	-0.34**	-0.27**	elim
Adjusted R Square	0.62	0.53	0.50	0.65	0.36
F Statistics	265**	95**	68**	123**	122**

Note: Beta (Standardised Regression Coefficient) ** $p<0.01$ * $p<0.05$ r (reference group) elim (eliminated) LA (Local Authority)
HA (Housing Association) PRSU (Private Renting Unfurnished) PRSF (Private Renting Furnished) MORTG (Mortgagor)
Source: Analysis of FES 1991

Nevertheless, there is still valuable information that can be drawn from the sub-models. First, it is interesting to observe that neither gross income nor housing benefit were significant in determining the gross housing cost of housing association tenants. On the contrary, household size and presence of school age children were the only important factors. The explanatory power of this model was so small that these two factors were of no help in explaining the variation of gross housing cost among housing association tenants.

Second, housing benefit was a more important factor than net income in the determination of net housing cost amongst tenants. It is a reiteration of the importance of the housing benefit system in this sector. In fact, this influence was particularly strong among housing association tenants and tenants who rented unfurnished

accommodation from a private landlord. Among housing association tenants, housing benefit was the only other factor which was significant in the determination of net housing cost beside net income. Yet, it does not mean that housing association tenants were very special compared with tenants in other sectors, because the other significant factors in the models involving other tenants had a relatively small influence. The exceptions were single person households among local authority tenants, the north region for private tenants in the unfurnished sector and lone parent households for private tenants in the furnished sector. These factors had a relatively stronger influence albeit they were not comparable with the influence of housing benefit.

Moreover, the analysis conducted in this section contrasted with the regression models investigated by Maclennan and colleagues (1990) and supports the comment made in section 8.2 on Maclennan's models. First, it was confirmed that housing benefit is a strong determinant of housing cost. Arrival at this conclusion is only possible if housing benefit is one of the explanatory variables. Even if housing benefit is a relatively more significant determinant, other socio-economic factors can still account for some of the variation. Thus it is difficult to separate out the effects of housing benefit and socio-economic factors per se. It is thus premature to judge from the influence of socio-economic factors alone, as was the case in Maclennan's model, on the importance of housing benefit.

Second, tenure was established as being the most influential factor besides income. However, the contribution of a particular variable in a regression model can only be conditional upon the presence of other variables. It was demonstrated that when similar variables were applied to separate tenure groups the results can vary enormously. In fact, nothing relating to the contribution of tenure can be derived from information from submodels in different tenure groups because tenure has not been compared with the other variables in the regression models. Therefore its effect relative to other variables is unknown.

Third, the relation of income and housing cost was demonstrated as being non linear. Therefore, the linear models constructed by Maclennan and colleagues (1990) may not have been a correct description of the relationship. Therefore they could have suffered

from the problem of heteroscedasticity. Meanwhile, the increased explanatory power of the double log models analyzed in this chapter, together with the absence of OLS assumption violation in such models, provide indirect evidence of a lack of fit of their linear models. Compared with the results of Maclennan's linear models, the explanatory power of the double log models in this chapter could explain more than two thirds of the variation of net housing cost, which is a good model when contrasted with the poor fit by Maclennan and colleagues (1990).

8.8 CUT-OFF RATIO BY SOCIO-ECONOMIC CHARACTERISTICS

Multivariate analysis in the preceding section showed that there was no single characteristic, apart from income, which was more influential than any other in determining housing cost in both models. Tenure was more important in determining gross housing cost, but housing benefit was more important for net housing cost.

In the absence of a single significant variable, and proceeding with the analysis with caution, it is appropriate to explore the cut-off ratios for each of the important socio-economic characteristics. Non-linear regression models were constructed for a sub-sample of households with different characteristics using the same method as described earlier in this section and the parameters of the models were presented in tables 8.7 and 8.8. One noticeable feature is that the majority of models fail to establish significant values for all the parameters. Although it is common in regression analysis for one or more parameters in a model to fail to establish a value significantly different from zero, the model can still be valid with the remaining significant parameters. A similar situation in non-linear regression, especially regarding the models in this section, creates confusion.

Table 8.7 Non-linear Regression: Housing Cost by Income by socio-economic Characteristics (Model N_1)

Dependent Variable: Gross Housing Cost			Independent variable: Gross Income		
Parameter	A	B	C	X_0	Ratio %
All households	6.1*	0.4*	0.2*	335*	20.6
Tenure					
Local Authority Tenants	1.6ns	0.7*	-0.6*	96*	na
Housing Association Tenants	10.5*	0.3*	-0.3*	177*	28.4
Private Tenants (Unfurnished)	6.2*	0.4*	-2.0ns	520*	na
Private Tenants (Furnished)	7.0ns	0.4*	0.3*	355*	na
Mortgagors	6.6*	0.4*	0.2*	581*	16.5
Age of Householder					
Under 30	5.2*	0.5*	0.04ns	164ns	na
30 - 39	6.5*	0.4*	0.3*	342*	19.7
40 - 49	4.4*	0.5*	2.0*	1543*	9.1
50 - 59	8.0*	0.4*	0.3*	586*	15.5
60 and Over	16ns	0.3ns	0.3ns	288ns	na
Housing Benefit					
Claimants	1.4ns	0.6*	0.2*	92*	na
Non-claimants	5.6*	0.3*	0.2*	460*	17.2

Note: * $p<0.05$ ns Not Significant na Not Applicable Source:Analysis of FES 1991

Table 8.8 Non-linear Regression: Housing Cost by Income by socio-economic Characteristics (Model N_2)

Dependent Variable: Net Housing Cost			Independent variable: Net Income		
Parameter	A	B	C	X_0	Ratio %
All households	0.6	0.9	-0.2	196	27.6
Tenure					
Local Authority Tenants	0.7*	0.8*	-0.58	181*	22.6
Housing Association Tenants	2.1*	0.6*	-1.0ns	427*	na
Private Tenants (Unfurnished)	0.7ns	0.9*	-0.3ns	123ns	na
Private Tenants (Furnished)	1.0ns	0.8*	0.03ns	190ns	na
Mortgagors	4.7ns	0.5ns	0.2ns	67ns	na
Age of Householder					
Under 30	0.6*	0.9*	-2*	564*	25.9
30 - 39	0.4ns	0.9*	-0.2ns	207*	na
40 - 49	2.2*	0.6*	1.1*	988*	13.9
50 - 59	0.2ns	1.1*	-0.4ns	196*	na
609 and Over	0.7ns	0.8*	-0.4*	753*	na
Housing benefit					
Claimants	0.7*	0.7*	-0.6*	188*	24.2
Non-claimants	4.5ns	0.7ns	0.2ns	67ns	na

Note: * $p<0.05$ ns Not Significant na Not Applicable
Source: Analysis of FES 1991

First, parameters in NLR are evaluated by the iteration alogarithm. A parameter is said to have been established only if successive iterations converge within a range preset by the investigator. Thus, a value for a parameter cannot be established if fail to converge. Such non-convergence may only relate to inadequacy in the iteration process.

Second, all parameters in these NLR models were closely linked with each other and if one was established as zero, the model would collapse. For example, if the parameter A is zero, the expected value of the whole model would be zero. Meanwhile, if C was zero then the presence of a two phase model would be overturned and X_0 should simultaneously be zero. Conversely, the same situation would apply to C if X_0 was zero.

Third, the failure to establish significant parameters might reflect the inadequacy of the assessment procedure used. The confidence level was evaluated with the asymptotic method which relies on a large sample. Small sample size would jeopardise the accuracy of estimation. Another method, the bootstrap method, was used to increase the accuracy of estimation. This generates a large number of random sub-samples so that the evaluation of the confidence levels can be evaluated numerically. However, it demands considerably more computer time, and so is constrained by both the time and the resources allowed by the research.

In addition, successful evaluation of a significant parameter relates to the quality of the initial values supplied. This quality can be improved by a more systematic experimentation, although this is a time consuming task. Limitation of time and computer resources made this tedious task prohibitively costly. The majority of models failed to establish a significant cut-off ratio, therefore the use of the ratios of the remaining models as reference ratios is not practicable.

8.9 SUMMARY AND CONCLUSIONS

A behavioural approach to affordability is a viable alternative to the commonly used normative approach which has dominated the measurement of affordability since the concept was developed. The normative approach, although it is alleged to be authoritative, has not been developed on a scientific basis. The use of a behavioural measurement approach may not possess similar status to the normative approach, but it can provide an independent validation of the threshold affordability level established by the normative approach.

Investigation of affordability from the behavioural perspective, generally, can be approached along two lines. The first approach is to look at the actual spending of a household on housing and to relate this spending level to income and other household socio-economic characteristics. Alternatively, households having difficulty in paying for housing or experiencing financial stress can also be regarded as indicators of unaffordability.

There are a number of empirical studies following similar lines of investigation but none make specific reference to the fixing of non-arbitrary threshold affordability levels. Without prior experience in the attempt to fix affordability levels from a behavioural perspective, it is essential to seek help from examples of a similar discipline. The S-curve technique in the poverty literature is regarded as an appropriate example, albeit it has shortcomings such as the lack of strong theoretical backing and technical sophistication to provide confirmative results.

In adopting this technique in the investigation of the threshold level of affordability, the variation of housing among households was examined in relation to household income. The inflection point in such a relationship, which indicates a qualitative change of expenditure pattern, was regarded as the threshold affordability level. It was then converted to housing cost to income ratio to render it in line with current affordability debates.

Technically, in using this S-curve method, one improvement has been made. Instead of assessing the inflection by the crude and over-simplified pencil and paper method, the inflection point was determined by the non-linear regression technique on a fast computer. Unlike the use of aggregate data in previous attempts, it does not only make use of all the information in the data, but can also provide a statistical estimation of the degree of accuracy of the threshold level. The process was technically complicated and required the facilitation of other graphic and statistical procedures.

Unfortunately, the threshold values evaluated were unsatisfactory. The threshold housing cost to income ratio was so low that it consequently included the majority of households in unaffordable housing, which is regarded as unreasonable. In addition, the

threshold gross ratio was at a level lower than the net threshold ratio which contrasted with empirical evidence presented in earlier chapters, and poses difficulties in the interpretation of the results. Furthermore, the analysis in chapter seven has demonstrated the necessity of establishing different ratios for households with various socio-economic characteristics; a similar attempt was also conducted in this chapter.

Despite the results in multivariate analysis which indicated that the influence of other socio-economic characteristics was significant to housing cost, their magnitude was not comparable to that of income. Meanwhile, the attempt to establish threshold ratios for different socio-economic characteristics was unsuccessful. This failure does not immediately warrant the dismissal of the S-curve method in affordability measurement, but may simply reflect the lack of time and computer resources to achieve the sophistication such methods require.

Notwithstanding the unsuccessful empirical experimentation, it nevertheless has merit. First, it demonstrates a methodologically more sophisticated procedure in the investigation of threshold affordability ratio. Experience has been gained in this attempt, together with improvements in computational technique. It warrants another attempt. Second, the analysis in this chapter has revealed the shortcomings of an earlier empirical analysis by Maclennan and colleagues (1990) and helps to improve future similar investigations.

CHAPTER 9
THE INCIDENCE OF UNAFFORDABILITY

9.1 INTRODUCTION

In the preceding three chapters, the residual income measurement, the composite measurement and the behavioural approach to measuring affordability have been examined, with varied success, in establishing thresholds for affordability. These approaches produce different classification schemes in classifying affordability. This chapter will provide a summary of these schemes as well as comparing and contrasting the results produced by the schemes. Once the measurement schemes are established, several issues around housing affordability can be examined. It was found in previous chapters that affordability had a strong association with tenure, employment status and housing benefit, as well as an apparent relationship with life cycle effect. Whilst analysis in the previous chapter could only reflect individual components of such effects, this chapter is able to provide a more holistic analysis at the multivariate level. Logit modelling and categorical principal component analysis will be employed in this analysis.

Housing consumption pattern is also believed to be affected by affordability. The burden exerted by high housing costs among households in unaffordable housing could have an undesirable effect on their other consumption. This chapter will use principal component analysis and logistic regression to examine the relationship between household expenditure and housing affordability.

Finally, it is argued that housing quality should be an important component in affordability measurement. Whilst previous discussion on the measurement issue deliberately ignored this aspect in order to make the development of measurement instruments less complicated, this chapter will examine the relationship between the quality of housing occupied and housing affordability in the light of the measurement schemes which were established in the preceding chapters. An attempt is made to examine the role of quality of housing in the measurement of affordability.

9.2 INCIDENCE OF UNAFFORDABILITY: A GENERAL PROFILE

Three different approaches to measuring housing affordability have been examined in preceding chapters, although not all were capable of successfully determining threshold affordability values. Chapter six employed the residual income measurement, which is a normative approach, to assess the affordability of a household. Three models of residual income measurement were developed: Model R_1 using 140% of Income Support level as the reference poverty line; Model R_2, using half of average equivalised residual income as the poverty line, and Model R_3, a modified version of residual income measurement in which poverty was differentiated from housing unaffordability.

In chapter seven, a composite approach to affordability was used which combined the ratio measurement with the residual income measurement to fix the threshold affordability ratio. It was found that only gross housing cost to income ratio was appropriate as an instrument of affordability measurement in this context, where separate threshold ratios had to be set for different tenures. This will be referred to as Model T. A summary of these four classification schemes is presented in table 9.1.

Chapter eight demonstrated experimenting with a behavioural approach to affordability measurement, employing the S-curve technique to determine the threshold affordability ratio. However, after extensive and laborious manipulation of the data, no reliable threshold ratios could be established. Despite this failure, this approach still remains a powerful instrument of investigation, given that the resources spent on this computational-intensive procedure could be increased.

Table 9.1 Classification Schemes of Housing Affordability

Scheme T	Gross housing cost to income ratio higher than the cut off ratio in the corresponding tenure group established by the composite method				
	LA	HA	PRS-Unf	PRS-Fur	Mortgagor
	27%	29%	32.5%	41.5%	45%
Scheme R_1	Residual income less than 140% of the income support entitlement relevant to the given household				
Scheme R_2	Equivalised residual income lower than half the national average				
Scheme R_3	Equivalised Income before housing cost higher that half the national average but equivalised income after housing cost lower then half the national average				

Note: LA (Local Authority Tenants) HA (Housing Association Tenants) PRS-Unf (Private Rented Unfurnished) PRS-Fur (Private Rented Furnished)

Although the successful implementations were based on different assumptions and strategies, they show a high degree of agreement in classification. It was demonstrated in chapter six that Scheme R_1 and Scheme R_2 already had a high degree of concordance at 97%. The degree of agreement between these schemes and Scheme T was also high. Scheme T agreed with either Scheme R_1 or R_2 in 90% of classifications.

However, the schemes agreed with each other more in the "affordable" groups than in the "unaffordable" groups. Whilst the highest agreement of classification in the "affordable" group was 98% (between R_1 and R_2), agreement in the "unaffordable" group was at the more moderate level of 76% (between Schemes T and R_1). Nevertheless, around 7% of households regarded as affordable by Scheme T were considered unaffordable by either Scheme R_1 or R_2, both being residual income measurements. Conversely, around 4% of households classified as unaffordable by the ratio measurement were classified as affordable by the residual income measurement. A Kapper test (Refer to Appendix A4 for technical details of the kappa test), indicated that this agreement was statistically significant (table 9.2).

Table 9.2 Agreement of Affordability Measurements

% of Households		Scheme T		Scheme R_1		Scheme R_2	
		Aff	Unaff	Aff	Unaff	Aff	Unaff
Scheme T	Aff	75	--	68	7	69	6
	Unaff	--	25	3	22	4	21
	Concordance	100%		90		90	
	Kappa	--		0.76		0.74	
	t value	--		49.9		48.8	
Scheme R_1	Aff	68	3	71	--	70	1
	Unaff	7	22	--	29	3	27
	Concordance	90		100		97	
	Kappa	0.76		--		0.91	
	t value	49.9		na		79.8	
Scheme R_3	Aff	69	4	70	3	73	0
	Unclassified	0.3	0.1	0.2	0	0.3	0
	Unaff	3	8	.7	11	0	11
	Poverty	3	13	0.1	16	0	16

Note : Aff (Affordable) Unaff (Unaffordable) -- (Not Applicable)

As revealed in chapter three, Hancock (1993) argued that there could be an anomaly in the measurement of housing cost to income ratio where households whose housing cost to income ratio was high could, by definition, be in unaffordable housing. These households could, at the same time, still have more resources after housing expenditure

than their counterparts who were considered to be in affordable housing. Evidence from the analysis in this section supports the existence of this, but the degree of such an anomaly was not high. Only 4% of households regarded as being in unaffordable housing by the ratio measurement were considered affordable by the residual income measurement. Thus, although by definition such an anomaly could exist, in reality such an anomaly was not more serious than the discrepancy between different residual income measurements based on different poverty lines. Hence, the validity of ratio measurement should not be undermined by this low level of anomaly but rather it may represent only the discrepancy between different affordability measurements.

Scheme T showed a high degree of agreement between schemes R_1 and R_2 and, like these two later schemes, demonstrated a similar discrepancy to the modified residual income measurement scheme R_3. Only 8% of households classified as being in unaffordable housing by scheme T were in unaffordable housing under scheme R_3 while the majority (14%) were reclassified as being in poverty. If scheme R_3 was used as a yardstick, scheme T was unable to differentiate successfully between households which were unaffordable because of high housing cost from households which were unaffordable because of poverty. The proportion of households reclassified as in poverty in scheme T was similar to the proportions in scheme R_1 and scheme R_2.

Not only did the overall classification for schemes T, R_1 and R_2 match with each other, but the distribution of socio-economic characteristics of households classified as "unaffordable" by these three schemes were also similar. Social tenants, private tenants in the unfurnished rented sector, lone parents, single people, households with no dependent children, elderly people and households with unemployed or retired householders and housing benefit claimants were over-represented in the "unaffordable" group under schemes T, R_1 and R_2; whilst home owners, married couple households, households with more than one person, middle aged householders, households with a working householder, those with school age children and non-claimants were under-represented.

There was a difference in the regional distribution of unaffordability between the ratio measurement and the residual income measurement where households living in the

northern regions were in general more likely to be in unaffordable housing than households living in the south of the country, yet the regional difference was very small.

The South East and London were the exceptions. Households living in the South East would have a very much lower chance of being in unaffordable housing, measured by schemes T, R_1 and R_2, than the average. London, conversely, had considerably more households in unaffordable housing, measured by the housing cost to income ratio, though the level of households in unaffordable housing as measured by residual income was only about average. This reflects the situation of high housing cost in London where the wealthier households spend considerably more on housing, and thus had a high average housing cost to income ratio. Yet, these households had a higher amount of residual income left because of the more favourable initial financial situation. Conversely, the proportion of households which were claiming housing benefit in London were slightly higher than the national average, which also explains the slightly higher than average level of households in unaffordable housing in London under the residual income measurement.

It is also noteworthy that one of the largest differences between households was the characteristic regarding households which were on housing benefit and those which were not. This pattern was consistent in all four measurement schemes T, R_1, R_2 and R_3. Housing benefit should have been so designed that claimants on full housing benefit were protected from the burden of high housing costs, yet the above evidence suggests that it did not offer the protection it should have provided. In addition, other household characteristics are associated closely with unaffordability: social tenants, unemployment, lone parents and the single elderly are closely linked with the characteristic of claiming housing benefit (table 9.3).

This suggests the inadequacy of housing benefit in the protection of claimants from high housing cost and the failure to achieve one of its intended goals. Yet several arguments should be considered before reaching a definite conclusion.

First, the definition of housing cost used in this thesis includes not only rent and mortgage interest payments but other related costs such as repair and maintenance,

because housing benefit only guaranteed claimants a minimum level of income after housing cost to the applicable amount (in most cases, the income support level) which was less than the poverty line used in scheme R_1.

Third, housing benefit is an endogenous variable in relation to the household's socio-economic variables that were considered in this section. Other household characteristics such as social tenants, unemployment, lone parents and the single elderly, which are typical attributes of housing benefit claimants, were also significantly related to housing unaffordability. In another word, housing benefit was acting only as a proxy to income and other household socio-economic characteristics, upon which determine the eligibility of housing benefit claiming rather than housing benefit being an attributing factor to housing affordability.

Yet there was a consistent pattern of inadequate protection of housing benefit against unaffordability demonstrated in alternative affordability measurements: the ratio measurement in Scheme T and the use of half average household income as the poverty line in Scheme R_2, provide support for such inadequacy to be real. There are several explanations for such inadequacy. First, it is only tenants who have full protection from high housing cost; home owners could only get support from social security if they were on income support, thus excluding home owners who are in employment. At the same time, only part of the housing cost is supported during the first sixteen weeks for new claimants on income support. Consequently, many home owners have to pay their housing cost, unsupported by social security, from other income sources and this reduces their level of residual income.

Third, the problem of non-take-up contributes to this situation. Although a thorough analysis of take-up based on the FES is possible, it is not pursued in this thesis because of its complexity and the constraint of time. A preliminary analysis shows evidence of take-up as a problem. Among non-claimants who experienced unaffordable housing about a third had an income below the income support level, and the majority of this group were public or private tenants. Thus, around a fifth of households which were experiencing an unaffordability problem did not take up housing benefit for which they might be eligible.

The latter two factors relates to the functioning of the housing benefit system. Whether they are variables being able to offer distinct explanation of the incidence of unaffordability or whether the presence of the exogenous variables (the other socio-economic variables that determine housing benefit claiming) is enough to represent the effect of housing benefit needs further exploration.

Table 9.3 Incidence of Unaffordability by Socio-Economic Characteristics by Classification Schemes

% of Household	Sch T	Sch R₁	Sch R₂	Scheme R₃	
	Unaff	Unaff	Unaff	Poverty	Unaff
All	25	29	28	16	11
Tenure					
Local Authority	58	63	58	39	19
Housing Association	56	60	52	36	17
Private Rented (Unfurnished)	43	45	40	22	18
Private Rented (Furnished)	25	30	29	12	17
Owned With Mortgage	7	11	11	4	7
Region					
North	31	36	32	23	9
Yorks & Humberside	28	35	32	22	10
North West	26	33	30	20	11
East Midland	24	30	29	17	12
West Midlands	30	36	35	23	12
East Anglia	20	26	25	15	10
London	29	30	30	15	15
South East	18	20	19	8	10
South West	23	27	24	12	12
Household Type					
Married Couples	12	18	18	10	7
Single Person	53	51	47	25	22
Lone Parent	67	74	69	50	19
Others	19	27	23	17	8
Household Size					
1 Person	53	51	47	25	22
2 Persons	22	25	23	15	8
3 persons	14	20	18	12	7
4 Persons	11	20	19	11	8
More than 5 Persons	12	27	28	20	9
Age of Head of Household					
Less 30	25	27	26	16	11
30 - 39	14	19	19	11	8
40 - 49	10	14	15	8	7
50 - 59	19	21	21	14	7
Over 60	57	64	55	32	23
Employment Status of Head of Household and Partner					
Both Full Time	4	4	4	1	3
Hoh FT wife PT	4	6	7	1	5
Hoh FT Wife Unocc	9	14	14	5	10
Hoh PT Wife FT	28	30	30	23	17
Hoh PT Wife PT/Unocc	38	40	36	17	18
Hoh Unocc Wife FT/PT	60	66	61	38	23
Both Unoccupied	61	72	65	46	20

Table 9.3 Incidence of Unaffordability by Socio-Economic Characteristics by Classification Schemes

% of Household	Sch T	Sch R₁	Sch R₂	Scheme R₃	
	Unaff	Unaff	Unaff	Poverty	Unaff
Dependent Children					
No Dependent Child	28	31	28	12	16
Children Aged Under 5 No Child Aged 5-15	25	32	27	12	15
No Child Under 5 Children 5-15	16	24	24	8	16
Children Under 5 And Aged 5-15	17	32	33	13	19
Housing Benefit					
Claimants	75	82	78	24	54
Non-claimants	10	14	13	8	5

Note : Refer to Appendix 3 for abbreviations
Source: Analysis of FES 1991

Most of the socio-economic characteristics, when considered individually, show some degree of association with the state of unaffordability, but they only represent isolated pictures of the relationship. To determine which household socio-economic or housing characteristics were more important in connection with housing affordability is not an easy task since the majority of the socio-economic characteristics are inter-related: for example, the unemployed and those on benefit were concentrated in the social rented sector, and elderly people were likely to be living alone. It is, therefore, not possible to isolate the relative importance of each characteristic and consider it individually. The next section examines the inter-relationship between socio-economic characteristics and affordability. Because the dependent variables, housing affordability, and many of the socio-economic characteristics are qualitative variables, a limit is placed on the choice of analytic tools. The particular analytic procedure selected, loglinear modelling, in turn sets a limit to the number of variables that can be involved. Thus, not all relevant characteristics can be investigated simultaneously in a single model. Subsequent analysis will focus on two issues around affordability and household socio-economic characteristics: first, between affordability, housing benefit, tenure and the employment status of the head of household; second, the effect of the life cycle on affordability.

9.3 AFFORDABILITY, TENURE, HOUSING BENEFIT AND EMPLOYMENT STATUS

It was found in the previous section that housing benefit was an important factor associated with unaffordable housing where an overwhelming majority of the households in unaffordable housing were also housing benefit claimants. However, a similar sharp

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contrast was found between social tenants and home owners as well as between households which had double earners and those without a wage earner. To examine the interaction between housing affordability and the household's socio-economic and housing characteristics, so as to identify the relatively more important characteristic attributing to affordability, a multivariate technique was employed.

Regression analysis is a powerful tool for investigating a multivariate model which has been used in chapters six and seven. However, since the relevant dependent variable is housing affordability, which is a qualitative variable, able to take only a limited number of values, the use of OLS regression analysis is not appropriate. The alternative choice, logistic regression analysis, which was used in chapter six is also unsuitable because the explanatory variables are all qualitative. Therefore in this chapter it is necessary to resort to loglinear modelling and categorical principal component analysis as tools for investigation.

The analysis of categorical variables relies, traditionally, on the use of contingency tables. When more than two variables are involved, conventional contingency table analysis is no longer capable of handling the complexity of the analysis. Loglinear modelling tackles the problem by expressing the marginal totals of a contingency table as a linear combination of the related cell frequencies. Using mathematical transformations and statistical manipulations, the relationship between the variables and the interaction between the variables in the model can be examined. The main focus of the examination is whether alternative models can be produced from a reduced number of variables without losing any statistically significant information. Given two models with the same degree of significance, the simpler model is always preferred. With this method, variables whose effect on the model are minimal are excluded in the final model. It is the interaction effect of variables, and whether the effect of a variable is "independent" of the effect of other variables present in the model, which is the focus of concern (Fienberg, 1977; SPSS, 1990b; Demaris, 1992).

A variation of loglinear modelling, logit modelling, is used to investigate schemes T, R_1 and R_2 whilst hierachical loglinear modelling will be used for scheme R_3. Logit modelling is based on the same principal as loglinear modelling, but arranges the

variables so that one variable can be expressed as a linear combination of all the other variables. This is equivalent to the dependent variable which is used in other statistical analysis (SPSS, 1990b; Demaris, 1992). Only a dichotomous variable can be used in this way and thus only affordability in schemes T, R_1 and R_2 can be used in logit modelling, whilst scheme R_3 has to use loglinear modelling.

Despite the usefulness of loglinear modelling in the analysis of categorical variables, it places a limit on the number of variables which can be analysed. This is partly because it is cell frequencies in a continency table rather than individual case values which are used in the analysis, and empty cells in the continency table would hamper the evaluation of the model. This situation is inevitable if a large number of variables are involved. Another difficulty of using too many variables is the complexity of the interpretation of the final model. Since the focus of concern is the interaction effect between variables, the number of interaction terms would increase logarithmically with the increase in the number of variables. Too many interaction terms render the final model beyond comprehension. The implementation of logit and loglinear modelling was conducted on SPSS VAX/VMS V4 and the technical details of logit modelling are presented in Appendix A12.

Although loglinear modelling is powerful in investigating the interaction between categorical variables, the effect of individual subgroups in a variable is not easy to understand. The effect of a subgroup is usually embedded in the complex web of interaction and the contribution of an individual subgroup can be far from apparent. Another technique, principal component analysis, can be used to facilitate the visualisation of the contribution of an individual subgroup.

Principal component analysis is basically a dimension reduction technique. Its main purpose is to construct some new "variables" which largely represent the variation in the data with no significant loss of information. The new "variables", termed components in the analysis, are a linear combination of the original variables. It is so designed as to make the number of components the same as the number of variables so that the total variation of the variables can be exactly reproduced by the components.

To reduce the dimensionality of the data, a few "principal components" will be used instead of the complete set. Because the contribution of each variable is represented by the coefficient of that variable in the component function (the loading of that component), the relationship between variables can be visually represented by plotting the loadings of the variables of the most influential components on a graph (SPSS, 1990b; Dunteman, 1989; Jolliffe, 1986).

Principal component analysis (PCA) was first designed for numerical variables only. For use with categorical variables, the method has been modified to use a non-linear component function so that the effect of categorical variables can be accommodated (SPSS, 1990c; van de Geer, 1993). The non-linear PCA in this section and the conventional PCA in section 9.5 are implemented respectively by the PRINCAL and the FACTOR procedure on SPSS VAX/VMS V4 and a technical description of PCA is presented in Appendix A13.

It has been shown in previous chapters that residual income, housing cost and housing cost to income ratio all varied considerably between housing benefit claimants and non-claimants where claimants were found to be likely to be experiencing unaffordable housing in section 9.2 of this chapter. However, reliance on housing benefit may in fact be a manifestation of other characteristics, for instance, participation in the labour market. Tenure is another influential factor. Not only were housing related benefits used differently by owners and tenants, but the level of housing cost varied between tenures. Thus, housing benefit, employment status and tenure are better considered simultaneously when assessing the effect on affordability of these factors.

Table 9.4 shows the results of the logit models relating housing affordability, employment status of the head of the household, housing benefit and tenure for models T, R_1 and R_2. Employment status was divided into subgroups of full time, part time and unemployed or unoccupied, which roughly represented the degree of involvement in the labour market. Housing benefit had two categories: claimants and non-claimants, but whether the claimants were on full benefit or not was not further differentiated. The simplest model for model T was that which involved the main effect of tenure, employment and housing benefit and the interaction between housing benefit and tenure.

For models R_1 and R_2, beside the main effects, the interaction between employment and tenure which was significant.

Table 9.4 Logit Models: Affordability by Tenure, Employment and Benefit

Scheme	Final Model	G^2	p
Scheme T	[TB] [T] [B] [E]	18.69	0.41
Scheme R_1	[TE] [T] [B] [E]	19.72	0.14
Scheme R_2	[TE] [T] [B] [E]	20.04	0.13
Scheme R_3*	[TE] [T] [B] [TB]	34.74	0.52

Note : G^2 Likelihood Ratio Chi Square p Probability (T)enure (E)mployment (B)enefit * Hierarchical Loglinear Model Refer to appendix A15 for the assessment of the final models

These results indicate that the effect of all three variables, when considered singly, were significant. In other words, combining the effect of any two variables could not satisfactorily represent the effect of the third. Because of the exclusion of the interaction term, these effects were shown to be independent of each other.

In scheme T, affordability not only varied between tenures but, given the same tenure, it was dependent on whether or not the household was on benefit. Since affordability in scheme T was measured in terms of gross housing cost to income ratio, it suggests a close relationship between the level of gross ratio with both tenure and housing benefit. It is not surprising, given the current system of housing benefit which buffers the impact of high housing cost on very poor households, and it is not uncommon for households on benefit to have a high housing cost to income ratio. It is the result of the differential impact of housing benefit on the numerator and denominator of the housing cost to income ratio formula which increases the numerator at a much faster rate. Thus, the higher the cost of housing for a claimant, the higher the subsidy will be. This leads to an increase in the gross housing cost to income ratio and, consequently, the dependency of the household on benefit. In schemes R_1 and R_2, the basis for measuring affordability was residual income. For these two models, the interaction between employment status and tenure was the most important. This is because, given the importance of the level of earned income on the level of residual income, and the close relationship between employment status and the level of earned income, unearned income - for instance from housing benefit - would have no effect on the level of residual income.

The results also indicate the relative importance of tenure over the other two variables. Given the close relationship between employment status and housing benefit, it was expected that the interaction between these two would be great enough to represent the variation of other variables. However, in the event the variation of housing benefit and employment status between tenures was even more substantial. This reiterates the notion of the marginalisation of social tenants, not just in terms of their involvement in the labour market or their reliance on benefits, but also in their inferior housing affordability situation.

Logit modelling cannot be applied to scheme R_3 because affordability in this scheme has more than two categories. Instead, hierarchical loglinear modelling was employed. The results of a backward selection indicate similar significant factors to those in schemes R_1 and R_2. The final model for scheme R_3 was identical to the final models for schemes R_1 and R_2 except for the three way interaction of benefit, tenure and employment[14]. Hence, the relationship of the modified residual income measurement with tenure, employment and benefit was the same as the traditional residual income measurement.

Whilst loglinear modelling has revealed, in the preceding paragraphs, an interaction between affordability, tenure, employment status and housing benefit, the relationship between individual categories of the characteristics could not be explicitly depicted. Principal component analysis (PCA), on the other hand, is capable of presenting, graphically, the contribution of individual categories by expressing the "weight" of each category in the two most important components. These two components, when put together, reproduce most of the variation in the original sample.

Figure 9.1 to 9.8 show the category quantification of all categories of the relevant variables evaluated as multiple nominal variables individual category was treated as if it was separate variables). The relative positions of the individual categories in the first and second components indicate their relative contribution to the variation in the data as well as their similarity to each other. Categories closer to each other would imply their similar contribution to the first and second component (refer to appendix A13 for more technical details). Figures 9.1 to 9.4 show the results of principal component analysis on affordability, tenure, housing benefit and employment for schemes T, R_1, R_2 and R_3. All

displayed a similar picture of the relationship between the four characteristics. In all four schemes the first component could explain three times as much of the variation in the data as component two (an eigen value of about 0.7 in component one as against about 0.25 in component two).

The variables affordability, unaffordability, local authority tenants, home owners, full time employment and unemployed/unoccupied and housing benefit dominate the first component, indicating their influence on the variation in the data. This component could be explained as the contrast between deprivation and affluence: households which were likely to experience deprivation consisted of benefit claimants and the unemployed or unoccupied; regarding more affluent households: those whose heads were in full time employment were thus in possession of the resources necessary to support an acceptable standard of living. Households which were in affordable housing had a close association with the characteristics of households in the latter groups, while local authority tenants and those which could not afford housing were linked closely with the former group.

The second component was the contrast between private tenants who were in the unfurnished sector and their counterparts in the furnished sector. This component could account for the variation that was not represented by the first component. Categories which were heavily represented in the first component had a very small value in the second component. It indicates that these characteristics could be explained by the poverty-affluence component. Yet it accounted for hardly any of the variation among private tenants in the furnished sector, and little among private tenants in the unfurnished sector, nor for households whose householder worked only part time.

There were some underlying characteristics in this latter group that were distinct from the characteristics explained by the poverty-affluence attribute. Private tenants in the unfurnished sector, housing association tenants and part time workers were closer to unaffordability than home owners, whilst private tenants in the furnished rented sector had a relatively neutral affordability situation. Meanwhile, housing association tenants acquired relatively larger values on both components. This suggests that housing association and private sector tenancy did not have an obvious relationship with employment, affordability and benefit.

The relative positions of all the categories remained the same in scheme R_3, with the exception of private tenants in the unfurnished sector, poverty and unaffordability. Unlike the category of unaffordability in the previous schemes, in which the first component satisfactorily represented variation in the data, poverty and unaffordability had to be represented by both components. Poverty and unaffordability were of the same sign in the first component, but differed in the second. This indicates that they were basically similar but with small differences.

Whilst poverty was still close to households on benefit, local authority tenants and unemployed/unoccupied householders, it was not as close as the "unaffordability" categories in schemes T, R_1 and R_2. On the contrary, "unaffordability" in scheme R_3 was further away from the position of unaffordability in the other scheme, and was closer to part time workers and private tenants. This suggests that the incidence of unaffordability was more likely to be observed in these groups than in the other groups. The distance between benefit and poverty was closer than the distance between benefit and unaffordability, indicating a similarity between poverty and benefit. The position of private tenants in the unfurnished sector in the first component remained relatively the same compared with the other schemes, whilst the position in the second component had changed - probably because of its closeness to unaffordability, so that the position in the second component had to be altered correspondingly to the change in position of unaffordability.

The results of the PCA do not contradict the results of the logit modelling earlier in this section. They demonstrated a close relationship between tenure, employment, housing benefit and affordability. This relationship was consistent in all four measurement schemes. However, the PCA also indicated that in the ratio measurement scheme T and the two traditional residual income measurements R_1 and R_2, private tenants, and households whose head of household worked part time and, to a certain extent, housing association tenants did not fit well with this pattern.

Figure 9.1 Principal Component Analysis: Affordability, Tenure, Employment Status and Housing Benefit (Scheme T)
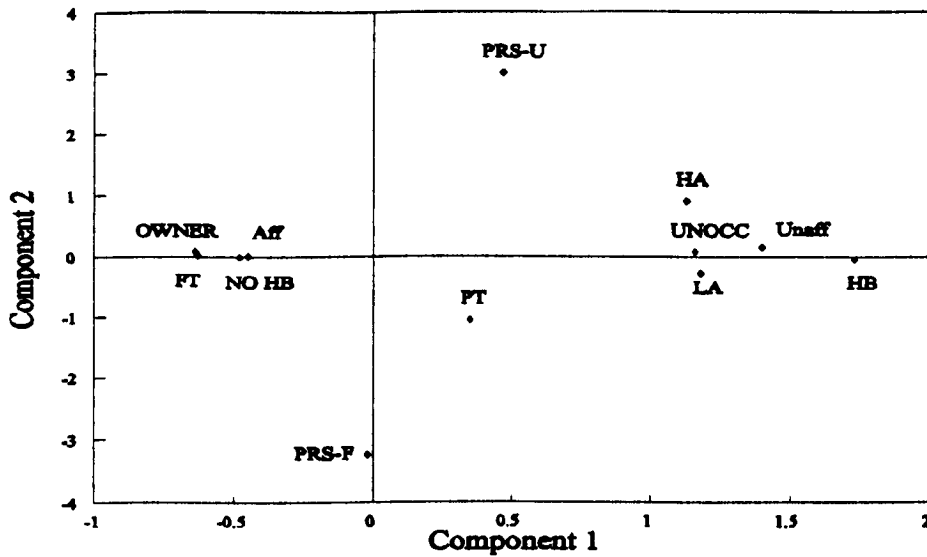
Figure 9.2 Principal Component Analysis: Affordability, Tenure, Employment Status and Housing Benefit (Scheme R_1)
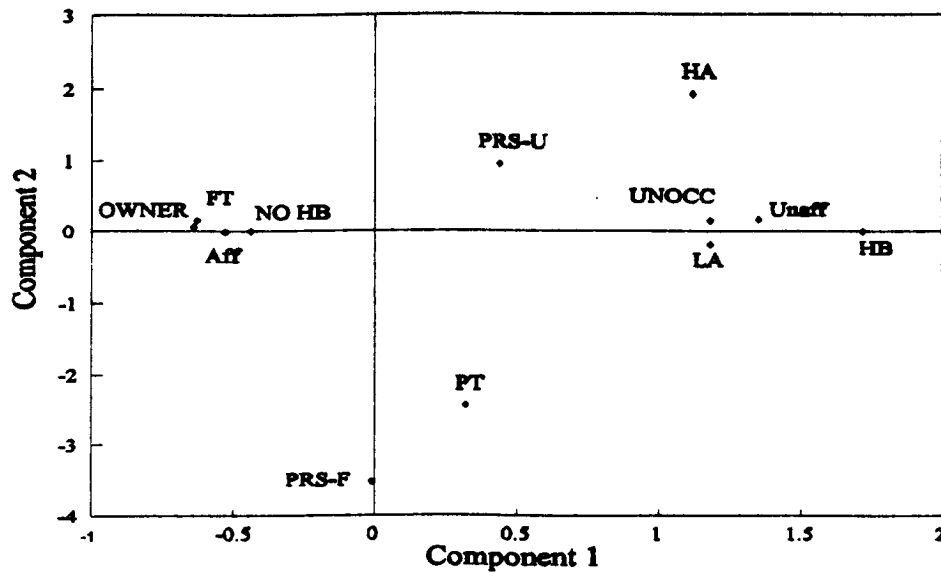
Yet, under the modified residual income measurement, scheme R_3, these groups came closer to the reclassified "unaffordable" group than local authority tenants, housing benefit claimants and households with unoccupied or unemployed householders. This suggests that private tenants and households with the householder working part time were in unaffordable housing because of the high cost of housing they had to pay and

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not as a result of a lack of resources. It reflects the increasing housing cost in the private rented sector as a result of deregulation and the diverse situation of people working part time.

Figure 9.3 Principal Component Analysis: Affordability, Tenure, Employment Status and Housing Benefit (Scheme R$_2$)
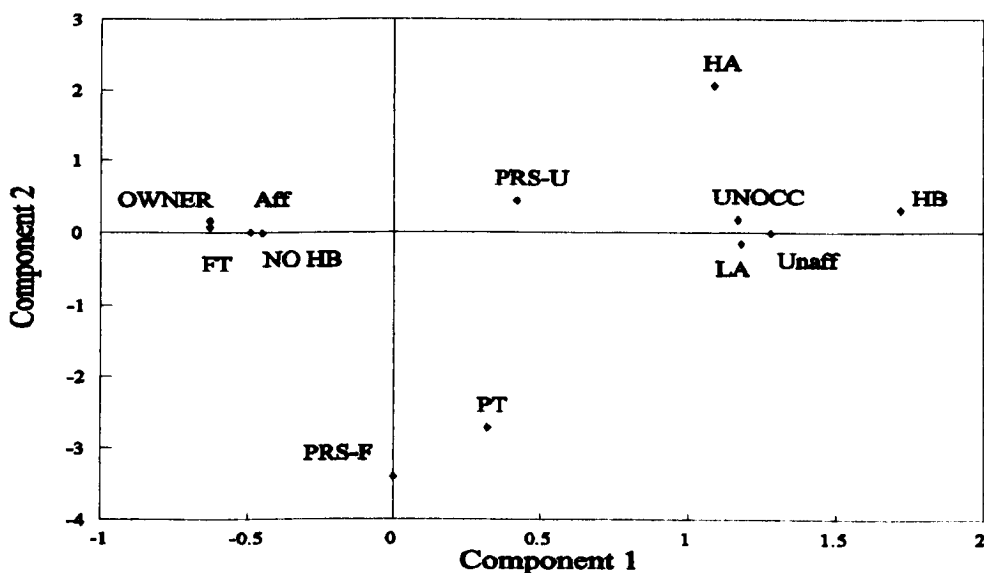
Note: Refer to Appendix A3 for Abbreviation
Source: Analysis of FES 1991

Figure 9.4 Principal Component Analysis: Affordability, Tenure, Employment Status and Housing Benefit (Scheme R$_3$)
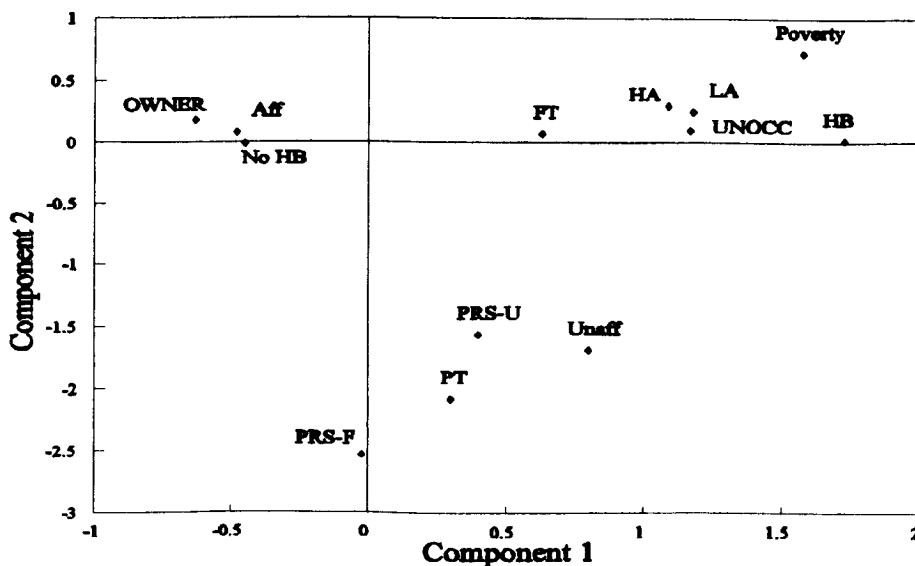
Note: Refer to Appendix A3 for Abbreviation
Source: Analysis of FES 1991

9.4 AFFORDABILITY AND LIFE CYCLE EFFECT

It was found in section 9.3 that the proportion of households in unaffordable housing varied between households of different household type, age of head of household and size of household, as well as presence of dependent children. Such factors constituted the dimensions of a life cycle effect. Thus, the influence of the life cycle on affordability is worthy of investigation. One approach to examining the life cycle effect is through the concept of a life cycle group, as proposed by Bradshaw and colleagues (1988), who employed the concept in the analysis of income distribution and income transfer within the life cycle of a household. Eleven life cycle groups (Appendix A16), which were intended to embrace "a progression of stages through which a household might pass" (Bradshaw et al 1988:230), were defined. Whilst 88% of households were covered in the UK in Bradshaw's sample, which was based on the 1986 FES, only 75% of the sampled households studied in this thesis were covered by the life cycle groups (Appendix A16).

The percentage of households in unaffordable housing is shown in table 9.5, with an apparent pattern of life cycle effect on housing affordability. The "young singles", a period of "relative" want, had a lower than average chance of being in unaffordable housing. Households in this group were more likely to be in unaffordable housing owing to high housing cost rather than through a lack of resources. Those in the "young married" group, which was a period of "relative plenty", had the lowest chance of being in unaffordable housing. However, these two groups exhibited a higher chance of being in unaffordability on the ratio measurement, which reflected the high starting cost of a home owner's housing career and the pressure of market rent in the private rented sector. Progressing to the period of family formation and child rearing brought a higher pressure on housing affordability. Although the chance of being in unaffordability was slightly lower than average, it showed considerable deterioration compared with the young married group. Contrary to the situation of young single and young married households, the chance of the family formation and child rearing group being in unaffordability, as measured by the residual income measurement, was greater than it would have been by ratio measurement. This reflects both the lower income of these

two groups and their higher housing costs. These two groups also had a higher level of both "unaffordability" and "poverty" in scheme R_3 than the young married group.

The affordability situation improved among households with middle aged householders. The Complete Family, Early Disposal and Two generation groups had the lowest levels of unaffordability, indicating the effect of increased earnings and a reduced burden of the children. However, there was some inconsistency between ratio measurement and residual income measurements for the Early Disposal group, probably due to sampling error, as the number of households in this group was very small. Thus, more information regarding the affordability situation of the "Early Disposal" group should be substantiated before any conclusion is drawn. Upon retirement, ageing households enter a period of relative need. Their affordability situation deteriorated rapidly when the householders were retired so that when they reached old age and had to live alone, the overwhelming majority of them experienced unaffordable housing. They were also more likely to be in poverty than in unaffordability as measured by scheme R_3, indicating a lack of resources among these households.

In addition, lone parent households, which are supposed to be at odds with the principles of the life cycle classification, were included in the life cycle analysis because of their growing importance in contemporary British society. These households also showed a high incidence of unaffordability and, as with households in the later stage of their life cycle, exhibited a higher chance of being in poverty To determine the relative importance of the elements of the life cycle effect in relation to affordability, analysis at the multivariate level was employed. In the course of analysis, some simplification had to be adopted: the age of head of household, household type and the composition of dependent children were used as a proxy for life cycle effect. Although these factors could not reproduce the life cycle effect exactly, it was nevertheless possible to depict the relationships between the influential elements.

Figures 9.5 to 9.8 show the results of the principal component analysis of schemes T, R_1, R_2 and R_3. The relative positions of the categories in all four schemes were very similar. The first component could be interpreted as the contrast between a single elderly household and that of a couple with children. Affordability showed the same

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sign for couple families, households with dependent children, lone parents and middle aged and young householders in the first component; whilst unaffordability was shown for elderly, single and no dependent children.

Table 9.5 Affordability by Life Cycle Groups

Life Cycle Group	Scheme T	Scheme R$_1$	Scheme R$_2$	Scheme R$_3$	
	Unaff %	Unaff %	Unaff %	Unaff %	Poverty %
Young Single	24	19	21	10	11
Young Married	7	3	3	2	1
Family Formation	15	23	20	10	10
Middle Child Rearing	11	23	26	12	13
Complete Family	6	11	10	8	9
Early Disposal	0	32	34	6	29
Two Generation	2	4	5	3	2
Empty Nest	13	18	17	5	11
Early Retirement	49	64	57	17	40
Old And Single	95	95	91	42	50
Lone Parent	68	75	70	19	50
Unclassified	21	25	22	10	13
All	25	29	28	11	16

Note: Unaff (Unaffordable)
Source: Analysis of FES 1991

Although the first component could explain around a third more variation in the data than the second component, it was not enough in itself to account for most of the variation in the data. Thus, the majority of the categories acquired a high value in the second component. The second component could be viewed as the contrast between young householders who were in their twenties and thirties, with pre-school age children, against householders who were in their forties and fifties with no pre-school age child; the former group was closer to unaffordability. For scheme R$_3$, the same descriptions apply in general. In addition, both poverty and unaffordability had the same sign in the two components, indicating their similarity with respect to a life cycle effect.

There are a number of implications from the analysis in this section: first, the main contrast in the life cycle effect was between younger families with dependent children against households with elderly people, in which unaffordability was associated with the latter group. Second, there was a contrast between younger householders with preschool children and middle aged householders with school age children. The former group was more likely to be in unaffordability. Third, the relatively small value of affordability in both components suggests a small influence of life cycle effect on

affordability. Instead, life cycle effect has a close relationship with unaffordability Finally, with reference to the modified version of residual income, poverty was close to unaffordability with respect to life cycle effect, which was contrary to their relative positions in the models in the previous section.

Figure 9.5 Principal Component Analysis: Affordability, Household Type, Dependent Children Tenure and Age of Householder (Scheme T)
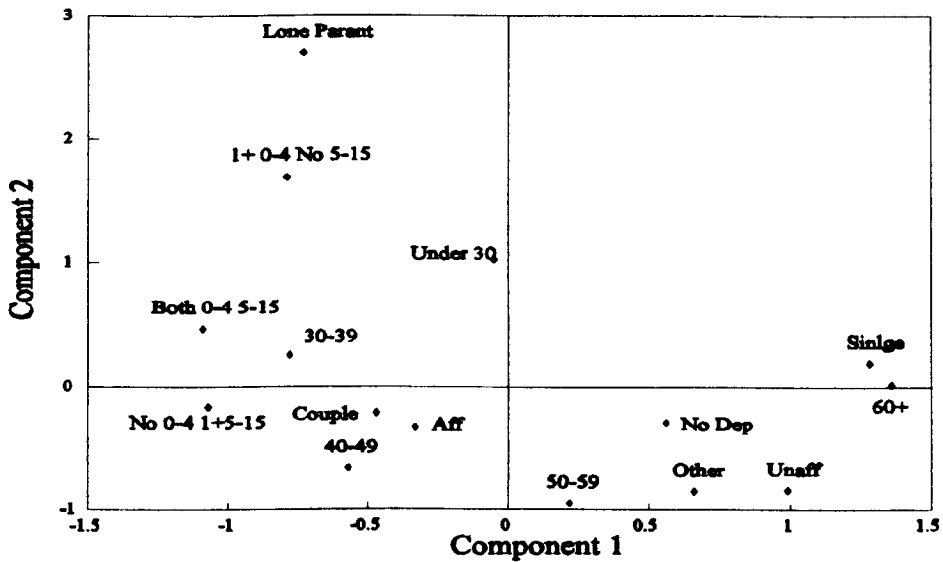
Note: Refer to Appendix A3 for Abbreviation
Source: Analysis of FES 1991

Figure 9.6 Principal Component Analysis: Affordability, Household Type, Dependent Children Tenure and Age of Householder (Scheme R₁)
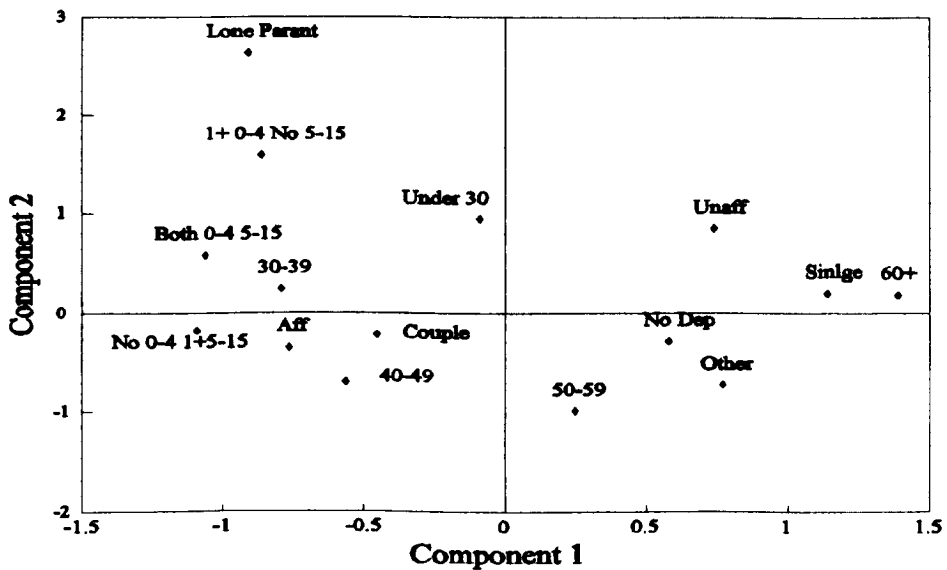
Note: Refer to Appendix A3 for Abbreviation
Source: Analysis of FES 1991

Figure 9.7 Principal Component Analysis: Affordability, Household Type, Dependent Children Tenure and Age of Householder (Scheme R_2)
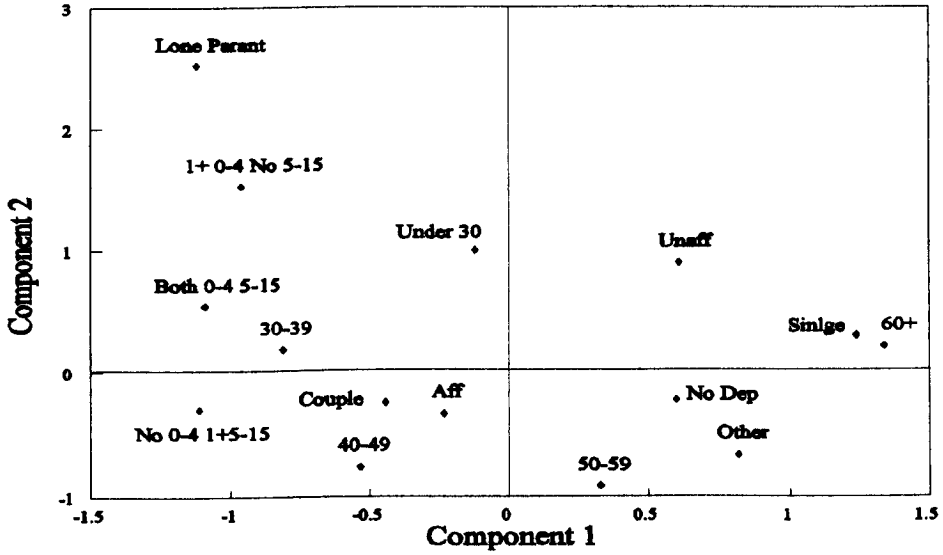
Note: Refer to Appendix A3 for Abbreviation
Source: Analysis of FES 1991

Figure 9.8 Principal Component Analysis: Affordability, Household Type, Dependent Children Tenure and Age of Householder (Scheme R_3)

Note: Refer to Appendix A3 for Abbreviation
Source: Analysis of FES 1991

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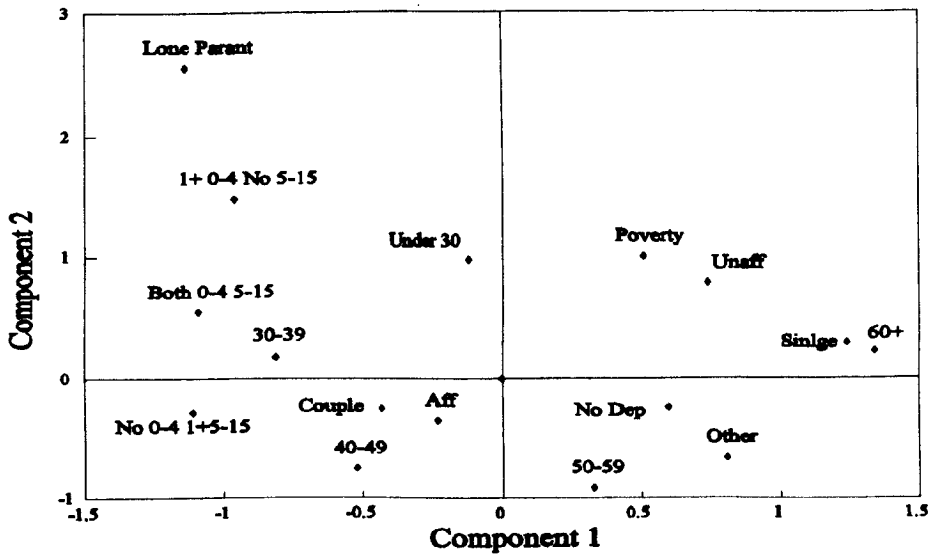
9.5 AFFORDABILITY AND HOUSEHOLD EXPENDITURE

Housing affordability is defined as the state in which high housing cost is exerting a financial burden on a household, where the high housing cost would either have forced the household to forgo other areas of consumption, or to have their quality of housing consumption adjusted to a sub-standard level in order to lessen the financial burden. These two deliberations were subject to empirical testing in this section and the section that follows. In this section there will first be an examination of the pattern of household consumption expenditure in respect of housing affordability.

Because of the high housing costs of households in unaffordable housing there is an expectation that these households would exhibit a different pattern of household consumption. A straightforward conjecture is that households experiencing unaffordability will be consuming fewer "luxury" items in order to spend an adequate level on "necessity" items. A similar line of investigation was pursued by some researchers on poverty (e.g. Love and Oja, 1977. Lahiri, 1990) in which the difference in the consumption of necessity and luxury items between poor and rich households was compared.

Expenditure on "necessity" items, which was defined in this section as the expenditure on food eaten at home, housing and clothing whilst the rest of the expenditure items were defined as "luxury" items (a complete list of expenditure items used in this chapter are presented in Appendix A17). Table 9.6 indicates that the "affordable" group in all four schemes had substantially higher mean expenditure on both necessity and luxury items than both the "unaffordable" and the "poverty" group. It is more apparent, from the proportion of luxury and necessity items in a household's total expenditure, that there was evidence showing that households in unaffordable housing had to forgo expenditure on luxuries. Households in unaffordable housing could only spend 41% to 42% of their expenditure on luxury items whilst about 60% of their resources had to be devoted to necessities. Conversely, households in affordable housing only had to spend slightly less than half of their resources on necessities, leaving half for luxury items.

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Table 9.6 Households Expenditures by Affordability Groups (Necessity and Luxury Items)

Expenditure Item	Scheme T		Scheme R_1		Scheme R_2		Scheme R_3		
	Aff	Unaff	Aff	Unaff	Aff	Unaff	Aff	Unaff	Poverty
	Mean Household Expenditure (£ per week)								
Total Expenditure	322	132	334	132	328	136	328	174	109
Necessity	136	73	142	71	139	72	140	92	59
Luxury	185	58	192	61	188	63	182	81	50
	Mean Percentage in Household Total Expenditure (%)								
Necessity	47	59	46	58	47	58	47	59	58
Luxury	53	41	54	42	52	42	54	42	42

Note: Aff(ordable) Unaff(ordable)
Source: Analysis of FES 1991

Yet, differentiating "necessity" from "luxury" items in contemporary British society may create considerable ambiguity. Many consumption items which were traditionally regarded as a "luxury" may have become "essential"; for instance, leisure activities may be regarded as a means of participation in society (Townsend 1979) and thus an essential expenditure item. In contrast, public transport, under certain circumstances, may be more expensive than private transport, which was traditionally associated with affluence. Thus, a dichotomous categorisation overlooks the complex pattern of household consumption. In this section an attempt will be made to retain as much information as possible and to use a fourteen item expenditure list which is used in the FES, to summarise the pattern of household consumption.

As with the distribution of expenditure on "necessity" and "luxury" items, there is an indication in table 9.7 that the level of total expenditure and the level of all constituent expenditure items of the "affordable" group in Scheme T, R_1 and R_2 were substantially higher than in the "unaffordable group" and such differences were statistically significant. Likewise, differences were observed in scheme R_3, between the "affordable" and the "unaffordable" groups as well as between the "unaffordable" and the "poverty" groups. The mean total expenditure of the "affordable" group was 2.5 times that of the "unaffordable" group in schemes T, R_1 and R_2 whilst in scheme R_3 it was two times that of the "unaffordable" group and three times that of the "poverty" group.

Among the individual constituent expenditure items, the largest difference between the "affordable" and the "unaffordable" groups was in expenditure on motoring, leisure services, and food eaten out of home in schemes T, R_1 and R_2. In scheme R_3, these three were among the items with the largest differences between the "affordable" with,

respectively, the "unaffordable" and the "poverty" groups, but the expenditure items demonstrating the greatest difference was expenditure on alcohol. It was also noted, in scheme R_3, that the mean expenditure of the "unaffordable" group on all expenditure items was between the corresponding level of expenditure for the "affordable" group and the "poverty" groups (table 9.7).

In terms of the proportion of individual items in total expenditure in table 9.8, it is apparent in schemes T, R_1 and R_2, that the "unaffordable" group had to spend a larger proportion of household income on housing, food eaten at home and tobacco and spent relatively less on motoring, leisure services, food eaten out, clothing and alcohol. The remaining items showed a minimal difference between the two groups.

In scheme R_3 such observations on the whole held between the "affordable" group with, respectively, the "unaffordable" and the "poverty" groups, but the "unaffordable" group spent the highest proportion of their income on housing whilst the level for the "affordable" and the "poverty" groups was the same. Although it seems to support a conclusion that the "affordable" group could spend more on luxury goods whilst the "unaffordable" group had to consume more on necessities, yet such evidence is not conclusive.

Table 9.7 Household Expenditure by Affordability Groups

Expenditure Item	Mean Household Expenditure (£ per week)								
	Scheme T		Scheme R_1		Scheme R_2		Scheme R_3		
	Aff	Unaff	Aff	Unaff	Aff	Unaff	Aff	Unaff	Poverty
Total Expenditure	322	132	334	132	328	136	328	174	109
Net Housing	74	43	79	37	78	38	78	55	25
Food (in)	41	25	41	27	41	28	41	29	27
Food (out)	14	4	15	4	15	4	15	6	3
Alcohol	15	5	15	5	15	5	25	7	4
Tobacco	6	4	6	5	6	5	6	5	5
Clothing	21	6	22	7	21	7	27	9	6
Household Goods	25	10	25	10	25	10	25	13	8
Household Services	15	8	16	7	16	7	16	8	6
Personal Goods & Services	12	5	14	5	13	5	13	6	4
Motoring	45	8	47	10	46	10	46	15	7
Fares	8	4	8	3	8	3	8	3	3
Leisure goods	15	5	15	6	15	6	15	8	5
Leisure Services	30	7	31	7	31	7	30	10	5
Miscellaneous	2	1	2	1	2	1	3	1	1

Note: Aff(ordable) Unaff(ordable)
Source: Analysis of FES 1991

First, whilst the "affordable" group spent relatively more on leisure services, they spent relatively less on leisure goods. Second, difference in the proportion of expenditure items was actually very small. Finally, one of the strongest indicator of a higher level of spending on luxury items was the difference in the expenditure on motoring. Yet, this may only reflect locational factor and the availability of public transport which may have nothing to do with affordability.

Table 9.8 Distribution of the Proportion of Household Expenditure By Affordability Group

Expenditure Items	Mean Percentage in Total Expenditure								
	Scheme T		Scheme R₁		Scheme R₂		Scheme R₃		
	Aff	Unaff	Aff	Unaff	Aff	Unaff	Aff	Unaff	Poverty
Net Housing	25	31	26	29	26	29	26	32	26
Food (in)	15	24	14	25	15	25	15	21	27
Food (out)	4	3	4	3	4	3	4	3	3
Alcohol	5	3	5	4	5	4	5	4	4
Tobacco	2	4	2	4	2	4	2	3	5
Clothing	6	4	6	4	6	4	6	4	4
Household Goods	7	7	7	7	7	7	7	7	7
Household Services	5	5	5	5	5	5	5	5	5
Personal Goods & Services	4	4	4	4	4	4	4	2	4
Motoring	12	4	12	4	12	5	12	5	4
Fares	2	2	2	2	2	2	2	2	3
Leisure goods	4	4	4	4	4	4	4	5	4
Leisure Services	8	5	8	5	8	5	8	5	5
Miscellaneous	1	0	1	0	1	0	1	0	0

Note: Aff(ordable) Unaff(ordable)

Source: Analysis of FES 1991

However, conclusions drawn from a comparison of aggregate expenditure may be misleading. First, a few extremely high values might have raised substantially the mean value of a particular expenditure and distorted the conclusion based on the comparison of the means. Although a formal statistical test comparing means can identify such an anomaly, since the test considers the standard deviation at the same time, there is a second problem with this kind of simple comparison. Because there were altogether fourteen expenditure items, to examine individual expenditure items as if they were unrelated would hamper the intended objective in this section: the pattern of inter-relationship between expenditure items. What is more important is the distribution of expenditure of the individual household, which is the focus of concern; it is inappropriate to investigate the distribution of expenditure within an individual household without using multivariate analysis.

Principal component analysis (PCA) is one among several possible analytic tools suitable for this purpose. As described in a previous section, PCA is intended to reproduce variation of the data by the reconstruction of new "components" so that individual data in the sample can be expressed as a linear combination of those components which are not correlated with each other. The structure of the data can be simplified if the first few components represent the major part of the variation. Another reason for using PCA is the attempt to make sense of the most influential components so that the "underlying structure" of the data can be uncovered (refer to Appendix A13 for a detailed technical description of PCA).

Results of the PCA on the fourteen expenditures items were shown in table 9.9 and a graphical display of the component loadings of the first two components are presented in figure 9.9. All the component loadings in the first principal component were positive and this can be viewed as a general indication of the expenditure level where a high level of total expenditure was associated with a high level of expenditure in all constituent expenditure items. At the same time, items of housing cost, food eaten in and out of the home, and clothing had a higher magnitude of component loading. These items could be regarded as basic necessities of life and thus the first component was also a representation of the level of expenditure on daily necessities.

The second component represents that part of the remaining variation in the data not accounted for by the first component. These items are food, alcohol, tobacco, clothing, personal goods and services, motoring, fares for public transport and miscellaneous expenses which had positive loading as against expenditure on housing, household goods and services, leisure goods and leisure services which had negative value in this component. Where the absolute sign of the component loading is arbitrary and unimportant, it is the contrast in the sign of the loadings, besides their magnitude, which provides the interpretive interest. Thus the second component can be viewed as a contrast between essential goods such as food and clothing and luxury goods and services such as leisure and household goods and services.

However, alcohol and tobacco, which cannot be considered necessity items, acquire large magnitude in this component and bear the same sign as the necessity items. This

appears to be inconsistent with the interpretation. A similar anomaly was observed in previous research on poverty where a relatively high level of spending on such items, especially on tobacco, was often associated with households living on benefit (Bradshaw and Morgan 1987, Bradshaw and Holmes 1989). This indicates a discrepancy in the interpretation of necessity and luxury between those who make the normative judgement and those who actually make the consumption decisions.

The third component is less readily interpreted. It is not uncommon in PCA involving a large number of variables for some components to show no obvious pattern (Jolliffe 1986). The variations in the data in the remaining components were considered to be too trivial and were therefore not listed.

The first two components, when put together, represent approximately one quarter of the variation in the data, and were used as a proxy for the variation of fourteen expenditure items among individual households. Reducing the number of dimensions to two permits the expression of the variations on a two dimensional graph, where it is possible to grasp visually the relationship of expenditure patterns between affordable and unaffordable groups.

One method by which to take advantage of the dimension reduction PCA technique, as suggested by Dunteman (1992), is to use a scatter plot. The component scores of the first two components of each individual household are plotted before inspecting the clustering effect of the individual cases so that a comparison can be made with a pre-defined classification scheme. The component score is the summation of the products of standardised expenditure for each item, and the corresponding component loading represents the relative position of the case for that component. Because of the relative nature of the sign of the component loading, the sign of the component score has no intrinsic absolute interpretation.

Figures 9.10 to 9.14 show the scatter plots of the component scores of the affordable and unaffordable groups in the four classification schemes T, R_1, R_2, R_3. It is evident that there is much overlapping of the "affordable" group with the "unaffordable" group in all four schemes, as well as with the "poverty" group in scheme R_3, and thus no

apparent clustering effect can be observed. It is therefore not possible to distinguish the "affordable" group from either the "unaffordable" group or the "poverty" group based on the pattern of household expenditure.

Nevertheless, two additional points should be considered. First, the pattern of distribution of the component scores of the "unaffordable" and "poverty" groups relative to the "affordable" group is that the former tend to concentrate in the bottom left corner of the distribution, while that of the "affordable" group tends to spread over a much larger range. This suggests the wider freedom of how much to spend on necessities and luxuries of the "affordable" group relative to the "unaffordable" and the "poverty" groups. Thus, while there is no evidence that the "affordable" group spent more on luxury items, they have more choice on how much to spend, and on what.

Second, the first two components could only account for around a quarter of the variation in the data. Thus, even if a clear pattern could be established, there is still much variation in the data that is not represented by these two components. A low percentage is not a typical pattern of highly correlated data, and the chance of uncovering any dominant pattern behind the distribution of expenditure is reduced.

Table 9.9 Principal Component Analysis: Household Expenditure

Expenditure Items	Component Loading		
	Component 1	Component 2	Component 3
Net Housing	0.62	-0.30	-0.18
Food (in)	0.62	0.18	0.36
Food (out)	0.71	0.07	-0.31
Alcohol	0.50	0.44	-0.40
Tobacco	0.13	0.77	-0.08
Clothing	0.59	0.11	0.17
Household Goods	0.41	-0.09	0.38
Household Services	0.36	-0.38	-0.01
Personal Goods & Services	0.56	0.01	0.20
Motoring	0.34	0.01	0.12
Fares	0.36	-0.10	-0.52
Leisure goods	0.39	-0.02	0.23
Leisure Services	0.41	-0.38	-0.23
Miscellaneous	0.35	0.05	0.29
Eigenvalue	3.18	1.22	1.11
% Component Accounted for	22.7	8.7	7.9

Source: Analysis of FES 1991

Figure 9.9 Principal Component Analysis: Household Expenditure
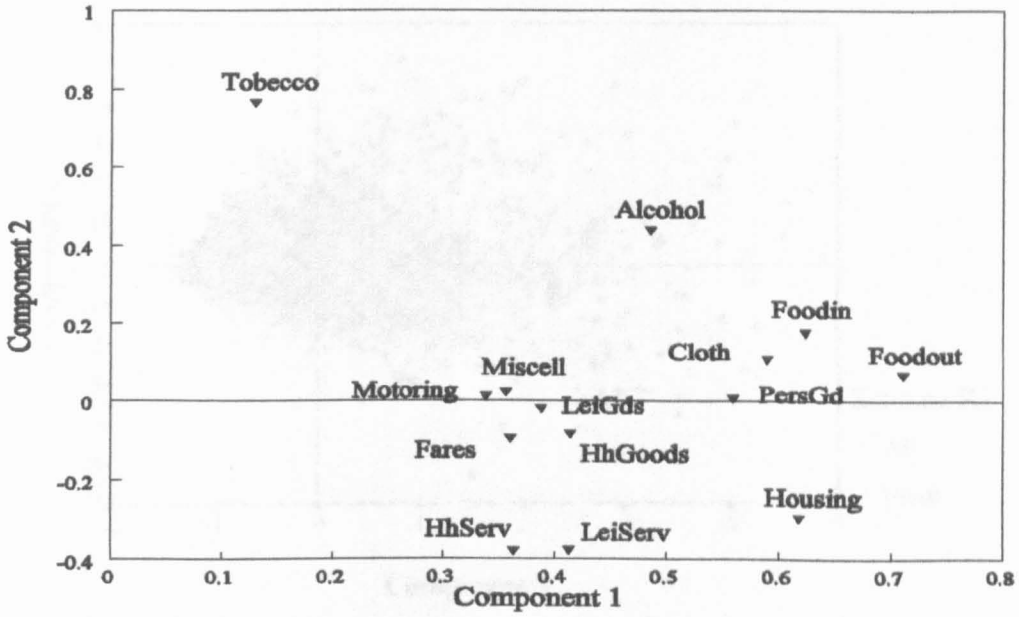
Figure 9.10 Scatter Plot: Principal Component Score (Scheme T)

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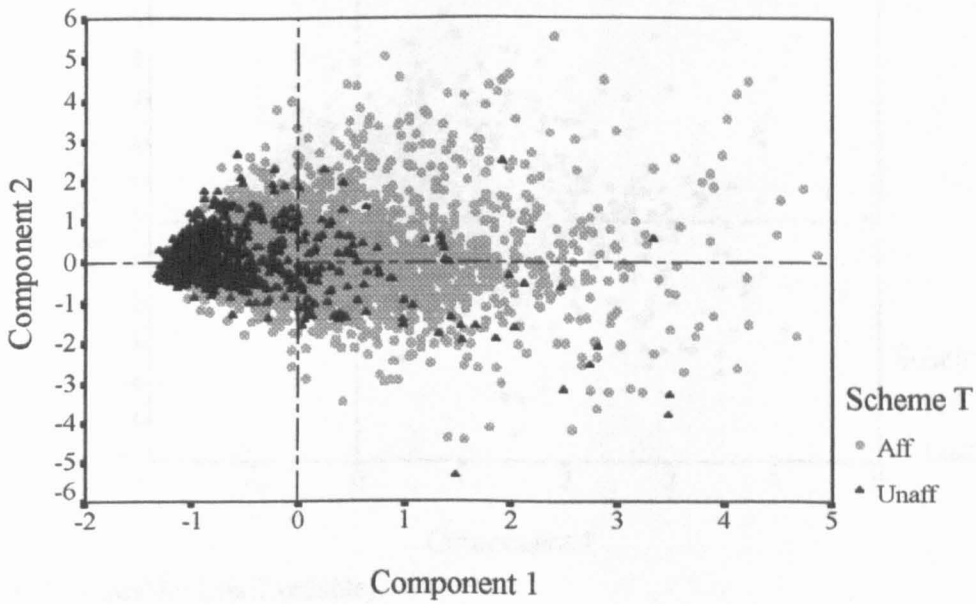
Figure 9.11 Scatter Plot: Principal Component Score (Scheme R_1)
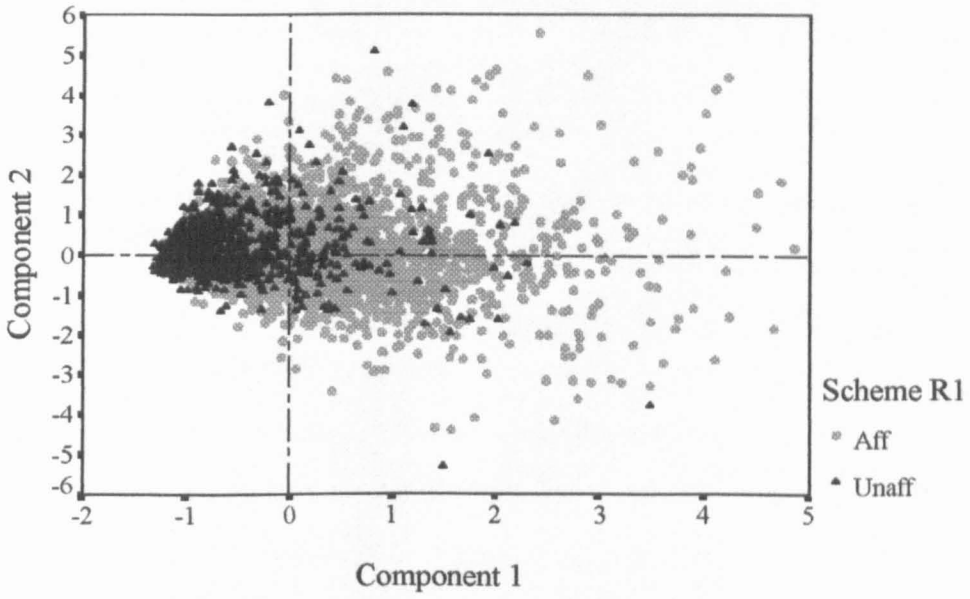
Note: Aff(ordable) Unaff(ordable)
Source: Analysis of FES 1991

Figure 9.12 Scatter Plot: Principal Component Score (Scheme R_2)
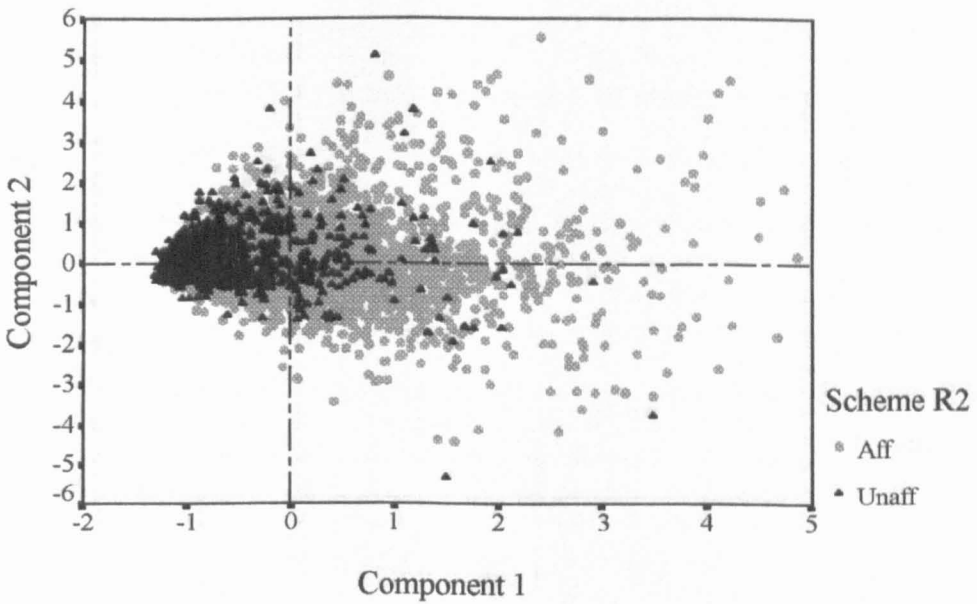
Note: Aff(ordable) Unaff(ordable)
Source: Analysis of FES 1991

Figure 9.13 Scatter Plot : Principal Component Score (Scheme R₃)(1)
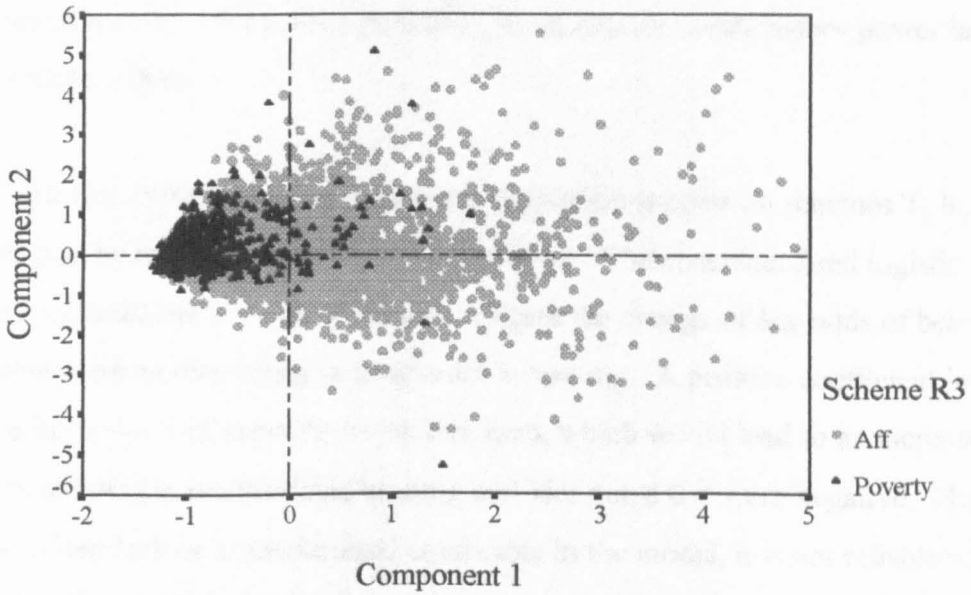
Note: Aff(ordable) Unaff(ordable)
Source: Analysis of FES 1991

Figure 9.14 Scatter Plot : Principal Component Score (Scheme R₃) (2)
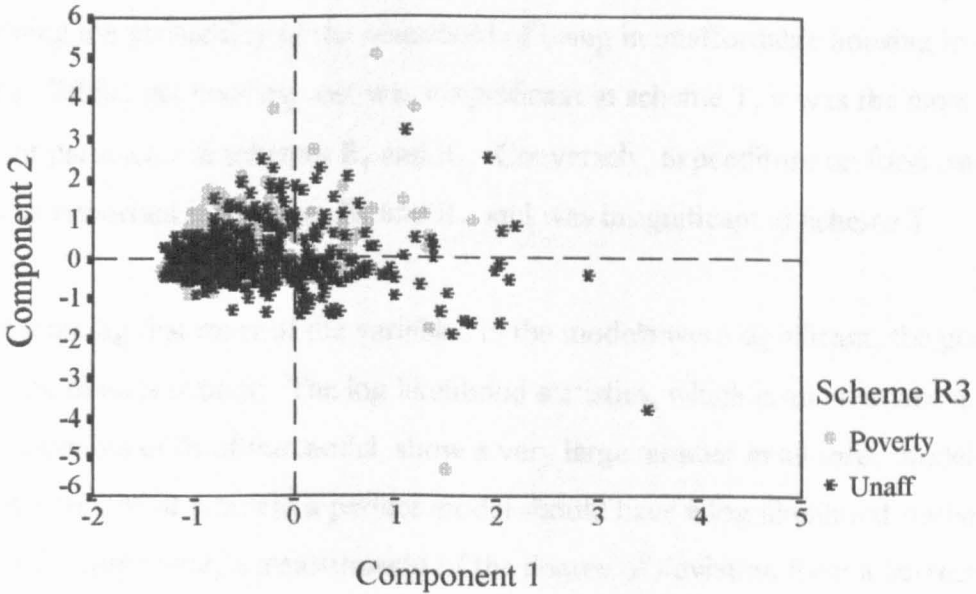
Note: Unaff(ordable)
Source: Analysis of FES 1991

Despite the absence of evidence of distinct expenditure pattern among the "affordable" and the "unaffordable" groups, as indicated by the PCA earlier in this section, logistic regression technique is used below to provide an independent validation.   Logistic regression is used here as a classification tool where the level of household expenditure on items was used to predict the state of affordability, with "unaffordable" as the reference group. Logistic regression, although less efficient in computation than

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discriminant analysis, requires less restricted assumptions of the distribution of the variables (Kennedy, 1991) while providing the necessary confirmatory power lacked by PCA (Joffille 1986).

Table 9.10 shows the results of the logistic regression models on schemes T, R_1, R_2 and R_3 evaluated by the stepwise method of inclusion. The unstandardised logistic regression coefficient (B) can be used to indicate the change of log odds of being in affordable housing over being in unaffordable housing. A positive coefficient implies an increase in the level of expenditure on that item, which would lead to an increase in the log odds of being in unaffordable housing and vice versa if it were negative. However, because of the lack of a standardised coefficient in the model, it is not reliable when comparing the relative contribution of an individual variable based on the unstandardised coefficient. The partial correlation (R) is a more useful indicator.

Expenditure on tobacco, household goods and miscellaneous items was not significant in determining the probability of the household of being in unaffordable housing in all three schemes. Whilst net housing cost was insignificant in scheme T, it was the most important parameter in schemes R_1 and R_2. Conversely, expenditure on food eaten at home was important in schemes R_1 and R_2, and was insignificant in scheme T.

Notwithstanding that most of the variables in the models were significant, the goodness of fit of the models is poor. The log likelihood statistics, which is an assessment of the overall goodness of fit of the model, show a very large number in all three models. This indicates a lack of fit whereas a perfect model should have a log likelihood statistic of zero. At the same time, a measurement of the degree of deviation from a correct prediction can be assessed with a plot of deviance and a perfect model should show a normal distributed deviance. However figure 9.15 to figure 9.17 show that all three models deviated from the normal distribution, which was another indication of a lack of fit.

This evidence suggests the inappropriateness of using household expenditure to classify affordability and thus also implies, conversely, that the expenditure patterns of households in affordable housing and those in unaffordable housing showed little

difference. This confirms the results of the PCA in the earlier part of this section.

Table 9.10 Logistic Regression: Household Expenditure by Affordability Groups

Expenditure Item	Logistic Regression Coefficients					
	Scheme T		Scheme R₁		Scheme R₂	
	B	R	B	R	B	R
Net Housing	ns	-	-0.01**	-0.13	-0.01**	-0.12
Food (in)	-0.03**	-0.12	ns	--	ns	--
Food (out)	-0.03**	-0.06	-0.05**	-0.1	-0.05**	-0.09
Alcohol	-0.03**	-0.1	-0.03**	-0.08	-0.03**	-0.09
Tobacco	ns	--	ns	--	ns	--
Clothing	-0.01**	-0.06	-0.01**	-0.06	-0.01**	-0.05
Household Goods	-0.00*	-0.02	-0.01**	-0.05	-0.01**	-0.05
Household Services	ns	--	ns	--	ns	--
Personal Goods & Services	-0.01*	-0.02	-0.02**	-0.04	-0.01*	-0.04
Motoring	-0.03**	-0.14	-0.02**	-0.12	-0.02**	-0.11
Fares	-0.02**	-0.04	-0.01*	-0.03	ns	--
Leisure goods	-0.01*	-0.03	ns	--	ns	--
Leisure Services	-0.02**	-0.09	-0.02**	-0.08	-0.02**	-0.08
Miscellaneous	ns	--	ns	--	ns	--
Intercept	-1.3		1.5		1.15	
-2LogL	3361		3518		3634	
Correctly Predicted as	0.63		0.71		0.65	
Correctly Predicted as	0.93		0.9		0.91	

Note: ** p<0.01 8*p<0.05 ns Not Significant
B Unstandardised logistic Coefficient R Partial Correlation
Source: Analysis of FES 1991

Normal Probability Plot: Logistics Regression Residuals
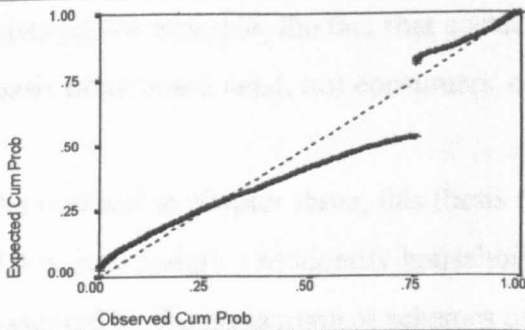
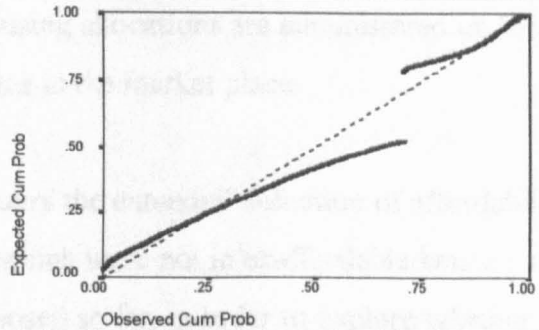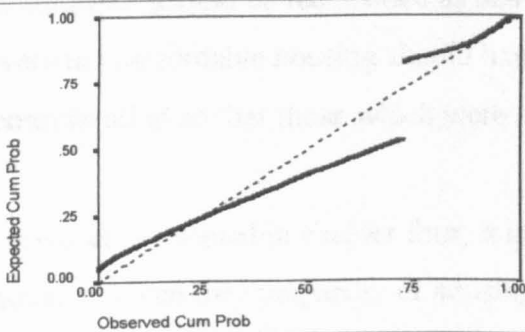Figure 9.15 Deviance Plot (Scheme T)   Figure 9.16 Deviance Plot: (Scheme R₁)

Figure 9.17 Deviance Plot: (Scheme R₂)

Source: Analysis of FES 1991

9.6 QUALITY OF HOUSING AND AFFORDABILITY

As argued in chapter three, the quality of housing occupied is an integral part of affordability measurement whereas the assessment of affordability should take into consideration the level of housing consumption. Households which choose to consume a higher level of housing than they can properly afford should not be classified as being in "unaffordable" housing, whilst households living in inadequate housing because they could not afford better housing should be classified as being in unaffordable housing (Sueke et al 1980, Fallis 1985, Lerman and Reeder 1987).

On the other hand, Hancock (1993) argues for a more relaxed definition of affordability. Whilst households in inadequate housing should be regarded as in unaffordable housing regardless of whether they are assessed to be so by the affordability indicators, households assessed as unaffordable while over-consuming housing beyond their level of income should have their assessment relabelled "voluntary" unaffordable. This latter scenario should be considered as a grey area of affordability because, as Hancock contends (1993), it may not be possible to adjust the consumption of housing towards a prescribed standard. Altering housing consumption by a small amount is not possible owing to the discrete nature of a unit of housing consumption with respect to cost, and other non-economic considerations may over-shadow the decision for this kind of change, for example, the fact that social housing allocations are administered on the basis of assessed need, not consumers' choice in the market place.

As outlined in chapter three, this thesis favours the extended definition of affordability. Thus, it is desirable to identify households which were not in unaffordable housing as assessed by the measurement schemes proposed so far, in order to explore whether such households should be reclassified as being in unaffordable housing. Households which were in unaffordable housing should have the quality of their accommodation taken into consideration so that those which were over-consuming housing could be identified.

However, as argued in chapter four, it is not easy, technically, to evaluate the quality of housing, given the complexity of housing consumption in general and the lack of relevant information in, particularly, the present data set. Among the various evaluation

methods described in chapter four, over-crowding is the only possible indicator of quality of housing, albeit it is only a weak representation. Occupancy norm was considered a more appropriate indicator of over-crowding, whilst occupation density (room density) can be used simultaneously as a reference.

Occupation density, which is expressed as the number of persons per room including the living room and kitchen, was used in the Census of 1991 to indicate overcrowding in a dwelling. In 1991, households in Britain were fairly well-housed, with nearly all households having an occupation density of less than one person per room. Only a very small minority, 0.3% of households, had to live in dwellings with an occupation density of over 1.5 persons per room.

In the FES 1991, "paying" households in England enjoyed even better living space compared with the Census figures, with only 0.5% of households living in a house with more than one person per room, and 0.1% households with a density of over 1.5 persons per room. Breaking down the density of occupation into affordability groups reveals that households in unaffordable housing were more likely to be living in dwellings with a higher occupation density. Households in unaffordable housing in schemes R_1 and R_2 were almost two times more likely to be in dwellings with a density of more than 1.5 persons per room than households in the "affordable" group. The situation of households in the "poverty" group regarding occupation density was closer to the "unaffordable" group than to the "affordable" group measured by the modified residual income measurement in scheme R_3 (Table 9.11).

However, although there appears to be evidence showing under-consumption of housing among households in unaffordable housing, such evidence was weak because the number of households involved was few: less than 10 households were both in unaffordable housing and experiencing high occupation density in all schemes. This makes the conclusion subject to large sampling error and also hampers further statistical analysis. Thus, it is not appropriate to pursue further this line of investigation.

At the same time, it was observed that households in unaffordable housing were not only more likely to occupy dwellings of higher occupation density, but also more likely to be

over-consuming housing. This situation was also observed when the occupancy norm was used as an indication of over-crowding and the implication of this will be discussed later in this section.

Table 9.11 Housing Affordability and Occupation Density

Affordability Measurement		Occupation Density (Person per Room) (% of Households)			
		Less than or equal to 0.5	Over 0.5 less than 1	Over 1 less than 1.5	Over 1.5
Scheme T	Affordable	54	45	0.5	0.1
	Unaffordable	76	24	0.4	0.1
Scheme R₁	Affordable	57	43	0.4	0.1
	Unaffordable	66	33	0.5	0.2
Scheme R₂	Affordable	58	42	0.4	0.1
	Unaffordable	65	34	0.5	0.2
Scheme R₃	Affordable	58	42	0.4	0.1
	Unaffordable	70	29	0.6	0.4
	Poverty	61	38	0.4	0
All		60	40	0.4	0.1
1991 Census		98		1.6	0.3

Source: Analysis of FES 1991; OPCS, 1993b

The occupancy norm was another indicator used by the Census for assessing over-crowding. The intention was that the Census would use this variable only in Scotland. However, it will be adopted, with minor alterations, for use in this thesis for households in England. Details of the alteration have been set out in chapter four of this thesis and a summary of the occupancy norm is listed below. A household needs one living room and one bedroom for each of the following combinations of household members:

* Each married couple
* Each single person aged 21 or above
* Each pair aged 10-20 of the same sex
* Each pair formed from a remaining child aged 10-20 with a child aged under 10 of the same sex
* Each pair of children aged under 10
* Each child unable to form a pair

Using the occupancy norm as an indication of the quality of housing also showed that households in England in 1991 were well housed with nearly two thirds of the "paying" households occupying dwellings over the occupancy norm and the remaining one third at the norm, Only 3% of households were living in dwellings below the norm (table 9.12). Breaking down this latter group of households into "affordability" groups shows

that households which were in "affordable" housing were more likely to be under-consuming housing than households in "unaffordable" housing (in all residual income measurement schemes).

Yet a case by case scrutiny of the households which were in affordable housing but, at the same time, under-consuming housing reveals that among the ninety five households in this group, six households, all of them single persons or couples, were living in a one-room house or flat and should not be considered as having inadequate housing. Another forty one households were one or two rooms short of the standard only if their baby sons or daughters were counted. The overcrowding of such households should not be severe. A further thirteen households had taken in non-relatives, who were likely to be the partner of the head of household or that of his son or daughter. They should be able to make pairs with one of the members of the household.

This left thirteen households, about 0.8% of the total sample, who were actually short of space. Almost all of them were one room short of the norm. Together with the observation made concerning the density of occupation, the problem of under-consuming housing by living in over-crowded dwellings can neither be regarded as a significant problem, nor is there an adequate sample size to pursue this further.

However, this only warrants the conclusion that, measured in terms of over-crowding, there is insufficient evidence showing that some households, apparently, maintained affordability only by the deliberate containment of their housing consumption at a level that was inadequate for their need. Over-crowdedness can only capture one dimension of housing consumption, whereas other aspects of housing inadequacy such as the lack of amenities and repairs, poor dwelling conditions and so forth cannot be provided by the present data set. Given that 1.5 million dwellings in England in 1991 were considered unfit for habitation, and 10% of the housing stock was in need of urgent repair, or households incurred additional cost by making the dwelling fit to live in (DoE 1993), there was plenty of "opportunity" for a household to keep down their housing consumption by occupying these unfit dwellings. Investigation into this aspect of the unaffordability problem requires more substantial information on housing conditions than is available from the present data set.

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Conversely, over half the households which were in unaffordable housing were occupying dwellings above the occupancy norm appropriate to their households' composition (table 9.12). The over-consumption of housing was significantly related to affordability in all four schemes. Households in unaffordable housing which were over-represented among households over-consuming housing. A similar pattern was also observed in an analysis earlier in this section using density of occupation as an indicator of over-crowding.

Table 9.12 Housing Affordability and Occupancy Norm

Affordability Group (% of Households)		Number of Rooms Under/Over the Occupancy Norm			
		Just Right	Over the Norm		Below the Norm
			1 Room	2 Rooms or More	
Scheme T	Aff	31	41	25	3
	Unaff	47	34	17	2
Scheme R$_1$	Aff	29	42	26	2
	Unaff	47	35	15	4
Scheme R$_2$	Aff	30	41	26	2
	Unaff	47	35	15	4
Scheme R$_3$	Aff	30	41	27	2
	Unaff	39	39	19	3
	Poverty	52	32	12	4
Total		34	40	24	3

Note : Aff(ordable) Unaff(ordable)
Source: Analysis of FES 1991

It begs the question whether households which were both in unaffordable housing and over-consuming housing should be classified as experiencing a voluntary but not a genuine affordability problem. However, further analysis suggests that among households which were both in unaffordable housing and, at the same time, occupying dwellings at a standard above the occupancy norm, a surprisingly high proportion were on housing benefit. Over half the households in this group were claiming housing or related benefit as against one fifth of households in the general sample. This resembles the socio-economic characteristics which were closely related to benefit claimants who were also over-represented in this group: local authority tenants, tenants in the unfurnished private rented sector, the single elderly, lone parents and households with unemployed or retired householders (table 9.13).

Housing association tenants were an exception to this later generalisation. Although the chance of claiming housing benefit was as high for their counterparts in the public rented

sector, they were not so likely to be in both unaffordable housing and, simultaneously, consuming housing above the occupancy norm.

A breakdown of the "unaffordable group" into "unaffordability" and "poverty" in scheme R_3 did not change the basic socio-economic characteristics of households which were both over-consuming and in unaffordable housing, albeit the polarisation of characteristics for this group was less extreme in scheme R_3 than in the other schemes.

As far as the current housing benefit system in Britain is concerned the over-representation of benefit claimants, local authority tenants and single elderly people in the unaffordable group who were, at the same time, over-consuming housing above the norm poses several queries regarding the previous proposition of reclassifying this group as affordable (Lerman and Reeder 1987, Sueke et al 1980).

First, the majority of people in this group were already on housing benefit, and there was little incentive for these households to diminish their level of housing consumption since this would be deducted pound for pound from their benefit.

Second, over half the households in this group were local authority tenants, so even if there was some incentive to persuade these households to adjust their level of housing consumption, the feasibility of such a change is doubtful, given the difficulties involved in exchanging houses in the public rented sector.

Finally, over a third of households in this group consisted of single persons. If these people were to reduce their level of housing consumption, it is unclear whether the housing system could provide accommodation at a level appropriate to the need of such people, given the slow adjustment of the housing stock to the changing demographic and economic structure.

In addition to Hancock's analysis of the difficulties, both economic and non-economic, of fine tuning the level of housing consumption would be controversial if it excluded households which were over-consuming housing, while unable to afford this level of consumption, from the "unaffordable" group. Empirical evidence in this section adds

impetus to the controversy of such an exclusion. Rethinking is required about treating households which are over-consuming housing as affordable regardless of their actual financial or housing situation. At least, as suggested by Hancock (1993), more detailed information is required before an assessment can be made.

Table 9.13 Households in Unaffordable Housing by Socio-Economic Characteristics by Overcrowding

Socio-economic characteristics	Households Over the Occupancy Norm (%)					
	Sch T	Sch R₁	Sch R₂	Sch R₃		All
	Unaff	Unaff	Unaff	Unaff	Poverty	
Tenure						
Local Authority	60	53	53	43	62	26
Housing Association	4	4	4	2	6	4
Private Rented (Unfurn)	10	8	8	7	9	5
Private Rented (Furnished)	2	3	2	3	1	5
Owned With Mortgage	24	32	33	45	22	60
Household Type						
Married Couples	41	48	49	48	50	65
Single Person	45	38	37	41	34	24
Lone Parent	8	8	9	6	11	5
Others	5	6	5	4	6	6
Household Size						
1 Person	45	38	37	41	34	24
2 persons	35	35	33	26	40	31
3 persons	9	12	13	12	14	18
4 Persons	9	16	14	17	11	19
More than 5 Persons	6	2	3	3	2	9
Age of Head of Household						
Less 30	12	11	11	12	10	20
30 - 39	14	14	16	19	13	25
40 - 49	10	11	13	16	10	21
50 - 59	12	11	13	11	14	14
Over 60	52	53	48	42	53	21
Employment Status of Head of Household and Partner						
Full Time	19	19	22	37	8	63
Part Time	4	4	4	5	3	4
Unemployed/Retired	77	77	74	58	89	33
Housing Benefit						
Claimants	58	52	52	37	67	21
Non-claimants	42	48	48	63	33	79

Note : Sch(eme) Unaff(ordable)
Source: Analysis of FES 1991

9.7 SUMMARY AND CONCLUSIONS

Three approaches to affordability measurement have been attempted in the previous three chapters, with varied success. The residual income measurement and an approach

combining ratio and residual income measurement have been successful in establishing a threshold level of affordability, while the behavioural approach failed.

The two successful approaches have created four measurement schemes: scheme T, which is based on the composite approach merging ratio and residual income measurements schemes R_1 and R_2 which are based on the residual income approach and made reference to, respectively, 140% of the income support level and half the average income as the poverty line; and scheme R_3 which attempted to differentiate unaffordability from poverty.

In schemes T, R_1 and R_2, there was a very high degree of agreement in classification, with a concordance rate of over 90%. This agreement was higher in the classification of the "affordable" group but less so among households which were "unaffordable". Because of this high degree of agreement between the three schemes, they shared a similar relationship with scheme R_3, which was a modification of the traditional residual income, and intended to differentiate poverty from unaffordability. Around half of the households which were classified as "unaffordable" by scheme T, the composite measurement scheme, were reclassified as in "poverty" by the modified residual income measurement scheme R_3. It suggests that if nearly half of the households were regarded as in unaffordable housing by the traditional measurement because of high housing cost but not a lack of resources, a fine tuning of the affordability measurement is thus necessary. These two groups may require different policy prescriptions to solve their problems.

Nevertheless, characteristics of households which were more likely to be in unaffordable housing, as revealed by these four schemes, were similar. Social tenants, lone parents, single elderly people, households with unemployed or retired heads and households with no dependent child were over-represented in the "unaffordable" group. Although when a more refined classification was made in scheme R_3, which further differentiated unaffordability and poverty, these basic characteristics were more appropriate to the "poverty" group than the "unaffordable" group, although the description still applied in general to households in "unaffordability" in this latter scheme.

Multivariate analysis was used to examine the combined effects of tenure, employment and benefit on affordability, as well as that of the life cycle. It was demonstrated in logit modelling that when the composite measurement approach, scheme T, was used, the interaction effect of benefit with tenure had more influence on affordability than the effect of employment. In schemes R_1 and R_2 the interaction of employment and tenure was more significant. A hierarchical loglinear model of scheme R_3 showed a similar relationship between these factors and affordability to that in schemes R_1 and R_2. This suggests that while the significance of tenure in affordability was unequivocal, benefit was significant to ratio measurement; but in residual income, employment (and implicitly earned income) was more influential.

With the help of categorical principal component analysis, a detailed picture locating the inter-relationship of affordability, tenure, employment and benefit was portrayed. It was found that affordability was closer to home owners, full time employment and non-claimants of benefit, whilst unemployment/retirement, local authority tenants and benefit claimants were associated closely with "unaffordability". This pattern could be observed in all four schemes. However in scheme R_3 "unaffordability" had moved closer to part time workers and private tenants while "poverty" had largely taken the place formerly occupied by "unaffordability" in the other schemes. This suggests there may be a different course of unaffordability among private tenants, which was the high level of housing cost due to rent deregulation in the sector in contrast to the lack of resources among social tenants.

An analysis of the life cycle effect on affordability, employing the life cycle group perspective, depicted a pattern which roughly matched the periods of "relative want" and "relative plenty" portrayed by other research on life cycle effects (e.g. Bradshaw et al 1987). Yet such an observation was not conclusive owing to the small sample size in some of the life cycle groups. At the same time, if household type and composition, and age of head of household were used to reproduce the life cycle effect, it was shown that affordability was closer to married couple households and households with school age children, while unaffordability was closer to elderly and childless households. However, the association between affordability and the components of the life cycle effect was, in general, not strong.

As households in unaffordable housing had to spend relatively more on housing, it is worthwhile to investigate whether they had to forgo consumption in other areas in order to maintain the high cost of housing. A preliminary analysis of household expenditure showed that households in unaffordable housing had to spend a higher proportion of their income on necessities, which included housing costs, but the difference in consumption patterns of luxury and necessity goods between "affordable" and "unaffordable" households was not great.

Notwithstanding this difference at the aggregate level, analysis of the expenditure pattern of individual households, using principal component analysis on the major expenditure items, revealed that the distribution of "luxury" and "necessity" items expenditure between the "affordable" and the "unaffordable" groups overlapped to a large extent. The "affordable" group had a wider choice of both types of consumption in contrast to the "unaffordable" group, which had no choice but to restrain their consumption in both areas.

On the other hand, it was confirmed by logistic regression analysis that using level of expenditure could not satisfactorily predict whether the household was in affordable housing or not. The model generated, though largely interpretable, did not fit the original data well, thus indicating that it was not a good predictor.

Quality of the dwellings occupied, as argued in previous chapters, was an integral component in assessing the affordability situation of a household. This thesis adopts the position that households occupying dwellings below the minimally accepted standard were unable to afford housing regardless of their affordability situation. On the other hand, this thesis suggests a view similar to the extended definition of affordability delineated by Hancock (1993), which calls for caution when dealing with households which were in unaffordable housing but, at the same time, over-consuming housing. They should not be categorically regarded as being in a voluntary unaffordability situation, but more information about the households is necessary before an assessment of affordability can be made.

In using overcrowding as an indicator of housing under-consumption, empirical evidence showed that only a very small proportion of households had to keep housing affordable by restraining their housing consumption to a standard below the socially accepted minimum. Such a pattern still held when a more relaxed indicator of over-crowding, the occupancy norm, was used. Hence, where over-crowding was concerned, there was no indication of unaffordability owing to under-consumption of housing. However, other areas of under-consumption must be explored before any conclusion can be reached because overcrowding can explain only a minor element of housing consumption.

Conversely, using occupancy norm as a yardstick for housing over-consumption, there was evidence of unaffordability through housing over-consumption. Indeed, the majority of households which were in an unaffordable position were over-consuming housing. Yet empirical evidence showed that a large proportion of households in this group were either single person households, benefit claimants or local authority tenants. The willingness of such households, or the opportunity available to them, to adjust their level of housing consumption were questionable. Thus, it would be unfair to such households if they were categorically reclassified as in voluntary unaffordability.

CHAPTER 10
ACCESS TO HOME OWNERSHIP

10.1 INTRODUCTION

The empirical investigations carried out in previous chapters have been concentrated on the current cost of housing and its relation to income and socio-economic characteristics of the household. This can be seen as a concern about the affordability of sustaining current housing arrangements. Yet it did not address one of the key problems that triggered the concern about affordability in the 1980s, namely the problem of access to home ownership.

Throughout the 1980s the Conservative governments pursued home ownership as the primary goal of housing policy. They introduced a range of measures aimed at extending home ownership down the income scale. A particular focus of attention was in encouraging council tenants to buy their dwellings. Initiatives such as the right to buy at a substantial discount (and more recently, the rent to mortgage scheme) were introduced to make it possible for council tenants to achieve home ownership. On the other hand, the new financial regime for local authority housing aimed to increase rents in real terms, in part in order to increase the cost of renting relative to buying (Forrest and Murie, 1988; Bramley, 1994).

Whilst the "right to buy" reduced the obstacle of council tenants' access to home ownership in the 1988s, prospects for potential home buyers in the private market in the past decade were less promising. House prices increased, both absolutely and relative to income, throughout the 1980s. Such increases were expected to have exacerbated the access problem of many prospective new home buyers. Yet the concomitant changes in the financing of home buying might have partly offset such adversity. On the one hand, the deregulation in the financial markets in the 1980s triggered a more relaxed lending policy of building societies so that mortgages were made more easily available. Home buyers who were previously excluded from the housing markets because their income was regarded as too low to afford home ownership found themselves able to borrow

from building societies; other home buyers were also allowed to borrow more (Jones and Maclennan, 1984; Bank of England, 1992). Hence, despite the high level of property price, easily available mortgages lessened, to a certain extent, the hurdle of access to home ownership.

On the other hand, the differential increase of house price in different parts of the country, deteriorated employment markets and volatile interest rates, which were partly a result of the deregulation in the financial markets and easier borrowing, had entangles many home buyers who had bought in the latest boom period in difficulties regarding repaying their mortgages (Forrest and Murie, 1990; Bramley, 1994). This led to a new concern about the "sustainability" of home ownership (Maclennan, 1994) and also created an unclear situation of new buyers' ability to afford home ownership.

Thus, to assess whether a prospective buyer could afford to buy and to sustain their early years of home ownership become a critical and important tool in the analysis of access to home ownership at a time when changes in the housing market are complex. Yet measuring access to home ownership entails considerable measurement problems. Unlike the measurements of affordability in the previous chapters which were based on current costs of housing, housing costs of a prospective buyer could only be hypothetical. This was achieved in previous research by estimating how large a mortgage a household could obtain, given the household income and other parameters set by the researchers, and to assess whether this was enough to cover the purchase cost of a dwelling at some given reference prices (e.g. Littlewood, 1986; Bramley 1990b, 1991). The lack of reliable behavioural models in this area makes the work of setting such assumptions difficult and survey data was of little assistance.

Despite the difficulties in obtaining accurate and reliable estimates of the housing costs of prospective home buyers, and subsequent affordability of prospective home buyers, there is still enormous interest among academics to focus their work on affordability in this area. Owing to the continuous surge of people moving into owner occupation and its importance in relation to social and economic policy, issues such as whether there is still room for further development of owner occupation and its impact on the social and economic development of society became important issues in housing and social policy.

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Measurement of the ability of prospective home owners to afford owner occupation forms a crucial part of the empirical investigation of such issues.

This chapter attempts to outline previous efforts to examine the ability of prospective buyers to afford home ownership and to portray the situation of prospective home owners in the late 1980s with regard to their ability to afford home ownership. It begins with a review of previous research on such issues dating back to the early 1970s, and is then followed by a summary of the technical measurement used in this thesis. The dimension of tenure preference will also be incorporated into this measurement. A profile of the affordability situation of prospective home owners will be described in the third section whilst logit modelling on the mortgage potential, a measurement of home buyers' ability to buy, will be delineated in the section that follows. The last section looks at the sensitivity of the assumptions made on the measurement adopted in this chapter and the impact of the Right to Buy discount on the affordability of sitting tenants.

10.2   MEASURING THE ABILITY TO BUY: A REVIEW

The proportion of owner occupiers has been steadily increasing since the turn of the century (Merrett, 1982). The impetus of such an upsurge showed no sign of declining even after the mid-1960s, when the majority of households in Britain were already home owners. It is believed that tax incentives, the availability of mortgages, capital appreciation and favourable government policy all fuelled the momentum of this upsurge (Whitehead et al 1993).

As with the "non-existence" of any general discussions on affordability before the 1980s, whether or not prospective buyers could afford to buy was not a public concern. It was regarded as a conventional wisdom that only those who could afford to buy would take such action. As already described in chapter two of this thesis, it was the escalation in house prices in the 1980s, and the related issues of a high level of mortgage arrears and property repossessions in the late 1980s and early 1990s, that aroused considerable public concern about whether people could afford to buy, and the difficulties of entry to home ownership became one of the first affordability issues to interest researchers.

However, early empirical studies of the affordability of prospective buyers were not motivated by such concerns. In the early 1970s, the Housing Research Foundation conducted a survey, based on samples from the National Readership Survey, on the household characteristics, income and attitudes toward home ownership. The most important finding highlighted by the survey was that there were over one million households at that time which could afford to buy a home who were still renting (Housing Research Foundation 1971). The tenure preference surveys in the 1960s complemented this finding and showed that the majority of households would prefer to buy (BSA 1983), apparently giving support to policies that encouraged further expansion of home ownership.

Toward the mid 1980s, when the proportion of home owners was approaching two thirds of the population, and house prices began to surge, sceptical views on whether home ownership was affordable for the majority of potential buyers began to emerge (e.g. Littlewood, 1986). Such scepticism was reinforced by a series of measures introduced by the government, such as the RTB and a series of low cost home ownership initiatives, apparently aiming to promote home ownership among households further down the income spectrum which might not, in the past, have aspired to owner occupation.

Littlewood (1986) conducted a secondary analysis on the 1978 GHS on the ability of potential home owners to buy. She found that nearly 70% of tenants under the age of sixty, who were believed to be the main source of potential home owners, lacked the ability to buy a cheap house at the lower end of the housing market.

As already described in chapter two of this thesis, the 1980s saw a rapid upsurge in house prices, especially during the latter part of the decade. The problem of access to home ownership had reached the political agenda. Commissioned by the Association of District Councils and the Federation of House Builders, Bramley (1990a) published the reports titled "Bridging the Affordability Gap", in which he estimated that less than a quarter (22%) of new households could afford to buy a three bedroom house in the open market using a conventional mortgage; 41% could afford such a house if the price was discounted by 30%, while over two thirds (68%) could afford to buy on a shared

ownership basis. If the new household was only aiming for a starter home of one bedroom, the affordability situation would improve, with the corresponding proportions increased to, respectively, 55%, 69% and 80%.

Contrary to previous research on access to home ownership, Bramley's reports highlighted the demand for social rented housing. This was defined as the residual demand after all those households which could afford some form of house purchase had bought their homes. In 1989, 32% of new households could not afford to buy a three bedroom house, but this was reduced to a fifth if a one bedroom dwelling was required. This emphasised the need to maintain a certain level of social housing in the portfolio of housing stock and is, apparently, a response to the decline of resource input into social housing, and consequent decline in output throughout the 1980s.

In the light of rapid fluctuation in house prices in the late 1980s, which was believed to have worsened the affordability position of potential buyers, estimates of the affordability problem based on the 1989 data soon became obsolete. The report was thus updated in 1991. It was found that the affordability of prospective home owners had deteriorated substantially over the year. Only 29% of new households could afford a one bedroom house and those which could afford to buy a one bedroom house were 45%. Thus 38% of households had to rely on social tenancies (Bramley 1991).

As the increase in house prices varied between local areas in Britain, so did the impact of the affordability of prospective home buyers. Unsurprisingly, access became most difficult in the south of the country, where both the level of house prices and the degree of increase were higher than in other regions. Littlewood (1986) found that only around one fifth to a quarter of tenants in the South East, East Anglia and London areas could afford to buy. Bramley (1989) also demonstrated that the proportion of new households in these areas which could afford a new one bedroom house was lower than the national average, and that the demand for social housing was higher than in other regions (Bramley 1991).

SERPLAN (South East Regional Planning Conference) was concerned about the worsening affordability situation in the south east region. It identified two levels of

affordability problem: the primary level, which applies to households which will always need some form of social housing. This includes the unemployed and households on very low incomes. The secondary level comprised those which could not get access to housing in the open market because of a "cyclical shortage in local housing markets" or "fiscal conditions governing the house purchase" (SERPLAN, 1990:3). Obviously, the affordability problems of prospective buyers were regarded as a variety of problems at the secondary level, which is essentially short term.

10.3   THE MEASUREMENT OF ACCESS TO HOME OWNERSHIP

The technical measurements of prospective home buyers' ability to pay used in the studies mentioned in the previous section are all based on an assumed relationship between house price and household income. They apparently attempt to link ability to buy with the likelihood of the household to obtain a mortgage, since the formulae for calculation deliberately emulate what was believed to be the building societies' practice of assessing mortgage loan applications. The term mortgage potential, used in Littlewood's research, vividly reflects such a line of thought. Although other authors did not use this term explicitly, their studies were based on the same principle in assessing the ability of prospective home owners to purchase their homes. It was shown in chapter three of this thesis that the mortgage potential measurement is a variation of the ratio measurement of affordability.

Basically, mortgage potential is expressed as a certain multiple of a household's annual income, and if the amount is larger than the reference house price, the household is deemed to be in affordable situation (refer to formula 3.5 for an illustration). While such deliberations were used in this general form by all authors, they differ in minor details: in the choice of both the income multiple and the reference house price, as well as in their methods of estimating household income.

The Housing Research Foundation (1971) used the crudest measurement of mortgage potential. It assumed that households whose head was under the age of forty and whose gross income exceeded £1250 (£1500 in London) would be regarded as being able to

buy. No justification for the use of such figures was given. If the average home purchase price of 1971, the year the survey was conducted, was used as a reference (which was £5631 (DoE, 1972)), the income multiple used in this survey is approximately 4.5. Figures of household income were collected in a specially designed household survey.

Littlewood (1986) made a more sophisticated adjustment of both the multiple and the reference house price. She used house prices at the median and the bottom quartile of distribution of purchase price paid by first time buyers in the region, provided by the Five Percentage Sample Survey on Building Society Mortgages, as reference house prices. At the same time, the multiple was set at three times the income of the head of the household and partner, but was systematically reduced when the age of the head of household was over forty, to take into account the effect that age would have on the period of mortgage repayment. Income figures were supplied by the 1978 GHS, which were differentiated only at the regional level.

Bramley (1990, 1991) paid more attention to rectifying the crudeness of regional income figures, as well as to providing a large variety of housing options, which reflected the diversity of the routes to owner occupation. He estimated the distribution of income at the county and district levels based on information from the New Earnings Survey. Four options of housing were provided: market sales, low cost sales, shared ownership and housing association tenancy. The costs of the options were calculated on the assumed regional cost of development, the proportion of properties that were to be purchased, the proportion of mortgage that could be obtained and the amount of HAG for the rental portion. The multiple was set to three for single earner households and 2.5 for double earner households.

These kinds of assessment are criticised as static and mechanical. First, because the calculations rely heavily on the price purchase (or the price of land in Bramley's calculation), cyclical fluctuations in the price of houses would quickly render such a snapshot calculation out of date. This would be especially true during a period of rapid price fluctuation (Whitehead et al 1993).

Second, the mortgage potential calculation ignores contributions from savings and inheritance which would reduce the cost of access. Thus, it tends to produce an overestimate of the problem of access (Whitehead et al 1993). On the other hand, as was highlighted in chapter three of this thesis, the assumption of a one hundred percent mortgage assumed in all mortgage potential evaluations would underestimate the problem, owing to the difficulty of accumulating enough savings for the deposit which is normally required for a purchase.

Third, such a calculation takes no account of the structure and distribution of house prices in the locality (Barnet et al 1990) because it is often a particular point in the house price distribution that is used as the reference. Thus, the sensitivity of the results would depend both upon the distribution of house prices and the choice of the particular reference point.

Finally, it is questionable whether such estimates match actual behaviour. Whitehead and colleagues (1993) point out the discrepancy in Bramley's estimate of a more acute problem of access in the south east region, while the number of first time buyers in this region were also the highest.

Many of these comments are valid, and reflect the lack of sophistication of the mortgage potential measurement, especially its failure to tackle diversity of both income and house prices within the locality. This estimate also failed to take into account the decision of an individual household given its own particular characteristics, income constraint and the distribution of house prices in the local area.

Nevertheless, there has been some effort to rectify such drawbacks. Bramley (1990b, 1991) attempted to employ more sophisticated income and house price data to model the variation in income in a small locality. Integrating the calculation of mortgage potential with the vast literature on tenure choice and tenure preference can also help to establish behavioural models which enable a more accurate estimate of future housing outgoings.

On the other hand, problems imposed by the fluctuating price of houses are not specific to mortgage potential but are a general problem of cross-sectional survey studies. A modification has been attempted by Bramley (1991), who provided a statistical update when more recent data became available. A more satisfactory solution awaits a comprehensive longitudinal study.

Despite the shortcomings described above, assessment by mortgage potential is the most sophisticated method available for investigating the affordability of prospective home buyers. It is an improvement on attempting assessment of the access problem without the backup of any solid quantitative data (as in the discussions in SERPLAN, 1990).

Another small advance to match more closely estimates of access and the actual behaviour of home buyers was made by Littlewood (1986) who incorporated the element of tenure preference into estimates of ability to buy. Her original intention was to estimate the proportion of tenants who preferred home ownership who were in a position to realise their aspiration. However, it also enabled a differentiation of households which could afford home ownership who wanted to be home owners from those who, while having the ability, preferred to rent. This latter estimate can help to fine tune the situation of access. The simple assumption that all households would prefer to become home owners if resources allowed would lead to an overestimate of the problem of access. In addition, the characteristics of households with reference to tenure preference and ability to buy would help to establish behavioural models in this area.

As discussed in chapter two of this thesis, contrary to the general belief that the majority of households would prefer home ownership, preference varied much among tenures and households with different socio-economic characteristics. Surveys on tenure preference found that public and private tenants, the young and the elderly had a substantially lower preference for home ownership than married and middle aged home owners (Littlewood 1986, Coles 1991). Littlewood (1986) also discovered that over 10% of households, although capable of buying, preferred to rent. Among households lacking the required mortgage potential, only around two thirds preferred to own. These are not trivial figures when estimating the size of the problem of access. In the

following sections the ability of prospective owners to buy in the light of their preference in the late 1980s will be examined.

10.4   MORTGAGE POTENTIAL AND TENURE PREFERENCE: A GENERAL PROFILE

The definition of Mortgage Potential

The empirical analysis in this and the following sections is based on samples from the 1988 GHS. Only tenants who were under the age of sixty, living in England, and renting from either the local authority or private landlords were selected for detailed analysis. The 1988 GHS was selected because a question on tenure preference was included in the questionnaire of that year the first time after 1978 when such question was first asked . Details of the sample selection as well as the characteristics of the selected households were described in chapter four.

The ability of tenants to afford home ownership was measured by the mortgage potential of the households as used by Littlewood (1986). Mortgage potential is defined as the product of the income multiple and the annual income of the head of household and partner. When the head of household is above forty years of age, mortgage potential is systematically reduced by the age factor as listed in table 10.1. The result is considered to be the amount of mortgage loan available to the household for house purchase.

Two types of mortgage potential are defined. A household is deemed to have "average mortgage potential" if it can afford a house at the median price paid by first time buyers in the household's region. If the household cannot afford a house in the lower quarter of the price range paid by first time buyers in the region, the household is considered to have "marginal mortgage potential" (formula 10.1).

The use of marginal mortgage potential as an indicator allows more relaxed criteria for assessing the problem of access. It can serve as a lower threshold for becoming a home owner because only a quarter of first time buyers in the region could have bought a house at a price lower than the corresponding reference price.

$$MP = INP * (INC_{HH} + INC_S) * AF$$

MP   - *Mortgage Potential*
INP   - *Income Multiple*

Where INC_{HH}- *Income of Head of Household*

        INC_S - *Income of Spouse*

        AF   - *Age Factor*   (10.1)

If $MP > P_{AVG}$ *then the Household would have Average MP*

If $MP > P_{MAR}$ *Then the Household would have Marginal MP*

       P_{AVG}-*Avgerage House Price of the Region Paid by FTB*

Where P_{MAR}-*lower Quarter of House Price of the Region Paid by FTB*

       FTB-*First Time Buyer*

Data from the regional median and lower quarter of the house price distribution were based on an unpublished table from the 1988 Five Percent Sample Survey of Building Society Mortgages supplied by the DoE on request. Part of the analysis presented in this and the following sections have been published in Yip and McLaverty (1993), McLaverty and Yip (1993) and McLaverty and Yip (1994). Before the relationship between the ability to buy and tenure preference is analyzed, a general profile of the socio-economic characteristics of households which prefer to be home owners will be presented in the next section to provide contextual information.

Table 10.1 Age Factor in the Calculation of Mortgage Potential

Age of Head of Household	% of Reduction
Under 40	0
40 - 44	10
45 - 49	20
50 - 54	35
55 - 59	65

Source: Littlewood (1986)

As mentioned in the previous section, household savings should also be crucial to the calculation of the access to home ownership. Ignoring the contribution of savings would undermine the ability of the household to buy but assuming all households would have enough savings to pay for the down-payment may, on the contrary, over-estimated their ability to be home owners. However, it is not possible to include the contribution of savings in the evaluation of mortgage potential in this thesis owing to the lack of such information. There is no information on savings in the 1988 GHS. From the information of income from gross interests received by the respondents, proportion of households having savings of one form of another was small and the amount of their

savings was not big[15]. Although there may be a possibility that prospective home buyers could have other assets or they could get help from other sources, without reliable information, the assumption that they have no savings (or other realisable assets) to pay for downpaying should not be too far from reality.

Tenure Preference

As already described in chapter two of this thesis, various surveys conducted since the 1960s all found a preference for home ownership among households in Britain (BSA,1983,1986,1989; Coles 1991; OPCS,1979,1989). There was no exception to these findings in 1988. Over three quarters (79%) of households in England in 1988 preferred home ownership. Those which preferred to rent formed less than one sixth (16%) of all households.

To match the sample of households which was used to analyze mortgage potential, further analysis on tenure preference and socio-economic characteristics was performed on public and private tenants under the age of sixty who had expressed a definite preference for either renting or home ownership. A profile of this analysis is presented in table 10.2

A substantial difference is apparent in the preference to own between younger tenants in the public and private sectors. Less than three quarters (71%) of public tenants wanted to buy compared with 84% in the private sector. Such preference varied less between the regions. Although it is, in general, local authority tenants in the south of the country who preferred home ownership, the difference was small. The difference was small even among private tenants and a reverse pattern was observed: private tenants in the north preferred home ownership more than their counterparts in the south.

Households with heads who were in full time employment: professionals, employers, intermediate and junior non-manual workers and skilled manual workers, would be more likely to prefer to own. Married couples had a high level of preference to buy compared with both lone parent and single person households. Those with educational qualifications (GCSE or above) and those who were in good health were also more

likely to prefer home ownership.

The relationship between the preference to own and the age of the householder was more complicated. Middle aged householders were the most likely to prefer to buy, younger householders less so, and their older counterparts had the least inclination to purchase a home. Preference for home ownership also increased with the increase in income of the households. Less than two thirds (60%) of public sector tenants and around three quarters (73%) of private sector tenants in the bottom quartile of the income distribution preferred to own. The corresponding proportions of households in the upper income quartiles were 95% and 87%.

When comparing preference with figures from a decade ago, it was found that while home owners and tenants in the private furnished sector showed an increased preference for home ownership, preference among other tenants remained the same. Whilst the proportion of households which preferred to own had increased in the south, fewer local authority tenants in the northern regions preferred home ownership (Littlewood, 1986; Yip and McLaverty,1993).

Table 10.2 Preference to Own by Socio-economic Characteristics By Tenure (Tenants Under 60 in England)

Socio-economic Characteristics / Tenure Preference / Current Tenure	Tenants Prefer to Own %	
	Local Authority	Private
All Tenants	71	84
Region		
North	77	100
Yorks and Humberside	64	78
East Midlands	61	100
East Anglia	73	86
London	81	86
South East	76	76
South West	79	90
West Midlands	65	86
North West	82	80
Employment Status (HoH)		
Full Time	81	90
Part Time	67	85
Unemployed/Retired	75	56
Others	57	76
Socio-economic Group		
Professional/Manager/Employers	77	93
Intermediate and Jun Non-Manual Workers	78	91
Skilled Manual Workers	78	79

Table 10.2 Preference to Own by Socio-economic Characteristics By Tenure (Tenants Under 60 in England)

Socio-economic Characteristics / Tenure Preference / Current Tenure	Tenants Prefer to Own %	
	Local Authority	Private
Semi-skilled and Personal Service Workers	67	80
Unskilled Workers	54	63
Household Type		
Married Couple	79	87
Single Person	57	81
Lone Parents	66	87
Others	72	85
Qualifications of HoH		
Have Qualifications	82	86
No Qualification	65	75
Health Condition of HoH		
Good Health	76	87
Fairly Good Health	70	80
Not Good Health	59	79
Age of HoH		
Under 30	76	87
30 - 34	78	100
35 - 39	80	*90*
40 - 44	76	94
45 - 49	73	74
50 - 54	60	*50*
55 - 59	46	63
Income Quartile Group		
Bottom Quartile Group	60	73
Second Quartile Group	71	88
Third Quartile Group	81	89
Top Quartile group	95	87
Number of Households	884	294

Note: Percentage in italic denotes number of cases less than 10
Source: Analysis of GHS 1988

The ability to buy

In 1988, less than a quarter of tenants who were under the age of sixty, renting from local authorities or from private landlords, could afford to buy a cheap house in the bottom quarter of the price range for first time buyers in the region. Only half of these (12%) would be able to afford a house at the median price.

The situation among private tenants was slightly better than that for their counterparts in council housing. Less than a quarter (22%) of local authority tenants had marginal mortgage potential, of whom only half (11%) had average mortgage potential; over a quarter (28%) of private tenants had at least marginal mortgage potential, and half of

these (14% of the total) could afford to buy at the median house price paid by first time buyers in the region.

Since house prices across regions varied more than income, it is not surprising to find a difference in the proportion of households which would be able to buy. Households in Yorkshire and Humberside were more than three times more likely to be able buy than households in the South East, and more than six times than households in London. As with the pattern of regional house price levels and the findings of similar studies (e.g. Bramley,1990,1991), households in the south and south east were least likely to be able to afford home ownership.

Married couple households were found to be in a more affordable situation than single person households and lone parents; those with an educational qualification and those in good health were more likely to be able to afford home ownership.

Fewer households with young householders could afford to buy compared with middle aged householders. Because of the systematic reduction of mortgage potential once the householder was older than forty and the severe reduction when he approached retirement, only a few households with a householder over the age of fifty were in a position to buy.

There was also an apparent life cycle pattern in the ability to afford home ownership. Employing the life cycle group model (Bradshaw et al, 1987) used in the previous chapter, a period of "relative need" can be observed. The young single and family formation stages were periods in the life cycle when households were less able to afford home ownership. On the other hand, periods of "relative plenty": the young married, two generation and early disposal stages included the highest proportion of households which could afford home ownership.

However, the clearest patterns were found among households with varying income and, consequently, groups of households which were more likely to enjoy higher income. Whilst over 80% of local authority tenants and 61% of private tenants in the top income quartile could afford home ownership, none could who were in the bottom quartile.

Households with a householder working full time or in the professional, employers and managers group had the highest chance of being able to afford to buy. Those who were working part time, unemployed or in unskilled manual work were the least able to do so. Such a result is not surprising given the importance of household income in the definition of mortgage potential (table 10.5).

Comparing these with figures on affordability from a decade ago, it was found that the proportion of tenants below the age of sixty, in both the public and private sectors, who had average mortgage potential, remained the same. Those with marginal mortgage potential increased (Littlewood, 1986; Yip and McLaverty, 1993). This indicates that while affordability for an average tenant remained constant, for poorer tenants the situation had deteriorated over the decade. Such deterioration occurred in almost every region in England. Although this may be the effect of being at different position in the house price cycle, 1978 was at the ebb of the cycle whereas 1988 was just before the peak, at least the differential effect of house price changes on households at different points of the income spectrum.

Because only around three quarters of the households in the sample preferred to own, not all households in either the "affordable" or the "unaffordable" group are expected to prefer to be home owners. It is not surprising to find that households with mortgage potential would prefer home ownership, given the higher preference to own among households with higher incomes and the close relationship between the level of income and mortgage potential. Table 10.3 shows that among tenants who had the ability to be home owners, the overwhelming majority (90%) would prefer to own as against 70% of those who could not afford home ownership.

This pattern holds for all groups of households when broken down into housing and other socio-economic characteristics. However, it is difficult to observe the relationship between mortgage potential, the preference to own and socio-economic characteristics of the households by inspecting the descriptive statistics because of multi-dimensional interaction effects. This will be explained in the following section using logit modelling and logistic regression. Meanwhile, one thing about mortgage potential and tenure preference is certain. If a conclusion were to be drawn on the ability of access to home

ownership from the mortgage potential figures alone, there would be a 10% over-estimation of households who might buy because some of those who had the ability to buy would prefer to rent.

Table 10.3 Socio-economic Characteristics By Mortgage Potential by Preference to Own (Tenants Under 60 in England)

Socio-economic Characteristics / % of Households	Have MP		Prefer to Own	
	MMP	AMP	Have MMP	No MMP
All Tenants	23	12	90	70
Tenure				
Local Authority Tenants	22	11	86	67
Private Tenants	28	14	96	79
Region				
North	34	21	87	74
Yorks and Humberside	38	19	80	60
East Midlands	37	18	91	60
East Anglia	22	11	92	74
London	6	3	100	81
South East	13	6	96	73
South West	18	5	93	81
West Midlands	29	11	89	60
North West	28	16	90	56
Employment Status (HoH)				
Full Time	43	22	89	80
Part Time	8	3	100	59
Unemployed/Retired	7	2	92	70
Others	3	0	75	59
Socio-economic Group				
Professional/Manager/Employers	46	28	91	80
Intermediate and Jun Non-Manual Workers	15	7	97	80
Skilled Manual Workers	31	17	89	74
Semi-skilled and Personal Service Workers	19	7	82	65
Unskilled Workers	16	8	88	48
Household Type				
Married Couple	40	23	88	75
Single Person	15	5	90	64
Lone Parents	4	0	90	67
Others	18	6	93	78
Qualifications of HoH				
Have Qualifications	28	14	93	80
No Qualification	19	9	83	62
Health Condition of HoH				
Good Health	30	16	89	75
Fairly Good Health	18	8	90	69
Not Good Health	10	4	79	60
Age of HoH				
Under 30	21	8	93	77
30 - 34	38	25	90	78
25 - 39	35	19	88	76
40 - 44	35	20	92	75
45 - 49	25	10	81	70

Table 10.3 Socio-economic Characteristics By Mortgage Potential by Preference to Own (Tenants Under 60 in England)

Socio-economic Characteristics / % of Households	Have MP		Prefer to Own	
	MMP	AMP	Have MMP	No MMP
50 - 54	7	10	*53*	59
55 - 59	2	*0*	*50*	49
Income Quartile Group				
Lowest Quartile Group	0	0	0	63
Second Quartile Group	17	*1*	88	73
Third Quartile Group	45	25	85	82
Highest Quartile Group	80	61	95	80
Life Cycle Group				
Young Single	15	*5*	88	77
Young married	43	*32*	100	75
Family Formation	41	*15*	83	89
Middle Childrearing	54	32	86	77
Complete Family	55	31	85	82
Early Disposal	36	21	82	81
Two Generation	26	13	90	72
Empty Nest	*5*	*4*	*33*	58
Early Retirement	*0*	*0*	0	0
Old and Single	*0*	*0*	0	0
Lone Parent	*4*	*0*	89	69

Note: Percentage in italic denotes number of cases less than 10
Source: Analysis of GHS 1988

10.5   LOGIT MODELLING

Marginal mortgage potential was related to most of the tenure and socio-economic characteristics when each of these characteristics was examined in turn with marginal mortgage potential. Bivariate analysis of socio-economic characteristics with marginal mortgage potential shows significant chi-square or F statistics in nearly all of the characteristics, which indicate the existence of association (table 10.4). Households having a child below the age of five were an exception in which there is no association between the presence of pre-school children and the marginal mortgage potential of the household. A multivariate technique was employed to examine the relative importance of these socio-economic characteristics. Logit modelling and logistic regression analysis, which have been used in previous chapters, are used in this section to examine such effects. Logit modelling (Appendix A12) is appropriate for investigating the interaction effect of three or more categorical variables and three logit models are examined in this section.

Table 10.4 Bivariate Analysis: Marginal Mortgage Potential by Tenure, region and socio-economic characteristics

Socio-economic characteristics	Chi-square
Tenure	4.4**
Region	81.0**
Tenure Preference	37.4**
Socio-economic Status HoH	51.1**
Household Type	154.5**
Employment Status HoH	227.3**
Children Under 5	6.7ns
Children 5 to 15	19**
Children 16 to 24	4.9**
Children over 25	17.3**
Qualifications	13.3**
Health	40.2**
Employment status of spouse	31.7**

	F Value
Age	15.5**
No of Persons	39.5**
No of Children	0.58ns

Note: ** p<0.01 ns Not Significant
Source: Analysis of GHS 1988

These three logit models were intended to test the interaction of mortgage potential, tenure preference and a number of selected socio-economic characteristics. The first model explores the interaction of marginal mortgage potential with tenure preference, tenure and region. The second examines the interaction of mortgage potential with tenure preference, household type and household composition. The final model examines the interaction of mortgage potential with tenure preference, employment status and household income. The results of these logit models are presented in table 10.5.

Table 10.5 Logit Models: Marginal Mortgage Potential by Household Socio-economic Characteristics

Dependent Variable: Marginal Mortgage Potential		
Final Model	G^2	p
1. [M] [P] [R] [M*P] [M*R]	20.8	0.65
2. [M] [P] [E] [Q] [M*P] [M*E] [M*Q]	18.2	0.20
3. [M] [P] [H] [C5-15] [M*P] [M*H] [M*C5-15]	75.8	0.11

Note: M (Marginal Mortgage Potential) P (Tenure Preference) R (Region) E (Employment Status of HoH) Q (Income Quartile Group) H (Household Type) * denotes the interaction effect
Source: Analysis of GHS 1988

In model one, marginal mortgage potential was set as the dependent variable and the initial model region, tenure preference and tenure as the independent variables. The most appropriate model was selected with reference to the log likelihood statistics, with one variable at a time taken from the saturated model (the model that contains all the relevant interactions among all variables).

However, the final model, where an exclusion of any of the terms in the model will lead to a significant drop in the likelihood statistics, was simple. Tenure was found to be insignificant in the model, as were the two-way and higher order interaction effects. This indicates that, although tenure was found to be significantly related to mortgage potential when it was considered alone, the effects of tenure preference and region could explain the variation of mortgage potential between public and private tenants. All other factors in the model were independent of each other where mortgage potential was concerned. It is not surprising that the effect of region was significant given the importance of regional price variation in defining mortgage potential. However, it is interesting to note that this could not account for the effect of tenure preference on mortgage potential. This indirectly indicates that tenure preference is not shaped only by the level of house price but may act as an independent factor.

The second set of models looks at the effects of employment, income and tenure preference on the ability to buy. The final model of this set was simple, with only two-way interaction effects. Tenure preference, employment status of head of household and income quartile group, if considered individually, all showed a significant difference between households which could afford to buy and those which could not. The effects of these three factors on ability to buy were independent of each other. In other words, given that the households belonged to a particular income quartile group, there was no difference in the ability to buy between households which preferred to buy and those which preferred to rent. A similar relationship existed with other combinations of factors (table 10.2). The direct relationship between household income and mortgage potential is clear, but the independent effects of tenure preference and employment need some explanation. The independent effect of tenure preference was attributed to a similar factor mentioned in the previous paragraph, whilst the effect of employment not only represented a source of income (which should be accounted for by the income

variable) but was a proxy for other attributes not represented by income, for instance: age, education level and health (which were also significant for the determination of mortgage potential).

In the third set of models the effect of tenure preference is examined, with household type and household composition, on the ability to buy. The initial model included tenure preference, household type and whether there were children at various ages within the household. It was found that household type, tenure preference and having children aged 16 to 24 were significant in explaining the variation in ability to buy. The presence of children in other age ranges could be explained by other factors in the model. As with the two sets of models examined in this section, only the two-way interaction effects were significant. It is a more complicated model than the two described, which reflects the complexity of life cycle effect on with affordability.

The goodness of fit (the G^2 statistics) of the three models also indicates how well the explanatory variables fit the model. It is evident that the model involving income and employment status fits best, suggesting a strong effect of income on mortgage potential whilst the life cycle effect was the weakest. The inclusion of tenure preference in all three models would also suggest it as an independent factor influencing mortgage potential. This indicates that tenure preference is an informative intervening variable which plays a significant role in the study of affordability for prospective home buyers.

10.6   SENSITIVITY ANALYSIS

The ability of a prospective home buyer to afford owner occupation was evaluated in this chapter by the measurement of mortgage potential, which is only an estimate based on some assumptions about the behaviour of prospective buyers. A more formal way of validating this measurement is to compare the estimated outcome with real life data. However, the available data does not make this kind of validation feasible. Sensitivity analysis is a second-best option which provides a means of judging whether the estimate is acceptable by testing how the results of the analysis vary with a change in assumptions. Though sensitivity analysis cannot offer a definitive test of the validity of

the estimate, it does at least provide some clues on how sensitive the choice of assumption would have to be to affect the results of the analysis.

There are two parameters in mortgage potential evaluation in formula 10.1 in which explicit assumptions have to be made: the income multiple factor and the age factor. The importance of the sensitivity of selection of a particular value for these two parameters will be tested in this section. Likewise, although the levels of regional house price were based on behavioural data, implicit assumptions are also involved. A decision was made to select the average and the lower quartile of the price range as the reference price. This would have produced a different definition of classifications if different reference prices had been selected. Testing the use of an alternative reference house price because of the price reduction sitting tenants could enjoy under the Right to Buy Scheme was also significant. Therefore the variation in house price in results from previous analyses will also be examined.

The age factor used in the calculation of mortgage potential was set out in table 10.1 which was adapted from Littlewood (1986). It is assumed that the mortgage loan has to be paid back before the head of household retires, so the period of repayment for an older householder will be reduced. In order to take into account the reduced period of repayment, the amount of each regular repayment has to be increased. Thus because of a higher repayment, the mortgage potential of older householders is reduced.

Littlewood did not explain explicitly such assumptions nor did she provide any information justifying the levels of age factor chosen. Yet this can be tested against the increase in mortgage repayment as a result of a reduced period of repayment. An illustrative calculation is presented in table 10.6. Suppose that a household takes a 25 year repayment mortgage of £10,000 at an interest rate of 10% per annum. The normal monthly repayment of interest and principal is £9.19. If the length of repayment is to be reduced, the extra repayment in relation to the reduced period of repayment can be calculated.

It is shown that the percentage of reduction in mortgage potential using the age factor is close to the percentage of increase in mortgage repayment when the head of household

is younger than fifty. However, for older householders, the level of reduction by the age factor is not enough to reflect the increase in mortgage repayment. It is thus expected that the mortgage potential of older householders would be worse than the level calculated in formula 10.1. This sensitivity analysis is also sensitive to the choice of interest rate level and the reference period of repayment and should be interpreted with caution.

Table 10.6 Age Factor and Reduction of Mortgage Potential

Age of HoH	Age Factor	Mid Point of Age Range	Monthly Outgoing of Repayment £pw	% of increase over base reference
Under 40	0	Reference Group	9.19	0
40 - 44	10	42	10.17	10
45 - 49	20	47	11.74	22
50 - 54	35	52	16.68	41
55 - 59	65	57	33.51	73

Note: The Reference Mortgage Outgoings are based on the repayment of a mortgage loan of £10,000 at 10% interest repaying over 25 years
Source: Age Factor (Littlewood, 19866);Monthly Outgoings (BSA, no date)

Another parameter in the evaluation of mortgage potential is the income multiple. Littlewood (1986) took the value of 2.5 which is also used in this thesis. This level of income multiple implies that the household is able to obtain a mortgage loan two and half times the annual income of the head of household and partner. Since Littlewood (1986) assumes that the mortgage would be one hundred percent of the house price, statistics on income to price ratio would provide a comparison of the adequacy of this assumption.

The price to income ratio has varied substantially over the past two decades. The peak of this ratio for first time buyers was in 1974 (when such statistics were available) when first time buyers could, on average, obtain a mortgage loan 2.8 times their annual income. The ratio fell for the remainder of the 1970s, reaching a ebb of 2.06 in 1982. The 1980s saw a rise and in 1990 it was 2.66 (DoE 1991). In 1978, the price to income ratio was, on average, 2.25, a stricter ratio than the 2.5 level used by Littlewood (1986). In 1988, it was 2.54 which is close to the level used in this thesis. However, the income counted towards mortgage potential in Littlewood (1986) and in this thesis includes the income of the partner of the head of household, which may not always be the case when a building society considers a mortgage application. Because the income figures in the

price to income ratio statistics are based on information related to the mortgage application, the level would be reduced if the income definition used in Littlewood (1986) and this thesis was employed.

Another related assumption is the advance to price ratio. Littlewood (1986) assumed that a household could obtain a mortgage equal to the price of the house . However, this assumption of one hundred percent advance was not a close approximation to the mortgage first time buyers could actually secure in 1978, which was only 76% (DoE 1979) of the purchase price. Thus Littlewood (1986) over-estimated the potential of prospective buyers in getting adequate mortgage loans.

In 1988, the average advance to price ratio rose to 85% (DoE 1989), and many first time buyers could have an advance close to, or more than they needed, to cover the house purchase. In 1989, half of first time buyers could secure an advance of more than 94% of the price of the house, and a third could have borrowed more than the house purchase price (Bank of England 1991b). Thus, the scenario of obtaining a one hundred percent advance for first time buyers was more likely in 1988 than in 1978. In addition, the estimation of mortgage potential in Littlewood's study and this thesis does not take into account the transaction costs of home purchase and the lower value of surveyor's valuation, to which building societies make reference when granting mortgage loans, than the actual purchase price. It further widens Littlewood's over-estimation. This situation would be less serious in 1988 when a considerable proportion of first time buyers could get a loan more than the purchase home price.

The choice of income multiple might largely reflect the situation of first time buyers in 1988, but is nevertheless a suggested figure which was not precisely evaluated from behavioural data. A sensitivity test on the income multiple can be illuminating in judging the validity of the measurement. Figure 10.1 shows a simulation of the change in households having mortgage potential on a different assumption of the income multiple.

It is apparent from the graph that the proportion of households having both marginal and average mortgage potential increased as the level of income multiple increased. The change in proportion of both measures of mortgage potential followed a quadratic

regression function, with a high degree of fit, in relation to the change of income multiple (values of the R square statistics of the regression equations are shown). Marginal mortgage potential is more sensitive to the change of income multiple than average potential and the change of marginal mortgage potential at the lower end of the income multiple level is yet more sensitive. An increase of income multiple from 2 to 2.01 would produce in a 2.9% increase in households with marginal mortgage potential. The increase is smaller at 1.3% when the income multiple changes from 4 to 4.01.

A change of income multiple would have a different impact in relation to the ability to buy on different groups of households. Table 10.7 shows the regional, tenure composition and socio-economic characteristics of households having marginal mortgage potential under three scenarios of income multiple. When the income multiple is changed from 2.5 to 3, there are 3% more households with marginal mortgage potential. This would increase to 13% if the income multiple were 4.

This change of income multiple would have a great effect among private tenants and households living in regions where house prices were higher. Eleven percent of households in London would be able to buy if the income multiple were 3, an 80% increase over the level able to buy when the income multiple was 2.5. It is also, generally, households which were less likely to be in an affordable situation who would gain more if the income multiple were to be increased. The proportion of households which have mortgage potential and who, at the same time, preferred to buy, showed little change when the income multiple changed. Whilst 89% of households having the ability to buy preferred home ownership, the proportion decreased to, respectively, 88% and 85% when the income multiple changed to 3 and 4.

Figure 10.1 Mortgage Potential and Change of Income Multiple
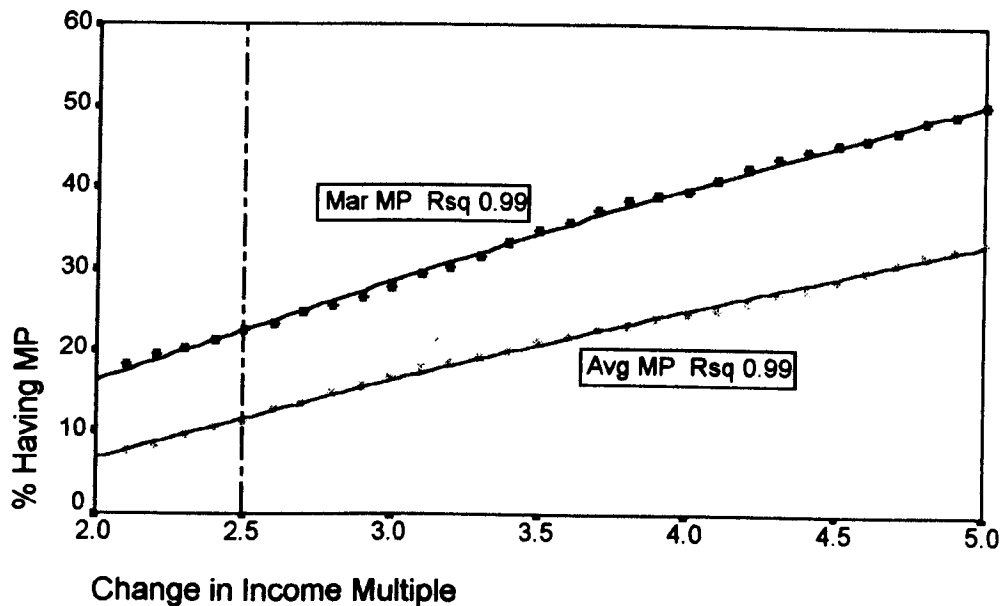
Source: Analysis of GHS 1988

Table 10.7 Sensitivity Analysis: Income Multiple

Income Multiple	Households Having MMP %		
	2.5	3	4
All Tenants	23	29	36
Tenure			
Local Authority Tenants	22	27	33
Private Tenants	28	35	44
Region			
North	34	42	48
Yorks and Humberside	38	43	52
East Midlands	37	42	49
East Anglia	22	26	46
London	6	11	16
South East	13	19	27
South West	18	22	29
West Midlands	29	35	40
North West	28	32	39
Employment Status (HoH)			
Full Time	43	51	61
Part Time	8	13	18
Unemployed/Retired	8	11	21
Others	3	2	7
Socio-economic Group			
Professional/Manager/Employers	46	55	66
Intermediate and Jun Non-Manual Workers	15	20	33
Skilled Manual Workers	31	38	54
Semi-skilled and Personal Service Workers	19	24	35
Unskilled Workers	16	19	29
Household Type			
Married Couple	40	51	27
Single Person	15	20	25
Lone Parents	4	8	12

Table 10.7 Sensitivity Analysis: Income Multiple

Income Multiple	Households Having MMP %		
	2.5	3	4
Others	18	21	33
Age of HoH			
Under 30	21	27	34
30 - 34	38	48	56
25 - 39	35	45	55
40 - 44	35	39	50
45 - 49	25	30	36
50 - 54	7	11	16
55 - 59	2	2	7
Average Age of HoH	35	35	35
Average Income of HoH+Partner £	15599	14599	13589
With MMP and Prefer to Buy	89	88	85

Note : MMP Marginal Mortgage Potential
Source: Analysis of GHS 1988

As mentioned earlier in this section, house price is the parameter. No explicit assumption has been made in the mortgage potential calculation, and a sensitivity test could be illustrative. House prices were not stable in the 1980s and early 1990s. It was shown in chapter two of this thesis that house prices escalated towards the later part of the 1980s, but plummeted in the early years of the 1990s. At the same time, the change in interest rates may have an effect similar to the change in house price, an increase in either house price or interest rate would force the monthly repayment upward. There was a substantial increase in the mortgage rate in 1988 from 10% in January to 13.5% in the early months of 1989. This produced an effect on outgoings equivalent to a 30% increase in house price.

Local authority tenants are given the right to buy the accommodation they currently occupy at a substantial discount under the Right To Buy Scheme. In 1988, the maximum discount available to a sitting tenant was 60% for a house and 70% for a flat. Simulating the effect of a change in house price on the mortgage potential would illustrate the effect that the fluctuation of both house price and the interest rate would have on mortgage potential, as well as the effect of the RTB policy on the affordability of local authority tenants.

Figure 10.2 shows the change in the proportion of households with average and marginal mortgage potential when house prices change. In a similar manner, the change

in mortgage potential with the change of income multiple might fit well with a quadratic regression equation in relation to the change in house price.

The shift in mortgage potential was slightly more sensitive to house price change if the reduction in house price was large. If the house price was reduced from 100% to 99%, a corresponding further 0.3% of households would have marginal mortgage potential; but the same percentage change for around a 50% discount, the corresponding change was 1%. Marginal mortgage potential was more sensitive to price change than average mortgage potential. Yet the effect of house price change on both types of mortgage potential was small if there was only a small fluctuation around the 100% mark.

In 1988, the average discount available to sitting tenants from RTB was 51%. The average valuation of dwellings sold in 1989-89 under the RTB was £36600 (HM Treasury 1989). This was close to the average price of £38028 paid by first time buyers in the market in 1988 (DoE 1989). Thus, simulating the change in average mortgage potential at a 51% price reduction would be a close approximation of the ability to buy under the RTB. These results are presented in Table 10.8.

Only 11% of local authority tenants could afford to buy an averagely priced house in the market. Twenty two percent had the ability to buy a cheaper house in the lower quartile of the price range. Under the RTB, nearly a third (31%) of local authority tenants could afford to buy. Tenants living in regions with high house prices in general gained greater benefit from the RTB. Whilst a small minority of local authority tenants in London and the South East could afford an average priced house in the market, over a quarter (28%) in the South East and about one in six (16%) in London could afford to buy under the RTB. Although the RTB narrowed the gap in the ability to buy in the regions, London, the South East and the South West had the lowest proportion of local authority tenants who could afford home ownership.

Notwithstanding the RTB, there was an increase in ability to buy among groups which were less likely to be in an affordable situation in the open market: households living in regions with high house prices, those working part time, the unemployed, semi-skilled and unskilled workers, single persons and households on low incomes. These groups

remained among those with the least ability to afford home ownership. Local authority tenants who most likely to be able to afford to buy under the RTB were married couple households, with householders in their thirties and forties, in full time employment, who belonged to the socio-economic group of professionals, employers and managers. One exception to this was the group of households headed by manual skilled workers, which saw a three fold increase in the likelihood of being able to afford to purchase under the RTB, and reached a level comparable to that of the professionals and employers. This picture largely matches findings on the profile of council house buyers, in which 55% were aged between 35 and 44; 70% were in full time employment; and 86% were manual skilled workers (Kerr 1988).

Table 10.8 Sensitivity Analysis: House Price Change (RTB)

Local Authority Tenants Having Mortgage Potential			
Reduction of House Price	AMP		MMP
	No Reduction	51% Reduction	No Reduction
All Tenants	11	31	22
Region			
North	20	41	33
Yorks and Humberside	18	45	32
East Midlands	15	36	32
East Anglia	6	33	12
London	1	16	4
South East	3	28	10
South West	4	28	17
West Midlands	12	30	27
North West	15	30	24
Employment Status (HoH)			
Full Time	23	61	44
Part Time	3	12	7
Unemployed/Retired	1	12	7
Others	0	5	2
Socio-economic Group			
Professional/Manager/Employers	23	50	40
Intermediate and Jun Non-Manual Workers	5	18	12
Skilled Manual Workers	18	47	32
Semi-skilled and Personal Service Workers	7	25	18
Unskilled Workers	7	22	15
Household Type			
Married Couple	21	53	38
Single Person	3	17	12
Lone Parents	0	6	3
Others	8	24	16
Age of HoH			
Under 30	9	29	22
30 - 34	20	51	34
35 - 39	17	47	31

Table 10.8 Sensitivity Analysis: House Price Change (RTB)

Local Authority Tenants Having Mortgage Potential			
Reduction of House Price		AMP	MMP
40 - 44	20	44	32
45 - 49	8	35	23
50 - 54	3	14	9
55 - 59	0	2	1
Average Age of HoH	36	36	36
Average Income of HoH+Partner £	17517	13348	14277
With MP and Prefer to Buy	90	85	86
With MP Considering to Buy (RTB)	11	34	23

Note : MMP Marginal Mortgage Potential AMP Average Mortgage Potential
Source: Analysis of GHS 1988

Figure 10.2 Mortgage Potential and Change of House Price
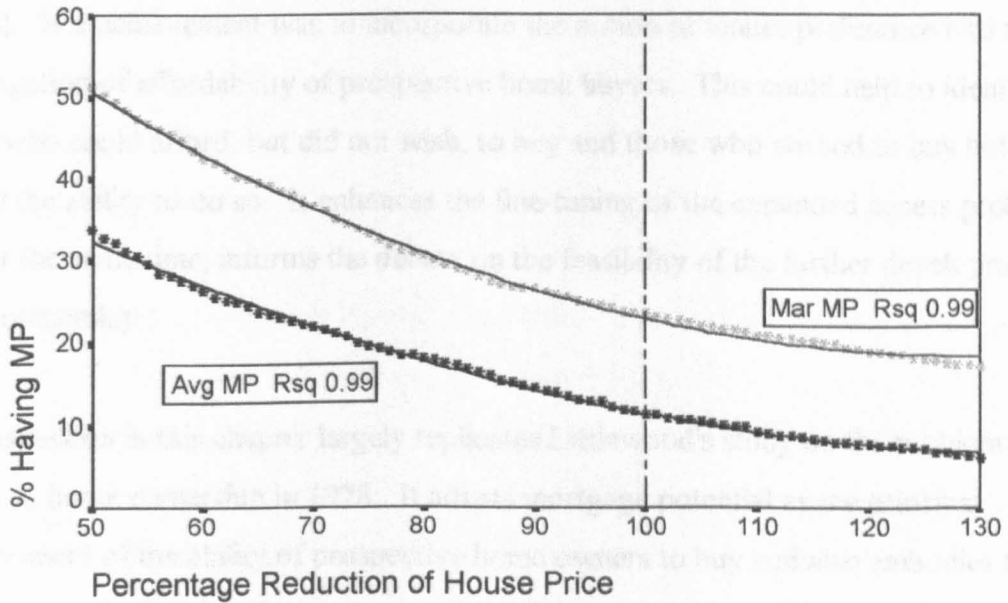
Source: Analysis of GHS 1988

10.7 SUMMARY AND CONCLUSIONS

The problem of sustaining current tenure is examined in chapters five to eight; attention
is diverted, in this chapter, to the affordability of prospective home buyers. The problem
of access to home ownership was one of the issues that triggered concern about the
problem of affordability in the mid 1980s. An investigation of affordability would be
incomplete if it lacked an exploration into this aspect of affordability.

Mortgage potential was used in this chapter to assess prospective home buyers' ability to
afford home ownership. It is defined as a multiple of the income of the head of the
household and partner which is systematically reduced once the head of household

reaches forty years of age. It is supposed to be the maximum amount of mortgage a prospective buyer can obtain from a building society. If the assessed mortgage potential is larger than the average purchase price paid by first time buyers in the region, the household is deemed to have average mortgage potential. Another benchmark of mortgage potential, marginal mortgage potential, is defined with reference to the price in the lowest quartile of house price distribution paid by first time buyers. This latter benchmark allows a less strict assessment of access to home ownership by referencing the purchase at the lower end of the market.

This measurement of the ability to access home ownership was first used by Littlewood (1986). Her achievement was to incorporate the notion of tenure preference into the investigation of affordability of prospective home buyers. This could help to identify those who could afford, but did not wish, to buy and those who wished to buy but who lacked the ability to do so. It enhances the fine-tuning of the expanded access problem and, at the same time, informs the debate on the feasibility of the further development of home ownership.

The discussion in this chapter largely replicates Littlewood's study on the problem of access to home ownership in 1978. It adapts mortgage potential as the principal measurement of the ability of prospective home owners to buy and also embodies tenure preference in fine-tuning the access problem. Tenants in the public and private rented sectors from samples of the 1988 GHS were used for analysis, with house price figures from the 1988 Five Percent Sampled Survey Of Building Society Mortgages as the reference house price.

In 1988, only one in ten (11%) local authority tenants and around one in six (14%) private tenants could afford to buy an average priced house in the market. If a cheaper purchase option was considered, in the lowest quartile of the house price range, only around a quarter of local authority tenants (22%) or private tenants (28%) would have been in an affordable situation. Compared with the situation a decade ago, the average mortgage potential of tenants remained the same, but marginal mortgage potential deteriorated. This reiterates the situation of residualisation and marginalisation in the rented sector, particularly in the public rented sector.

Tenants with the least ability to buy were those living in London and the South East, householders who were approaching retirement age, single persons, lone parents and households with a low income. There was also evidence of a life cycle effect in relation to the ability to buy. A period of relative plenty in a household's life cycle was also period when the household was more likely to be able to afford home ownership.

Tenants who preferred home ownership were more likely to be able to afford to buy, and those who had the ability to become home owners were more likely to prefer owner occupation. However, it would be imprecise to assume that all households which had the ability to buy would do so given the constraints they were facing and their preference. Whilst over 90% of tenants who had the ability would prefer to buy, only 70% of those who could not afford it preferred home ownership. Thus, there was over-counting if those who could afford it but did not wish to buy were regarded as potential home buyers.

While a systematic relationship between the ability to buy, the preference to own and households' socio-economic characteristics was not apparent, multivariate analysis of these factors reveals a simple pattern of relationship. When compared with tenure preference and region, the tenure of a household was insignificant in explaining the variation of the ability to buy whilst the effects of the former two variables were independent of each other. Tenure preference was also independent of income and employment status of the head of household in relation to the ability to buy. Whilst household type and tenure preference could explain the variation in ability to buy, household composition was insignificant except for the presence of school age children. Goodness of fit of the model shows the relative significance of income and region (a proxy for regional house price) on mortgage potential and the effect of tenure preference as a strong intervening variable. The life cycle effect on mortgage potential, which was significant, was weak.

The assessment of mortgage potential in this chapter depends on certain assumptions in the formula of evaluation. Analyses were undertaken to test the sensitivity of these assumptions in comparison with the choice of alternative values. The age factor in the mortgage potential formula appears to reflect the increase in monthly outgoings owing

to the shortened length of repayment period for an older head of household. However, the burden of increase of the repayment, and thus the reduction in mortgage potential for householders who were close to retirement age, is underestimated.

The income multiple in the evaluation of mortgage potential was set at 2.5. This provides a closer approximation to the mortgage loan available to an average borrower as a multiple of his income in 1988 than in 1978, the year on which Littlewood's study was based. A simulation of the change of the proportion of households in an affordable situation regarding home ownership with the change in income multiple shows that marginal mortgage potential was slightly more sensitive to the change of income multiple than average mortgage potential. It would have produced a larger effect among private tenants and those living in regions with higher average house prices. The 1980s also saw a period of more relaxed lending policy among building societies, with the apparent consequence of an increase in price to income multiple. Thus, a more favourable effect on households in high price areas should have been produced for those who could only afford to buy a house at the lower end of the price range.

At the same time, a change in house price would also affect the households' ability to buy. Not only did the late 1980s experience a period of rapid house price escalation, it was also a time of interest rate fluctuation. The increase in house price and mortgage rates decreased the purchasing ability of prospective owners. A simulation of house price change in respect of the change in mortgage potential indicated that the effect of a short term house price change on the proportion of households having mortgage potential would be weak. Thus, unless the short term house price change was substantial, it would not affect the estimate of mortgage potential.

Under the Right to Buy Scheme, local authority sitting tenants are entitled to a substantial discount when buying the accommodation they occupy. The effect of such a price change cannot be ignored as it would have a significant effect on the mortgage potential of local authority tenants. A simulation of the effect of such a price change on mortgage potential shows that if local authority tenants received the average discount on an average local authority dwelling in 1988, nearly 50% more households would be able to buy, compared with their ability to buy a cheap house in the open market.

Households which were less able to buy in the market, those who lived in high price areas, those who worked part time or were unemployed, lone parents, single person households and those on a low income, would benefit more than others, albeit those households were still the least able to afford home ownership.

The peak of the latest house price boom was around 1988 and 1989 (house prices in the south collapsed earlier than in the north). The gap between average house prices and average income was among the highest in recent decades. The unlikelihood of being in a position to buy among tenants compared with a decade ago reflects this gap. The market slump in the early 1990s might have improved the ability of tenants to buy, although this was partly offset by the worsening employment conditions and instability of earnings. The outcome of the combined effect of these factors on ability to buy awaits further empirical study.

Whitehead et al (1993) have criticised the cyclical fluctuation of prices in the housing markets regarding estimation of mortgage potential because it is based on the price level at a particular moment. It is therefore capable of giving only a snapshot of the problem and cannot demonstrate the trend. The sensitivity of the change in households having mortgage potential to a change in house price reveals the stability of such a "snapshot" estimate with respect to house price. Unless there is a large change in the level of house price, the estimate of households unable to buy would fluctuate little. While it is important to reveal the "trend" of the affordability problem, this could not be established without a solid and accurate empirical basis. A snapshot is unable to indicate the motion of a moving object, but a series of snapshots could provide an approximate representation of such movement. Likewise, repeated snapshots which examine a problem at different points in time could reflect the trend. This is the contribution of the updated statistics of Bramley (1991) when linked with Bramley (1991), and the analysis of this chapter with that of Littlewood (1986) would have on the trend of the access problem.

CHAPTER 11
SUMMARY AND CONCLUSIONS

11.1   POLICY CONTEXT AND METHOD OF INVESTIGATION

Policy Context

Affordability, a term almost unheard of in Britain before the 1980s, became a newsworthy subject in the media and a topical issue in academic discourse in the late 1980s and early 1990s. Two issues are believed to have triggered such concern, namely the escalation of house prices, especially in the south of the country; and the new financial regime for housing associations, which involved a substantial reduction in housing association grants and a consequent increase in rent levels.

Post war house prices were characterised by cycles of boom and bust. Yet the latest house price boom in the mid 1980s was unprecedented, both in absolute terms and relative to wages. This triggered concern over the obstacles of access to home ownership, particularly in London and the South East where the increase in house prices was greatest. Escalating house prices and fluctuations in the housing market coincided with the government policy to encourage home ownership to new levels.

The great house price slump in the early 1990s followed the peak in 1988 and 1989, causing great social distress. Not only did the fall in nominal prices create a psychological lack of confidence in the housing market, but the concomitant deterioration in the economic environment pushed many owner occupiers into financial difficulties. Significant among these were people who had bought at the peak of the recent price boom. Both the absolute level of mortgage arrears and property repossessions, as well as the relative increase over previous years, were startling. Other recent buyers, while able to sustain repayment, found themselves trapped in negative equity created by the depreciation in value of their dwelling. This raised concern not only because of its impact on the housing market or as a hindrance to labour mobility, but also because of the financial burden on many low income home owners who may

have aspired to home ownership as a result of government policy and the expectancy of a stake in the property market.

At the same time, the government introduced a new financial regime for housing associations with the aim of incorporating private finance in order to boost output and improve efficiency in the sector. Reliance on private finance inevitably involved higher risk and the need to guarantee rental income. This change, together with reforms in the Housing Association Grant, exerted pressure on the level of housing association rents. This not only ran counter to the traditional role of many associations in providing housing for low income households but, given the social composition of housing association tenants, raised doubt over tenants' ability to meet those rents.

While housing associations were asked to keep rents of their new lettings and reletting "affordable" to tenants, there were no official guidelines on what would constitute an affordable level of rent. Debate was thus generated on how affordability could be defined and measured. Despite affordability being a vital element in housing association rent setting policy, compromise within the movement was neither easy nor maintained.

On the other hand, affordability goes beyond the two tenures described above which attracted explicit concern. The new subsidy system of council housing which aimed to widen rent differentials and to relate the level of rent to the value of the RTB valuation of the council's existing stock, would push up rents in the medium to long term. This would make affordability an even more acute problem for the already marginalised council tenants. Indicators of this were their increased reliance on housing benefit and a high level of rent arrears.

Deregulation in the private rented sector also induced an upward pressure on rent levels and, consequently, the cost of housing for many private tenants. It is evident that private tenants put an increasing relative amount of their resources into housing, as well as increasing their reliance on housing benefit.

An alarming level of homeless families and the visible presence of young single homeless people in metropolitan areas serves as a further reminder of the acute problem of the

access to, and the ability to afford, decent housing, albeit there is no strong evidence that homelessness is directly related to affordability.

Furthermore, with the increasing emphasis on demand side subsidies to housing in the past few decades, housing benefit has become an important policy instrument for helping those who cannot afford high housing costs. The design of the current housing benefit system in Britain has protected those on full benefit from the increased cost of housing and, by default, they were immune from any affordability problem. Yet the problem of take up and the lack of similar protection for home owners would still make low income households in the latter group vulnerable to affordability problems. In addition, such full protection creates a poverty trap and is a disincentive to finding employment.

Definition of Affordability

Despite the recent popularity of affordability in the discourse of housing policy, there is no commonly accepted definition of the term. Yet concepts of user costs of housing, notions of merit good and opportunity cost are common elements found in definitions of affordability which are deliberated in the literature. Such deliberations also link affordability to standards of housing consumption and the concept of poverty.

Likewise, there is a lack of consensus on how the concept of affordability should be operationalised. The measurement methods found in the literature can be roughly classified into three categories: the normative, the behavioural and the subjective approaches. The normative approach measures affordability with reference to a yardstick value which has supposedly been fixed by experts. The use of housing cost to income ratio, which is the most popular approach, regards a household as being in unaffordable housing if the household has to spend a proportion of income on housing higher than the reference ratio. Quality-based measurement and core need measurement are variations of the ratio measurement which add the dimension of the quality of accommodation occupied to the measurement of affordability. With slight alteration, the ratio measurement can also be used to measure the mortgage potential of a prospective home buyer.

The use of residual income, another measurement of the normative approach, was developed in order to rectify the alleged shortcomings of the ratio measurement. It compares income after housing costs against the poverty line. Households are deemed to be in affordable housing only if the residual income is above the poverty line.

The behavioural approach, on the other hand, measures affordability by how much households spend on housing or how households fall into difficulties paying for housing. Whilst the basic principles of operationalising the concept of affordability behaviourally has been proposed, no empirical implementation of this technique has been developed in the literature.

Lastly, the subjective approach bases measurement on the perception of the households on their own affordability situation. It is as yet a primitive approach to measurement, and development of both the theoretical basis and empirical implementation are required.

Method of Investigation

This thesis has attempted to construct a comprehensive definition of affordability which allows the concept to be operationalised by different approaches. It contains two elements: households living in inadequate housing should be regarded as being in an unaffordable situation regardless of how much they spend on housing. For those whose housing consumption is at, or above, an acceptable standard, housing costs should not impose an unreasonable burden on their household resources. The financial burden on the household should allow the normative, behavioural, subjective or any combination of these to be used as an assessment instrument, thus facilitating different approaches to measuring affordability.

Six measurement schemes of affordability which are based on both the normative and the behavioural approaches are used in this thesis. The first two schemes are based on the traditional residual income approach which made reference to, respectively, 140% of the income support benefit level, and fifty percent of equivalised average household income, as poverty lines. The third scheme was a modified form of the residual income approach which attempts to differentiate unaffordability from poverty. Only households

whose income before housing cost were above the poverty level, but fell below the poverty line after housing cost, would be counted as being in unaffordable housing. Those who were poor both before and after housing cost would be regarded as in poverty. In this measurement, fifty percent of average equivalised household income was used as the poverty line.

The fourth scheme seeks to rectify an alleged shortcoming of the ratio measurement, namely an arbitrarily fixed reference ratio. This scheme employs the poverty line as a reference of household financial burden; the threshold affordability ratio can then be fixed where it crosses that particular housing cost to income ratio at where the household would be likely to be in poverty. The fifth scheme attempts to operationalise the behavioral approach in which the threshold affordability ratio is fixed at the ratio where expenditure on housing shows a qualitatively different relationship when crossing that particular ratio. The last scheme, the mortgage potential measurement, is used to assess the mortgage potential of prospective home owners. This latter scheme belongs to the normative approach and is effectively a variation of the ratio measurement.

The first five measurement schemes were implemented with data from the 1991 Family Expenditure Survey. This was also used to explore the problem of housing affordability in the early 1990s. To allow subsequent discussions of relevant policies to have a sharper focus, only households in England were selected for analysis. The sample was further restricted to "paying" households so that the affordability problem could be reflected in their current expenditure rather than as a consequence of past investment or special living arrangements. In order to incorporate tenure preference into the understanding of the affordability of prospective home owners, the 1988 General Household Survey was used, which provided information on tenure preference as well as relevant information for affordability assessment. Analysis of the affordability of prospective home owners was restricted to public and private tenants in England who were under the age of sixty.

11.2   MAIN FINDINGS

Measurements

The first three measurement schemes used the residual income as the measurement indicator. These were straightforward normative measurements, with no noteworthy findings where the measurement per se was concerned. Likewise the sixth measurement scheme, the mortgage potential measurement, which was based on the ratio measurement but with the threshold ratio implicit, yielded no notable findings on this aspect.

Conversely, the fourth and the fifth measurement schemes were behaviourally based and the analysis in this thesis produced several important findings on the behavioural (the fifth scheme) and semi-behavioural (the fourth scheme) approaches to affordability. It was found in the fourth measurement scheme, which attempted to fix threshold affordability ratios referencing to a normative poverty line, that the gross housing cost to income ratio was a better predictor of whether a household was in poverty than net housing cost to income ratio, and thus was also a better indicator of affordability in the context of this measurement scheme. Whilst it was shown to be inadequate in fixing one affordability ratio for households with varying characteristics, it was not manageable to set an array of threshold affordability ratios for each of the important characteristics. Instead, it was shown that establishing different threshold ratios for different tenure groups would be sufficient.

Furthermore, the cut-off ratios established in this way would make little difference to whether the 140% benefit level or 50% average household income was used as the reference poverty line. Cut-off ratios were established at: 27% for local authority tenants, 29% for housing association tenants, 32.5% for private tenants in the unfurnished sector and 41.5% for those in the furnished sector. The ratio was 45% for home owners with a mortgage.

Using the fifth scheme, based on the behavioral approach, a cut-off ratio could be established from examining the relationship between household income and housing

expenditure. Yet the ratio so established was regarded as unstable and unreliable. On the one hand, assessing affordability with the ratios so established would have included the majority of households in unaffordable housing which did not match perceived reality. On the other hand, contrary to the evidence that it was not adequate to establish one threshold ratio for all households, it failed to establish threshold ratios for households with various characteristics. It was therefore dropped from further analysis.

Households in Unaffordable Housing

There was a high degree of agreement between the measurement schemes. The two schemes based on traditional residual income measurements showed agreement in 97% of cases. The concordance rate was as high as 90% between these two schemes and the scheme which was based on ratio measurement.

More than a quarter of households were in unaffordable housing according to measurements based on these three schemes. Social tenants and private tenants in the unfurnished sector were more likely to be in unaffordable housing than private tenants in the furnished sectors and home owners with mortgages. Affordability varied less across regions, but households in the north were slightly more likely to be in unaffordable housing. Lone parent households and people living alone also had a higher chance of experiencing unaffordable housing, as did elderly people and households with unemployed or retired householders. Notably, households on housing benefit or home owners claiming income support were seven times more likely than non-claimants to be in unaffordable housing.

The modified residual income approach, the third scheme (Scheme R_3) referred to in this thesis, on the other hand, reclassified over half of the households previously classified by the traditional residual income measurement schemes (the first and the second measurement scheme, R_1 and R_2) as "unaffordable" into the "poverty" group. These households were unaffordable because of a lack of general resources rather than because of high housing costs. Regardless of whether the traditional or a modified scheme was used, housing benefit claimants and home owners on income support were more likely

to be in the "unaffordable" group, as were single persons, lone parents, elderly people and households with employed or retired householders.

Conversely, under the modified scheme, social tenants were as likely as private tenants, and households living in the north as likely as their counterparts living in the south, to be experiencing unaffordable housing. Social tenants and households in the north were considered to be less unaffordable in the traditional measurement scheme. Households in London were an exception. Almost fifty percent more were likely to be in the "unaffordable" group compared with their counterparts in the north.

Mortgage potential

Only a quarter of tenants could afford to buy in 1988. This number had decreased compared with a decade previously, probably attributable to an elevated price level in the private housing market, the exodus of better-off tenants in the 1980s, which left behind the poorer ones and the lesser involvement of both public and private tenants in the labour market. Tenants in London and the South East, single person households, lone parents, householders who were approaching retirement age and householders on a low income were the least able to afford home ownership. Households which could not afford to buy also had a lower preference for home ownership. Seventy per cent of them would have preferred to be home owners compared with 90% of those who could afford it.

A sensitivity analysis on the assumptions on income multiple and house price in the assessment of mortgage potential indicated that the choice of the income multiple in the formula used in this thesis was appropriate; a small change in the house price would not have produced a significant effect on the assessment of mortgage potential. However, if the discount on house price was substantial, as in the case of the Right to Buy, it would produce a far more favourable affordability situation among local authority tenants.

A simulation of discounted sales under the RTB scheme shows that 50% more local authority tenants would be able to afford home ownership under the RTB than would on the open market. Householders who lived in high priced areas, those who worked part

time or were unemployed, lone parents, single people and those on low incomes would have benefited from the RTB, although they were still the groups who were the least able to afford home ownership.

Affordability, Tenure, Employment, Housing Benefit and Life Cycle Effect

Consideration of affordability relative to tenure, employment and housing benefit demonstrated that the effect of housing benefit on affordability, when measured in terms of gross housing cost to income ratio, the preferred ratio mentioned in section 11.2, was more important than the effect of employment status. This reflects the relative importance of housing benefit over employment status (a proxy for income) on the housing cost to income ratio. Conversely, when affordability was measured in terms of residual income, the effect of employment was more influential then housing benefit. This finding illustrates the effect of employment, which indicates implicitly the relative importance of earned income on residual income. At the same time, tenure was important in both measurements, and its effect was independent of the other two factors.

Analyses breaking down these factors into their respective subcategories shows that affordability is closely associated with home ownership, full time employment and non-receipt of housing benefit, while unaffordability is associated with local authority tenancy, unemployment/retirement, and benefit claiming. The situation of housing association tenants, private tenants and those working part time, with reference to housing affordability, was less clear. However, when the modified residual income scheme attempted to differentiate between "poverty" and "unaffordability", the new "unaffordable" group moved closer to private tenants and part-time workers, while the original position of the "unaffordable" group was taken up by the "poverty" group. It suggests that the problem of unaffordability of the latter groups may be attributed to different causes, notably the deregulation of the private rented sector, which increased the rent burden of private tenants, in contrast to the lack of resources among social tenants.

There was also an apparent life cycle effect on housing affordability. Households in periods of "relative want" were more likely to be having an affordability difficulty, while those in a more favourable affordability situation were likely to be in a period of "relative plenty". There was no evidence that this relationship was strong.

Affordability and Household Expenditure

It is generally expected that because of the heavier housing burden which is borne by households in unaffordable housing, they spend relatively more on necessity items (including housing) in order to maintain a reasonable standard of living. Thus they would have to forgo the consumption of other items, particularly luxury goods and services. Empirical evidence in this thesis shows that on the aggregate level, households in unaffordable housing did spend a higher proportion of their income on necessities, while households without an affordability problem spent relatively more on luxury items, although the difference was not great.

At the household level, no distinct pattern in the distribution of necessity and luxury consumption between these two groups could be found. Generally, however, households with an affordability problem would have a more limited choice of how much they could spend on both necessity and luxury items, which did not necessarily preclude the consumption of luxury items. On the other hand, household expenditure pattern was not a good predictor of whether or not the household was having an affordability problem.

Overcrowding and Affordability

With over-crowding as an indicator of housing consumption, empirical evidence in this thesis did not support the proposition that households were deliberately under-consuming housing in order to keep their housing cost within their means. On the contrary, the majority of households occupying unaffordable housing were consuming housing at a standard above the occupancy norm appropriate to the size and composition of the household. This begs the question of whether households in unaffordable housing, which are over-consuming housing services, should be regarded

as in voluntary unaffordability, or should be treated leniently (still regarded as in unaffordability) as Hancock (1993) suggests.

The evidence in this thesis shows that the majority of households which were both in unaffordable housing and were over-consuming were the single elderly, local authority tenants and those on housing benefit. Whether it was feasible for these households to adjust their housing consumption to a level deemed to be affordable, in the case of an administrative housing allocation system in social housing, or whether such adjustment would lead to a lower financial burden, as the present system of housing benefit would imply, remains unclear. Thus, grey areas of assessment of affordability in these situations still exist. Hence, it may be inappropriate to reclassify households in unaffordable housing which are over-consuming as affordable.

11.3 CONCLUSIONS

Measurement Issues

New Approaches to Affordability Measurement

The measurement of affordability has been dominated by the normative approach in which affordability is assessed with reference to some authoritative threshold values, which were either explicitly designated by government or advocated by experts. Notwithstanding that threshold value is a housing cost to income ratio of 25% or having a residual income less than the benefit level, such threshold values are established not as a result of any scientific research, nor have they any solid theoretical backing. Such an approach was perceived to be the only method of affordability measurement. However, this thesis has introduced alternative approaches: the behavioural approach and the subjective approach. Because of the limitations of the data set used in this thesis, only the behavioural approach could be implemented in detail.

The behavioural approach is a purely empirical method of establishing threshold affordability values which reflects the actual behaviour of households and is free from any arbitrarily predetermined values. A more sophisticated method of determining such

threshold values is also presented in this thesis, although owing to the limitations of the data set, reliable results could not be successfully generated.

The behavioural and the subjective approaches advance the understanding of the affordability problem from a perspective distinct from the normative approach. These two approaches are in the early stages of development and have yet to be consolidated into strong, stand-alone measurement methods. Nevertheless, they could offer an independent validation of the commonly accepted normative approach.

An Empirical Method to Fix Threshold Ratio

The use of housing cost to income ratio has the longest history in normative measurement of affordability. Yet the threshold reference ratio, which has been used for several decades, has been shown to have originated from a rule of thumb rather than being based on solid theoretical or empirical work. It is shown in this thesis that the gross housing cost to income ratio can be used, to a reasonable degree of accuracy, to predict the incidence of poverty. It thus provides an empirical method for determining the threshold affordability ratio: using housing cost to income ratio as an indicator of housing burden, and residual income as an indicator of household financial burden, a threshold ratio could be identified at the point above which the household would have a high probability of being in financial difficulty. It was also shown that different threshold housing cost to income ratios should be established for different tenure groups.

A Narrower Distinction Between Residual Income and Ratio Measurement

Establishing a threshold affordability ratio using empirical methods also demonstrates the possibility of combining the behavioural approach and the normative aspect of affordability measurement. What is more interesting is the close agreement between different affordability measurement schemes. Not only was there almost perfect agreement between the two measurement schemes, based on the traditional residual income approach but reference to different poverty lines; the difference in classification between these two measurement schemes and the scheme that was mentioned in the

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previous section, which combines the behavioural approach and the normative approach, was very small.

This indicates that if a suitable threshold ratios could be chosen, the distinction between ratio and residual income measurement could be blurred. Thus, the allegedly antagonistic contrast between ratio and residual income measurements, as claimed by most advocates of residual income measurement, should not be over-emphasized.

A Finer Residual Income Measurement

Residual income, which has been advocated as a better alternative to the ratio measurement of affordability, suffers from a serious weakness as an indicator of affordability. It was used initially, and still is being used, as an indicator of poverty. Confusion is created if a measurement indicator of affordability virtually equates affordability with poverty. This confusion would undermine not only the usefulness of residual income as an affordability indicator, but also the concept of affordability per se as a functional concept.

It is suggested in this thesis that when residual income is used as a measurement indicator, a method should be developed for differentiating poverty from unaffordability. A new residual income measurement, referred to as the modified approach to distinguish it from the traditional approach, was developed to achieve this. It was shown that, under this modified version of residual income measurement, the relationship between income and housing cost among the "affordable" and "poverty" groups was similar; but those households in the "unaffordable" group exhibited quite distinct characteristics. The "poverty" group in the modified version was part of the "unaffordable" group in the traditional version; because this former group was more numerous in terms of size, its characteristics would have over-shadowed the "unaffordable" group in the traditional measurement. Although poverty can be regarded as a form of affordability, yet analysis in chapter nine also indicates that the cause leading to unaffordability between the "unaffordable" and "poverty" groups (in scheme R_3) may be different. Thus, the inability to differentiate unaffordability from poverty in the traditional measurement would easily

lead to a policy prescription which inclines towards those in poverty rather than solving the problems of those in unaffordability.

Behavioral Element in Mortgage Potential

Against the background of a continuous surge in the demand for home ownership, a measurement of affordability would not be comprehensive if the affordability of prospective home buyers were ignored. The potential of prospective owners to buy is usually estimated by their mortgage potential, which is in turn derived from information on income, house price and other factors related to mortgage lending application. It has been shown that most of the measurements popular in the literature are a variation of the ratio measurement, and could be used to measure the mortgage potential of a prospective home buyer. Thus, development of other forms of affordability measurement would also have an influence on the measurement of the affordability of potential buyers. Mortgage potential measurement, as a variation of the ratio measurement, carries a strong undertone of the normative approach.

The incorporation of a behavioural element into the measurement of affordability of prospective home buyers would help to rectify the liability to bias of the normative approach. In this thesis, the preference for home ownership was used to adjust the measurement of mortgage potential. However, if the estimation of mortgage potential is to reflect more accurately the actual behaviour of potential buyers, more sophisticated models of tenure choice and demand would have to be incorporated into the analysis.

Under-development of Measurement Instrument

Given the popular current concern, measurement issues of affordability are under developed. This is especially so for measurement instruments of affordability, where the rule-of-thumb housing cost to income ratio has been used for decades without scientific enquiry. This thesis is an attempt to reverse the under-development of the affordability measurement instrument and it has been successful in filling the gap in developing a scientific method for fixing reference affordability values. Yet in experimenting with alternative approaches to affordability measurement, the results were not promising.

It is also short of the ideal that no longitudinal perspective, nor any corresponding measurement instrument for such a perspective, has been adapted in the analysis of the affordability problem. Yet the contribution of a snapshot measurement of survey data advocated in this thesis is nevertheless significant. Not only does the economy of using this method facilitate a more efficient and inexpensive method of enquiry but, because income, housing cost and other household circumstances are relatively stable in the short term, it provides a close approximation in the short term. In addition, repeating measurements of this kind over time, although a second best solution, could serve as an indicator of the trend with regard to affordability.

Policy Issues

Extent of The Affordability Problem

This thesis paints a rather gloomy picture of affordability: over a quarter of the households in England in the early 1990s suffered from a problem with affordability. Compared with the situation found in other research at the local level (Hancock 1993) or within a particular tenure (Kearns et al 1993), the extent of the problem at the national level was more serious and more widespread. It is even more noteworthy that the majority of social tenants experienced a problem of affordability; more than half the housing association tenants, and almost two thirds of those in local authority housing were regarded as being in unaffordable housing.

Tenure and Assistance to Housing Costs

Empirical evidence also points to the importance of tenure and the assistance to housing costs (housing benefit and help from social security to home owners) in relation to affordability. Social tenants, housing benefit claimants and home owners getting help from social security towards their housing costs, were in a far less favourable affordability situation relative to other groups. The strong relationship between housing association tenants and affordability problems is understandable since it is the change in subsidy policy in this sector that arouses concern about affordability. The evidence in this thesis serves as a confirmation that such concern is justified.

Whilst local authority tenants were traditionally believed to have been protected against high housing costs because of the rent policy and a substantial subsidy from the government, it has been shown in this thesis that the new financial regime and its concomitant rent policy have eaten into this safety net. Using the modified version of residual income measurement, the majority of those classified as being in unaffordable housing were reclassified as poor; around a fifth of social tenants were still categorised as being in the "unaffordable" group.

This has added a new element to notions of marginalisation and residualisation in the social sector. Not only are social tenants excluded from the labour market and increasingly dependent on welfare, but the increasingly high cost of local authority housing has led to a new form of deprivation.

Likewise, the housing benefit system, which should have protected poor tenants from falling below a certain level of deprivation, is shown to be inadequate in achieving this aim. The majority of households which were on housing benefit were also in unaffordable housing. Fine-tuning of the residual income measurement by the modified version of measurement differentiated unaffordability into unaffordability and poverty, but still housing benefit claimants formed the majority of households in an unaffordable situation with regard to housing. In addition, home owners receiving help from social security towards their housing costs were in a position similar to housing benefit claimants.

Reasons for this outcome are complex and findings from this research is not rich enough to provide an explanation.. It may in part relate to the particular poverty line chosen for the affordability measurement that was different from that implicit in housing benefit calculation. It may also due to the non take-up of benefit that leaves households who need the help outside the safety net.

To Inform Debates on Housing Associations Rent

The findings in this thesis help to inform debates on affordability aimed at the housing association movement. Whether to include income from housing benefit in the

evaluation of affordability, and the level at which housing cost to income ratio should be fixed as a reference, have long been troubling the NFHA. Their most recent choice of employing net rent to income ratio of tenants not receiving housing benefit in the calculation of affordability (Housing Association Weekly 17 Dec 1993) avoids the "blind spot" of affordability measurement using net income, because of zero housing cost among tenants on full housing benefit.

Yet because of the exclusion of tenants on housing benefit in the assessment of affordability, the NFHA has to supplement the measurement to take into account the consequences of an increasing reliance on housing benefit by the addition of an additional qualification to the rent setting policy so that increased rent in the sector would not lead to increased dependency on housing benefit (Housing Association Weekly 17 Dec 1993). This indicates the importance, as well as the complexity, of the housing benefit system in the assessment of housing affordability. This thesis has demonstrated a method of integrating the effect of housing benefit into affordability measurement without resorting to complicated methods of evaluation.

At the same time, the threshold ratio for housing association tenants established in this thesis can also serve as an indicative figure for setting affordable rents in that sector. Although the figure settled on in this thesis is considerably higher than that recommended by the NFHA, 29% as against 22%, it nevertheless provides an independent validation of principles advocated by the NFHA. It demonstrates, at least, that the NFHA figure is already quite lenient, offering a large margin to cater for anomalies among tenants in the housing association rented sector.

An Income or A Housing Affordability Problem

There were several questions raised in chapter two relating to the policy implications of affordability: namely, the question of whether affordability is an income problem or a housing affordability problem; whether it is one, or actually several problems; whether such problems are cyclical or enduring; and whether it is merely a myth with no basis in reality. Empirical evidence in this thesis has shed light on these questions.

The use of the traditional form of residual income as an affordability measurement inevitably implies taking affordability as an income problem, regardless of whether or not any explicit assumptions have been made on the nature of the problem. This is so not simply because the measurement looks only at "income', but mainly because residual income is itself a measurement of poverty. The cost of housing, and consequently housing per se, could easily become invisible. Considering the affordability problem as merely one of income undermines the role of the housing system in solving it.

Yet to distinguish affordability from an income or housing problem is far from straightforward. First, the inability to pay for the cost of housing could be regarded as a component of the problem of poverty. Second, the effect of a change in income on the change in housing cost is complex. Third, housing affordability is an intermediate concept whose calibration has to rely on other indicators, plausibly indicators of poverty. These factors all make the interaction between affordability and poverty difficult to differentiate satisfactorily.

Although empirical evidence in this thesis could not provide a solution to the relative nature of the affordability problem, it has contributed to the debate on affordability in this aspect. First, it argues that the traditional form of residual income measurement is itself indistinguishable from poverty measurement; this leads to further confusion about whether affordability is a housing or an income problem. Second, ratio measurement, which bears a high degree of agreement with the traditional residual income measurement, would not be sufficiently powerful for the purpose of differentiation. Finally, a modified version of the residual income measurement provides the necessary instrument enabling further investigation of this issue.

A Myth or Reality

Affordability drew attention from the media to the difficulties of entry into home ownership. This could be perceived as a problem of the rising aspiration among the middle class which needs to be real for the majority of households. Evidence in this thesis shows, on the contrary, that the problem of affordability was a real one for many households, notably those on a low income and which had to rely on state benefits. Not

only did many tenants face a high housing cost burden, but the chance of becoming home owners was increasingly unrealistic given the gap between their income and the level of house prices. Although it is unclear whether the aspirations of the ambitious middle class to trade up exists or not, affordability is a problem based more in reality than in myth for many households.

Yet one myth requires further exploration. It was shown that among social sector tenants who were in unaffordable housing many were, at the same time, over-consuming housing services above the occupancy norm. It was argued that there were difficulties in adjusting the level of housing consumption for these households, and that the adjustment of housing consumption would not necessarily reduce the affordability problem. Thus, whether or not it is possible to mitigate the affordability problem by adjusting downward their level of housing consumption remains unclear.

A Cyclical or Enduring Problem

The problem of affordability attracted media attention in the mid 1980s because of the unprecedented upsurge in house prices. But the historical price peak in the late 1980s, and the price slump that followed, seemed to create a perception that the problem of affordability is merely the result of a cyclical movement of house prices. Conversely, the problem among housing association tenants continues to attract attention both in the media and among housing professionals (Bramley 1994).

Evidence in this thesis shows that difficulties of affordability faced by tenants in all sectors already exist. This problem has endured longer than was once thought likely owing to the changes in rent setting policy in the social rented sector and deregulation in the private sector. In addition, an analysis of the ability to buy indicates that the downturn in house prices may not have eased entry to home ownership by a substantial amount. First, a rise in real interest rates in the early 1990s offset the benefit of reduced house prices. Second, a simulation of changes in affordability with respect to house price changes suggests that unless the reduction was substantial, the gain would not be significant. Thus, the affordability problem for prospective home owners can fluctuate relatively, but the absolute level of the problem may not have been reduced.

The above analysis would suggest that addressing affordability as one problem would over-simplify the issue. It involves problems of insufficient income as well as an inadequacy to contain housing costs within the reach of those on a low income. It reflects not only the need of the aspiring middle class, but rather a real problem for those who have insufficient resources to pay for the cost of housing. It is more enduring, and affects many more tenants in the social rental sector as well as in the private rented sector, than was once thought. Likewise, although the relative level of affordability among prospective home buyers fluctuates with the variation in the volatile housing market, the absolute level of the problem should not be under-estimated.

Affordability is a multi-dimensional issue. It involves both the distribution of income and the cost of providing housing. It also embraces a spatial dimension and should be understood in a temporal perspective. This thesis addresses only a very limited aspect of the problem, namely the issue of how to provide a benchmark against which affordability can be measured, yet already formidable difficulties have been encountered. Whether such a measurement should be approached from a relative perspective or an absolute perspective; whether an objective assessment is possible, or if the problem should only reflect a subjective evaluation, are unresolved issues.

11.4   IMPLICATIONS FOR FURTHER RESEARCH

This thesis has systematically summarised and critically evaluated the major approaches to affordability measurement. It has also successfully revealed, with the measurement instrument established in this thesis, the affordability situation in England in the early 1990s. Yet, owing to the limitation of time, resources and the experience of the investigator, there are still several important areas which warrant further exploration, in addition to the problems inspired by the findings in this thesis. Three topics for further investigation are suggested:

1.   This thesis suggests a behavioural approach to measuring affordability. Neither the theoretical basis nor the technical implementation of the measurement could

be dealt with in depth. Examining the relationship between household income and housing expenditure empirically would help to develop a behavioural pattern of the problem of affordability.

2. A subjective approach to the evaluation of affordability, pioneered by Kearns et al (1993), is another area in measuring affordability which it would be useful to explore. Both the theoretical basis and the technical methods of implementation of the subjective measurement of poverty advocated by the Leyden School could be adopted. It would help to inform how the major actors involved in the issue, namely the tenants and home owners themselves, perceive their own problem and help in a cross examination of the threshold values implied by other affordability measurements.

3. This thesis shows the strong influence of both the housing benefit system and tenure on the problem of affordability. The problems of the current housing benefit and proposals for its improvement have been examined elsewhere (e.g. Hills 1991, Kemp 1992b, Webb and Wilcox 1991). It would also be worthwhile to examine in greater detail the effect of the current system, as well as that of the proposed alternatives, in relation to affordability.

Note

1. The average income of a first time buyer in 1979 was £6290 whilst the average price to income ratio was 2.37 and the advance to price ratio was 75.4%. This would enable the household to take up a loan of £14097, about 99% of the average house price paid by all first time buyers. The average mortgage rate in 1979 was 11.94%. In 1989, an income of £6290 would equivalent to an income of 16126, adjusted by index of earnings rather than the retail price index. The corresponding ratios, interest rates and eligible loan were 2.61, 82.9, 13.61% and £16126 (DoE, 1990). The monthly outgoing, assuming a repayment mortgage of 25 years, would be £138 in 1979 and £286 in 1989. The corresponding percentages of outgoings to income were 24% and 28%. Using the same mortgage rate in 1989 as that in 1979, the outgoing would be £369 per month, or 28% of the household income.

2. Assuming a repayment mortgage at 25 years, the repayment of mortgage interest and principal would be £9.54 per month per £1000 of loan at a mortgage rate of 10.5% (BSA, no date). If the mortgage rate increases to 15.4%, the corresponding outgoing is £13.21.

3. Surveys on Tenure Preference

Year	Commissioned by	Conducted by	Unweighed Sample
1967	Building Societies Association	Opinion Research Centre	-
1975	National Economic Development	British Market Research	1597
1978	Office of Population Census and Statistics	Office of Population Census and Statistics	11185
1983	Building Societies Association	British Market Research Bureau	2501
1986	Building Societies Association	British Market Research Bureau	2455
1988	Office of Population Census and Statistics	Office of Population Census and Statistics	8683
1989	Building Societies Association	British Market Research Bureau1	0215
1991	Council of Mortgage lenders & BBC	British Market Research Bureau	2260

4. Although the two types of tenancy differ in the protection of security of tenure, it is easy for a landlord in a market favourable to the supply side, to opt for the assured shorthold tenure which provides no security beyond the period of the contract.

5. Suppose the maximum eligible loan of a household can just enable it to buy a house at the threshold price. Given the current interest rate and the repayment terms, the monthly repayment of interest and principal would be a fixed amount. The repayment to income ratio can then be evaluated. The household is regarded as affordable to home ownership if the mortgage potential is greater than the threshold house price, it follows that the repayment to income ratio should be less than the quotient of income multiple and the parameter which depends on the interest rate and the mortgage terms. Such quotient will be the affordability ratio :

Assuming   P = b * RP

and	MP > P if home ownership is affordable
because	P = MP
then	MP > b * RP if affordable
because	MP = α * INC
then	α * INC > b * RP if affordable
and	(RP / INC) < (α / b) if affordable

6. For the previous endnote, $r = \alpha / b$ where r is the threshold affordability ratio, α the income multiple and b is a constant which depends on terms of the loan. In the previous formula, b is expressed as $P = b * H$ where P is the price of the house, b the constant and H the monthly repayment. Thus $P = (l*k/i) * H$ where i is the current interest rate (after MIRAS), l the length of repayment and k a constant, since for a fixed loan monthly repayment will be directly proportion to the current interest rate but inversely proportional to the length of repayment. Then $r = (\alpha * i) / (k * l)$.

7. Whilst data on house price can be available on a district level, household income and household characteristics are more conveniently available, on a regional level through national surveys like the FES and GHS.

8. The number of housing association tenants qualified for inclusion in the sub-sample was only 91, a number too small for some statistical manipulations to be significant. Housing association tenants would only constitute 3% of the sub-sample if they were included.

9. $P = 13933 (1.13) (NRm))^{1.17} (Gar) (Reg) (DAge) (DType)$

Where NRm	Number of Rooms
Gar	Having a Garage (1 if there is amd 0 if there is not)
Reg	Region where the dwelling is
DAge	Age of the dwelling
DType	Type of the Dwelling

R square = 0.60

Coefficients for the variables in the equation:

Independent Variable	Coefficient	Independent Variable	Coefficient
Region		Age of Dwelling	
North	1.49	Pre 1919	0.97
Yorkshire and Humberside	1.69	1919 - 1939	0.92
North West	1.61	1940 - 1960	0.89
East Midlands	1.77	1961 - 1980	0.90
West Midlands	3.28	Post 1980	1.00
East Anglia	2.45	Type of Dwelling	
London	2.01	Bungalow	1.41
South East	1.79	Detached House	1.13
South West	1.71	Semi-detached House	1.12
Wales	1.55	Terraced House	0.95
Scotland	1.74	Flat	1.00
Northern Ireland	1.00		

10. Mortgagors who provided information on mortgage interest payment and who did not :

Mean Value £ pw	Provided Information (n=2293)	Did Not Provide Information (n=272)
Interest Payment	58	--
Imputed Rent	36	32
Household Income	387	295
Interest and Principal	70	83

Source: Analysis of 1991 FES

Mortgagors who did not provide information on mortgage interest payment were on a lower income, occupying dwellings of lower rateable value but who also have higher mortgage burden. Thus may also have a higher housing cost to income ratio. Replacing the mortgage payment with the imputed rent may have under-estimated their mortgage interest payment and consequently a downward bias of the housing cost to income ratio.

11. The z score of the variarble with mean equls zero and standard deviation equals one.

12. It was quoted as 35% in Maclennan and Williams (1990)..

13. Step Shape Curve
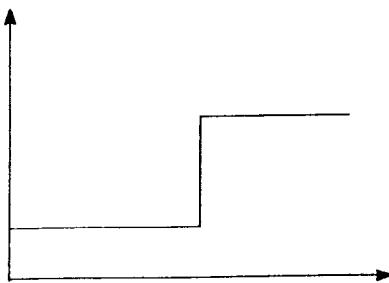
14. A logit Model can be expressed as a hierarchical loglinear model whereas it assumes the presence of all the interaction terms of the relevant variables in the final models are significant. A hierarchical loglinear model would assume all the lower order interaction terms are significant.

Appendix

Appendix A1 A Comparison of the Selected Sample and Excluded Cases in 1991 FES and 1988 GHS

Table A1.1 Exclusion of Extreme Cases with High Ratios (FES 1991)

%	Before Excluding Extreme cases		After Excluding Extreme cases	
	Gross Ratio	Net Ratio	Gross Ratio	Net Ratio
Mean	28.5	42.6	25.7	25.4
Std Dev	63.6	911.8	15.7	15.4
Median	22.2	22.3	22.0	22.1
Skewness	37.9	65.1	1.2	1.5
N	4325		4272	

Source : Analysis of FES 1991

Table A1.2 Characteristics of Selected and Unselected Cases

	Excluded	Selected	All
Total	1638 (28%)	4272 (72%)	5909 (100%)
Household Type			
Married Couples	908 (55%)	2772 (65%)	3680 (62%)
Single persons	598 (37%)	1004 (24%)	1602 (27%)
Lone parents	26 (2%)	227 (5%)	256 (4%)
Others	106 (7%)	269 (6%)	375 (6%)
Age of Head of household			
Under 30	31 (2%)	830 (20%)	961 (15%)
30 - 39	64 (4%)	1059 (25%)	11233 (19%)
40 - 49	162 (9%)	879 (21%)	1031 (17%)
50 - 59	278 (17%)	594 (14%)	9871 (15%)
Over 60	1113 (68%)	910 (21%)	2023 (34%)
Region			
North	86 (5%)	341 (8%)	427 (7%)
Yorkshire and Humberside	194 (12%)	422 (10%)	422 (10%)
North West	218 (13%)	558 (13%)	558 (13%)
East Midlands	137 (8%)	365 (9%)	635 (9%)
West Midlands	181 (11%)	454 (11%)	269 (11%)
East Anglia	81 (5%)	189 (4%)	760 (5%)
London	173 (11%)	587 (14%)	1297 (13%)
South East	367 (22%)	930 (22%)	629 (22%)
South West	201 (12%)	427 (10%)	11 (11%)
Size of Household			
1 Person	598 (37%)	1004 (24%)	1602 (57%)
2 Persons	712 (44%)	1337 (31%)	2049 (35%)
3 Persons	181 (11%)	750 (18%)	931 (16%)
4 persons	98 (6%)	815 (19%)	913 (15%)
5 Persons or Over	49 (3%)	566 (9%)	415 (7%)
Employment Status of HoH			
Full Time	320 (20%)	2270 (53%)	2598 (44%)
Part Time	76 (5%)	158 (4%)	234 (4%)
Unemployed/ Unoccupied	1086 (66%)	1394 (33%)	2480 (42%)
Other	140 (9%)	450 (11%)	598 (10%)

Source : Analysis of FES 1991

Table A1.3 A comparison of Selected Sample and Excluded Households in England FES 1991

Pounds per week/ Percentage		Mean	Std Dev	Min	Max	F Value
Gross Income	Excluded n = 1638	289	347	3	8968	89.7**
	Selected n = 4272	375	299	20	4349	
Net income	Excluded	242	297	-22	8898	694.4**
	Selected	236	226	19	3141	
Gross Cost	Excluded	32	49	1	1073	56.9**
	Selected	72	53	4	886	
Net Gross	Excluded	32	49	-4	1073	471.0**
	Selected	67	56	1	886	
Gross Ratio	Excluded	23	103	0	2865	1.8ns
	Selected	26	16	1	100	
Net Ratio	Excluded	63	1482	-46	59779	2.7ns
	Selected	25	14	1	100	

Note : ** p < 0.01 ns Not Significant
Source : Analysis of FES 1991

Table A1.4 Cases With and Without Income Information GHS 1988

Number of Households	With Income Information	Without Income Information
Local Authority Tenants	884	183
Private Tenants	294	58
$X^2 = 0.13$ (p = 0.7)		
Prefer to Rent	845	180
Prefer to Own	169	58
$X^2 = 0.005$ (p = 0.8)		

Source: Analysis of 1988 GHS

Appendix A2 Interpretation of the box plot

1.5 Inter-quartile Range
From median

Upper Quartile

Median

Lower Quartile

1.5 Inter-quartile Range
From median
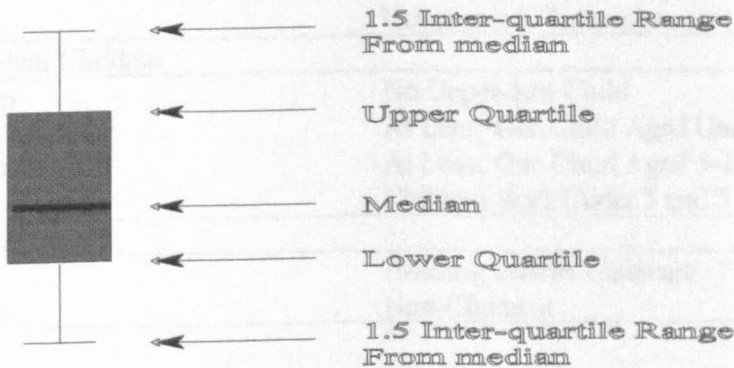
Appendix A3 Meaning of Abbreviations in Charts

Abbreviation	Meaning
Tenure	
Local Authority (LA)	Local Authority Tenants
Housing Association (HA)	Housing Association Tenants
Private Unfurnished (PRS-Unf)	Private Tenants In Unfurnished Sector
Private Furnish (PRS-Fur)	Private Tenants In Furnished Sector
Mortgagors (Owner)	Home Owner with an Mortgage
Region	
North	Northern
Yorks	Yorkshire and Humberside
NW	North West
E Mids	East Midlands
W Mids	West Midlands
E Ang	East Anglia
London	Greater London
SE	South East excluding London
SW	South West
Type of Household	
Couple	Married Couple Household
Single	Single Person Household
Lone Parent	Lone Parent Household
Others	Other Household
Affordability	
Aff	Affordable
Unaff	Unaffordable
Employment Status	
FT	Full Time
PT	Part Time
Unocc	Unoccupied / Unemployment
Dependent Children	
No Dep	No Dependent Child
1+ 0-4 No 5-15	At Least One Child Aged Under 5 And No Child 5 To 15
No 0-4 1+ 5-15	At Least One Child Aged 5-15 No Child Under 5
Both 0-4 5-15	Children Both Under 5 and 5 - 15
Housing benefit	
HB	Housing benefit Claimant
No HB	Non-Claimant

Appendix A4 Kappa Coefficient of Agreement Between Measurements

The Kappa coefficient is a measure of association and a test for the degree of agreement in classification. For a simple contingency table with 4 cells (table A1), the degree of agreement is the sum of the percentage both measurements agreed, i.e. $a_1 + a_4$. However, such agreement may happen by chance. If it is the case, there would still be $(t_1 \times s_1 + t_2 \times s_2)$. Cohen's Kappa (calculate the difference of the observed degree of agreement with the degree of agreement if it happens by chance and is then normalised by dividing it by the largest possible difference for the marginal totals (1 - expected agreement).

For large samples, the distribution of Kappa is approximately normal distribution (Craemer, 1983) thus testing whether kapper is significantly different from zero is possible using z test. Other more conservative test, such as the t test which would approach normal distribution when the sample size is very large, was proposed (SPSS 1990). The evaluated of kappa in this paper was implemented by SPSS VMS V4.0 and t-test was employed as the test of significance.

Table A4.1 Kappa Coefficient: an Illustration

		Measurement 2		
		State A	State B	Subtotal
Measurement 1	State A	a_1	a_2	t_1
	State B	a_3	a_4	t_2
	Subtotal	s_1	s_2	T

Appendix A5 Income and Housing Cost between Housing Benefit Claimants and Non-claimants

£ pw	Households in Unaffordable Housing			
	Scheme	Non-claimants	Claimants	F
Equivalised Income After Housing	R_1	76	72	6.5*
	R_2	71	70	0.9ns
Gross Income	R_1	168	107	250**
	R_2	175	105	302**
Net Income	R_1	145	82	470**
	R_2	149	79	519**
Net Cost	R_1	66	20	641**
	R_2	70	20	670**
Gross Cost	R_1	66	44	125**
	R_2	70	45	254**

Note : * $p<0.05$ ** $p<0.01$ ns Not Significant
Source: Analysis of FES 1991

Appendix A6 Households in Unaffordable Housing by Socio-economic Characteristics: Residual Income Measurement

Characteristics (%)	Model R$_1$	Model R$_2$	Model R$_3$	
	Unaff	Unaff	Unaff	Poverty
All	29	28	11	16
Tenure				
Local Authority Tenants	63	58	19	39
Housing Association tenants	60	52	17	38
Private Tenants (Unfurnished)	45	40	18	22
Private Tenants (Furnished)	30	29	17	12
Owners with Mortgage	11	11	7	4
Region				
North	36	32	9	23
Yorks and Humberside	35	32	10	22
North West	33	30	11	20
East Midlands	30	29	12	17
West Midlands	36	35	12	23
East Anglia	26	25	10	25
London	30	30	15	15
South East	20	19	10	8
South West	27	24	12	12
Household Type				
Married Couple	18	18	7	10
Single Person	51	47	22	25
Lone Parent	74	69	19	50
Others	27	23	6	17
Age of Head of household				
Under 30	27	26	11	16
30 - 39	19	19	8	11
40 - 49	14	15	7	8
50 - 59	21	21	7	14
Over 60	64	55	23	32
Employment Status				
Both Full Time	4	4	3	1
HoH FT Wife PT	6	7	5	2
HoH FT Wife Unoccupied	14	14	10	5
HoH PT Wife FT	30	30	7	23
HoH PT Wife PT/Unoccupied	40	36	18	17
HoH Unoccupied Wife FT/PT	66	61	23	38
Both Unoccupied	72	65	20	46
Housing Benefit				
Non-claimants	14	13	8	5
Claimants	82	78	24	54
On Full Benefit	85	80	20	60
Part Benefit	84	80	26	53

Appendix A7 Lowess Method of Curve Smoothing

LOWESS stands for Locally Weighted Scatterplot Smoother. it is a technique to produce a smooth curve fitted to a given scatterplot of a bivariate data set. Curve smoothing is a procedure "to remove accidental irregularities resulting from sampling error" (Kruskai and Tanur 1978:428). A smooth curve can help to identify graphically the relationship between the variables.

Lowess method produces a smooth curve in the following way:

1. Locally weighted regressions are performed with reference to every data point in the scatterplot. Each regression only involves a certain fraction of the data points adjacent to the reference data point whereas the fraction is assigned by the investigation. The weights are assigned so that the reference data point would have the highest eight of 1 and the further the data point is from the reference point, the lower the weight would be until it reaches 0 at the boundary. A regression line is then fitted using weighted least square method. The predicted value of the regression line at the reference point is then calculated. This process will be repeated for every data point in the scatterplot.

2. Weights of outlier (data points that deviate very much from the fitted regression line) is down-weighted by adjusting the weights of data points with large residual. Stage one and two are then reiterated until it reaches the maximum iteration assigned by the investigator.

3. The Lowess curve is then drawn by joining all the predicted values produced by the regression lines at each of the data point in the scatterplot.

In this paper, the Lowess curves were produced using SPSS for Window Version 5 with 50% smoothing fraction and two iterations.

Appendix A8 Tests of Violation of Regression Assumptions

There are a number of assumptions linear regression should not violated, two more important ones are the homoscedasticity and normal distribution of residual terms. Homoscedasticity refers to the homogeneity of variance across all observations. This assumption would be violated if there is unequal or non-constant variance, which vary from observation to observation. One method to test the degree of heteroscedasticity is to plot the residuals with the predicted values of the equation. The assumption of homoscedasticity holds if there is not obvious pattern between the residuals and the predicated values.

Another important assumption of regression analysis is the normal distribution of the residuals, which is the difference between the value of the actual observation with the predicted value. It is important only in statistical inference of the parameter. The violation can be detected by plotting the normal plot of the studentised residual. Deviation of the observed residual from the expected value of residual, assuming they are normal distributed, will be the an indication of such violation. (Source: SPSS 1990d; Gujarati, 1992)

Regression: Gross Housing Cost to Gross Income Ratio by Unequivalised Residual Income

Scatter Plot: Standardised Predicted Value by Standardised Regression Residuals   Normal Probability Plot: Regression Residuals

Linear Model

Double Log Model

Semi-log Model

Log Inverse Model

Hyperbolic Model

Note: Std (Standardised) Cum (cumulative) Prob (probability)
Source: Analysis of FES 1991

Regression: Net Housing Cost to Net Income Ratio by Unequivalised Residual Income

Scatter Plot: Standardised Predicted Value by   Normal Probability Plot: Regression Residuals
    Standardised Regression Residuals
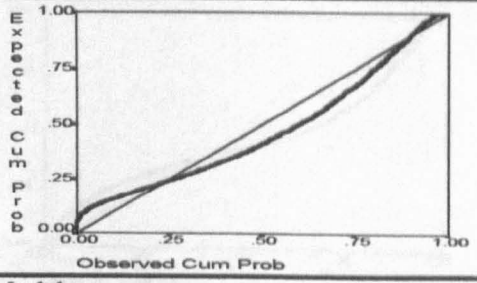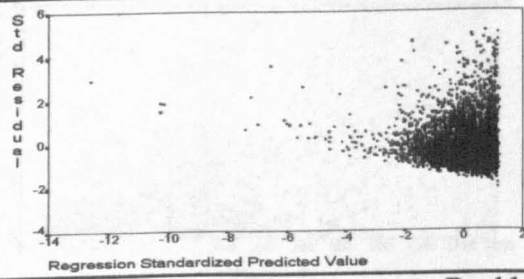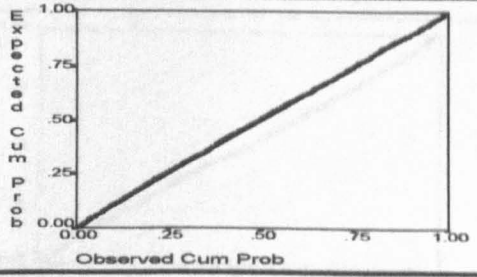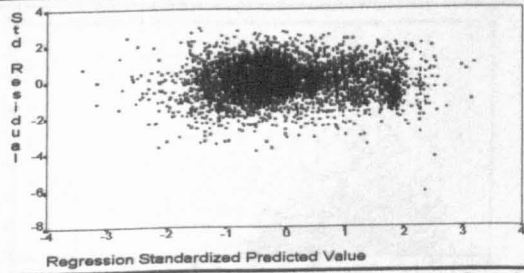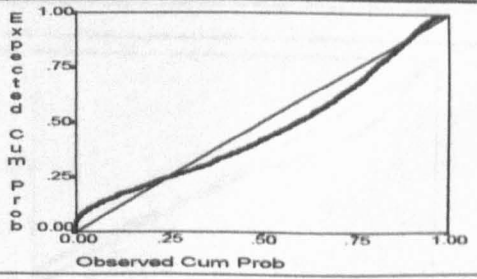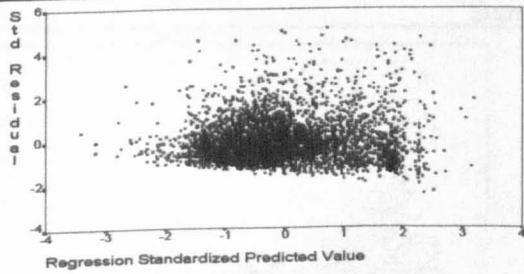
Linear Model

Double Log Model

Semi-log Model

Log Inverse Model
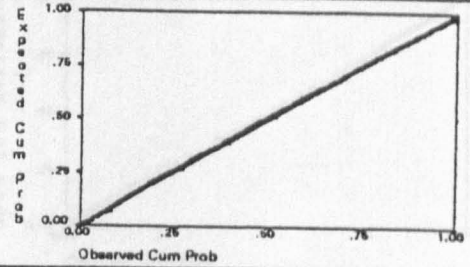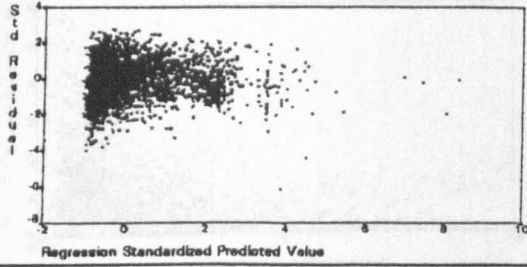
Hyperbolic Model
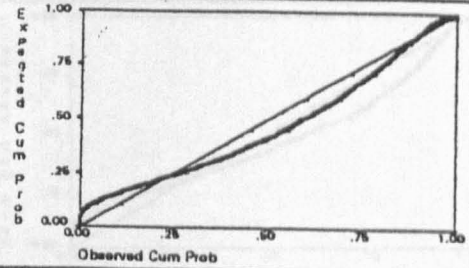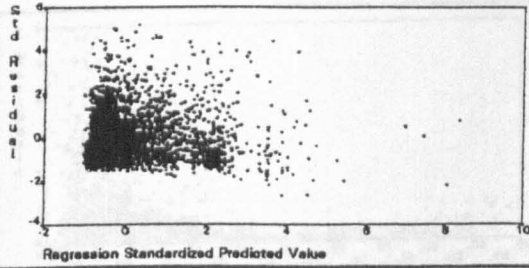
Note: Std (Standardised) Cum (cumulative) Prob (probability)
Source: Analysis of FES 1991

Regression: Gross Housing Cost by Gross Income (Chpater 8)

Scatter plot: Income by Standardised regression residuals	Normal Probablity Plot: Stabdardised Regression Residuals

Linear

Double log

Semi-Log

Log Inveerse

Hyperbolic

Note: z (Standardised) Prob (probability) Cum (cumulative)
Source: Anlysis of FES 1991

Regression: Net Housing Cost by Net Income (Chapter 8)

Scatter plot: Income by Standardised regression residuals	Normal Probablity Plot: Stabdardised Regression Residuals

Linear

Double log

Semi-Log

328

Log Inverse
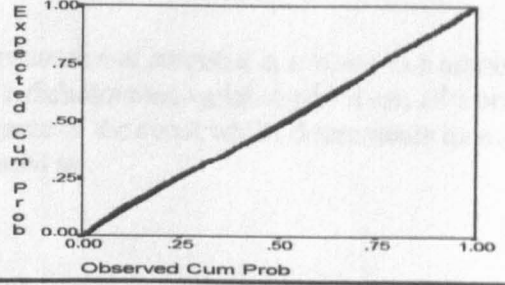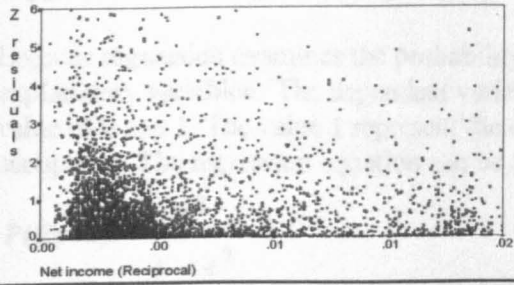
Hyperbolic
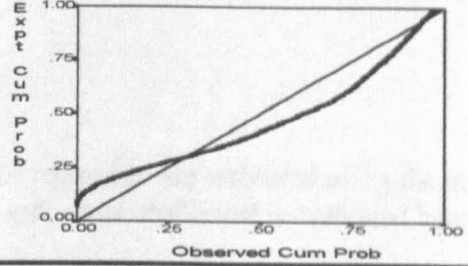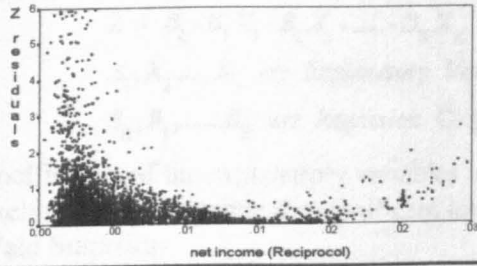
Note: z (Standardised) Prob (probability) Cum (cumulative)
Source: Analysis of FES 1991

Multivariate Regression: Housing Cost by Income and Household Socio-economic Characteristics

| Scatter Plot: Standardised predicted Value by Standardised Residual | Normal Probability Plot: Standardised Regression Residuals |

Gross Housing Cost by Gross Income and Socio-economic Characteristics
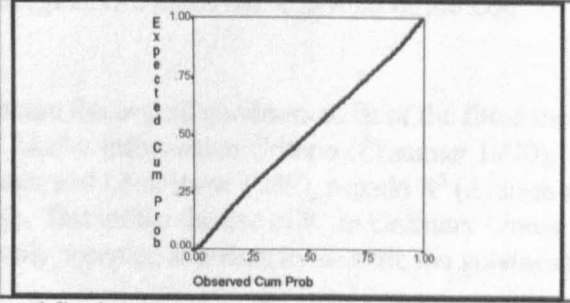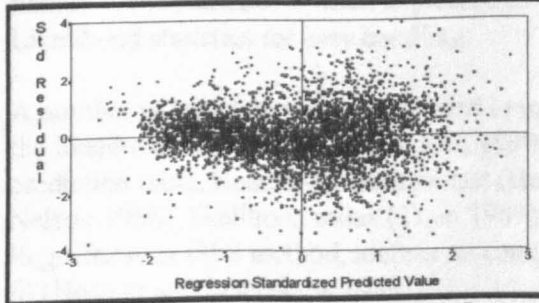
Net Housing Cost by Net Income and Socio-economic Characteristics

Source: Analysis of FES 1991

329
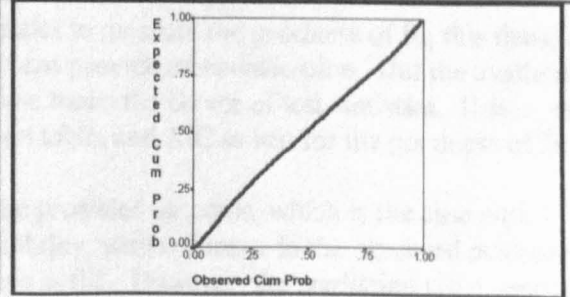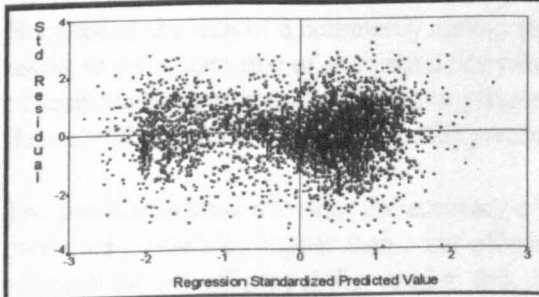
Appendix A9 Logistic Regression: A Technical Description

Logistic regression examines the probability of occurrence of an event in relation to a number of explanatory variables. The dependent variable is a dichotomous variable which can take only the value of 0 and 1. The value 1 represent the occupance of the event whilst 0 represents its non-occupance. The regression equation can be expressed as :

$$P(Event) = \frac{e^Z}{1 + e^Z}$$
(A9.1)

Where $P(Event)$ - *Probability of Occurrence of the Event*

   $Z - B_0 + B_1 X_1 + B_2 X_2 + ... + B_K X_K$

   $X_1, X_2, ... X_k$ *are Explanatory Variables*

   $B_0, B_1, ... B_K$ *are Regression Coefficients*

Coefficients of the explanatory variables in a logistic regression are estimated using the maximum likelihood method while the significant level of the individual coefficient is evaluated based on the Wald Statistics:

$$Wald\ statistics - (\frac{Coefficient}{Standard\ Error})^2$$
(A9.2)

The Wald statistics has a chi-square distribution whereas a chi square test is can be used to test whether the coefficient is significantly different form zero. At the same time, the Likelihood statistics can be used to test the hypothesis that all the coefficients except the intercept are all zero. This test statistics follow a chi-square distribution and thus chi-square test can be employed. Since the likelihood ratio is a very small number between zero and one, it is thus not convenient to handle. This statistics is often expressed as $-2LogLL$, two times the logarithm of the Log Likelihood statistics for easy handling.

A number of test statistics are proposed to measure the overall goodness of fit of the fitted model: the likelihood ratio (SPSS 1990b, SAS 1990), Akaike Information Criteria (Crammer 1990), prediction table, Hosmer-Lemeshow test (Hosmer and Lemeshow 1989), pseudo R^2 (Aldrich and Nelson 1986), likelihood index (Train 1989) etc. But unlike the use of R^2 in Ordinary Linear Regression by OLS method, there is no commonly accepted statistics to measure the goodness of fit (Hosmer and Lemeshow 1989).

Because of the lack of a commonly agreed statistics to measure the goodness of fit, this thesis will resort to more than one of such statistics which can provide cross-validation. But the availability of such statistics in popular computer programme limits the choice of test statistics. Hence, this theses will use the likelihood ratio, the prediction table, and AIC to test for the goodness of fit.

The prediction table provides the accuracy of the predicted outcome, which is the case with a predicted probability higher than a cut-off probability, with reference to the observed outcome, whereas the cut-off probability used in this thesis is 0.5. However, the prediction table depends on the choice of the cut-off probability, in which a change of predicted probability from 0.49 to 0.51 will result in a leap while the change is only very small. In addition, information is also lost in the transformation of predicted probability to predicted outcome. Hence, the prediction table should be used with caution and it is suitable as a assessment of goodness of fit if classification is the main focus of the model (Hosmer and Lemeshow 1989).

The AIC (Akaike Information Criteria) is basically an average measure of the log likelihood statistics in which such statistics is further adjusted by the number of fitted parameters. It is defined as (Crammer 1990):

$$AIC - \frac{-2}{n}(LogLL - k) \qquad \text{(A9.3)}$$

Where   AIC - *Akaike Information Criteria*
         k - *Number of Fitted Variables*
         n - *Sample Size*
         LogLL - *Log Likelihood Ratio*

The AIC for a perfect model is zero and the smaller the value of AIC, the better fit the model is.

The computation of the bivariate models were implemented on SAS on UNIX IRIS System V whilst the multi-variate model by SPSS on VMS V4. The basic operations of the two programme are the same except in multivariate analysis, the coding system of the categorical explanatory variable used in SPSS was the deviation coding scheme. This scheme, contrast with the commonly used indicator variable scheme, codes the last category (the reference category) as -1 instead of 0. Thus, coefficients of subgroups in the category should then be compared with the average effect of the variable instead with zero. The coefficient of the reference variable is then the negative value of the sum of the coefficients of the rest of the subgroups in the category (SPSS 1990c).

Output of SPSS includes the value of EXP(B) and R. EXP(B) is the logarithm of the unstandardised coefficient (B) of the explanatory variable. Expressing the unstandardised coefficient facilitate the comparison of the effect of the coefficient between it is the change of the log odd of dependent variable which is of interest.

R statistics is logistic regression is the equivalent of the partial correlation statistics in ordinary regression analysis which compares the relative contribution of individual explanatory variable in the model. R varies from -1 to 1 and a positive value of R means an increase of likelihood of the event with an increase in the explanatory variable. A value of R close to 0 implies a small contribution of the variable to the fitted model. R is defined as : (SPSS 1990a)

$$R - (\frac{Wald\ Statistics\ -2k}{-2LogLL\ (0)})^{\frac{1}{2}} \qquad \text{(A9.4)}$$

Where   k - *Degree of Freedom of the variable*
         -2LogLL (0) - *-2LogLL (0) of the Base Model*
              LogLL - *Log Likelihood Statistics*

Appendix A10 Goodness of Fit of Model T_{1G} And Model T_{2G} by Household Socio-economic Characteristics

Model T_{1G}

Characteristics	N	AIC	-2LogLL	Sensitivity	Specificity
All households	4272	0.62	2759	70	93
Tenure					
Local Authority Tenants	1144	0.57	645	90	83
Housing Association Tenants	168	0.47	74	91	90
Private Tenants (Unfurnished)	200	0.74	144	83	86
Private Tenants (Furnished)	195	0.65	123	72	93
Mortgagors	2565	0.42	1085	47	98
Region					
North	341	0.58	192	82	94
Yorkshire and Humberside	422	0.67	277	76	91
North West	558	0.74	409	71	91
East Midlands	365	0.7	252	66	91
West Midlands	454	0.57	253	82	91
East Anglia	108	0.65	119	65	94
London	587	0.65	378	69	93
South East	930	0.59	544	56	96
South West	427	0.52	219	74	84
Household Type					
married Couple	2772	0.91	1692	45	96
Single Person	1004	0.93	623	89	86
Lone Parent	227	0.72	159	92	67
Others	269	0.79	207	48	93
Size of Household					
1 Person	1004	0.63	923	89	90
2 Persons	1337	0.67	889	60	96
3 Persons	750	0.53	389	61	96
4 Persons	815	0.64	517	47	95
5 Persons or More	366	0.81	292	50	84
Housing Benefit					
Claimant	880	0.54	1827	48	98
Non-claimant	3392	0.5	433	97	58

Note: Sensitivity is the percentage of correct prediction when there is an event, Specificity is the probability of correct prediction when there is no event
Source: Analysis of FES1991

Model T_{2G}

Characteristics	N	AIC	-2LogLL	Sensitivity	Specificity
All households	4272	0.56	2659	69	93
Tenure					
Local Authority Tenants	1144	1.12	1278	79	51
Housing Association Tenants	168	1.13	186	74	60
Private Tenants (Unfurnished)	200	1.20	235	47	77
Private Tenants (Furnished)	195	1.11	213	33	97
Mortgagors	2565	0.52	1328	32	99
Region					
North	341	0.53	178	81	94
Yorkshire and Humberside	422	0.69	287	73	91
North West	558	0.74	408	65	91

Model T$_{2G}$

Characteristics	N	AIC	-2LogLL	Sensitivity	Specificity
East Midlands	365	0.67	238	67	92
West Midlands	454	0.53	236	82	92
East Anglia	108	0.63	115	64	95
London	587	0.66	382	69	93
South East	930	0.56	514	56	96
South West	427	0.43	198	77	95
Household Type					
married Couple	2772	0.83	2303	17	99
Single Person	1004	1.34	1341	53	59
Lone Parent	227	1.16	260	87	75
Others	269	1.06	280	19	95
Size of Household					
1 Person	1004	0.58	580	88	88
2 Persons	1337	0.61	816	57	94
3 persons	750	0.49	364	63	90
4 Persons	815	0.62	503	48	86
5 Persons or More	366	0.84	304	48	80
Housing Benefit					
Claimant	880	0.50	1698	45	98
Non-claimant	3392	0.65	584	96	55

Note: Sensitivity is the percentage of correct prediction when there is an event, Specificity is the probability of correct prediction when there is no event
Source: Analysis of FES 1991

Appendix A11 Non-linear Regression: A Technical Description

Non-linear regression fits a regression model which has a non-linear functional form and cannot be evaluated using ordinary least square or other methods employed in linear regression. The implementation of non-linear regression was performed by the NLR procedure of SPSS VAX/VMS Release 4 which used Lavenberg-Marguarch alogarithm to evaluate the regression parameters (SPSS, 1990a; SPSS, 1990b).

The functional form of the regression model has to be predetermined and supplied to the NLR procedure. In addition, initial values of the parameters have to supplied as well. Such initial values are important to the parameter estimation.

The usual test statistics commonly used in linear regression based on the Ordinary Least Square Method (OLS) is not useful in non-linear regression. The residual mean square, which is a useful tool in regression with OLS, is not an unbiased estimate of the error of variance, so the F ratio statistics testing the joint hypothesis that all parameters of the independent variables are zero used in the OLS regression cannot be relied on. Likewise, the R square statistics which indicate the proportion of variation explained by the model in OLS regression is not valid. Instead, SPSS NLR procedure produces a corrected R square figure which represents the sum of squared deviations about the mean. This statistics can be interpreted as the variations about the mean that can be explained by the fitted model.

In addition, the estimation of exact confident interval of the individual parameter is not possible with non-linear regression. Such estimation is computed using asymptotic approximation, i.e. the estimated value will roughly equal to the true value when the size of the sample is very large. Asymptotic estimation of the 95% confident interval of the parameters are provided in the NLR

output. If the estimated interval includes zero, it can be interpreted that the parameter is not different from zero (i.e. the parameter is insignificant) at a confident level of 5%.

(Source: Hartwig and Dearing, 1979; SPSS, 1990a, 1990b)

Appendix A12 Logit Modelling: A Technical Description

The logit model is a particular form of a general loglinear model. A loglinear model seeks to express the expected cell frequency of a contingency table as a additive function of several effects. Take an illustration of a two dimensional contingency table under the assuming that there is no association between the two variables in the table. The expected cell frequency of the table can be expressed as a product of marginal totals divided by the total number of sample. Upon some arrangement, the formula can be transformed in the form of equation A12.1 in which the logarithm of the expected cell frequency can be expressed in terms of a linear combination of several effects :

$$m_{ij} = \frac{t_i \cdot t_j}{n}$$

$$m_{ij} = n \left(\frac{t_i}{n}\right)\left(\frac{t_j}{n}\right)$$

$$m_{ij} = n \, \pi_{i\cdot} \, \pi_{\cdot j}$$

$$\log m_{ij} = \log n + \log \pi_{i\cdot} + \log \pi_{\cdot j}$$

(A12.1)

Where m_{ij} *- Expected Frequency of cell at row i column j*
   n *- Total sample*
   t_i *- Total Observed Freqency of row i*
   t_j *- Total Observed Freqency of column j*
   $\pi_{i\cdot}$ *- Marginal Proportion in row i*
   $\pi_{\cdot j}$ *- margianl Proportion in column j*
   log - Natural Logarithm

A more general expression of a loglinear model with two variables should also allow for the effect of the association between the two variables. This general form is shown in equation A12.2 with the notations changed to the most common ones used in the literature :

$$\log m_{ij} = \log n + \log \pi_{i\cdot} + \log \pi_{\cdot j} + \text{Interaction effect}$$

$$\log m_{ij} = \mu + \lambda_i + \lambda_j + \lambda_{ij}$$

Where μ *- Average Log Expected Frequency*
   λ_i *- Effect associated with row i*
   λ_j *- Effect associated with column j*
   λ_{ij} *- Effect association with cell ij*

(A12.2)

A saturated loglinear model is the model where all the association terms in the model are assumed to exist, thus, the expected frequencies are calculated in a way that they would always match the observed frequency. An unsaturated model, on the other hand, assumes that some of the associated terms do not exist, so the expected frequencies may not equal to the observed frequency. The major function of loglinear modelling is to test, with the aid of statistical tests, whether a particular unsaturated model can reproduce the observed frequencies. Then the unsaturated can be manipulated in a way that the significance of contribution of some particular association terms can be tested to identify some influential or insignificant variables in the model.

The most common test for the goodness of fit of a model is the likelihood ratio chi-square test (G^2). It tests the hypothesis that the expected frequencies do not deviated from the observed frequency. In another word, the model can represent the data even without some of the association terms and the more parsimonious model fit the data equally well. Contrary to the

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usual practice of hypothesis testing in contingency table using chi-square test, the hypothesis the new model can be rejected only if the level of significant of the G^2 is low. Whilst the G^2 test examine the joint hypothesis that the all coefficients of the sub-categories of a particular effect are all zero, a z test can be performed to test whether a particular coefficient is zero.

$$\log(m_{1ij}) = \mu + \lambda_1 + \lambda_i + \lambda_j + \lambda_{1i} + \lambda_{1j} + \lambda_{1ij}$$
$$\log(m_{2ij}) = \mu + \lambda_2 + \lambda_i + \lambda_j + \lambda_{2i} + \lambda_{2j} + \lambda_{2ij}$$

(A12.3)

The logit model is a special case of the general loglinear model. One variable is set as the dependent variable but this variable can only be a dichotomous variable with value 1 and 2. Expanding the loglinear model for each of the category in the dichotomous dependent variable, a new model can be established. To illustrate the transformation, a three way loglinear model is used with i rows and j columns whilst the third variable will be the dependent variable taking the value 1 and 2. So in loglinear model terms :

Instead of expressing the of cell frequency, the odds of being in category 2 against category is substituted as the dependent valuable. many of the common terms will be cancelled out. Making use of the facts that parameter of categories sum to zero, the expression can be further reduced to a linear combination of effects.

(A12.4)

$$\log\left(\frac{m_{1ij}}{m_{2ij}}\right) = \log(m_{1ij}) - \log(m_{2ij})$$

$$\log\left(\frac{m_{1ij}}{m_{2ij}}\right) = 2(\lambda_1 + \lambda_{1i} + \lambda_{1j} + \lambda_q)$$

Using the common notations in logit modelling, the log odds of in category 2 of the dependent valuable can be expressed in terms of a linear combination of a constant and some parameter estimates :

(A12.5)

$$\log O_1 = \alpha + \tau_i + \tau_j + \tau_{ij}$$
where α = *avearge of the* log *odds*
    τ_i = *effect of row i*
    τ_j = *Effect of column j*
    τ_{ij} = *Effect of row i and column j*

The logit models used in this paper were evaluated the procedure LOGLINEAR in SPSS VMS V4.0. The coefficients calculated are coefficients of the additive model which compares the log odds of the dependent variable. Since it is sometimes difficult to grasp the relationship between categories by log odds, coefficients of the multiplicative model are display instead, allowing comparison of the odds of the dependent variable. Although routine computer outputs of the coefficients excludes that of the last category since it is statistically redundant, evaluation of its value is straight forward since all coefficients across a variable should sum to zero.

Coefficients of the logit models can be compared with the coefficients in the same category. A value large than one means the odds of dependent variable in that sub-category is larger than the average value in that category, vice versa when it is negative. The likelihood ratio test (G^2) used to test the goodness of fit of a unsaturated loglinear model also applies to unsaturated logit models, and likewise, the z test for the significance of the individual parameters. To test whether a particular term, or a number of terms are necessary to fit a model, a conditional loglikelihood test can be performed. Supposed there are two models A and B where Model B is nested in Model A, i.e. all the terms in Model B are contained in Model A. The additional terms in Model A is necessary to fit the model if such addition would increase significantly the goodness of fit of Model A. In another word, the increase of goodness of fit from Model B to Model A will be significant. The difference in goodness of fit between two models is itself chi-square distributed with degree of freedom equals to the difference of degree of freedom between the two models. if the chi-square statistics is not significant, the addition terms is not necessary to fit the model.

Source: Demaris (1992); Fienberg (1077); SPSS (1990b)

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Appendix A13 Principal Component Analysis: A Technical Description

Principal component analysis is basically a parsimony technique aiming at reducing the complexity of the data. A set of complex and correlated variables can be transformed into an equal number of uncorrelated 'components' that retains all the information of the original data set. These components are linearly combination of the original variables and the weights given to each variable in the component are evaluated so that the variance of that component is the largest. There are two additional constraint to the evaluation of the weights, first, the sum of the squared weights across a component have to be summed to unity, or otherwise maximum variance can be achieved simply by boosting the absolute values of the weights. Second, the component should have no correlation with the preceding components so that the aims of reproducing a set of uncorrelated components can be achieved.

The sum of variance of all the components should be the same as the sum of all the variance of the original variables and it is in this sense retaining all of the information of the data set is referred to. Mathematically, principal component analysis can be expressed as :

$$y_i = a_{i1}x_1 + a_{i2}x_2 + \ldots\ldots + a_{ip}x_p$$
$$a_{i1} + a_{i2} + \ldots + a_{ip} = 1$$

$\qquad$ (A13.1)

Where y_i = ith principal component
$\qquad$ x = Original variables
$\qquad$ a_{ij} = weight of the jth variable in the ith component

Reproducing as many transformed components as the original number of variables is merely the first step in this technique. The most functional usage of it is to replace the correlated large number of original variables, with a much smaller number of components. Since the aim of the transformation is to retain all the information of the data and the components are so constructed as to maximise the variation of the data in that component, the first few components can be used to represent the original data set without losing much of the information in the original data. In doing so, the number of dimension of the data set is thus reduced from p to the number of components chosen.

Two pieces of information in the principal component analysis are of relevance in this report, the weight of variable each component and component scores of each cases. The weight each variable takes up in each component is technically referred to as the component loading, or sometimes factor loading, a term borrowed from factor analysis, because of its similarity with factor analysis. A comparison of the component loading of the variables in a component, which is proportional to the correlation of that variable with the component, can reveal the pattern of interaction between the variables in the original data set. This kind of interactions are usually too complication when the number of variables become very large. The similarity in the sign of the loadings represent the correlation of the variables with the components in the same direction and the relatively magnitude portrays the relative contribution between variables. It is possible a clearer picture of the pattern of interaction of the original variable can be described by analysing the first few component of the data.

The component score is evaluated by the equation presented in A13.1 substituting the appropriate loadings in the equation. It represents the relative position of individual cases with reference to a particular score. It is sometimes illuminating by presenting graphically the component scores of the cases of the first two components in a graph. Possible clustering can be inferred or outlier can be detected with such plots and underlying relationship between the cases can also probably be uncovered

Another figure associated with principal component analysis output is the communality of the component. t is a term used in factor analysis simply referring to the percentage of variation

accounted for by that components. The components are evaluated in a way that the first component will account for the largest variation in the data and this percentage of explained variation will diminish with subsequent components. Since all the principal components put together will explain all of the variations in the data, it follows that the communalities of all the components will sum to unity.

Basically, principal component analysis assumed all the variables be measured in a metric scale, i.e. continuous numeric variables, the restraint on the type of variable used limits its use in social sciences, because of the inevitability of using category variable. A non-linear principal component analysis is to be used with categorical variables, whether nominal or ordinal, included as independent variables.

The linear principal component analysis was implemented by the FACTOR procedure, on SPSS VMS 4.0, using PC option as the method of analysis. Covariance matrix was used to estimate the model coefficients and other test statistics. Whilst the procedure PRINCAL was used for the non-linear principal component analysis that involved categorical variables. PRINCAL can accept categorical variables which are assumed as single nominal, ordinal and multiple nominal. The same weights on all dimensions for the first two types of categorical data are applied so that all the sub-categories in the variable are forced on a straight line. Evaluation on multiple nominal data does not have this restriction and the sub-categories can lie anywhere on the plan. Thus, whilst co-ordinate quantification, which is a numeric value assigned to each category such that the score of the cases in the data set will have large correlations with each of the variables, are calculated for all types of variables, component loadings are only available for single nominal and ordinal data.

Source : SPSS (1990c); Jolliffe (1986); Dunteman (1989); Van de Geer (1993).

Appendix 14   Lowess Smooth Curves: Housing Cost by Household Income

Regression: Housing Cost by Household Income (All Households)
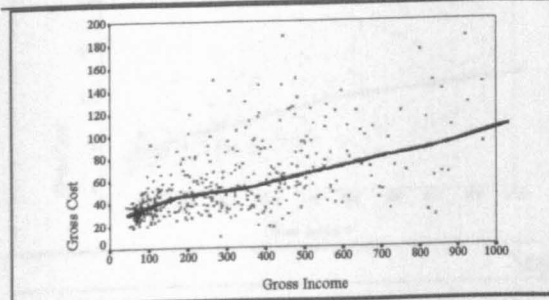
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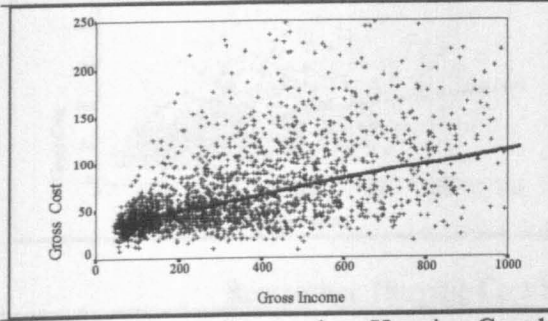
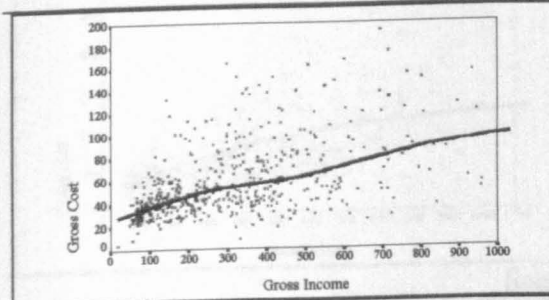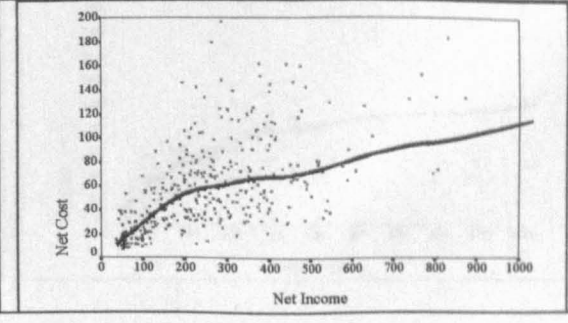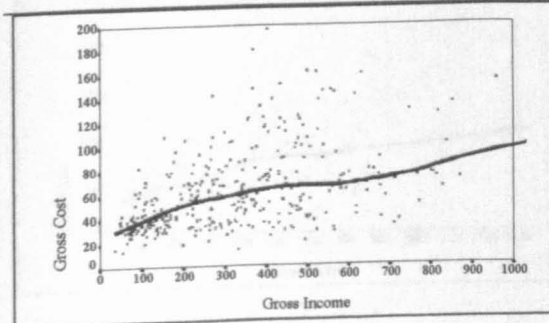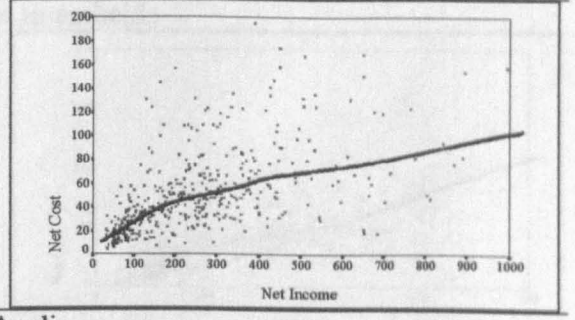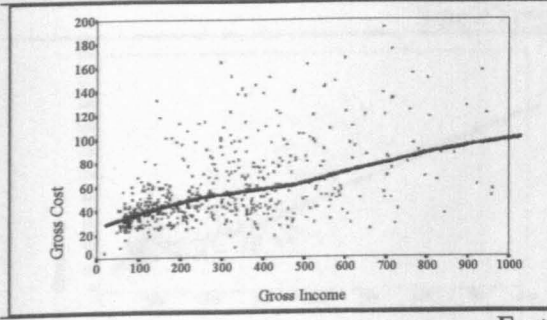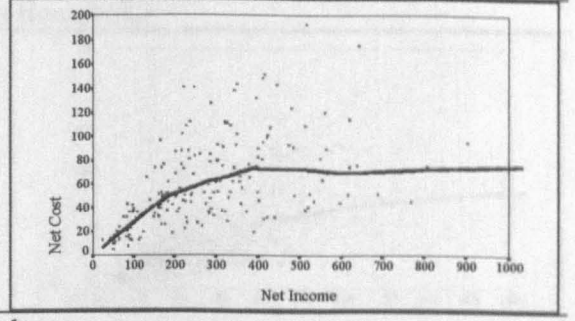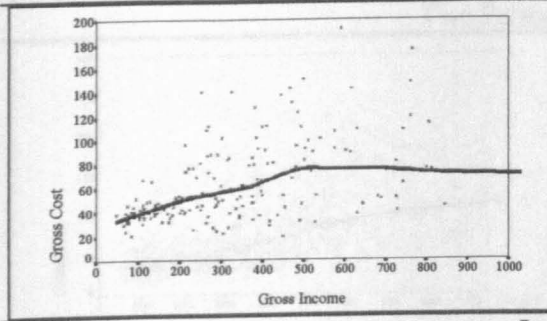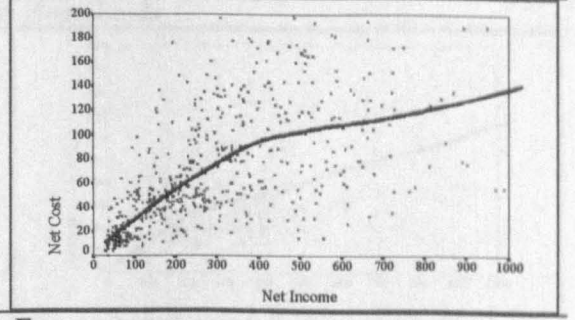### Net Cost and Net Income
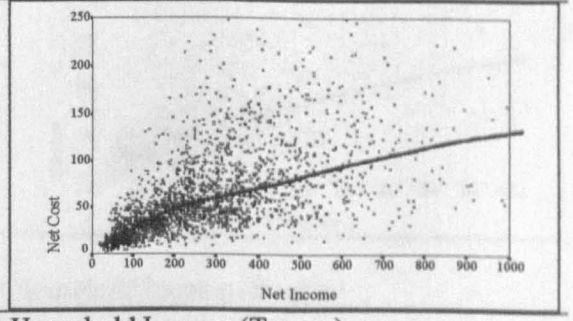
Regression: Housing Cost by Household Income (Tenure)

Local Authority Tenants
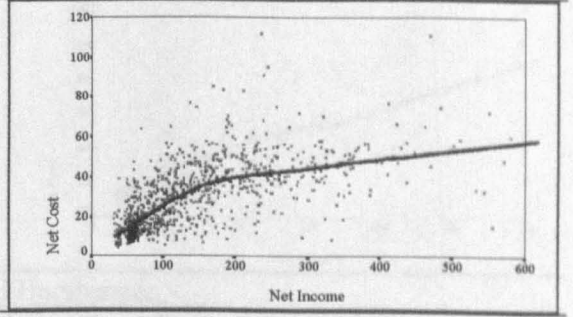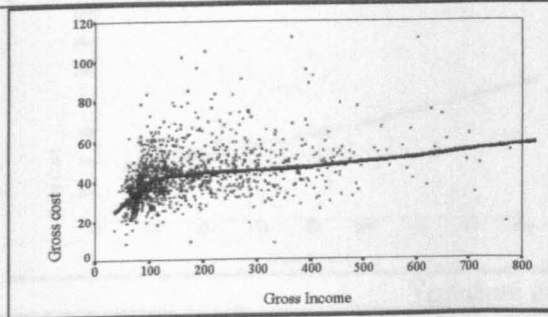
Housing Association Tenents
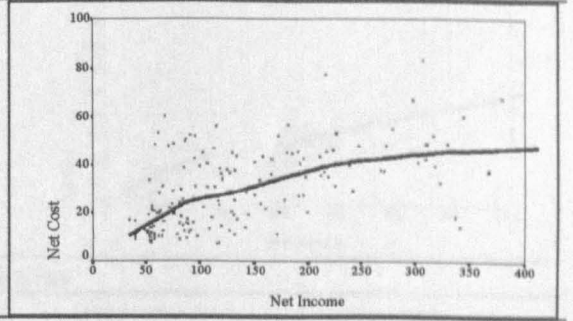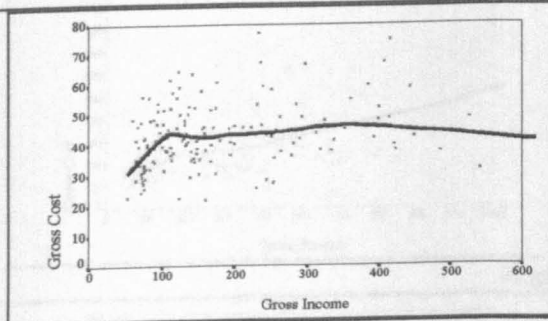
Pivate rented Unfurnished Tenents
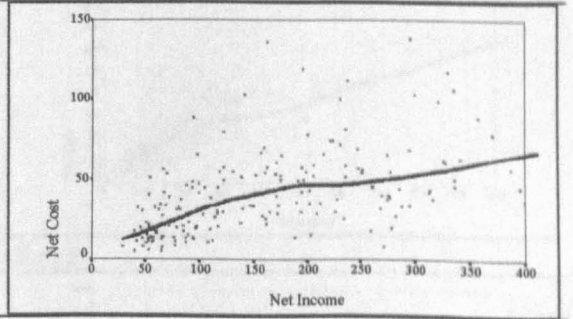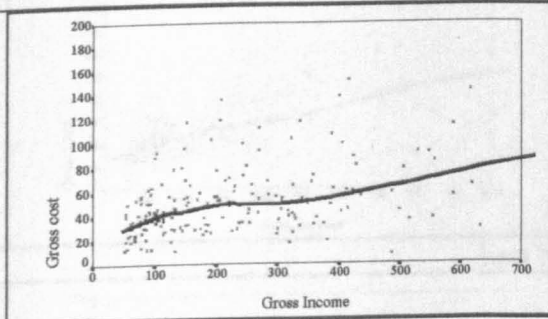
Private Rented Furnished Tenents

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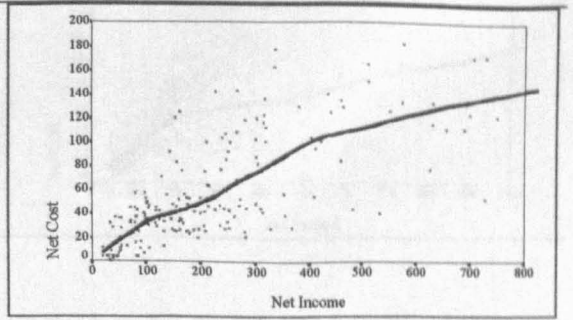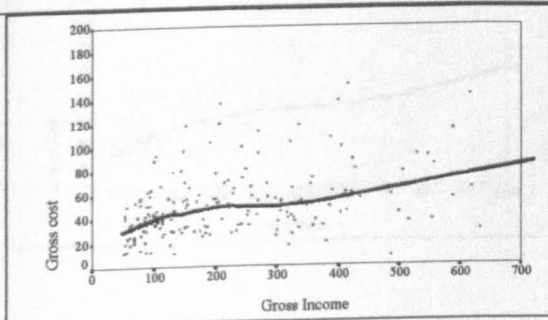
Mortgagors
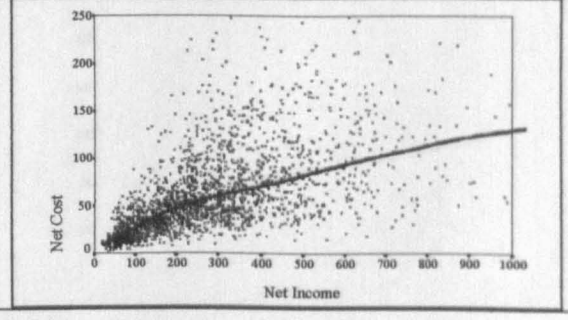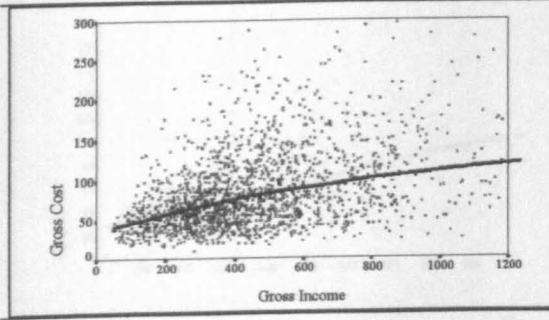
Regression: Housing Cost by Household Income (Region)

North
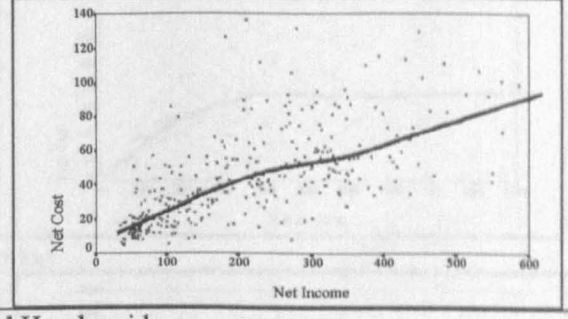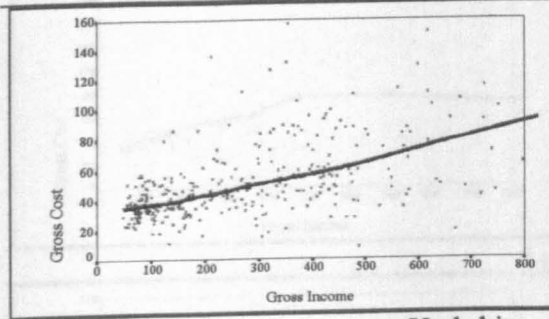
Yorkshire and Humberside
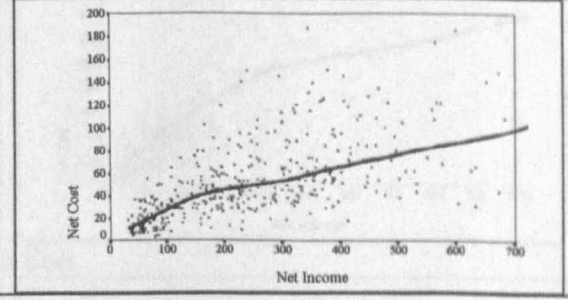
North west
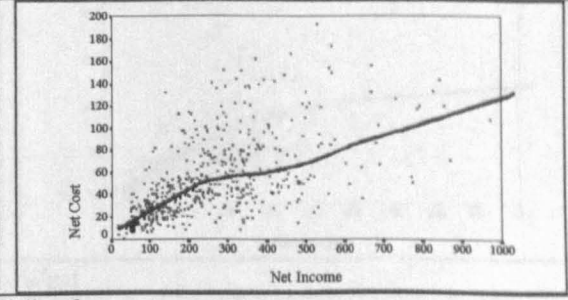
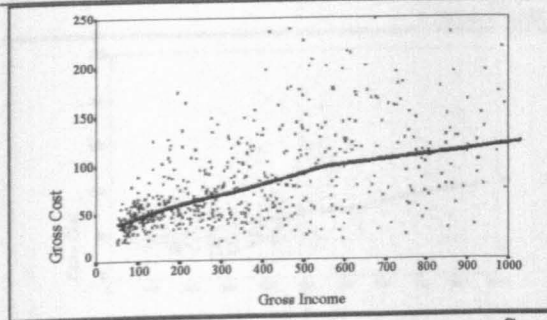### East Midlands

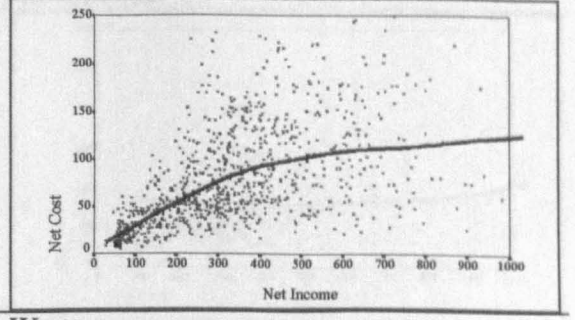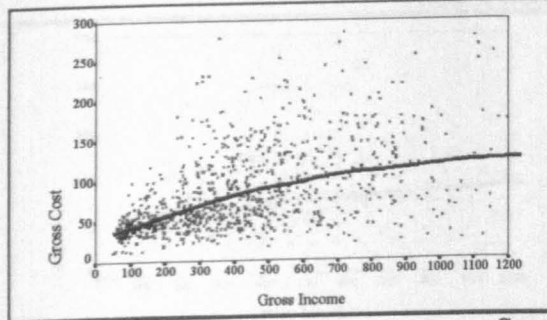Gross Cost and Gross Income | Net Cost and Net Income

West Midlands

East Anglia

Lnndon

South East

South West
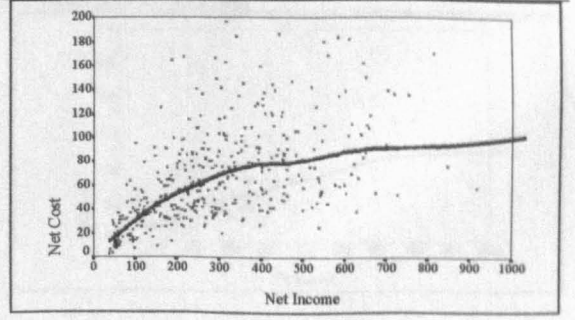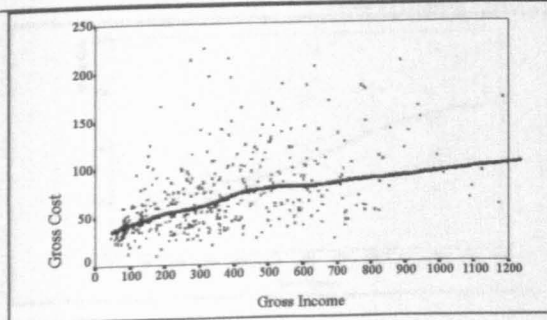
Regression: Housing Cost by Household Income (Household Size)

Single Person Households
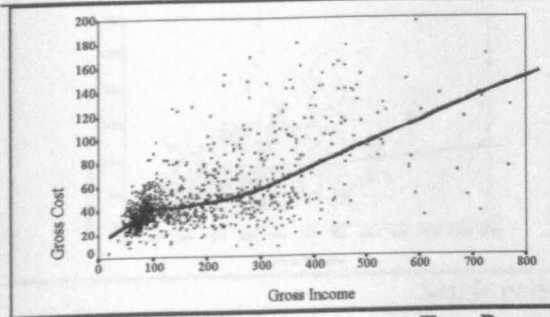
Two Persons Households
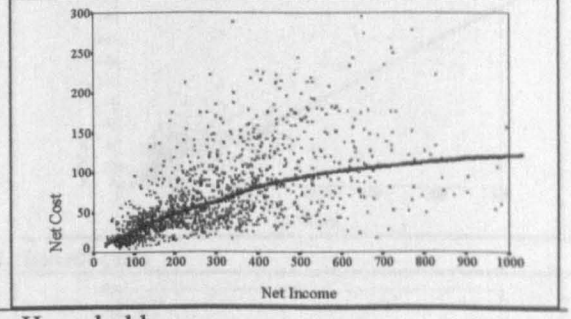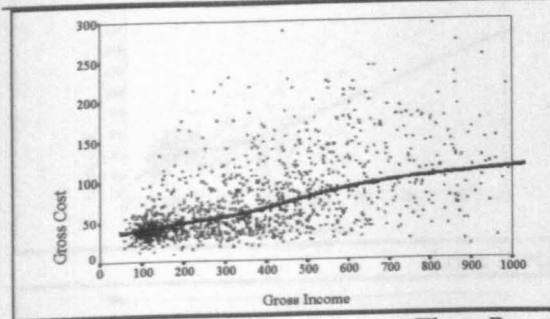
Three Persons Households
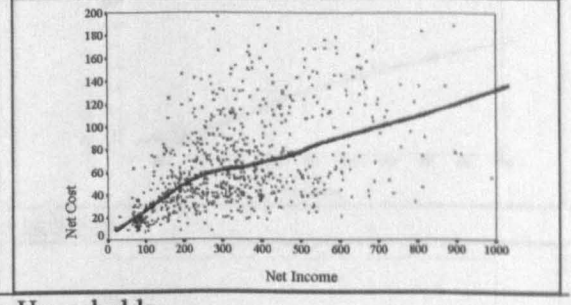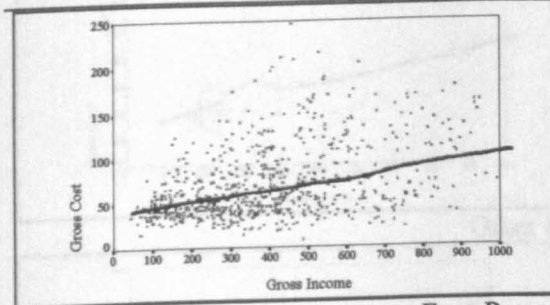
Four Persons Households
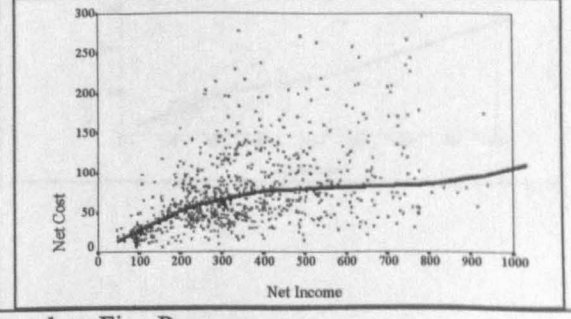
Households with More than Five Persons
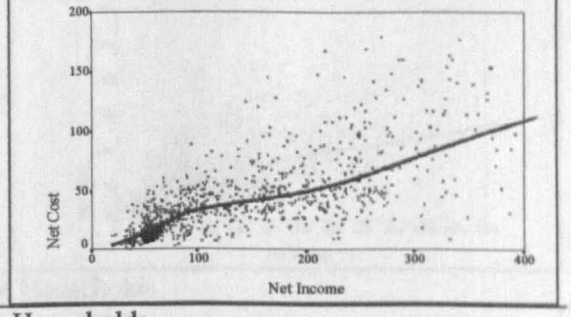
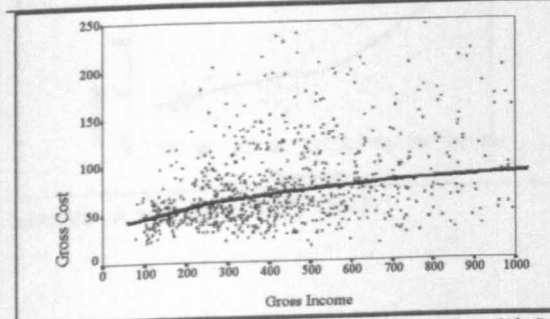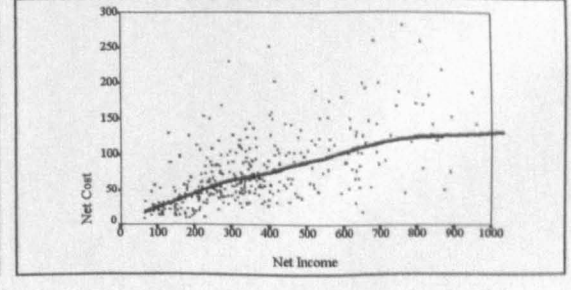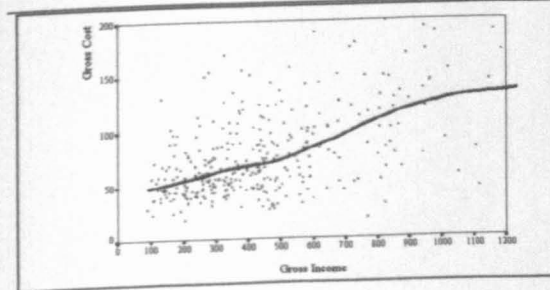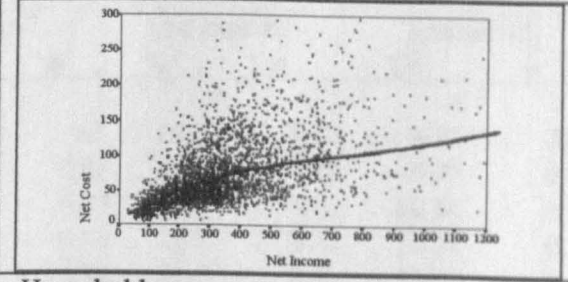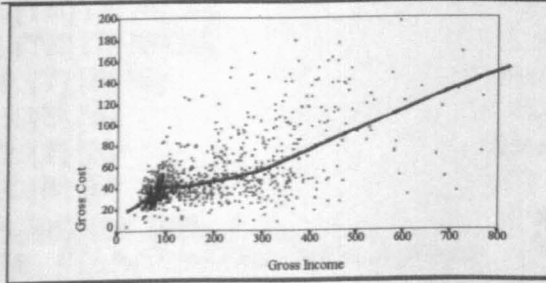| Gross Cost and Gross Income	Net Cost and Net Income

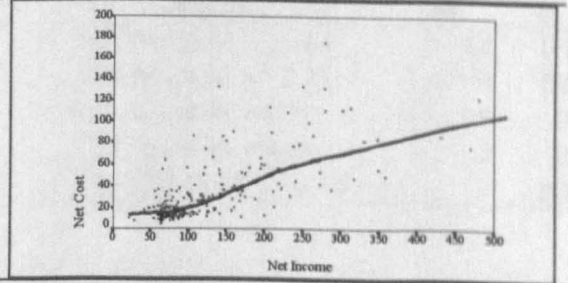## Regression: Housing Cost by Household Income (Household Type)

Married Couple Households
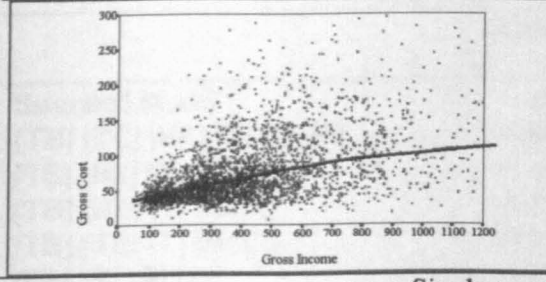
Single person Households
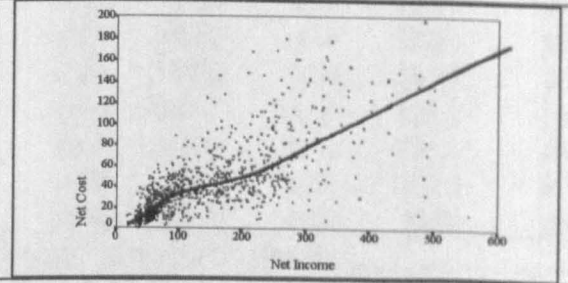
Lone Parent Households
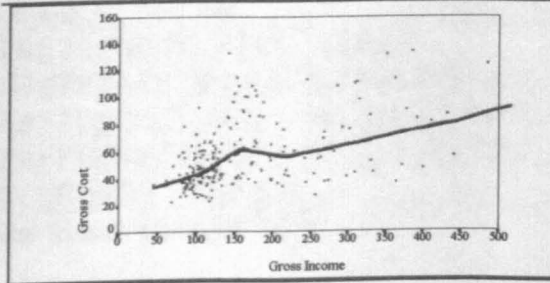
Other Households
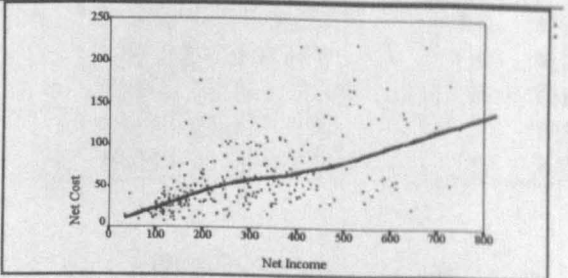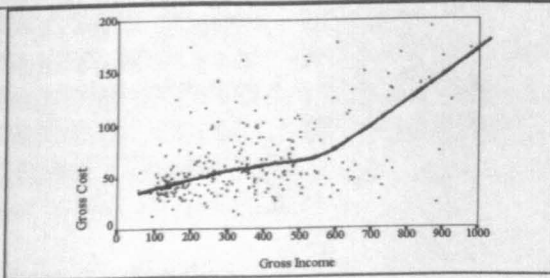
Source: Analysis of FES 1991

Appendix 15 Logit Models: Housing Affordability, Tenure, Employment Status and Housing Benefit

	Scheme T		Scheme R_1		Scheme R_2	
	G^2	p	G^2	p	G^2	p
1. Saturated Model	0	1	0	1	0	1
2. [TB] [TE] [BE] [T] [B] [E]	6.44	0.6	12.27	0.14	8.75	0.36
3. [TE] [BE] [T] [B] [E]	19.36	0.08	19.35	0.08	15.75	0.20
4. [TB] [BE] [T] [B] [E]	15.73	0.47	27.90	0.03	30.64	0.02
5. [TB] [TE] [T] [B] [E]	10.93	0.36	12.81	0.23	12.51	0.25
6. [BE] [T] [B] [E]	33.30	0.03	34.77	0.02	33.96	0.03
7. [TB] [T] [B] [E]	18.69	0.41	28.59	0.05	32.11	0.02
8. [TE] [T] [B] [E]	23.35	0.06	19.72	0.14	20.04	0.13
10. [T] [B] [E]	35.09	0.04	35.26	0.04	36.16	0.03
11. [T] [B]	225.6	0.00	241.7	0.00	263.1	0.00
12. [T] [E]	236.6	0.00	363.4	0.00	276.4	0.00
13. [B] [E]	179.7	0.00	94.1	0.00	263.1	0.00
14. Intercept Only	2102	0.00	2155	0.00	2156	0.00

Note : G^2 Likelihood Ratio Test   p Probability   T Tenure   E Employment B Benefit

Scheme A : Test For	Difference in G^2	df	p
[TB][TE][BE][T][B][E] - [T][B][E]	35.09 - 6.44 = 28.64	14	0.02
[TB][TE][BE][T][B][E] - [ET][BE][T][B][E]	19.36 - 6.44 = 12.92	4	0.02
[TB][TE][BE][T][B][E] - [BT][BE][T][B][E]	10.93 - 6.44 = 9.30	8	0.3
[TB][TE][BE][T][B][E] - [BT][ET][T][B][E]	10.93 - 6.44 = 4.49	2	0.1
[BT][B][E][T] - [B][T][E]	35.09 - 18.69 = 16.39	4	0.01

Best Model: [BT][B][E][T]

Scheme B : Test For	Difference in G^2	df	p
[TB][TE][BE][T][B][E] - [T][B][E]	35.26 - 12.27 = 22.98	14	0.06
[TB][TE][BE][T][B][E] - [ET][BE][T][B][E]	27.9 - 12.27 = 7.08	4	0.10
[TB][TE][BE][T][B][E] - [BT][BE][T][B][E]	27.90 - 12.27 = 15.62	8	0.04
[TB][TE][BE][T][B][E] - [BT][ET][T][B][E]	12.81 - 12.27 = 0.54	2	0.50
[ET][B][E][T] - [B][T][E]	35.26 - 19.72 = 15.54	8	0.04

Best Model: [ET][B][E][T]

Scheme C : Test For	Difference in G^2	df	p
[TB][TE][BE][T][B][E] - [T][B][E]	36.16 - 8.75 = 27.40	14	0.02
[TB][TE][BE][T][B][E] - [ET][BE][T][B][E]	15.75 - 8.75 = 7.00	4	0.10
[TB][TE][BE][T][B][E] - [BT][BE][T][B][E]	30.64 - 8.75 = 21.88	8	0.01
[TB][TE][BE][T][B][E] - [BT][ET][T][B][E]	12.51 - 8.75 = 3.76	2	0.20
[ET][B][E][T] - [B][T][E]	36.16 - 20.04 = 16.12	8	0.04

Best Model: [ET][B][E][T]

Appendix A16 Definition of Life cycle Groups

Life Cycle Groups	Definition	% in Sample
Young Single	One Adult Aged Under 35	6
Young Married	Married Couple Female Under 35	5
Family Formation	Married Couple, Children All Under 5	9
Middle Child Rearing	Married Couple, At Least On Under 5 Rest Aged 5-15	6
Complete Family	Married Couple, Children All Aged 5-15	11
Early Disposal	Married Couple, One Child 5-15 One Or More 16+	1
Two Generation	Married Couple, No Children Under 16 At Least One 16-24	7
Empty Nest	Married Couple Male 45-65	12
Early Retirement	Married Couple Both Pensioners	5
Old And Single	One Adult, Pensioner	7
Lone Parent	Lone Parent, With Children Under 16	5
Unclassified		25

Source ; Bradshaw et al (1988) p230

Appendix A17 A Description of the Expenditure Items Used in Chapter 9

Expenditure Items	Description
Net Housing (Housing)	Rent or Mortgage payment, plus fuel and power, plus repair and maintenance less housing benefit and help from social security towards mortgage interest payment
Food (in) (Foodin)	All food items consumed at home
Food (out) (Foodout)	All food items consumed out of home which include eating in a restaurant or take away
Alcohol	Beer, spirit, wine and other alcoholic drinks
Tobacco	Cigars, pipes and cigarettes
Clothing (Cloth)	Clothing and footwear
Household Goods (HhGoods)	Cooking equipments, electric goods, stationary, gardening tools, pet etc.
Household Services (HhServ)	postage, phone calls, subscription to trade union.
Personal Goods & Services (PerGd)	Personal hygiene goods, cosmetics, personal jewels.
Motoring	Purchase of cars or parts, petrol and diesel, licence and garage fee.
Fares	Fares for public transport
Leisure goods (LeiGoods)	Purchase and repair of telephone, computer, TV and other personal entertainment equipments, books and newspapers.
Leisure Services (LeiServ)	Entertainment and sport activities, charity and gift
Miscellaneous (miscell)	Fee on credit cards, children pocket money and other miscellaneous items

Appendix A18 Standardised Residuals: Households in Unaffordable Housing by Socio-Economic Characteristics

Standardised Adjusted Residuals	Sch T Unaff	Sch R₁ Unaff	Sch R₂ Unaff	Sch R₃ Unaff	Poverty
Tenure					
Local Authority	30.6	28.9	27.2	9.4	2.5
Housing Association	9.5	8.9	7.4	2.2	7.0
Private Rented (Unfurnished)	5.9	4.8	3.9	2.8	2.3
Private Rented (Furnished)	-.1	.1	.5	2.5	-1.5
Owned With Mortgage	-33.9	-31.8	-29.4	-11.7	-25.7
Region					
North	2.6	2.7	2.0	-1.2	3.7
Yorks & Humberside	1.5	2.7	2.2	-0.8	3.3
North West	0.6	2.0	1.5	-0.6	2.3
East Midlands	-0.6	0.3	0.7	0.5	0.3
West Midlands	2.8	3.3	3.7	0.1	4.4
East Anglia	-1.5	-1.0	-0.8	-0.5	-0.5
London	2.7	0.4	1.3	2.9	0.9
South East	-5.7	-7.0	-6.9	-1.0	-7.5
South West	-1.1	-1.3	-1.5	0.4	-2.2
Household Type					
Married Couples	-26.7	-22.1	-19.7	-11.4	-14.2
Single Person	23.6	17.4	15.6	12.5	8.2
Lone Parent	-15.1	15	14.3	3.7	14.1
Others	2.5	-0.8	-1.7	-2.8	-0.5
Size of Household					
1 Person	23.6	17.4	15.6	12.5	8.2
2 Persons	-3.1	-4.1	-4.5	-4.3	-1.8
3 Persons	-7.9	-6.5	-6.2	-4.3	-3.8
4 Persons	-9.9	-6.7	-5.8	-3.0	-4.4
More than 5 Persons	-6.0	-1.3	0.3	-1.8	1.9
Dependent Children					
No dependent child	7.0	2.0	0.7	1.5	-0.4
Have child aged under 5, no 5 to 15	0.1	1.1	-0.1	0.5	-0.6
No child aged under 5 have child 5 to 15	-6.5	-3.8	-2.2	-3.0	-0.1
Have child both aged under 5 and 5 to 15	-3.3	0.6	2.1	1.2	1.6
Age of Head of Household					
Less than 30	-0.2	-1.6	-1.1	-0.9	-0.6
30 - 39	-9.8	-8.8	-7.1	-3.8	-5.3
40 - 49	-11.4	-11.2	-9.2	-4.5	-7.5
50 - 59	-3.9	-4.9	-3.6	-3.4	-1.5
Over 60	25.0	24.0	20.7	12.1	14.3
Employment Status: HoH and Partner					
Both Full Time	-16.4	-19.5	-18.2	-8.8	-14.5
Hoh FT wife PT	-16.5	-16.9	-15.6	-6.4	-13.5
Hoh FT Wife Unoccupied	-12.4	-11.1	-10.0	-1.9	-10.5
Hoh PT Wife FT	0.5	0.1	0.4	-0.9	-1.3
Hoh PT Wife PT/Unocc	3.4	2.5	2.0	-2.4	-0.3
Hoh Unocc Wife FT/PT	20.2	19.8	18.9	9.6	14.9
Both Unoccupied	27.8	30.9	28.0	8.8	26.4
Housing Benefit					
non Claimants	-41.7	-41.0	-40.0	-13.9	-35.5
Claimants	41.7	41.0	40.0	13.9	35.5

Source: Analysis of FES 1991

Appendix A19 Regional House Prices Paid by First Time Buyers 1988

Region / £	Mean	Lower Quartile	Median	Upper Quartile
North	21733	13751	19000	26226
Yorkshire & Humberside	23814	15473	21542	29177
East Midlands	28581	18080	26205	35936
East Anglia	40720	27432	42711	50009
London	63055	49456	61522	73600
South East	52232	39134	52095	61975
South West	41383	28781	39912	49535
West Midlands	28136	16540	16540	16540
North West	24173	15955	22031	28962
England	38028	19821	32016	52021

Source : DoE Five Percent Sample Survey on Building Society Mortgages (unpublished table)

Appendix A20 Logistic Regression: Preference to Own by Socio-economic Characteristics (Tenants Under 60 in England)

Socio-economic Characteristics	Dependent Variable: Prefer to Own	
	B	R
Income (Log)	0.50**	0.09
Age of HoH	ns	na
Age of HoH (square)	-0.001**	-0.20
Household Size	ns	na
Number of Children	-0.14*	-0.06
Preference for Type of Dwelling	na	na
Prefer a House	0.71**	0.15
Prefer a Flat	-0.71r	r
Tenure	na	na
Local Authority Tenants	ns	na
Private Tenants	ns	na
Region	na	0.00
North	0.37ns	0.00
Yorks and Humberside	-0.44*	-0.04
East Midlands	-0.37ns	0.00
East Anglia	-0.04ns	0.00
London	0.44*	0.04
South East	-0.05ns	0.00
South West	0.46ns	0.00
West Midlands	-0.01ns	0.00
North West	-0.36r	r
Employment Status (HoH)		0.07
Full Time	0.17ns	0.00
Part Time	0.01ns	0.00
Unemployed/Retired	0.30ns	0.00
Others	-0.48r	r
Employment Status (Spouse)	na	na
Working	ns	na
Not Working	ns	na
Not Applicable	ns	na
Socio-economic Group	na	0.04
Professional/Manager/Employers	0.33ns	0.00

Socio-economic Characteristics	Dependent Variable: Prefer to Own	
	B	R
Intermediate and Jun Non-Manual Workers	0.24ns	0.00
Skilled Manual Workers	0.13ns	0.00
Semi-skilled and Personal Service Workers	-0.11ns	0.00
Unskilled Workers	-0.59r	r
Household Type	na	na
Married Couple	ns	na
Single Person	ns	na
Lone Parents	ns	na
Others	ns	na
Qualifications of HoH	na	na
Have Qualifications	-0.24*	-0.06
No Qualification	0.24r	na
Health Condition of HoH	na	na
Good Health	ns	na
Fairly Good Health	ns	na
Not Good Health	ns	na
Dependent Children		
Have Children Under 5	ns	na
Have Children 5 - 15	ns	na
Have Children 16 - 24	-0.47**	-0.11
Have Children Aged Over 25	ns	na
-2LogLL	931.2	
Correctly Predicted Prefer to Own	94%	
Correctly Predicted Prefer to Rent	34%	
N	1012	

Note: ** p<0.05 * p<0.01 ns Not Significant   na Not Applicable

Source: Analysis of GHS 1988

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