HOUSING TENURE CHOICE IN SCOTLAND: AN EMPIRICAL STUDY OF THE 1996 SCOTTISH HOUSE CONDITION SURVEY

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ABSTRACT

This thesis analyses Scottish households' tenure choice behaviour by using economic approaches. The data set comes from the 1996 Scottish House Condition Survey (SHCS). To estimate the household's tenure decision behaviour, two simulation models with different structures are developed. The first tenure choice model contains a simple one-level choice set. A multinomial logit model is employed to estimate three choice alternatives: owner-occupation, social renting and private renting. The second tenure choice model contains a two-level choice structure assuming that the household firstly decides to move or stay and then chooses a tenure alternative. A nested multinomial logit model is employed to estimate the decision to move/stay and the choice of three tenure alternatives. The determinants of the two tenure choice models not only include household attributes but also include housing attributes. The household attributes generally consist of the household's demographic and socio-economic variables, while housing attributes include dwelling type, location and neighbourhood variables. In addition, this thesis also includes the housing subsidy and rationing variables to estimate their impacts on tenure choice. The estimation results show that the household long term income, the user cost of housing, housing subsidy and rationing variables, as expected, have the most significant influences on households' tenure decisions in Scotland. Moreover, three policy issues are derived from the results of the tenure choice models. The first issue discusses the simulation of the influences of changes in the income tax rate and the mortgage rationing ratios on tenure choice. The second issue analyses income inequality and tenure polarisation. The third issue examines the distribution of housing subsidy between tenures and income levels. The simulation results suggest a direction of these changes on the household's tenure choice behaviour, especially the choice of owner-occupation. The results of the second and the third issues show that low-income households are significantly concentrated in the social rented sector. The rigid need-based allocation system and the small private rented sector could partly be the result of tenure and income polarisation in the social housing sector. On the other hand, some low-income homeowners, primarily elderly and outright owners, could not afford to remain in owner-occupation. Finally, the results of the three issues would have implications for housing policy reform regarding the reform for housing benefit and the allocation system, assisting low-income homeowners, and promoting the private rented sector.

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CHAPTER ONE INTRODUCTION

1.1 Background

Housing tenure through owning or renting (public or private) implies a range of social and economic relations surrounding housing (Barlow and Duncan 1988). The choice of housing tenure expresses the household's ability, preferences, expectations and relations to different tenures. From a sociological viewpoint, the choice of housing tenure implies the housing class and social relations to different tenures (Rex and Moore 1967, Gray 1982). From an economic viewpoint, the housing tenure decision presents a consumer's choice behaviour by maximising his/her utility on different tenures and choosing the tenure that yields the maximum utility (Fallis 1985). This thesis analyses the household's tenure choice behaviour by using economic approaches. The core method is to employ economic models to estimate the household's tenure choice in Scotland.

In the economic perspective, a household in its demand for housing services has to make several choices. An important one is to decide whether to acquire housing services through owning or renting. Many studies have been devoted to estimating the demand for housing, either ownership or rental (for example see Lee and Trost 1978, Rosen 1979, Henderson and Ioannides 1983, Börsch-Supan and Pitkin 1988, and Laakso and Loikkanen 1995). In the UK, however, the choice of housing tenure is not simply whether to own or to rent. Over the past several decades, the outcomes of government policy in the housing market have been shown in a rapidly growing owner-occupied market and in a strong social housing sector with limited access (King 1980). The private rented sector is relatively small and it is vigorous. It plays an important transitional role between owner-occupation and social renting. As a result, in the study of tenure choice in the UK, the household's choice for housing tenure should at least include three alternatives: owner-occupation, social renting and private renting.

Many studies of tenure choice in the UK have been concentrated in England (see for example Doling 1973, King 1980, and Di Salvo and Ermisch 1997). Few studies have

been carried out in Scotland. While Scotland is often referred to as a region of the UK, it is a quite distinct country with its own administrative, legal and education system. In the housing market, the unique housing bidding system and historically strong policy on social housing have impacts on Scotland's tenure pattern as well as housing market conditions, distinguishing it from the rest of the UK (Murie 1996a). We have seen a lower starting point but a rapid increase in the homeownership rate in Scotland over the last three decades. In 1971, Scotland's homeownership rate accounted for 31.2 per cent of the total housing stock while the homeownership rate in England and Wales was 52.4 per cent and 55.8 per cent respectively. By 1998, Scotland's homeownership rate rose to 61.3 per cent, compared to 68 per cent and 71.5 per cent in England and Wales respectively.

The historical importance of the public housing sector is greater in Scotland than in the rest of Britain. In the 1970s, Scotland's public dwellings accounted for half of the housing stock, while in both England and Wales public dwellings accounted for less than 30 per cent of their housing stock. Since the 1980s, as a result of the Right to Buy scheme and the Large Scale Voluntary Transfer scheme, the public housing stock in Scotland, as well as in the rest of Britain, has significantly reduced (Murie 1996b). By 1998, Scotland's public dwellings only accounted for 26.6 per cent of the total housing stock but the figure still remained the highest among the three countries and was about 10 percentage points higher than that in England and Wales. In addition, Scotland's independent housing association sector remains much smaller and there are no equivalents of England's large housing associations (Murie 1996a). In contrast to a rapidly growing owner-occupied housing and a strong social rented sector, private rented dwellings in Scotland remain the lowest percentage of the total housing stock among the three countries. By 1998, Scotland's private rented dwellings accounted for only 6.7 per cent of the total housing stock, compared to 11.1 per cent and 8.5 per cent in England and Wales respectively.

To some degree, the long-term tenure pattern reveals the outcomes of the household's tenure decision behaviour. We have seen that Scotland's tenure pattern is significantly different from the rest of Britain. Hence it implies that the Scottish household's tenure choice behaviour would be different from the household in the rest of Britain. As a result, there is a need for more studies to analyse the household's

tenure choice behaviour in Scotland. To study tenure choice, this thesis attempts to clarify the determinants of tenure choice and to analyse the impact of the determinants on Scottish households' tenure decision.

In the tenure choice literature, a household's tenure decision is influenced by a variety of factors. These factors can generally be grouped into several key determinants such as preferences, the user cost of capital, and non-price constraints (Maclennan 1997). A household's preference for owner-occupation or renting can be expressed through different household structures, socio-economic backgrounds and household formation. The user cost of capital is reflected in the relative prices of owning versus renting. Further, non-price constraints are the household's employment, mobility and the housing policy. Housing policy through housing subsidy and the taxation system has undoubtedly had significant impacts on the household's tenure decision.

Moreover, the importance of these tenure choice determinants varies between countries. For instance, the income tax advantages for owner-occupation have major influences on the household's tenure choice in the United States (see Rosen 1979, Henderson and Ioannides 1983). In the UK, due to the government's strong intervention in the housing market, the housing subsidy system and rationing in the admission to owner-occupation and to social housing have significant impacts on the household's tenure decision (see Doling 1973, King 1980, and Gallent, Baker and Wong 1998). As a result, this thesis contains an analysis of the influences of housing subsidy and rationing factors on the household's tenure choice in Scotland. In particular, these two factors may have important contributions to a growing owner-occupied sector and a strong social housing sector in Scotland.

To analyse the household's tenure decision behaviour, two simulation models with different structures are developed in this thesis. The first model contains a one-level choice structure to estimate the household's choice behaviour between three alternative tenures. The second model contains a two-level choice structure to estimate the household's tenure choice behaviour given its decision to move. These two models would provide a robust analysis of Scottish households' tenure choice behaviour from different aspects.

Furthermore, to estimate these two simulation models, appropriate discrete choice models are employed in this thesis. Among the discrete choice models, the multinomial logit model and the nested multinomial logit model have been widely applied to the tenure choice study, and these two models are employed in this thesis. The multinomial logit model contains a simple functional form to estimate the influence of the determinants on the household's tenure choice behaviour. The nested multinomial logit model contains a hierarchical functional form and is used to estimate the household's mobility decision and tenure choice. The empirical data set comes from the 1996 Scottish House Condition Survey. This data set is a cross-sectional survey data set with a large sample size. The data set is rich in information about household socio-economic characteristics and dwelling conditions, which are suitable for the tenure choice study.

It is expected that the results of the two tenure choice models would provide a better understanding of Scottish households' tenure decision behaviour. The results would indicate that some key determinants such as household income, the user cost of housing and some household demographic characteristics would have substantial influences on tenure choice. Two determinants — housing subsidy and rationing variables emphasised by this thesis — are expected to have important impacts on households' tenure choice. This indicates that the household's tenure decision is not only affected by household attributes but also affected by housing attributes and housing policy. Moreover, the thesis attempts to interpret the model results from the housing policy perspective. Some policy issues are derived from the model results. The first issue relates to some simulation work regarding the influences of changes in some policy or schemes on the household's tenure choice. Two other issues expect to discuss the outcome of tenure choice and income distribution, and the distribution of housing subsidies between different tenures and income levels. Finally the analysis of these issues is expected to have some implications for current housing policy.

1.2 Research Questions

The main objectives of this thesis are not to develop the model but rather to clarify the determinants of tenure choice and to estimate the influences of these determinants on

tenure choice, then to explore policy issues and implications. Based on these objectives, three research questions are developed as follows:

1. What is the nature of tenure choice and its determinants in Scotland?

   A review of literature intends to clarify the nature of tenure choice and the determinants of tenure choice. The literature review includes a discussion of the definition of housing tenure choice from different perspectives; a discussion of theoretical and empirical studies of the tenure choice model; a review of Scottish housing tenure structure and housing market conditions (such as long-term tenure patterns, house prices, housing transactions, rationing in the housing market); and housing subsidy to assist with housing cost.

2. To what extent do these determinants influence the household's tenure decision in Scotland?

   Two simulation models are developed to estimate the influence of the determinants on the household's tenure choice. The first model simply estimates the impact of the determinants on the household's tenure decision between three alternative tenures. The second model estimates the impact of the determinants on the household's mobility decision and tenure choice. The data set used in the thesis is the 1996 Scottish House Condition Survey, which consists of a household survey and a physical inspection of the dwellings covering the whole Scottish areas.

3. What policy issues emerge from the model results and what are the implications for current housing policy in Scotland?

   Three policy issues are derived from the results of the tenure choice models. The first issue concerns some simulations in terms of the influences of changes in the income tax rate and the mortgage rationing criteria on the household's tenure choice. The second issue concerns the outcomes of the household's tenure choice and income distribution. The third issue relates to an analysis of the distributional effect of housing subsidies on households in different tenures and income levels. These issues have implications for current housing policy in terms of the policy of sustainable homeownership and the reform for housing subsidy and social welfare policy.

1.3 The Structure of the Thesis

The structure of the thesis is designed to achieve the goal of the thesis and to answer the research questions stated above. Chapter Two is a literature review of theoretical and empirical studies of tenure choice. This chapter begins with a discussion of the nature of housing tenure choice from both sociological and economical perspectives; it then defines the scope of this thesis's tenure choice study focusing on economic approaches. From an economic viewpoint, the theory of tenure choice is derived from consumer choice and housing demand theories. The theory of consumer choice applying to housing commodity and the consumer's housing decision in housing demand study are discussed in this chapter. In general, the decision of demand for housing services and tenure choice can be seen as a joint choice. On the other hand, the choice of housing tenure is one of the important decisions in the housing decision package. This chapter emphasises the importance of tenure choice in the housing decision process. A variety of tenure choice studies is discussed, which includes a review of the cross-sectional and the longitudinal analysis of tenure choice models, and a review of tenure choice and some specific determinants such as residential mobility, mortgage rationing, social housing rationing and housing subsidy. Through a review of these tenure choice studies we can identify the determinants of tenure choice chosen for this thesis.

Chapter Three is an analysis of the housing tenure structure and housing market conditions in Scotland. Through a review of the long-term tenure pattern and housing market conditions we can identify the unique characteristics of housing tenure and the housing market in Scotland, thus helping us to identify the determinants of tenure choice suitable for the Scottish housing market. This chapter begins with a discussion of Scotland's long-term housing tenure pattern. To a certain extent, tenure pattern reflects the household's tenure decision behaviour in the Scottish housing market. Housing tenure pattern is also influenced by housing market conditions and housing policy. In the housing market, the changes in the number of new house building, house prices and the number of housing transactions are discussed in this chapter. In addition, the rationing factor and housing subsidy also contributed to the changes in tenure pattern as well as the household's tenure decision behaviour. An analysis of

the mortgage constraint in the owner-occupied sector and the administrative constraint in the social rented sector can lead us to understand the importance of these rationing factors on the household's tenure decision. A review of the changes in housing subsidies to households across tenures can help to analyse the effect of housing subsidies in reducing households' housing costs. Housing subsidies addressed in this chapter are the government's expenditures on housing subsidy programmes to households and housing suppliers.

The methodology of this thesis is to model the household's tenure choice. In Chapter Four, two simulation models with different structures are developed to estimate the household's tenure choice behaviour from different aspects. The first model sets out to estimate the household's choice for three alternative tenures: owner-occupation, social renting and private renting. Based on this framework, a multinomial logit model is chosen to estimate the first tenure choice model. The maximum likelihood estimation method is employed to estimate the coefficients of the explanatory variables. The second model estimates the household's mobility decision and tenure choice. This model assumes that the household's mobility decision and tenure choice are interdependent. Using a hierarchical choice assumption, this model assumes that a household will first decide to move or stay, then to choose a tenure alternative. Based on this framework, a nested multinomial logit model is employed to estimate the two-stage decision of mobility and tenure choice. The full information maximum likelihood estimation method is used to estimate the coefficients of the explanatory variables. The functional forms of the multinomial logit model and the nested multinomial logit model are discussed in this chapter.

Chapters Five and Six relate to the empirical study of the household's tenure choice in Scotland. Chapter Five introduces the data set – the 1996 Scottish House Condition Survey (SHCS) – and the variables used in the two tenure choice models. The 1996 SHCS is a cross-sectional household survey containing a large sample size and rich information about household socio-economic characteristics and dwelling conditions, which are useful for modelling the household's tenure choice behaviour in Scotland. The detailed information and characteristics of this survey are discussed in this chapter. The variables of the two tenure choice models are chosen on the basis of the discussion in Chapter Two and Chapter Three. The determinants of the two tenure

choice models not only include the household attributes but also include housing attributes. The household attributes consist of household demographic and socio-economic variables such as the household head's age, gender, marital and employment status, the number of dependent children in the household, household head's previous tenure status, likelihood to move, household long-term income and the user cost of housing. The housing attributes generally include the dwelling type, location and neighbourhood quality. In addition, housing subsidy and rationing variables are also included in the two tenure choice models. Housing subsidy reduces the housing user cost, therefore the housing subsidy effect can be derived by examining the coefficients of the user cost and the net user cost (after subsidy). The rationing variables are constructed to examine whether the household is possibly constrained from mortgages or from entering the social housing sector.

In the model of mobility and tenure choice, the mobility decision and tenure choice are assumed to be interdependent. In this sense, some variables would influence both mobility decision and tenure choice. As a result, the research includes the household head's age, gender, marital and employment status, the number of dependent children, household long-term income and neighbourhood quality variables into the mobility decision level. Inevitably, the 1996 SHCS does not contain all the variables used in the two tenure choice models. Therefore, some variables are imputed in this chapter. These imputed variables include household long-term income, the user cost of housing, housing subsidy and rationing variables. The use of household long-term income is assumed that the household's tenure decision is made on the basis of long term, multiple periods rather than a current and single period. In this sense, the use of long-term income would be better than current income. The user cost of housing presents the relative cost of owning, social renting and private renting. Housing subsidy is measured in economic terms. The rationing variables are the simulation of households who could potentially be constrained by mortgage rationing and social housing rationing. The interpretation of variable selection and the expected sign of these variables are also discussed in detail in Chapter Five. Moreover, this chapter also discusses the properties of the data and variables applied to the two tenure choice models including the selection of the explanatory variables and the correlation analysis of these explanatory variables.

Chapter Six analyses the estimation results of the two tenure choice models. The parameter estimates and the sign of explanatory variables are fully interpreted to show their influences on tenure choice. To examine the impacts of the rationing and housing subsidy factors, a simulation is carried out in the two tenure choice models. Each of the two tenure choice models involves three separate simulations (called Model One, Model Two and Model Three). Model One examines all the explanatory variables without housing subsidy and rationing variables. Model Two examines the housing subsidy effect by replacing the user cost variable to the net user cost variable in the model. Model Three examines the rationing effect by adding mortgage rationing and social housing rationing variables into the model. From the model results, some variables such as household long-term income, housing user cost, housing subsidy and rationing variables have expected determining influences on the household's tenure choice in Scotland.

Chapter Seven explores policy issues and implications drawn from the results of the two tenure choice models. This chapter first discusses two simulations of the tenure choice models. The first simulation examines the influence of a change in the income tax rate on the user cost of owner-occupiers and on tenure choice. The second simulation analyses the influence of a reduction in the mortgage rationing ratios on tenure choice. The second issue relates to an analysis of income inequality and tenure polarisation. The third issue concerns the distribution of housing subsidies between tenures and income levels. The distributional context of tenure, income and housing subsidy is not fully addressed in the two tenure choice models. However, these topics have been important policy issues in the last two decades. The purpose of the analysis of these two issues is twofold. It is not only to address the problem raised from tenure and income distributions but also to draw attention to the switch of housing subsidies between tenures in the 1990s (say 1996), compared to the 1980s. The three issues are expected to have some implications for current housing policy with regard to supporting sustainable homeownership, flexible tenure, housing subsidy and welfare reform, and the reform for the social housing allocation system.

The last chapter of the thesis contains the conclusions. I summarise the results of each chapter to answer the three main questions stated in the first chapter. Then the

contributions of this thesis and some suggestions for future research are also addressed in the concluding chapter.

CHAPTER TWO THEORETICAL ANALYSIS OF HOUSING TENURE CHOICE

This chapter discusses the theory of housing tenure choice and reviews previous tenure choice studies. Through a review of theoretical and empirical studies of housing tenure choice, this thesis summarises the framework of tenure choice analysis used in this thesis. This chapter is organised into four sections. The first section discusses the definition of housing tenure choice. The second section discusses the theory of housing demand and consumer choice, and analyses the relationship of housing demand and tenure choice. The third section reviews previous studies of tenure choice and its determinants, and the last section is a summary and derives the tenure choice analytical framework.

2.1 The Definition of Housing Tenure

Housing tenure has been widely discussed in housing research in the last three decades. There is also a variety of explanations of housing tenure. Barlow and Duncan (1988) suggest that the term 'housing tenure' has a statistical and a conceptual interpretation in housing research. Statistically, housing tenure can be seen as a taxonomic collective like owner-occupation or social rented housing corresponding with other categories such as housing quality or social status. Conceptually, housing tenure identifies abstract categories such as housing classes or consumption cleavages with specific tenures. Barlow and Duncan also argue that "'tenure' has become more widely used as a taxonomic 'shorthand' to describe broad categories which very often do not have substantive, binding attributes" (p. 229). This means that the use of a single and uniform explanation of housing tenure cannot cover its diverse activities linking with social, economic and political dimensions, thus leading to a severe loss of information and of analytical sensitivity. As a result, the authors suggest that many different explanations should be used to describe housing tenure depending upon the nature of the problem under investigation.

In general, all housing professionals define housing tenure for particular purposes. For instance, statisticians and economists use tenure in describing housing classes

associated with different techniques. Sociologists see housing tenure as a general social category related to the household's social-economic status and political relations. This gives housing tenure various meanings depending upon the purpose of the research. From a broader view, housing tenure is taken to refer to a whole range of financial, social, political and economic relations surrounding housing. As a result, the choice of housing tenure is not just a simple choice. It is a choice of a complex package, and the choice expresses the household's ability, preferences and expectations. In this thesis, the definition of housing choice focuses on economic interpretation.

In neo-classical economic theory, housing tenure choice is treated as a special example of consumer choice. As Fallis (1985) indicated, housing tenure choice differs from conventional consumer choice in several aspects. The choice of tenure is discrete rather continuous, that is, whether to own or to rent; the durability of housing has to be considered in the household's tenure decision; the intertemporal nature of choice allows for developing a multi-period model.

According to Fallis' interpretation, the discrete choice of housing tenure can be analysed by modelling the household's behaviour as solving multiple maximisation problems rather than just one. For example, the household maximises utility as a renter, choosing the quantity of housing services and other goods to consume, facing the rental price of housing and other prices. Then the household maximises utility as an owner, choosing the amount of housing services and other goods to consume, facing the user cost of housing and other prices. The household ultimately chooses the tenure (and consumption bundle) that yields the maximum utility subject to the budget constraint.

Moreover, the model of tenure choice would be extended to multiple periods because the transaction costs of owner-occupation are relatively high, compared to other tenures and also because a household will consider the value of the housing stock in future periods when making a tenure and consumption choice (Fallis 1985). Therefore, households are likely to maximise not a one-period utility function but a several-period utility function. In other words, today's consumption choices are the outcome of intertemporal utility maximisation; that is, households in each time period

formulate consumption plans to maximise lifetime utility subject to a lifetime budget constraint. The budget constraint is established not only by current prices and incomes but also by expected future prices and incomes.

The intertemporal nature of tenure choice can also be introduced in the life-cycle analysis. In the life-cycle model, households in each period pay either the user cost of housing if they decide to own or the rental price of housing if they choose to rent. The household evaluates all possible tenure and consumption patterns and then chooses the package of consumption and tenure that yields the maximum utility over the life cycle. However, in equilibrium, the rental price and user cost are equal, implying that tenure choice is not significant. As Fallis stated, tenure choice becomes important either in disequilibrium or when the assumptions of no taxes, a perfect capital market and no transaction costs are removed. In other words, in the existence of income and property taxes, mortgage rationing and transaction costs in the housing market, the household's price for renting or owning would be affected by these conditions thus it shows different utility of renting and owning for the household.

Another important element of tenure choice analysis considers the investment issue. For a householder, owning a house is to place some of his/her savings in the housing asset as opposed to other assets, such as government bonds and stocks. These different investments have different characteristics. For example, they are different in rate of returns, in risks and in liquidity. In this sense, ownership of housing can be seen as part of a portfolio decision which allocates saving amongst different possible investments. However, it is noted that homeownership is a joint consumption and investment decision, which means that housing stock appears both in the budget constraint and in the utility function of the household (Fallis 1985).

In addition to the currently dominant economic theory of tenure choice, some economists believe that uncertainty and expectation play an important role in the housing and tenure choice process. According to Marsh and Gibb (1997), uncertainty and expectation in the housing and tenure choice process are important for several reasons. The authors suggest:

> In the owner occupied sector housing decisions relate to what is, for most households, their single largest long term investment and item

> of revenue expenditure. Also, decisions regarding tenure choice or residential mobility require assessments of the future path of events over extended time horizons (Marsh and Gibb 1997, p. 2)

Although the neo-classical aspect of consumer choice theory is the dominant economic theory of tenure choice, the theory of uncertainty and expectation can provide an alternative view to understand housing tenure choice study. As Marsh and Gibb suggested, the alternative view must recognise the meaning of genuine uncertainty in the housing decision process in that:

> Individuals are more likely to adopt behaviour that is rational in a procedural, rather than maximising, sense (e.g. Lavoie, 1992) and to employ more or less sophisticated behavioural rules which allow them to cope with uncertainty and reach a decision (1997, p. 33)

In summary, housing tenure choice has a variety of explanations depending upon who is using it and the purpose of the research. In a sociological aspect, housing tenure choice can be seen as a choice of social relations and housing classes. In an economic aspect, housing tenure choice emphasises the measurement of the household's preference and economic ability between tenures. As the aim of the thesis is to model the household's tenure choice behaviour, the definition of housing tenure choice addresses the economic interpretation. The following section will discuss the economic theory of tenure choice, focusing on consumer choice and housing demand.

2.2 Consumer Choice and Housing Demand

As discussed in the last section, tenure choice is a kind of consumer choice. In the housing commodity, the choice of tenure can be seen as one of housing consumption decisions. Thus, in the discussion of tenure choice theory, this section focuses upon the theories of consumer choice and housing demand. There are three parts in this section. The first part reviews the theory of consumer choice applying to the housing commodity; the second part discusses the household's housing decisions in the housing demand study, and the third part analyses the relationship between housing demand and tenure choice.

2.2.1 Applying Consumer Choice Theory to Housing Commodity

In applying consumer choice theory to housing demand analysis, previous neo-classical economists have assumed that there is a competitive housing market and, in the housing market, the household has a rational and complete preference ordering defined over the array of existing commodities (see Muth 1960 and Olsen 1969). The quantity of the household's demand for housing under the competitive theory can then be expressed by maximising utility subject to the budget constraint equating household income with expenditure over the relevant time period (Maclennan 1982). In this case, housing is a function of income, the price of housing and the price of all other commodities.

There are, however, several problems in applying the standard consumer choice model to housing due to the characteristics of housing commodity and the housing market. Firstly, the durability of housing characteristics implies that housing is both a consumption and investment good, and it is usually purchased with loan finance. In this sense, loan institutions may place rationing on borrowers according to their income and expenditures. Further, as the income measure in the housing demand analysis is likely to refer to permanent income rather than current income, it often has an operational problem when measuring the household's permanent income (see Struyk and Marshall 1976, Maclennan 1982).

Secondly, housing is a complex, multi-dimensional commodity. This implies housing "as a composite demand for a flow of services embodying a variable mix of characteristics rather than for identifiable units of a commodity" (Maclennan 1982, p. 41). The neo-classical consumer choice model can be modified to allow for this problem by identifying the implicit prices of housing attributes. It is possible to derive demand functions for individual attributes which will be functions of income, life-cycle characteristics and various prices, amongst which will be the implicit prices of attributes (ibid.). Since the early 1970s, it has become popular to attempt to estimate implicit prices by using hedonic techniques in housing demand analysis (see for example Rosen 1974, Maclennan 1977, Case 1987, Case and Quigley 1991, and Mason and Quigley 1996).

However, there are some criticisms of the hedonic price technique. Maclennan (1982) argues that hedonic price has a theoretical and empirical drawback because it constrains the income elasticity of demand for each attribute to unity. 'It is important to recognise that in this case the choice of a particular demand model has imposed strong *a priori* notions or constraints, which are *built in* and will *interact* with the data thus influencing the result yielded' (ibid., p. 46). Further, the estimates of a hedonic price regression tell us little about how and over what likely time period equilibrating processes take place (ibid.). The most critical drawback is that the selection of the content and the form of the hedonic regression always fail to consider the housing time inputs (MacDonald 1979). Another major weakness of hedonic models, given their own assumptions, is that they pay no regard to differences in the quality of housing attributes (Maclennan 1977).

The third problem for applying the standard consumer choice model to housing demand is that the economic model does not pay attention to the spatial and social situational aspects of housing. Maclennan (1982) stresses:

> Once a household has acquired the tenure rights of home-ownership or rental housing the jointly supplied neighbourhood and environmental attributes supply monetary and psychic costs and benefits which to a great extent originate externally to that household (p. 47).

Thus it is noted that the satisfaction yielded by the purchased tenure rights to homeownership or rental housing will not be independent of the jointly supplied neighbourhood and physical environment, and thus spatial preferences are important determinants of the demand for housing. Moreover, the external attributes such as the quality of the environment and socio-economic status of the neighbourhood can be directly entered into the household's utility function. However, the role played by status in the housing decision is a complex one, which is difficult to measure in the housing demand analysis.

Fourthly, there are market disequilibrium or even frictional factors in a market, and these conditions and factors are usually excluded from the consumer choice model. For example, the search costs may influence budget constraints and the search expectation may influence choices, and these factors are ignored in the model. Maclennan identifies several features of the housing market disequilibrium regarding

imperfect information, transaction costs and search costs. He indicates that individuals infrequently transact in the housing market, which means that consumers possess imperfect housing market information when entering the market. It is also costly to re-enter into the housing market because imperfect information is likely to lead the consumer to engage in a lengthy search process. Furthermore, the house purchase process requires households not only to engage in a search for a housing vacancy and for loan finance but also to engage in some form of bidding. Finally, the fixity of secondhand housing stock and its relatively slow rate of turnover and relatively sluggish new supply is likely to be in considerable disequilibrium in particular submarkets as a result of changes in demand (Maclennan 1982).

In contrast to the standard consumer choice model, which treats uncertainty in terms of probability and expectation as rational, Maclennan seeks an alternative explanation of housing and tenure choice. Maclennan thus develops a behavioural framework of housing choice, which recognises the particularities of housing market choice. The framework does not make assumptions about choice processes, nor include standard assumptions about the existence of equilibrium as a necessary feature. "The framework attempts to incorporate explicitly the linkage between individuals and housing market institutions and it introduces the concept of pre-search aspiration because it is argued to be more readily identifiable than the more conventional concepts of 'preference' and 'constraint'" (Maclennan 1982, pp. 66-67). Maclennan's framework expresses a first step towards an alternative to current choice models. His framework is, however, considerably loose and needs to be strengthened and elaborated. "It could be strengthened theoretically by drawing explicitly on a rigorous conceptualisation of decision making under uncertainty" (Marsh and Gibb 1997, p. 33).

Due to these weaknesses for applying consumer choice model to housing demand, urban housing economists have attempted to modify the standard model. Many studies emphasise the estimation of price and income elasticities of housing demand; others focus on the housing choice in the housing market. The latter is the focus of this section and will be discussed in the following section.

2.2.2 Housing Decision in the Housing Demand Study

Since the mid-1970s, there has been extensive and substantial research on the household's housing decision in the housing demand analysis (see Quigley 1976, Boehm 1982, Clark and Onaka 1985, Quigley 1985, Fischer and Aufhauser 1988, Tu 1994). These studies mainly concern the nature of the housing decision process and analyse the household's housing choice behaviour in the housing market. Quigley (1985) recognises that the consumer's consumption decision is the choice of one unit from a large of set of discrete alternatives. In making these choices, housing consumers presumably select samples from a large number of available dwellings. They then evaluate the physical characteristics of these sampled dwellings, the neighbourhoods in which they are located, and the public services provided to them (ibid.). On the basis of these evaluations and the prices at which dwellings are offered, the consumer ultimately chooses one dwelling out of the sampled alternatives.

In his study, Quigley assumes that there are three distinct features of consumer choice for a dwelling. Firstly, a consumer selects one and only one dwelling from a large population of alternatives in almost all the cases. Secondly, the bundle of services provided by each dwelling alternative is extremely heterogeneous. Thirdly, the consumer choice for a dwelling includes a selection of a price as well as of the other characteristics associated with the dwelling. Based on these features, Quigley considers the household's housing decision within three stages: the choice of dwelling, given the neighbourhood and town; the choice of neighbourhood, given the town; and the marginal choice of the services and amenities provided in a town. Quigley employs a nested logit choice model to estimate the household's housing choice behaviour in the Pittsburgh metropolitan housing market. His empirical results suggest that the previous studies' assumption of the independence of irrelevant alternatives (IIA)[1] may be inappropriate and also that housing choice may be more sensitive to variations in workplace accessibility than is indicated by the more restricted household choice model.

[1] The IIA is a consequence of the initial assumption of the discrete choice models, which delineates that the probabilities of choosing any two choice alternatives are independent and irrelevant from the probabilities of choosing any other alternatives in the choice set. The detailed analysis of the IIA assumption will be discussed in chapter four and chapter six.

Based on Quigley's concern, an analysis of housing choice should take these different relationships between dwelling units into account. Hierarchy is a way of organising these differences. Boehm (1982) states that housing choice should include tenure choice as well as choices for dwelling size, structural quality, neighbourhood conditions, and public services. Thus Boehm constructs a three-level hierarchical probability model of housing choice. In Boehm's model, the probability of the household's tenure decision is estimated at the first level of a choice hierarchy. Then the household's choices over dwelling size and dwelling quality are estimated at the second and the third levels, respectively. These conditional choices are combined to produce eight joint probabilities of housing choice.

One of the most significant contributions of Boehm's study is the development of the hierarchical housing choice model, which provides better estimation results than the conventional housing choice model with regard to the effects of income, relative prices of owning or renting and other socio-economic variables on the household's housing choice. However, Boehm's hierarchical choice model which classified into eight probabilities would be too simple in his assumptions of defining dwelling size and quality. This model should be expanded in order to include additional hierarchy levels and perhaps incorporate other consumer decisions related to housing choice. Of course, the ability to expand this hierarchy level would depend upon the availability of a sufficient number of observations and data sources.

A further study by Börsch-Supan and Pitkin (1988) explores several specifications of discrete choice models in estimating housing consumption decisions. Unlike previous studies, the authors include household formation into housing decisions. In their study, housing decisions are defined as the choice between headship and shared housing, tenure choice, and the selection of dwelling size. As a result, housing choice is classified into nine groups including three types of homeownership, five types of rented housing and a non-head household group. In order to estimate the optimal housing consumption decision pattern, the authors simulate several forms of decision tree. A variety of multinomial and nested multinomial logit models were also proposed to estimate these housing decision trees. Their empirical results suggest that the hierarchical choice models provide better goodness-of-fit in estimating housing decisions. The results also show that the multinomial logit model strongly

overestimates some of the actual price responses and underestimates others, while the nested multinomial logit models may present reasonable results. With respect to the determinants of housing choice, the results show that current income and relative out-of-pocket costs have strong influences on housing choice.

Börsch-Supan and Pitkin's study provides a new insight into housing choice in which they put a form of housing demand, the household formation, into the housing decision process. Their results also demonstrate the importance of household headship in the selection of the optimal housing decision structure. Börsch-Supan and Pitkin's study suggests that a hierarchical housing choice structure provides better estimation results of the household's housing choice behaviour. However, the hierarchical structure of the housing decision process implies strong assumptions in the ordership of housing decision tree and thus it only represents an analytical device. Moreover, the use of current income as an explanatory variable in their housing choice models is questionable. Studies have indicated that long-term or life-cycle income would be more adequate than current income in estimating housing choice since the decision of housing demand is based on a life-cycle decision (see Maclennan 1982 and Fallis 1985).

In addition to the study of the nature and the process of housing choice, some studies have paid attention to the cause-effect of the household's housing choice, for example, the relationship between residential mobility and housing choice. Clark and Onaka (1985) suggest that the type and quantity of housing unit available for occupancy surely influences housing dissatisfaction as well as the cost of searching for a new home. As a result, the decision to move and to make a choice of a specific dwelling are closely interrelated. As Clark and Onaka indicate, the traditional model of intraurban residential mobility, however, did not fully account for the impact of housing choice on the mobility decision. Therefore they propose an alternative model of residential mobility which considers the joint nature of the decisions concerning mobility and housing choice.

In their study, Clark and Onaka employ a nested multinomial logit (NMNL) model to estimate the joint choice of moving and housing choice. In the three-level choice model, the choice of the dwelling type is followed by the choice of neighbourhood

and finally by the choice of moving or staying. The hierarchical choice model is estimated for three household categories stratified by the age of the household head and household size, and for nine neighbourhoods with different locations. Their model results show that space has a significant impact on the household's choice for dwelling type. Length of stay plays an important role in the household's mobility decision but it is least effective in small young households. However, a major weakness is that the model has less confident estimation results on neighbourhood choice. There is a need to make greater efforts in identifying the spatial structure of neighbourhoods and the factors which influence the household's choice among neighbourhoods.

The above studies have attempted to estimate the household's housing choice under the assumption of a relatively competitive housing market. Some studies, however, have analysed the housing choice in a regulated housing market (see for example Fischer and Aufhauser 1988, and Timmermans et al. 1996). Fischer and Aufhauser (1988) indicate that in many Western European countries, housing markets are highly regulated by the government. Thus characteristics of the housing market in these countries are organised by a relatively competitive part of the market and a part that is subject to varying degrees and forms of government regulation. The authors, therefore, integrate several important elements of the institutionalised and regulated nature of the housing market, and analyse the relationship between household type and housing choice in Vienna where the housing market was a "prototype of a highly regulated and institutionalised market" (ibid., p. 48). The authors assume that the institutionalised nature of the housing market could be expressed in three ways. Firstly, dwelling units are categorised on the basis of institutional settings, such as public housing, private regulated rental housing, and owner-occupied housing, etc. Secondly, there are institutional, informational and income-based constraints in the access to specific tenure and dwelling type of housing units. Thirdly, government subsidies, such as housing and rent allowance and non-interest-bearing state loans, are explicitly taken into account in the choice set.

Fischer and Aufhauser also employ a nested logit model to estimate the three-stage housing choice: the choice of a dwelling unit given dwelling type and residential zone, the choice of a dwelling type given a residential zone; and the marginal choice of a

residential zone. Their empirical results suggest that demographic variables accounted for in the definition of the household types appear to have significant impacts on housing choice behaviour. Residual income, used as a single explanatory variable as well as its interaction with dwelling size and dwelling quality, has an important influence on the household's choice for dwelling unit. Housing costs interacting with incomes appear to have a strong influence on the choice among dwelling types.

Noted again in Fischer and Aufhauser's study, the use of nested multinomial logit model appears to contain strong assumptions of the hierarchical structure. The authors are also aware of this weakness. Therefore, they suggest that 'this hierarchy only represents an analytical device that reflects the relative degree of similarity among choice alternatives and does not imply that a household choosing a dwelling unit necessarily follows a path down the tree' (Fischer and Aufhauser 1988, p. 49). This statement can also be applied to all hierarchical choice models.

Timmermans et al. (1996) also recognise the important influence of the institutional structure of the housing market on the household's housing choice. They indicate that in The Netherlands, as well as in most Western European countries, housing markets are highly regulated by the government. As a result, households, when searching a new home, will face not only budget and socio-economic constraints but also the institutional constraints set by the government. Unlike Fischer and Aufhauser, the target household in Temmermans et al study is the divorcees who represent one of the vulnerable groups in the housing market that face substantial constraints. The authors experiment with the universal logit model to estimate the effects of those constraints on households' (divorcees') housing choice behaviour and residential preferences. A total of 16 choices are selected in the study; each choice set varies in size and composition and represents different constraints on behaviour, in terms of the access to eight housing market segments. Their results suggest that dwelling type and neighbourhood have the most significant influences on the divorcee's housing decision. The number of rooms and the social environment also have important impacts, while distance attributes are of lesser importance. The results also indicate that the importance of these attributes to divorcees is not different from those to other groups in the past.

One of the contributions of Timmermans et al. study concerns the model methodology. The universal logit model employed in their study is distinguished from the standard multinomial logit model in that the former is qualified from the assumption of independence from irrelevant alternatives (IIA). However, the parameter estimates in the universal logit model are more difficult to interpret than in the multinomial logit model. Another contribution of Timmermans et al study is the emphasis of housing market segments (housing submarkets) in the housing choice process rather than the importance of price and non-priced constraints, which the authors intended to address in the study.

In fact, the importance of the housing submarket in the housing choice process has been emphasised by many studies. Maclennan et al. (1987) emphasise the importance of housing submarkets for the research of present urban housing models. They suggest that "(housing) submarkets are deemed to exist when systematic differences exist in housing attribute prices over areas or sectors and where variations show some persistence" (p. 37). As a result, the household's housing choice behaviour in the housing market is critically influenced by characteristics of the housing commodity, which are the essential issue of the housing submarket and the trading system used to exchange housing assets.

Based on the concept of the housing submarket, Tu (1994) estimates the household's housing choice behaviour under several housing submarkets divided by neighbourhood and dwelling types. She indicates that urban housing submarket structure is suitable for analysing disaggregate housing choice behaviour. In her study, Tu also compares several discrete choice models in estimating the housing choice behaviour in housing submarkets. Her results suggest that no discrete choice model in her study is superior to another one. The multinomial logit (MNL) model violates the IIA assumption, while the nested multinomial (NMNL) model does not. However, the MNL model provides better predictions of housing choice behaviour than the NMNL model does.

A further study by Tu and Goldfinch (1996) develops a new two-stage housing choice forecasting model based on Tu's (1994) housing submarket structure. The authors

argue that previous models treat housing choice as a joint decision of all components associated with a dwelling. These components create a huge bundle of dwelling alternatives. If each dwelling were treated as an alternative, it would cause a serious calculation problem and bias. To avoid this problem, the Tu and Goldfinch's model separates the joint choice behaviour into two stages. The first stage is the choice of the key dwelling components, which construct housing submarkets; the second stage is the choice of non-key dwelling components, which distinguish individual dwellings in each housing submarket. The authors divide households into three different age groups to estimate their housing choice behaviour. Their results show that different age groups of households have significantly different housing preferences in terms of housing prices, dwelling components and neighbourhood quality, which are of interest in the study of housing demand forecasting as well as in the analysis of housing investment and housing subsidy policy.

In a review of the above studies of housing choice behaviour a clear picture can be drawn where a household's housing decision can be seen as a bundle of choices, including the decisions of tenure, dwelling type, neighbourhood quality and location. Hierarchy is a way to model housing choice behaviour. In a hierarchical choice model, a household, for instance, may first choose tenure then choose dwelling type and so on before choosing neighbourhood and location. However, it is noted that the hierarchical framework of housing choice is just an analytical device that reflects the relative degree of similarity among choice alternatives. Therefore, it does not imply that a household should necessarily follow this kind of decision tree while making a housing decision.

Furthermore, in Britain and in most Western European countries, the housing market is highly regulated by the government. Thus the housing market in these countries is characterised as partly a relative competitive market and partly a market subject to non-priced, administrative constraints. Therefore, there are access constraints for households from entering certain types of housing segments. Due to imperfect information in the housing market, households need to spend time and money in searching for a home, thus the search costs should not be ignored in the housing decision process. The housing market can also be separated into several submarkets because of imperfect information and the demand/supply constraints in the market.

As a result, a household's housing decision can be estimated under different submarket conditions, which are based on tenure, dwelling and neighbourhood components.

2.2.3 Housing Demand and Tenure Choice

In the housing demand analysis, the choice of tenure is a kind of decision of demand for housing services. This subsection discusses the relationship between tenure choice and other decisions for housing consumption. In earlier literature, the analysis of tenure choice and housing demand is separated, which means that housing demand is analysed separately with different demand specifications for renters and owners (see de Leeuw 1971, Straszheim 1973, and Polinsky 1977). Later research (for example Lee and Trost 1978, and Rosen 1979) recognised that the discrete choice for tenure and the continuous decision for housing demand are interdependent, by specifying the error terms of the discrete and continuous decision models to be correlated because the same elements of behaviour are in both models.

Although studies by Lee-Trost and Rosen have indicated that the interdependent nature of the tenure choice and housing demand decision, they only partially deal with this interdependence. Neither they nor earlier literature deal econometrically with the capital market imperfections that influence tenure choice. A study by King (1980) recognises that the household's choice of tenure and its demand for housing services can be seen as a joint decision determined by a common preference ordering. In his study, King assumes that tenure choice and housing demand are based on maximisation of the same utility function, hence that both the discrete and the continuous decision models can involve some of the same parameters, depending upon the precise assumptions. In this sense, joint estimation involves imposing cross-equation constraints on the parameters of the tenure choice and housing demand equations, as well as recognising that the error terms are correlated.

One of the contributions of King's study is to identify the importance of rationing in the British housing market. Therefore his model allows for estimating the impact of non-priced rationing on the access to the local authority rented market. King also suggests that, because of the government's high level of intervention in the housing market, there is subsidised social housing accounting for at least one third of total

dwellings in the housing market, along with the owner-occupied sector and the unsubsidised private rented sector. Thus the choice of tenure in Britain is not a simple binary choice of owning and renting. Instead, King proposes three types of choice in 1980: (1) owner-occupation, (2) subsidised renting, consisting of local authority renting and unfurnished (regulated) private renting, and (3) unsubsidised private furnished renting. By using a cross-sectional data set from the Family Expenditure Survey, King estimates the price elasticity of housing demand for three alternative tenures, which is ranged between –0.5 and –0.65. In estimating tenure choice, his results show that the variables such as age, sex, and race of the household head which represent constraints in the capital market, have important influences on household's tenure decisions.

Following King's research, Henderson and Ioannides (1983, 1986) completed similar studies in the US. They assume tenure choice and the housing consumption decision as a joint decision by using the same behavioural model in analysing these discrete and continuous elements of housing market behaviour. Their models allow for an analysis of the role of capital imperfections and discriminatory practices in constraining housing consumption decisions. They also consider rationing and incomplete specification of ownership prices as important aspects of the housing market. In examining recent movers in 36 Standard Metropolitan Statistical Areas (SMSAs), Henderson and Ioannides (1986) find that current income, age, education, and marital status have important influences on households' tenure and housing consumption decisions. Their results suggest that people with lower education, age and current income face an increased probability of being denied a mortgage, as do those who are single, while race does seem to have an impact but not as significant.

Both King's and Henderson-Ioannides' studies provide a new insight into the relationship between tenure choice and housing demand decisions. King highlights the impact of non-price rationing on the household's choice for public rented housing. Henderson and Ioannides emphasise the effect of income tax advantages on the household's home ownership decision. However, Henderson and Ioannides' studies were carried out in the US where the housing market conditions, tax structure and subsidy policy are significantly different from the UK. King's study is also out of date. In the UK, the housing tenure pattern has been dramatically changed over the

last two decades due to the change in housing policy. Government regulations on the private rented sector have been relaxed; subsidies to social housing have been significantly reduced, and there has been a rapidly growing owner-occupied sector in the housing market. Another weakness of King's study is the rationing assumption in access to three tenures. King assumes that a household chooses unconstrained private renting because it is rationed in the access to both owner-occupation and public housing. However, in the real world, many households, for instance young and single households, choose private renting for various reasons but not only because they are constrained from entering owner-occupation or social housing.

Moreover, in the analysis of housing demand and tenure choice, some researchers have been interested in examining the income and price effects on the household's demand for housing and tenure choice. For example, Kent (1983) examines the relationship between income and price elasticities and their effects on housing demand, tenure choice, and household formation. In his study, Kent delineates three distinct decisions pertaining to the demand for housing: a decision of household formation, a decision of tenure and a decision of how much housing to consume, given the household formation and tenure decisions. Kent theoretically demonstrates that income and price elasticities can be estimated to include one, two, or all three of these decisions. Kent's study, however, is limited on theoretical analysis. As he indicated, the empirical results of some of the income and price elasticities in his study may not be available.

In contrast to Kent's study, Gillingham and Hagemann (1983) evaluate the empirical importance of the simultaneity between tenure choice and consumption level decisions based on the Lee-Trost (1978) model. In their model, Gillingham and Hagemann estimate overall income and price elasticities of housing demand, which incorporate the impacts of income and price on both tenure choice and consumption decisions. By examining the household data drawn from the 1972-73 Consumer Expenditure Survey in the US, they find that the structures of both tenure choice and housing demand vary substantially across household types and are, in general, non-linear functions of income and price. Although there is no evidence that the tenure choice is significantly affected by variations across cities in expected house price appreciation, these variations have statistically significant impacts on the quantity of housing services the

household consumed. The overall income and price elasticities vary substantially across household types in both overall level and the level of the tenure choice and conditional demand components.

A similar study by Goodman (1988) estimates the joint decision of tenure choice and housing based on the Lee-Trost and the Rosen model structure. A major advance of Goodman's study is that he separates the consumption and the investment motives in tenure choice. Goodman's model emphasises the investment and consumption demands and adopts house value to rental ratio to measure investment demand. The hedonic price method is adopted to define price indices for owners and renters and to define value-rent ratios for the investment components of the housing purchase. Tenure choice is estimated as a function of the relative prices of owning or renting, value-rent ratios, permanent and transitory incomes, and socio-demographic variables. Housing demand is estimated for both owners and renters.

Goodman's study provides a clear picture of the determinants and their impacts on tenure choice and the decision of housing demand. His empirical results show that income and price are significant impacts on tenure choice. Controlling for tenure choice, the effects of permanent and current incomes are approximately the same, whereas they differ significantly on the tenure decision. Permanent income has a greater influence on the tenure choice, while current income provides more satisfactory demand estimates. Many studies have criticised this, however, arguing that using current income would lead to downward bias in estimating the income elasticity of housing demand (see for example Reid 1962, Winger 1968, de Leeuw 1971, Rosen 1979, Maclennan 1982).

Further research by Loikkanen (1992) estimates the joint choice of tenure and housing demand in Finland. Similar to some previous studies, Loikkanen uses the two-stage estimation procedure suggested by Lee-Trost and by Rosen in order to estimate tenure choice and demand for dwelling size. The first stage is probit estimation of the probability of owning or renting; the second stage is the ordinary least square estimation of the demand for dwelling size. In his study, Loikkanen also emphasises rationing in the Finnish housing market, where there is rent control in the private rented market, administrative constraints in the public rented market and credit

rationing in the owner-occupied market. As a result, prices in these sectors are not market-determined and vary across regions. Loikkanen constructs the shadow price (user cost) for different tenures based on the market level. Loikkanen also assumes that tenure choice and demand for dwelling size are affected by the rental market shortage, which is a result of rent control. He recognises that rent control has a negative impact on the supply of private rented dwellings. Thus the rental market shortage is a driving force to push households in to the owner-occupied market. In order to estimate the impact of regional rented market disequilibrium on tenure choice and housing demand, Loikkanen constructs regional queue variables. His results show that the regional queue variables have significant influences on tenure choice and owners' demand for dwelling size. In addition to queue variables, his results also show that the user cost has an important and significant impact on tenure choice.

Loikkanen's study highlights the importance of rationing, shortage of supply in the private rented sector, and the user cost in estimating tenure choice and housing demand. However, the rental market disequilibrium does not show significant influences on the renter's demand for dwelling size. Neither does it show that the regional user cost has a significant impact on housing demand. As the author suggests, these problems can be improved by using more detailed regional data. In this case, it also implies a weakness of measuring endogenous rationing factors, especially when estimating housing demand.

In summary, the above studies have indicated that tenure choice and housing demand decisions are interdependent. This relationship can also link to housing choice, where tenure choice is included in the housing decision package, and where tenure choice and other housing decisions such as dwelling type, location, and neighbourhood are interdependent. In the study of tenure choice and housing demand, many previous studies have addressed income and price effects, and these studies estimated a variety of income and price elasticities for housing demand. In fact, the income and price elasticities vary by the empirical data and across countries. In Britain, income and price elasticities for housing demand are slightly lower than those in the US and this is probably because the housing market in Britain is more regulated than in the US (see Meen 1994 and Ermisch, Findlay and Gibb 1996). Some studies, such as King (1980), Fischer and Aufhauser (1988), and Loikkanen (1992), have addressed the important

impact of non-price rationing on tenure choice. In a series of housing decisions, tenure choice would be more important, particularly where there is non-price, administrative rationing in housing market, and where households face a choice between the public and private housing sectors (Clapham and Kintrea 1984). As a result, many studies have emphasised the importance of tenure choice in the housing choice study. The following section is a review of tenure choice studies.

2.3 Tenure Choice and Its Determinants

This section analyses the household's tenure choice and its determinants. There are two parts in this section. The first part reviews the studies of tenure choice model; the second part analyses tenure choice and its specific determinants.

2.3.1 The Studies of Tenure Choice Model

There have been a large number of studies that have modelled households' tenure choice behaviour in the last three decades. Some studies assume that tenure choice is made solely with regard to the contemporary period, thus emphasising the influence of the determinants on tenure choice by using cross-sectional data sets. Some other studies assume that tenure choice is made on the basis of multiple periods and thus address the impact of the change in determinants on tenure choice by using longitudinal data. As a result, the analysis of tenure choice models can be classified into two categories: cross-sectional analysis and longitudinal analysis of tenure choice, based on the nature of data and the purpose of the study. They are discussed in detail below.

2.3.1.1 Cross Sectional Analysis of Tenure Choice

With regard to cross-sectional analysis of tenure choice, some studies regarding housing demand and tenure choice have been discussed in the last section. In this section, the focus is on specifying the determinants of tenure choice. In earlier studies, Struyk and Marshall (1974) and Struyk (1976) have examined the determinants of homeownership in the Pittsburgh metropolitan area in the US. They indicate that tenure choice is a single and very important of aspect of housing demand, thus the determinants of tenure choice are essentially the same set as those for the demand for housing services. In their studies, Struyk and Marshall address the income effect on

household tenure choice. They suggest that the decision of tenure and housing need is based on a long term view, as is the income prospect, and as a result permanent income is stressed in their studies.

In addition to household (permanent) income, Struyk and Marshall classify three other groups of determinants: income tax advantages, household characteristics, and the tenure choice of peer groups. The authors indicate that the reduction in federal income tax as income rises associated with the housing tax deduction is directly related to the income expended on housing. Other household characteristics include family type and size, age and sex of household heads. An additional factor of tenure choice, which has received little attention in previous studies, is the tenure choice of peer groups. Struyk and Marshall suggest that middle-age households may be more strongly influenced by the tenure choice of their peer groups than younger or older households, since middle-age households are more likely to be settled into jobs and family responsibilities.

In their tenure choice model, Struyk and Marshall examine the impact of these determinants on different household groups divided on the basis of family type and age of household head by using 1970 US Census sample data. Their results suggest that the relationship between income and the probability of choosing owner-occupation is non-linear, with the effect of increase in income generally being positive but at a decreasing rate at the upper income range. Both current income and permanent income were found to have significant influences for all but individual households. As expected, their results show that family size, age and sex of household heads are important determinants of tenure choice. Tenure choice of peer groups was found to have significant effects on middle-aged households' tenure decisions. The effect of income tax advantages was found to be significant only for younger and small-size households. As the authors indicate, the effects of tax subsidy could be largely captured by the income variables, as there is a high correlation between income and tax subsidy variables.

Struyk and Marshall's studies clearly delineate the determinants and their influences on household tenure choice. However, there are some criticisms of their studies. The first criticism is that they put both current income and permanent income into the

independent variables in the tenure choice model, and this could imply a problem of multicollinearity. The authors explain that the use of current income can adequately express the income of younger and individual households, while permanent income is used in middle-age and large-size households, and the coefficient of correlation between these two incomes in their studies is low. This could, however, imply a technical problem in the calculation of permanent income and it needs a further discussion.

The second criticism of Struyk and Marshall's studies regards the income tax subsidy rate. The authors calculate the federal income tax subsidy rate based on the ratio of housing expenditures to permanent income. This income tax subsidy rate, in fact, could have a high correlation with income variables. If the subsidy is viewed as a reduction in the relative price of housing, the tax subsidy effect would be expressed on the relative price of housing rather than household income. Many studies of tenure choice and housing demand, such as King (1980), Gillingham and Hagemann (1983), and Loikkanen (1992), have demonstrated the important influence of the relative price of housing (also called the user cost of housing) on household tenure choice. Unfortunately, Struyk and Marshall's studies ignore the user cost variables. The third criticism is of the tenure choice of peer groups. In their studies, the peer group variables are associated with the household head's education and employment level. As a result, it is more likely the case that the household head's education and employment status could have more significant effects than the peer groups on tenure choice.

Many studies of homeownership have employed a variety of analytical techniques using the Struyk and Marshall's approach. A similar study carried out by Maclennan and Wood (1981) examines the determinants of entry to homeownership in the British housing market. As discussed earlier, the housing market in the UK is more regulated than in the US. Thus a particular concern in Maclennan and Wood's study is the discontinuities in supply that exists in the British urban housing market. In this case, housing tenure is associated with particular house types, ages and locations. Because of imperfect information in the housing market, a search process is necessary for the household before buying a home. The authors also indicate the existence of market disequilibrium at the time of study and, as a result, inflation is an important

determinant of homeownership. Maclennan and Wood also assume that the household attached to the qualities of ownership is influenced by peer group pressures and family formation pressures. In their model, Maclennan and Wood analyse the basic determinants of homeownership including current household income, deposit capacity, family size, inflation, parents' tenure status, the age of the household head, and stay intentions. A variety of search variables are then added to extend their tenure choice model.

In a survey of first time homebuyers and potential buyers in the private rented sector in the Glasgow area, Maclennan and Wood classify the sampled households into several groups. In their study, private tenants are categorised into temporary rationed, permanent rationed and disinterested groups based on their preference and income. A series of aggregate and disaggregate tests were undertaken both by multiple regression and logit models to examine the impact of homeownership determinants on these different target groups. Their results show that the logit model has better goodness-of-fit than the regression model. Household income, deposit capacity, inflation and search strategies show important influences on household tenure choice. The results also show a significant difference between entrants (first time buyers) and searchers (temporary rationed tenants) in terms of the coefficient estimates of these determinants. Cheaper entrants (lower income first time homeowners) have a greater propensity to adjust price, location and source of finance they searched than other entrants and searchers.

In Maclennan and Wood's study, the aggregate estimation results of tenure choice model are insignificant. As they suggest, it still has room for improving model techniques. Furthermore, a neglect of local authority tenants' tenure choice would make this study incomplete. In particular, the local authority housing sector accounted for one third of total dwellings in the British housing market in 1981. As a result, to analyse tenure choice in the British housing market, the local authority rented sector should be included. In the local authority rented sector, tenure choice is primarily influenced by housing policy, such as the Right to Buy and the allocation system. The policy context will be discussed in Chapter Three.

Several studies have addressed local authority tenants' tenure choice in Britain. Doling (1973) develops a two-stage model to identify the determinants of tenure decision in the local authority sector. Doling assumes that tenure choice is a two-stage process. Households first evaluate their best attainable combination of a physical structure and of non-housing goods in each tenure market. They then choose the most preferable of these combinations. The two-stage tenure choice model was tested in the local authority housing market by using data from Derby on sales to sitting tenants of council houses in 1971. In the first stage of the model, Doling rations out ineligible sitting tenants by income and by non-purchasers. If monthly loan repayments exceed gross weekly income of the head of household, the household is identified as not being able to purchase its house. In the second stage, discriminant analysis is then used to generate a model producing the fewest tenure misclassifications of households. This objective is met in a model having five attitude scores, income, the cost of buying and renting and the number of adults in the household. In Doling's results, the signs of the coefficients in most cases are as expected and make economic sense. But some cases have incorrect signs for their coefficients. This is probably due to multi-collinearity between variables and cases.

A recent study by McNabb and Wass (1999) also examines the tenure decision of council tenants under the Right to Buy regime. The main issue of McNabb and Wass's study is to analyse council tenants' decision about whether or not to buy the accommodation they currently rent. Based on Rosen's (1979) model, the authors employ a univariate probit model to examine the tenure decisions of council tenants by using data selected from the 1986 General Housing Survey. The variables in their model include house price after 1980, household income, life-cycle effects on preferences for both types of housing tenure, the characteristics of the accommodation, and the quality of the match between the accommodation and the household. A particular concern in McNabb and Wass's study is the price variable, which is the relative cost of owning measured by the discount value of the property. The discount property value is calculated on the basis of the RTB formula under the 1984 Housing Act. Their results suggest that the discount price of housing has a significant effect on the household's decision to switch from renting to owning under the RTB policy. This implies that tenure transfers under the RTB are efficient, undertaken by council tenants on the margin of owner-occupation. In addition, household income, the age of

the household head, and the type and age of the accommodation are also important determinants of tenure choice in the public sector. Regional effects are limited to under-presentation of transfers to owner-occupation in Scotland and the northern counties of England.

McNabb and Wass' study provides a clear analysis of council tenants' decisions under the RTB scheme. As the authors suggested, their results would have implications to the RTB policy as well as the social housing policy. Both Doling's and McNabb-Wass' studies focus on local authority tenants. The target households of this thesis are households in all three main tenures. However, some determinants of tenure choice in their studies are still useful for this thesis.

2.3.1.2 Longitudinal Analysis of Tenure Choice

In addition to cross-sectional analysis of tenure choice, researchers have emphasised longitudinal analysis of tenure choice by using time series data sets. Many studies of longitudinal analysis of tenure choice have been performed by American researchers since there are sufficient time series data sets in the US. For example, Kent (1984) estimates a model of tenure choice using the US federal subsidy program annual data from 1955 to 1976. The aim of Kent's study is to analyse the changes in owner-occupation rate and the changes in homeownership determinants during the estimation period. Kent's model highlights two specific points. Firstly, a simple expression for the expected rate of return on equity for a homeowner is developed and thus its importance could be tested in the tenure choice equation. Secondly, the influence of federal subsidy programs is also included in the model. Other determinants of owner-occupation selected in Kent's model include permanent income, the relative price of owning or renting, assets, mortgage loan conditions and household characteristics.

Kent's results show that an increase in expected return on equity has the largest quantitative impact on owner-occupation. In fact, an increase of this variable increased the demand for owner-occupation by about 4.5 per cent from 1955 to 1976. The federal housing subsidy programmes have substantial effects on the demand for owner-occupation. The homeownership subsidy programme, in its peak effect of 1973, increased the demand for owner-occupation by 0.87 percentage points. In contrast, the rental subsidy programme reduced the demand for owner-occupancy by

1.1 percentage points from 1955 to 1976. As expected, permanent income and the housing user cost have important impacts on owner-occupation. Kent's results show that an increase of household permanent income raised the demand for owner-occupation by 3.5 percentage points, while an increase of the user cost reduced the demand for owner-occupancy by 4 percentage points from 1955 to 1976. Changes in mortgage payment constraints had little effect on the demand for owner-occupation during the estimation period. This is partly because of a loose policy in mortgage credit rationing and a stable mortgage interest rate during this period.

Kent's study simply concerns the influences of the changes in determinants on owner-occupation during the estimation period. However, in time series analysis of tenure choice, another important issue is to estimate the changes in tenure status over years. Krumm (1987) analyses tenure status change by using data from the Michigan Panel Study on Income Dynamics for the period 1976-1979. Taking a different approach from other cross-sectional studies of tenure choice, Krumm's study focuses the determinants of tenure status duration and the time of their changes. Krumm indicates that households' differences in time-invariant characteristics are systematically related to differences in the propensities to change tenure status, and thus estimated effects of these variables on tenure choice at a specific point in time are likely to be misleading. As a result, Krumm extends the choice pattern over a 4-year period. A multinomial logit model is employed to estimate the effect of determining variables on tenure changes. The determinants in Krumm's model are classified into non-varying demographic variables and time-varying variables. Non-varying variables include sex, race, and education of household heads, while time-varying variables include income, marital status of household heads, household size and spouse employment conditions. The empirical results support Krumm's assumption that changes in time-varying variables have significant impacts on tenure status changes. The results also suggest that lead and lag in household conditions have systematic and substantial effects on tenure status changes.

The determinants of tenure status changes in Krumm's study focuses on the household demographic and socio-economic characteristics. In fact, other factors such as expected mobility and length of stay would be important determinants in time series analysis of tenure choice. A study by Henderson and Ioannides (1989) estimates a

model of joint choice of tenure, length of stay, and consumption level by using the data from the Panel Study of Income Dynamics for the period of 1971-1981. In their model, Henderson and Ioannides examine a household's choices of owning or renting, and consumption levels at the time of moving into a dwelling unit. They also examine how long a household stays in the dwelling unit before moving again. The vector of dependent variables associated with a time of moving includes tenure choice, planned length of residence spell and housing consumption. The dependent variables are influenced by the expected future path of household income, the relative price of owning or renting, non-housing consumption bundles and a number of household characteristics.

Henderson and Ioannides' results suggest that in the estimation of length of stay, wealthier and more well educated households are more mobile, while the age of the household head has a quadratic effect with planned lengths of stay but is minimised at about age 55. In the estimation of housing consumption, their results show that increases in planned length of stay appear to reduce housing consumption for renters. After accounting for tenure choice and controlling for planned length of stay, renters and owners were found to have similar demand function relationships. This implies that renters and owners are not particularly differentiated by tastes but simply in life-cycle circumstances as to when it is optimal to own or rent. As the authors state, these findings are at an initial stage and would be of interest to researchers devoting further analysis to this subject.

In Britain, only a few studies have emphasised time series analysis of tenure choice because of a lack of sufficient longitudinal data sets. Recently, a series of studies by Ermisch and Di Salvo (1996) and Di Salvo and Ermisch (1997) analyse the dynamic aspect of tenure choice by using data from the British Household Panel Study (1991-1994) and data for the 1958 birth cohort from the National Child Development Study. Ermisch-Di Salvo's (1996) model estimates the determinants of tenure transition between three main tenures—owner-occupation, social renting and private renting. The authors emphasise that surprises like partnership breakup, acquisition of a partner and spells of unemployment tend to have important influences on tenure changes for younger households from the ages of 16-33.

Ermisch and Di Salvo employ multinomial logit models to estimate the influences of these variables on tenure changes during the estimation period. Their results show that a partnership breakup reduces the probability of owners remaining in their current tenure status. For social tenants, a partnership breakup has a significant effect in forcing them to return to their parents' homes. Their results also suggest that acquisition of a partner increases the probability of moving from renting into owner-occupation. In contrast, it does not affect tenure transition from owner-occupation to social renting. Unemployment has an increasing trigger effect on tenure transition from both owner-occupation and private renting to social renting. In addition, the authors indicate that the tenure transition rate is significantly influenced by household income. Households with higher income favour moving to owner-occupation and discouraging flows to social housing. Both owners and social tenants are more likely to remain in their tenure when house prices are higher.

A further study by Di Salvo and Ermisch (1997) analyses the dynamic aspect of tenure choice for younger households by using data from the 1958 birth cohort collected in the British National Child Development Study (BNCDS). They propose a risk hazard model to estimate the younger household's first entry to each of the two major tenures: owner-occupation and social renting. Their empirical results show that lifetime earnings, family background, a person's spells of unemployment, regional unemployment rate and regional relative house prices were found to have significant impacts on entry into owner-occupation or social housing. Households with better lifetime earnings are more likely to become owners and do so earlier in their lives. With respect to family background, people with fathers in non-manual jobs are more likely to become homeowners eventually, although not more quickly, than those with fathers in manual jobs. People with middle class parents were found to spend more time in private renting before entering either owner-occupation or social renting. Becoming a parent was found to have strong effect on pushing young households toward social housing. The authors also suggest that a person's spells of unemployment forces young households to be less likely to become owner-occupiers. A higher regional unemployment rate and higher regional relative house prices were found to slow down the speed of entry into either owner-occupation or social housing.

Ermisch-Di Salvo's studies show interesting findings about British younger households' tenure decision behaviour and their studies can be seen as a corner stone for British researchers devoted to the longitudinal analysis of tenure choice. In respect to a comparison of cross-sectional analysis and time series analysis of tenure choice, as Ermisch and Di Salvo's indicated, time series analysis of tenure choice would be a better approach to 'align' the tenure choice event, especially with the determinants, such as incomes, prices, demographic characteristics, which vary over time. Again, a time series analysis of tenure choice needs a sufficient longitudinal data set. However, there is a lack of sufficient longitudinal data sets in Britain, especially in Scotland, thus making this kind of study more difficult.

2.3.2 Tenure Choice and Specific Determinants

In addition to overall estimation of the determinants of tenure choice from both cross-sectional and longitudinal aspects, a variety of studies have addressed some specific relationships and determinants of tenure choice. These specific relationship and determinants are mainly categorised into residential mobility, rationing, and subsidies.

2.3.2.1 Residential Mobility and Tenure Choice

In a study of expected mobility and tenure choice, Boehm (1981) recognises that a household's mobility decision and tenure choice is seen as a joint choice. In this sense, the probability that a household makes a given tenure choice and expects to move should be estimated as a simultaneous system of equations. A multinomial logit model is employed to estimate four alternative choices: own-expected move, own-expected stay, rent-expected move and rent-expected stay.

The data in Boehm's study is selected from the panel data gathered by the University of Michigan from 1968 to 1976. A subsample is then selected for households who moved and made a tenure choice during one of following three time periods: 1969-1970, 1970-1971, and 1971-1972. The sample targets recent movers because their relative costs of owning or renting have significantly been adjusted. Boehm uses a series of house prices and lagged house price variables to represent the differential market conditions. In addition to household demographic variables, permanent income and wealth are imputed in Boehm's study to estimate the life-cycle effect on tenure choice and expected mobility. His results show that permanent income, wealth

and the house price variables have significant impacts on tenure choice and expected mobility. The age of the household head is statistically significant in determining tenure choice but it becomes insignificant in determining joint choice of tenure and expected mobility. Therefore, Boehm questions whether the household head's age, which in previous studies had been one of the most significant variables in tenure choice analysis, is acting as a proxy for the expected mobility and wealth of the household.

However, Boehm's results could be criticised because the age of the household head could be correlated to household permanent income and wealth. Another argument is the sample selection. Since Boehm's sample focuses on recent movers, these sampled households could be concentrated in certain age groups, for instance, the younger households. Because younger households have higher mobility, the age effect could be insignificant on these households.

Another study by Krumm (1984) also estimates the joint decision of migration and tenure choice. In contrast to Boehm's study, Krumm emphasises the cost-benefit of migration decisions and tenure status choice. He indicates that the structural dependence of the migration and tenure status change comes from the dependence of the relative cost of owning or renting in both periods and expected migration benefits. The relative cost of owning or renting in his definition is a function of expected migration benefits and all other factors affecting the cost. As a result, the joint decision of migration and tenure choice can be seen as a function of a series of benefits on migration and tenure status changes in both periods, and a vector of all other factors. Krumm employs a logistic model to estimate the joint choice and each of the marginal tenure status and migration probabilities by using the data from the Panel Study of Income Dynamics (PSID) 1977-78.

However, in Krumm's model, the net benefit does not show expected significant effects on migration and tenure status change. This is the weakness in his study. On the other hand, the household head's characteristics, such as age, race and employment are found to have most important influences. Other household characteristics, such as household income and spouse's education, also have significant effects. In addition, Krumm also indicates that change in household size is

the main driving force of migration. Location also has a significant effect on the migration decision and tenure choice. The most interesting finding in Krumm's study is that the decision to change tenure has substantial influences on the decision to change the household residence location. This could explain the relationship between the dwelling's tenure type and location.

Similar studies performed by Ioannides (1987) and Ioannides and Kan (1996) use the same data as Krumm did from the PSID data but different time periods. Ioannides (1987) develops a semi-Markov model to estimate the simultaneous decision of tenure and length of stay by using the PSID data for 1970-81. The basic assumption of Ioannides' study is that tenure choice and length of stay are determined by the household's socio-economic characteristics at the time the move and housing tenure choice is made. The results show that housing price and household wealth play a significant role in determining the tenure choice and residential mobility. The author indicates that higher wealth implies a higher likelihood of owning, higher mobility for renters and lower for owners. Housing price is found to have statistically significant effects but not always as anticipated. Other demographic characteristics, such as age, education, race, and marital status of household head and family size, also have important influences on tenure choice and length of stay.

A recent study by Ioannides and Kan (1996) employs a dynamic probit model to estimate households' decisions to move and whether to rent or own after moving by using the PSID data for 1970-87. Unlike Ioannides' previous study, Ioannides and Kan emphasise the impact of financial aspect of housing on tenure choice and residential mobility. The housing financial factors involved in their study are prices for owning or renting, house value and interest rate, while housing asset represents the financial aspect of the household. The authors also use a series of dummy variables to estimate the effect of liquidity constraints on tenure choice and mobility. Their results suggest that the financial aspect of housing plays an important role in determining tenure choice and residential mobility. Other variables, such as family size and liquidity constraints, and changes in those variables, are found to have significant influences on tenure choice and the decision to move.

The above studies indicate that the relationship between mobility and tenure choice is interrelated. On one hand, the decision to move and tenure choice can be seen as a joint choice. On the other hand, expected mobility can be seen as a determinant of tenure choice. For instance, it is very often the case that households who like to move within a short term are more likely to choose lower transaction costs of renting (especially private renting) rather than higher transaction costs of owning. In addition, wealth (or permanent income), housing prices, and household life-cycle characteristics (for instance, age, race, education, marital and employment status) have significant influences on tenure choice and residential mobility. Changes in these variables are the main forces pushing households to move.

2.3.2.2 Rationing and Tenure Choice

As discussed in the last section, the rationing factor has been discussed in some previous tenure choice studies. Some studies also emphasise the rationing effect in terms of mortgage rationing to homeownership and the administrative constraints to enter the public rented sector. Very few studies discuss rationing in the private rented sector in tenure choice analysis.[2]

(1) Mortgage Rationing in Owner-Occupied Housing

Many studies regarding mortgage rationing effect on tenure choice have been produced by North American researchers. Linneman and Wachter (1989) carried out a typical study of mortgage constraints on individual homeownership propensities. The authors address the income and wealth requirements for mortgages, and develop measures of the degree to which a family is constrained by mortgage underwriting criteria. In their study, two key mortgage criteria are developed on the basis of criteria from the Federal Home Loan Mortgage Corporation. The first criterion is that the loan-to-value ratio should be less than or equal to 0.8; the second criterion is that the annual mortgage payment should be less than or equal to 28% of the borrower's annual family income. Based on these two criteria, a family's maximum home purchase price can be derived.

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[2] This is probably because most studies of rationing in private renting have to focus on the policy context, such as rent control and limited housing supply in this sector, or focus on their economic impacts on housing markets. In tenure choice analysis, many researchers assume that the private rented sector is relatively free of rationing, compared to the other two main tenures.

In order to determine whether a family is constrained by either the income or wealth criteria, Linneman and Wachter also estimate the capital value of housing as the predicted optimal home purchase price. They indicate that because a family facing a mortgage constraint may choose to purchase a home at a price that is less than the optimal price, the observed home purchase prices cannot be used in their study. By comparing predicted optimal purchase price with maximum purchase price, the authors then set up a series of dummy variables to proxy the degrees of mortgage constraints (high and moderate income constraints, and wealth constraint). A series of mortgage constraint variables along with household income, relative cost of ownership and a vector of household characteristics are included in the explanatory variables to estimate probability of homeownership. Their results show that wealth and income constraints both reduce homeownership propensities. Wealth constraint shows a stronger impact when a family applies the adjusted interest rate mortgage. Linneman and Wachter also suggest that the impact of mortgage constraints is varied by the financial innovations and housing subsidy policy, for example the subsidy on interest rate or downpayment would loosen the income and wealth constraints on homebuyers.

A further study by Duca and Rosenthal (1994) evaluates borrowing constraints on households' access to owner-occupation by using a different methodology from Linneman and Wachter's study. Using the data from the 1983 Survey of Consumer Finances, Duca and Rosenthal divide households into two groups. Group One contains households whose tenure status is affected by mortgage constraints, while Group Two contains those whose tenure status may be affected by mortgage constraints. Duca and Rosenthal employ a binary probit model to estimate the probability of homeownership using only group one households. A vector of household socio-economic characteristics is included in the model to estimate the influence of households' taste and preferences on homeownership. To consider the age-related differences in tenure preference, the binary probit model is estimated separately for households with three different age groups: under age 35 (Young), age 35 through 54 (Middle age), and age 55 and over (Older).

The results of the binary choice model are then used to predict the probability of homeownership for all households, without controlling borrowing constraints.[3] Thus Duca and Rosenthal estimate the effect of borrowing constraints by comparing these two model results. Their results show that borrowing constraints have a significant negative effect on the homeownership rate. The negative effect is shown to be more significant on young households aged under 35. They find that homeownership in young households tends to be quite sensitive to potential earnings, the costs of owning or renting, and borrowing constraints, especially the downpayment constraint. Some studies like Brueckner (1986) and Haurin et al. (1997) also emphasise the important effect of downpayment constraints on young households' access to owner-occupied housing.

In Britain, a number of studies have discussed mortgage credit rationing. However, many of them analyse the impact of mortgage rationing removal on housing prices and on the housing market. For example, Meen (1990) estimates the effect of the ending of mortgage rationing on housing price. His results suggest that mortgage rationing in the past had statistically significant effects on house prices and that under rationing, inflation had quantitatively the largest impact on the length of mortgage queues, rather than on real house prices. A recent study by Lee (1995) examines the impact of mortgage rationing and the removal of rationing on the demand for mortgages. The results of Lee's study confirm Meen's findings that the removal of mortgage rationing is one of the driving forces for the house price boom and an increase in the homeownership rate during the middle to late 1980s.

With respect to tenure choice analysis, only a few studies in Britain, such as King (1980) and Maclennan and Wood (1981), have discussed mortgage rationing on homeownership. However, these studies did not examine the mortgage rationing effect on tenure choice model as American researchers did. Although there are different housing market and finance market conditions between the US and the UK, the important role of mortgage constraints in the access to owner-occupied housing should not be ignored in tenure choice study in the UK. It also indicates a need for

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[3] It is a simulation of the probability of homeownership. In the simulation, the probability of households who want to reside in owner-occupied housing is calculated by using the coefficients from the bivariate probit model.

further research to address this issue in the UK. The American literature may provide useful techniques in the analysis of the mortgage rationing effect on tenure choice.

(2) Rationing in the Public Rented Sector

Rationing in the public rented sector is usually associated with housing policy and the allocation system. The policy context of rationing in the public rented sector will be discussed in the next chapter. In this part, the academic research regarding the rationing effect on the access to the public rented sector is addressed. A series of studies by Clapham and Kintrea discusses rationing and housing choice in the social rented sector in Britain. Clapham and Kintrea (1984) state that, unlike the private housing market, the price mechanism does not work out in the public rented sector, and there is no consistent relationship between rent levels and property value and location. Thus households who want to enter council housing are primarily dependent upon the allocation system rather than their budget constraints. The allocation system, according to Clapham and Kintrea (1984), is a kind of 'bureaucratic rationing'. Because the allocation process is rarely instantaneous but relies on queuing, the ability to wait has been the main factor in getting access to good quality council houses (ibid.). The authors also indicate that, in the waiting list, most applicants have little power to express their preferences and make the choice of housing and location. "This lack of power, however, does not mean that the household is a passive agent, it does not bargain with the local authority but interacts with it" (ibid., p. 266). Therefore, the household should have the right to respond to the actions of the authority and make choices in order to achieve its preferences.

As a result, Clapham and Kintrea (1984) develop a housing choice model for the local authority rented sector. The model in fact has been used in previous studies to clarify the choice process in the private sector. The reason for Clapham and Kintrea adopting this model is that 'it frees the analysis from the mechanistic confines of the institutional approach (rationing) and enables the interaction between the bureaucracy and the individual household to be examined' (ibid., p. 266). Therefore, Clapham and Kintrea's housing choice model in the local authority rented sector concerns the applicants' choices and preferences. They suggest that the applicants should express their preferences on the local authority housing application form, and that the housing allocator should evaluate their applications on the basis of the applicants' resources

(mainly income and wealth), and tenure and housing preferences. Clapham and Kintrea also suggest that the likelihood of the applicant entering the local authority rented sector is determined by income, wealth, socio-economic group, present housing circumstances, parental tenure and the applicant's life cycle stage. Among these factors, the lower the income, wealth and socio-economic groups, the higher likelihood of entering the local authority housing sector. Similarly, the poorer the housing circumstances, the higher likelihood to enter this sector. The authors also suggest that parental tenure in any tenure is likely to have a positive influence on children's tenure.

It is noteworthy that these determinants are useful in constructing the rationing variable of entry into the local authority rented sector. A further study by Clapham and Kintrea (1986) examines some of these factors in the allocation process. In an analysis of per capita income, socio-economic group, and the degree of social segregation in the public housing allocation process in the city of Glasgow, Clapham and Kintrea find that income has a direct and significant impact on the allocation of housing area popularity. They indicate that the likelihood of accepting the first offer is related to income. Lower income households were found to have less ability to wait, thus they are more likely to accept the first offer or accept the dwelling located in less popular areas. On the other hand, higher income households have more ability to wait until they receive an offer of higher quality and better location of dwelling. However, Clapham and Kintrea state:

> Although income is related to ability to wait, it is clearly not income *per se* which determines the propensity to reject houses and wait for a better offer. Instead, income may determine the ability to afford suitable property while waiting or enjoying an adequate life-style outside the home (1986, p. 64).

In fact, the measure of per capita income in Clapham and Kintrea's study barely reflects the distribution of household sizes. A weakness is that it does not take into account the varying needs of households at different life-cycle stages. In addition to income, other factors such as homelessness, unemployment, long-term sickness, and lone parenthood may have important influences on the allocation process, even though these factors are still related to income. To model the household's tenure choice

behaviour, these factors can be used as indicators to construct the rationing variables for the social rented sector.

2.3.2.3 Subsidy Effects on Tenure Choice

Housing subsidy has been discussed by many studies as an important determinant of tenure choice (see for example Struyk 1976, King 1980, Henderson and Ioannides 1983, and Rothenberg et al. 1991). There are also quite a few studies emphasising the tax subsidy effect on owner-occupiers. However, previous research paid little attention to the rental subsidy effect on tenants' tenure decisions. In a discussion of tax subsidies to homeowners, Rosen (1979) provides a clear analysis of the federal income tax effect on homeownership decisions in the US. Based on Laidler (1969) and Aaron's (1972) framework, Rosen assumes that changes in income tax subsidy would alter the relative price of housing services and household income, so as to influence the propensity of homeownership. As a result, Rosen estimates housing demand and tenure choice equations, taking care to adjust price and income terms for the federal income tax. His results suggest that changes in relative price and income have significant effects on households' demand for housing services and tenure choice. In addition, Rosen also simulates the efficiency and distributional effects of the implicit income tax subsidy for owner-occupiers under four alternative tax regimes. His results suggest that both removing the federal tax benefits for owner-occupiers and replacing the current system with a 25% tax credit would have significant impacts on higher income groups in terms of changes in their housing consumption.

Rosen's study shows an interesting finding in the effect of the marginal tax bracket on homeownership decisions. However, some studies, such as Rosen and Rosen (1980) and Linneman (1985), have argued that the marginal tax bracket is not a sufficient statistic for homeownership. Linneman develops a net full cost model to examine the marginal tax bracket effect on homeownership decisions. Two special cases are specified in Linneman's homeownership model. The municipal band analogy case assumes that consumers do not sort into homogeneous housing markets and only a small number of consumers will be indifferent in terms of owning or renting. In contrast, the efficient market proposition case assumes that the heterogeneous consumers are sorted into a series of internally homogeneous housing quality markets.

The results show that tax benefits, quality sorting and transaction costs show insignificant impacts on homeownership decisions in both cases.

Linneman's study has, however, been criticised because he ignores capital gains tax in his model and his estimation for a landlord's self production costs could have some bias (Capone 1995). Instead, Capone develops a net-present-value model to estimate the homeownership decision for low- and moderate-income households by using different tax brackets. Capone's results concur with Linneman's study suggesting that tax benefits have important impacts on households who want to own a moderate priced home, except for single individuals, whereas families with children have a higher probability to change tenure from renting to owning.

Whether or not a significant statistic, tax subsidy to owner-occupiers should be included in the determinants of tenure choice, especially in the UK. A large number of studies on housing subsidy between tenures in Britain has been carried out over the past two decades in Britain (for example, see Rosenthal 1977, Robinson 1981, Ermisch 1984, Hills, 1991, Hancock and Munro 1992, and Walker and Marsh 1993). Whilst most of these studies address both the comparisons and the distributional effect of housing subsidies between tenures, only a few of them estimate the subsidy effect on tenure choice. Thus, we have seen a need for this kind of research. Moreover, in tenure choice analysis, housing subsidies should not only include the tax benefits to owner-occupiers but also account for rental subsidies to social tenants in tenure choice, and they are addressed in this thesis. The comparison and distributional effect of housing subsidy between tenures will be discussed in detail in later chapters.

In summary, this section has reviewed the tenure choice studies and the determinants of tenure choice. Tenure choice analysis can be classified into two categories: cross-sectional analysis; and longitudinal analysis of tenure choice, based on the nature of the data and the purpose of the study. The cross-sectional analysis of tenure choice estimates the household's tenure decision, based on their contemporary tastes and preferences, while the longitudinal analysis of tenure choice addresses the changes in tenure choice behaviour over multiple periods. The above studies of the tenure choice model have indicated basic determinants of tenure choice. These basic determinants can generally be categorised into three groups: household demographic characteristics,

household socio-economic characteristics, and the relative cost of housing. Household characteristics include the age, sex, race, and marital status of the household head, and the household size (or number of dependent children in a household). The household socio-economic characteristics basically consist of household income, wealth and employment status. The relative cost of housing is the user cost of owning or renting.

In addition to these basic determinants, studies have indicated that some specific relations and determinants have significant influences on tenure choice. Decisions to move and tenure choice are interdependent, thus they can be seen as a joint choice. On the other hand, the expected mobility can also be seen as a determinant of tenure choice. The rationing factors, such as mortgage rationing in the owner-occupied sector and the administrative rationing in the public housing sector, have significant effects on households' access to these two sectors. Housing subsidies, such as tax subsidies to owner-occupiers and rental subsidies to social tenants, play an important role in altering (reducing) the user cost of housing, thus it affects households' tenure decisions. However, in Britain there appears to be a lack of study in estimating the impacts of these determinants on tenure choice and this is what this thesis seeks to address.

2.4 Summary

In this chapter, the theoretical analysis of housing tenure choice begins with an interpretation of the definition of housing tenure. From a broader view, housing tenure can be seen as a whole range of financial, social, political and economic relations surrounding housing. As a result, the choice of housing tenure is a complicated decision. The definition of tenure choice in this chapter focuses on the economic interpretation. From an economic viewpoint, housing tenure choice represents a consumer's ability (budget constraints) matching his/her preferences for different tenures.

The economic theory of tenure choice is based on the consumer choice theory and housing demand theory. The standard model of consumer choice applying to housing has to be modified in order to fit the specific characteristics of housing commodity

and the housing market. The consumer's decision for housing demand can be seen as a bundle of choices which, for example, include the decisions of tenure, dwelling type, neighbourhood and location. Previous studies have indicated that these choices are interrelated and that hierarchy is a way to organise these choices. Among housing choice studies, Quigley (1985) develops a well-established hierarchical housing choice model, which has three stage choices. The first stage is to choose dwelling unit, then to choose neighbourhood and public services. Börsch-Supan and Pitkin's (1988) study suggests that the hierarchical structure of the nested logit model provides better estimation results of housing choice than the multinomial logit model does. Furthermore, it is noted that the hierarchical housing choice model involves a strong assumption of the tree structure, which reflects the relative degree of similarity among these choice alternatives.

The housing market in Britain and in most Western European countries is characterised as comprising a relatively competitive part of the market and a part of the market subject to non-priced, administrative constraints. There are constraints on households entering certain types of housing segments. Clark and Onaka (1985) and Fischer and Aufhauser (1988) have provided well-established results of housing choice in the regulated housing market. These studies also indicate the importance of non-price rationing factors in housing choice analysis. Moreover, studies like Maclennan et al. (1987) and Tu (1996) suggest that the housing market can also be separated into several submarkets because of the imperfection of market information and the demand or supply constraints in the market. As a result, the household's housing decision can be estimated in different submarkets, based on tenure, dwelling, and neighbourhood components.

In the housing demand analysis, previous studies (see for example King 1980, Henderson and Ioannides 1983) have indicated that the household's tenure choice and housing consumption decisions are interdependent. In other words, the discrete nature of tenure choice and the continuous housing consumption decision can be seen as a joint decision. King (1980) provides an important empirical analysis of tenure choice and housing demand in Britain. However, King's study should be treated with caution because current housing market characteristics and tenure categories are dramatically different from King's study two decades ago. Moreover, in a series of housing

decisions, tenure choice would be more important when a household faces a choice between public and private housing; in the public housing sector, particularly the tenure is usually attached to certain dwelling types, neighbourhood and location (see Clapham and Kintrea 1984, 1986).

Tenure choice analysis can generally be categorised into the cross-sectional analysis and the longitudinal analysis of tenure choice, depending upon the nature of data and the purpose of study. Studies such as Kent (1984), Di Salvo and Ermisch (1997) have emphasised that the longitudinal analysis of tenure choice is a better approach to estimate the effect of changes in the determinants over time on the household's tenure choice behaviour. It is unquestionable that the cross-sectional analysis of tenure choice provides a simple way to estimate the household's tenure choice behaviour in a given time period which avoids complicated data matching and the problem of autocorrelation happening in time series data (Koop 2000). In particular, while some areas like Scotland do not have sufficient longitudinal data, the cross sectional analysis of tenure choice, as this thesis intends to do, is currently the best alternative approach.

It has been seen that many studies have employed hierarchical choice models to estimate tenure choice and other decisions such as residential mobility, dwelling type and location. There is also a debate about whether the hierarchical choice model, such as the nested multinomial logit model, or the multinomial logit model provides a better estimation result of the household's housing decision behaviour (see for example, Börsch-Supan and Pitkin 1988 and Tu 1994). Since the multinomial logit model has a weakness of violating the IIA assumption, more recent studies have adopted the nested logit model to estimate the household's tenure choice behaviour. However, there is an opportunity to employ these two types of model in this thesis in order to compare the robustness of these two models in estimating the household's tenure choice behaviour in Scotland.

With respect to tenure choice determinants, studies like Struyk and Marshall (1976), Maclennan and Wood (1981) have delineated some important determinants of tenure choice, which can be classified into three basic groups: household demographic characteristics, such as household age, size, gender and marital status; household

socio-economic characteristics, such as permanent income and employment status; and the user cost of housing. In addition to these basic determinants, several specific determinants, such as expected mobility, mortgage rationing and housing subsidies, have significant influences on tenure choice. These determinants are also included in the tenure choice models of this thesis. It is noted that mobility decision and tenure choice is interrelated and they can be seen as a joint choice, particularly in the longitudinal analysis of tenure choice and residential mobility (for example see Boehm 1981, Ioannides 1987, and Ioannides and Ken 1996). Although this thesis adopts a cross sectional analysis of tenure choice, the interdependent relationship between mobility decision and tenure choice will be examined in the thesis.

In a review of tenure choice literature, a gap has been seen in estimating the rationing effect and the housing subsidy effect on tenure choice. Mortgage rationing, as stated before, is an important determinant of homeownership. Equally important, the non-price, administrative rationing, such as the allocation system, plays an important role in the admission to enter the social rented sector. There is a lack of research in estimating the effect of social housing rationing on the household's tenure decision behaviour. Regarding the housing subsidy effect, the majority of studies has emphasised the effect of tax advantages on homeownership. There obviously is a lack of an analysis in estimating the effect of below market rent subsidies and the effect of fair rent subsidies on the household's tenure decision. These gaps will be filled in this thesis.

Finally, the household's tenure choice behaviour and the determinants of tenure choice are shaped by the housing market conditions. The next chapter will discuss the housing tenure pattern and the housing market conditions in Scotland.

CHAPTER THREE HOUSING TENURE AND HOUSING MARKET STRUCTURE IN SCOTLAND

The last chapter provides us with a review of the tenure choice theory and empirical studies of tenure choice. The determinants of tenure choice are also identified from the literature review. The characteristics of tenure choice determinants are shaped by the housing market conditions as well as the household's tenure and socio-economic structure. To clarify the characteristics of tenure choice determinants in Scotland as a preparation work of modelling Scottish households' tenure choice behaviour, there is a need to analyse Scotland's housing development. In particular, housing in Scotland has developed a different pattern from the rest of Great Britain over the last several decades. This chapter discusses Scotland's housing development, with an emphasis on housing tenure and housing market structure, rationing and housing subsidy. This chapter is organised into five sections. The first section reviews the housing tenure structure. The second section analyses housing market conditions. The third section discusses rationing in the housing market. The fourth section discusses housing subsidies to help with housing costs and the last section is a brief summary.

3.1. Housing Tenure Structure

Different local economic activities and demographic developments have left different patterns in terms of the age and types of dwellings in the housing stock. State intervention in the housing sector and the exercise of local political power have also profoundly affected the patterns of housing development (Murie 1996a). These differences are reflected in tenure structure. In other words, tenure can be seen not only as an outcome but also a parameter of policy development. This section analyses the long-term tenure patterns in Scotland when compared with the rest of Great Britain. Since housing tenure in Britain is measured on the basis of dwelling stock, the Scottish dwelling characteristics between tenures are also discussed in this section.

3.1.1 Long Term Housing Tenure Patterns

Over several decades, Scottish housing has developed in a different way from housing in the rest of Great Britain and this has been most apparent in the different tenure

patterns of Scotland. Figures in Table 3.1 (see page 59) reveal significant differences between Scotland and England/Wales. Historically, Scotland has a lower rate of owner-occupied dwellings compared with England and Wales. In 1971, Scotland's owner-occupied dwellings only accounted for 31% of the total housing stock, while England and Wales both had more than half of the housing stock for owner-occupation. The most dramatic changes in tenure mix in Britain have taken place in the 1980s. There was a rapid increase in owner-occupied housing during this period. Between 1981 and 1989, the homeownership rate in both England and Wales increased about eight percentage points, while Scotland experienced a more dramatic increase in the homeownership rate up to 13 percentage points. The higher percentage growth in Scotland's owner-occupied housing is partly because of the lower starting point for homeownership, and is partly influenced by a relatively stable economic and housing market growth and the national housing policy (Wilcox et al. 1998).

In Britain, the growth of homeownership in the 1980s was mainly affected by a series of government policies. For example, financial markets were deregulated in the mid-1980s. The release of mortgage rationing along with income growth have encouraged the demand for owner-occupation and thus promoted a market boom in the late 1980s (Meen 1989). The mortgage interest tax relief provided substantial tax advantages to homeowners. The Right to Buy scheme offered a big discount price for sitting council tenants to buy their homes. These are the important driving forces to increase the homeownership rate over the last two decades. The growth of Scotland's owner-occupied housing in the 1980s was the result of the Right to Buy and related policies and new house building, which were contributory factors to almost equal extents (Murie 1996a).

In the 1990s, RTB policy and new house building continued to contribute to a rapid increase in Scotland's homeownership. Between 1990 and 1998, Scotland's homeownership rate increased by 10 percentage points, while the homeownership rate in both England and Wales increased by less than one percentage point. In fact a relatively stable economy in the 1990s has been one of major factors for the growth of new built owner-occupied dwellings in the Scottish housing market (Wilcox et al. 1998). The continuous market boom in the Scottish housing market also reveals different market conditions in terms of house prices, housing starts and housing

transactions from the rest of Britain. They are discussed in the later section. Although Scotland experienced a rapid growth in owner-occupied housing in the past two decades, its homeownership rate is still the lowest among the three countries. By 1998, the homeownership rate in Scotland accounted for 61.3%, while it was 68% and 71.5% in England and Wales respectively. Since the national housing policy has aimed to continue to promote owner-occupied housing, there may be room for increasing Scotland's homeownership rate in the future but the growth rate will not be as fast as in the last two decades.

The historical importance of the public housing sector is greater in Scotland than in England and Wales.[4] In the 1970s, Scotland's public dwellings accounted for half of the total housing stock, while in both England and Wales public dwellings accounted for less than 30% of their housing stock. Since the 1980s, council housing stock in Britain has rapidly reduced primarily due to the Right to Buy scheme. The decrease in council dwellings in Scotland is more significant than that in England and Wales. This implies a successful Right to Buy scheme in Scotland. Between 1980 and 1998, more than 300,000 public dwellings were sold to sitting tenants under the RTB scheme in Scotland, which accounted for 17% of the total RTB sales in Britain (Wilcox 2000).

Accompanying the Right to Buy scheme, a large number of council dwellings were sold to housing associations under the Large Scale Voluntary Transfer scheme after 1989 and this accelerated the reduction in council dwellings. In Scotland, between 1989 and 1998, there were more than 88,000 public dwellings transferred from local authorities, Scottish Homes and New Town Development Corporations to local housing associations (Taylor 1998). Because of the successful exercise of RTB and LSVT schemes with a very low level of new building and acquisition, Scotland's public housing stock reduced significantly over the past two decades (Murie 1996a). By 1998, Scotland's public housing stock only accounted for 26.6% of the total dwellings. Nevertheless, the share of public housing stock in Scotland still remained the highest among three countries and was about 10 percentage points higher than that in England and Wales by 1998.

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[4] The public housing sector in Scotland includes local authorities, new towns and Scottish Homes (now Communities Scotland).

The sale of council dwellings and stock transfers may have speeded the residualisation process in the public rented sector (Murie 1996a). Many affluent council tenants have become owner-occupiers under the RTB scheme. Moreover, the stock transfer scheme has transferred many better quality council dwellings to local housing associations. In this environment, council housing has been dominated by lower income groups who, in many cases, are living in lower quality dwellings. The rise of income inequality in the public rented sector has become a critical issue in Britain. In Scotland, the Scottish House Condition Survey provides rich data which can be used to examine the income inequality between tenures. This issue will be analysed in Chapter Seven.

The one part of the rented sector which has expanded, with government sponsorship since 1979, is the housing association sector. The expansion has taken place both though new building and stock transfers, and has only been partly offset by sales of properties (Murie 1996a). In spite of its expansion, housing association stock only forms a small proportion of the total housing stock. By 1998, the share of housing association dwellings accounted for 5.3% of the total housing stock in Scotland, compared to 5% and 4% in England and Wales, respectively. It is of interest to note that Scotland's housing association sector remains much smaller and there are no equivalents of the large English housing associations (ibid.). The new financial regime for the housing association sector established in 1988 has had substantial impacts on changing their role and also promoting their expansion. In Scotland, the financial regime did not lead to such significant impacts as it did in England, particularly in terms of the rent level (Wilcox et al. 1998). The new financial regime of the housing association sector and its impact is discussed in Section Four.

In Britain, the private rented sector also experienced a decline over the last several decades. The government's strong rent policy is the key factor for the decline in this sector. Rent control and large scale slum clearance have been the driving forces to limit the supply of private rented dwellings (Freeman et al. 1996). Equally important, the tax and subsidy system favouring owner-occupiers and social tenants is another key factor explaining the small size of this sector. In Scotland, in contrast to a growing owner-occupied housing and a strong social rented sector, private rented

dwellings have declined substantially. This may imply that Scottish households are more likely to stay in the social housing sector than the private rented sector, and regard social renting as a substitute for private renting. The share of private rented dwelling in the total housing stock is the lowest among the three countries in Britain. After the deregulation of private rents in 1989, the private rented sector appeared to be reviving in England and Wales but it only had positive impact on Scotland's private renting in 1990/91. After that, Scotland suffered continuous decline in the proportion of private rented dwellings. By 1998, Scotland's private rented dwellings only accounted for 6.7% of the total housing stock, compared to 11.1% and 8.5% in England and Wales respectively.

Table 3.1. Housing Tenure in Great Britain, 1971-1998
(Percentage of Dwelling)

	Scotland					*England*					*Wales*				
Year	Total Dwellings (000)	Owner-Occup. %	Public Renting %	Housing Assoc. %	Private Renting %	Total Dwellings (000)	Owner-Occup. %	Public Renting %	Housing Assoc. %	Private Renting %	Total Dwellings (000)	Owner-Occup. %	Public Renting %	Housing Assoc. %	Private Renting %
1971	1,822	31.2	52.0	Na	16.7	16,210	52.4	28.3	Na	19.3	967	55.8	28.5	Na	15.6
1976	1,921	33.6	54.2	Na	12.2	17,177	55.7	29.1	Na	15.2	1,029	58.6	28.7	Na	12.7
1981	1,970	36.4	52.1	1.8	9.7	18,025	58.2	28.1	2.3	11.3	1,089	62.4	26.9	1.1	9.4
1982	1,983	37.7	51.2	1.9	9.2	18,172	59.5	26.9	2.4	11.2	1,096	63.8	25.4	1.2	9.6
1983	1,998	39.1	50.1	2.1	8.7	18,346	60.5	26.0	2.4	11.1	1,103	64.6	24.5	1.4	9.4
1984	2,015	40.5	49.0	2.2	8.3	18,525	61.3	25.2	2.5	10.9	1,112	66.0	24.0	1.5	8.6
1985	2,032	41.8	47.9	2.3	7.9	18,697	62.2	24.5	2.6	10.7	1,120	66.7	23.4	1.6	8.3
1986	2,050	43.1	46.9	2.5	7.5	18,882	63.2	23.9	2.6	10.3	1,127	66.7	22.8	1.7	8.7
1987	2,067	44.6	45.6	2.6	7.1	19,078	64.3	23.1	2.7	10.0	1,148	68.1	22.0	1.7	8.1
1988	2,084	46.7	43.9	2.8	6.7	19,284	65.6	22.1	2.8	9.6	1,159	69.4	21.1	1.8	7.8
1989	2,104	49.1	41.7	2.9	6.3	19,468	66.6	21.0	2.9	9.5	1,170	70.8	19.8	1.9	7.1
1990	2,124	51.2	39.8	3.1	6.0	19,634	67.1	20.1	3.1	9.7	1,181	71.1	19.4	2.0	7.7
1991	2,160	52.4	37.8	2.6	7.1	19,790	67.5	19.4	3.1	9.9	1,192	71.0	18.3	2.5	8.0
1992	2,175	54.1	36.0	2.9	7.1	19,936	67.4	19.0	3.4	10.2	1,202	71.1	17.9	2.7	8.2
1993	2,193	55.5	34.4	3.1	7.0	20,085	67.4	18.4	3.8	10.4	1,211	71.2	17.5	3.1	8.3
1994	2,210	56.9	32.6	3.5	7.0	20,240	67.6	17.8	4.0	10.6	1,222	71.2	17.1	3.4	8.3
1995	2,230	58.0	31.0	4.1	7.0	20,399	67.5	17.2	4.4	10.9	1,231	71.3	16.8	3.5	8.4
1996	2,248	59.0	29.7	4.4	6.9	20,549	67.6	16.7	4.7	11.1	1,241	71.3	16.5	3.7	8.5
1997	2,267	60.2	27.9	5.1	6.8	20,699	67.8	16.2	4.9	11.1	1,250	71.4	16.2	3.9	8.5
1998	2,284	61.3	26.6	5.3	6.7	20,842	68.0	15.9	5.0	11.1	1,257	71.5	16.0	4.0	8.5

Source: Wilcox (2000), Table 17b;
The figures from1982-84 are based on Wilcox (1997) Table 17b.

3.1.2 Tenure and Housing Characteristics

In addition to the long-term housing tenure pattern, another important subject in the analysis of housing tenure structure is the dwelling characteristics compared with housing tenure, since the housing tenure is measured on the basis of dwelling units. Table 3.2 presents dwelling characteristics by tenures in Scotland based on the Scottish House Condition Survey in 1996. Houses have been the dominant dwelling type in Scotland, accounting for 62% of the total dwellings in 1996. Dwelling type is significantly different between owner-occupation and social renting. In the owner-occupied sector, about three quarters of dwellings were houses, while tenements and four-in-a-block flats were dominant dwelling types in the social rented sector in 1996. Dwelling type in the private rented sector is significantly varied between unfurnished and furnished renting. More than half of private unfurnished renting and 87% of tied accommodation were houses, while 72% of furnished renting were flats in 1996.

In Scotland, more than 60% of dwellings were built after the Second World War, while 21% were built before 1919. Similarly, most dwellings in the owner-occupied sector and the public rented sector were built after 1945. The difference is that there were 27% of owner-occupied dwellings built before 1919, compared to only 3% of public dwellings being built before 1919. The market boom and the growth of new built dwellings have contributed to an increase in the share of dwellings built after 1982 in the owner-occupied sector. Dwelling age of the housing association sector is significantly diverse. As the government aimed to expand the housing association sector, a large number of new dwellings have been built since the late 1980s. As a result, this increases the share of association dwellings built after 1982 which accounted for 39% of the total housing association dwellings in 1996. In contrast to new construction, a quarter of association dwellings were built before 1919, and many of these dwellings are rehabilitated tenements and flats located in the inner city providing for elderly people and those with special needs (Murie 1996a). Dwelling age of the private rented sector is very old with fewer new constructions compared to other tenures. More than 70% of private furnished rented dwellings and about half of unfurnished and tied accommodations were built before 1919, while less than 10% of private rented dwellings were built after 1982. This is the result of the long term decline of this sector.

In 1996, about two thirds of dwellings in Scotland had 4 or 5 rooms. Dwellings with 4-5 rooms were the dominant size in the owner-occupied sector and the public rented sector. About 80% of housing association dwellings had 3 or 4 rooms. To some extent, dwelling size is correlated to household characteristics and, in this case, the above results may imply different patterns of household size and household type between the public rented sector and the housing association sector. Similar to housing association dwellings, most private unfurnished and furnished rented dwellings had less than 5 rooms in 1996. In contrast, most tied accommodations are a larger size. Around 80% of tied accommodations had 5 or more rooms. With respect to dwelling location, most dwellings in the owner-occupied sector and the social rented sector were located in urban areas, while there were substantial proportions of private unfurnished and tied accommodation located in rural areas of Scotland.

In brief, there has been a rapid increase in owner-occupied housing over the last two decades in Scotland. Owner-occupied dwellings are dominated by houses with 4 to 5 rooms and most of them were built after Second World War, including a substantial amount of new construction after 1982. The historical importance of Scotland's public rented sector significantly comprises flats and tenements in the urban areas. The independent housing association sector is relatively small and young in terms of dwelling size and age. The government's policy to expand the housing association sector is a key force for a rapid increase in new built dwellings after 1989. The long-term state intervention in the private rented sector has resulted in the small size of this sector. Most furnished rented dwellings which are very old and of a smaller size are located in the inner city. On the contrary, many unfurnished rented dwellings and tied accommodation are located in rural areas and are a larger size.

Table 3.2 Housing Characteristics by Tenures in Scotland, 1996

Dwelling Type	Owner Occupied %	Public Rented %	Housing Association %	Private Unfurnished %	Renting: Furnished %	Tied %	All %	Tenures (000's)
Detached houses	27	0	2	20	9	43	17	367
Semi-detached	26	16	8	18	6	22	21	450
Terraced houses	21	30	19	17	8	22	24	500
Tenements	15	29	57	30	65	8	23	487
Four-in-a-block	8	17	7	11	7	3	11	223
Conversion	2	1	2	2	6	3	2	39
Tower/slab	0	7	6	3	0	0	3	56
Total	100	100	100	100	100	100	100	2,123
Dwelling Age								
Pre-1919	27	3	24	53	72	48	21	456
1919-1944	14	20	5	16	4	8	15	318
1945-1964	20	47	14	14	7	17	28	590
1965-1982	25	26	19	11	8	18	24	513
Post 1982	15	3	39	6	9	9	12	246
Total	100	100	100	100	100	100	100	2,123

Source: 1996 Scottish House Condition Survey
Notes: Public sector includes local authorities, new towns and Scottish Homes; housing associations includes co-op dwellings

Table 3.2 Housing Characteristics by Tenure in Scotland 1996 (Continued)

Dwelling Size	Owner Occupied %	Public Rented %	Housing Association %	Private Unfurnished %	Renting: Furnished %	Tied %	All %	Tenures (000's)
1-3 rooms	7	18	47	24	26	4	13	285
4 Rooms	26	48	32	35	37	17	34	713
5 Rooms	33	30	18	30	20	42	31	655
6 Rooms	19	4	3	8	11	16	13	279
7 + Rooms	15	0	1	3	6	21	9	191
Total	100	100	100	100	100	100	100	2,123
Location								
Urban	82	87	86	66	89	53	83	1,758
Rural	18	13	14	34	11	47	17	364
Total	100	100	100	100	100	100		2,123

Source: 1996 Scottish House Condition Survey
Notes: Public sector includes local authorities, new towns and Scottish Homes; housing associations includes co-op dwellings

3.2 Housing Market Conditions

We have thus seen a significant change in tenure mix in Scotland over the last several decades. The change in tenure pattern has had substantial impacts on the housing market. This section briefly discusses the difference of housing market conditions between Scotland and the rest of Great Britain in terms of new house building, house prices and housing transactions.

3.2.1 New House Building

New house building plays an important role in stimulating housing market activities as well as economic activities. According to Wilcox (2000), almost 20,400 new dwellings were completed in Scotland in 1998, adding nearly 0.9% to the housing stock. The number of Scotland's housing starts was about 20,200 dwellings in 1998, and accounted for 11.4% of the total of Great Britain's housing starts. Figure 3.1 reveals the level of new house building (housing start) in Scotland and in Great Britain as a whole between 1985 and 1998.

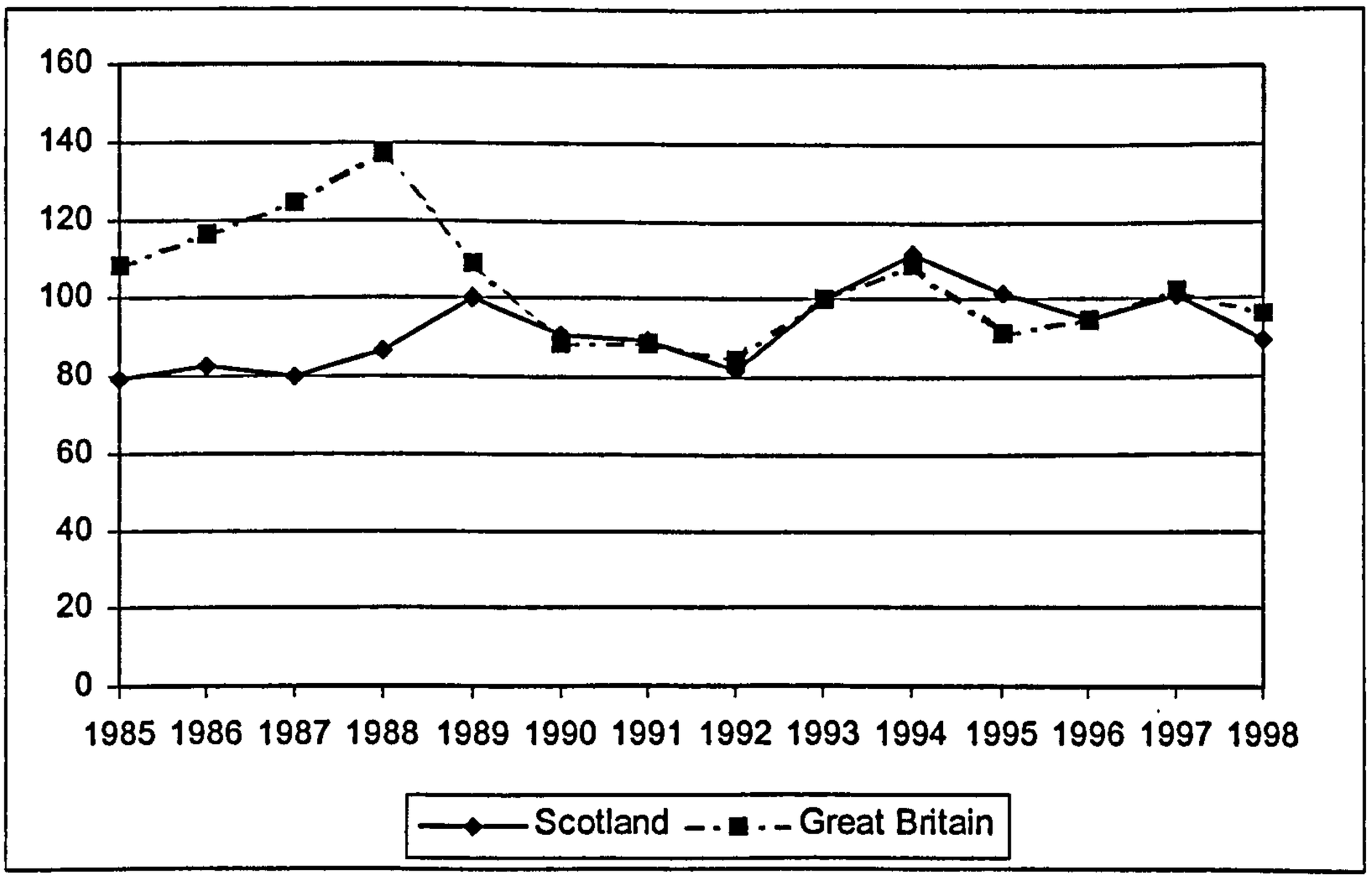

Figure 3.1 New House Building in Scotland and Great Britain 1985-1998

(Index, 1993=100)

Source: Based on Wilcox (2000), Table 19e and 19f.

Scotland's new house building experienced a smoother growth during the market boom in the late 1980s. Housing starts in Scotland reached its high level in 1989, one year later than that for the rent of Great Britain. The market recession beginning in the early 1990s had less influence on Scotland's new housing construction. It is striking that new house building in Scotland experienced a greater fluctuation in the mid-1990s than in the late 1980s. New house building in Scotland reached its highest level in 1994. About 25,100 new dwellings were built in that year. Then housing starts suffered a decline to some degree. The recent boom and slump of Scotland's new house building was partly affected by private market conditions and partly by the housing association activities since housing associations have been the main suppliers of new social dwellings in the 1990s (Wilcox et al. 1998).

In Scotland, the tenure division of new house building has significantly changed over the last two decades. Figure 3.2 shows the tenure share in Scotland's new house building between 1985 and 1998. It shows a clear picture that the share taken by the public sector was dramatically reduced after 1989. In 1990, there were about 1,600 dwellings built by the public sector. By 1998, public sector housing starts had dropped to 50 dwellings, accounting for only 0.2% of total housing starts (Wilcox 2000). The estimates of the local authority housing need vary widely. Studies have suggested that the current level of production is well below the requirement to meet the local authority housing need (Meen et al. 2001). In contrast, the number of housing starts taken by housing associations has been significantly increased after 1989 and reached its peak of 5,400 dwellings in 1995. It is evident that a rapid boom in Scotland's housing starts in the mid-1990s was partly boosted by the new housebuilding in the housing association sector. Recently, the number of new construction in the housing association sector has slightly declined. Nevertheless, the share constantly remained at 16%-18% of the total housing starts in Scotland between 1997 and 1998.

New house building in the private sector has been growing steadily over recent decades. This is partly a result of a rapidly growing demand for owner-occupied housing during these years. As discussed above, Scotland's new private house building also experienced less fluctuation than the rest of Great Britain in the last two decades. Scotland's private housing starts reached a high level in 1989 and then had a

slight slump during the market recession in the early 1990s. After recovering from the recession, private housing starts reached another high level of 19,450 dwellings in 1994. After that, the number of new private house building fell slightly but remained fairly constant at between 16,500 to 19,000 dwellings per year between 1995 and 1998.

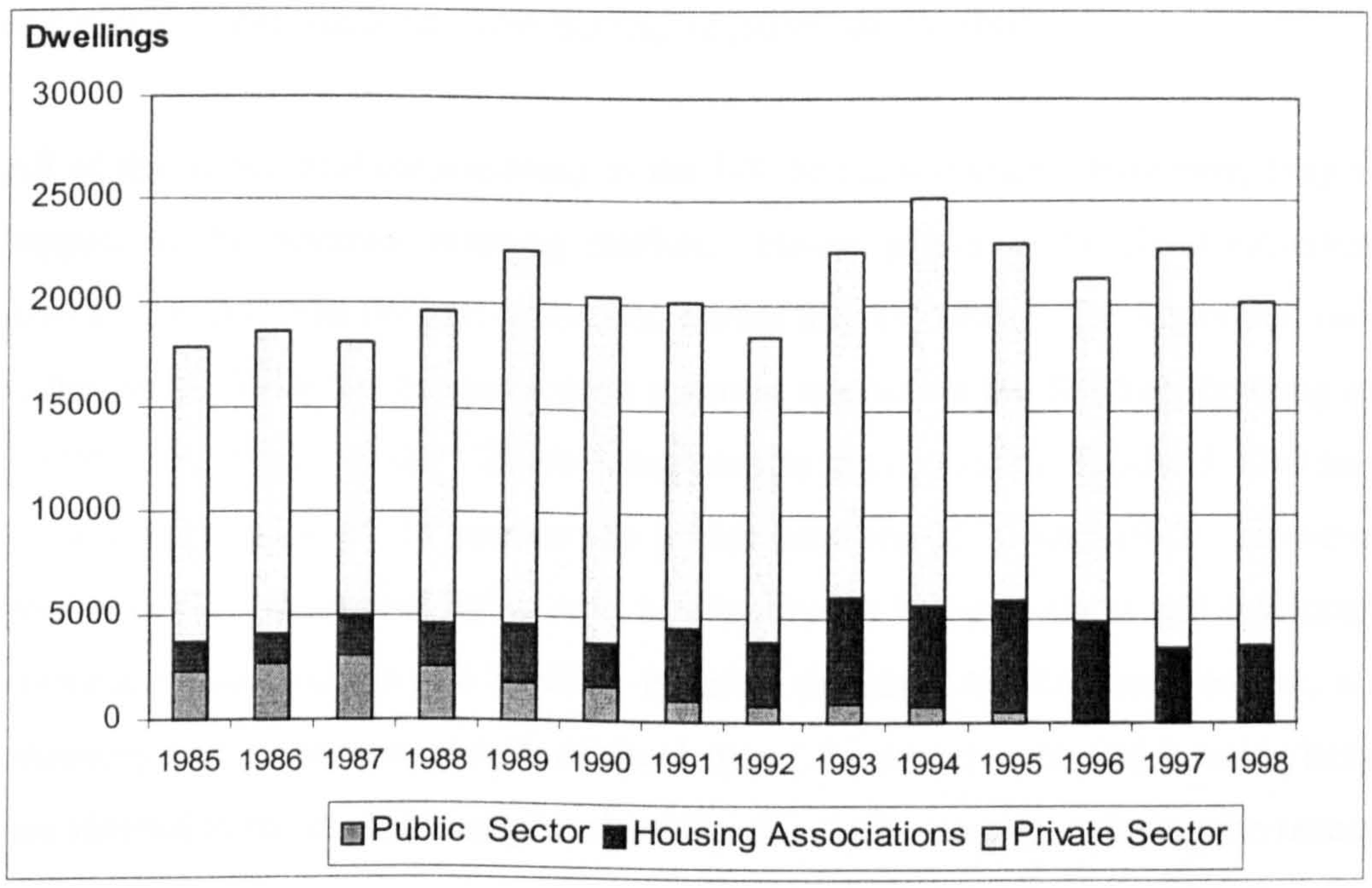

Figure 3.2 Tenure Shares in New House Building in Scotland, 1985-1998

Source: Based on Wilcox (2000), Table 19e

3.2.2 House Prices

House prices have always been an important indication of housing market conditions. House prices in Scotland have shown a different trend from the rest of the UK over the last two decades. Figure 3 .3 shows that house prices in Scotland were more stable than at the UK level over the past twenty years.[5] According to Council of Mortgage Lenders' (CML) data, the UK housing market experienced a price boom during the late 1980s. House prices reached their peak in 1989. Many factors determined the price boom during this period. As Meen (1996) pointed out, the liberalisation of the mortgage finance sector is undoubtedly one of the major causes, in addition, the increase in real income in the mid-1980s also contributed to the house price boom.

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[5] House price data is available at the UK level. Most comparisons in this chapter are based on Great Britain level data.

The economic recession beginning in the 1990s, however, caused a great fluctuation in the UK housing market. House prices changed from boom to slump between 1989 and 1990, and continued to decline until the mid-1990s. During 1990 to 1994, falling house prices and reduced housing transactions along with rising unemployment had together slowed down the recovery from the market recession (Murie 1996a). The consequences had been rising mortgage arrears and repossessions at their highest level, and many owner-occupiers also having negative equity (ibid.).

All of the above problems existed in the UK housing market. However, they did not happen in the Scottish housing market. House prices in Scotland experienced a smoother boom than the rest of the UK during the late 1980s. The economic recession in the early 1990s did not have such a strong impact on the Scottish housing market. While house prices in the UK level declined in the recession, Scotland's house prices continued to grow by 15 percentage points between 1990 and 1993. However, the impact of the market recession was a reduction in housing starts and the number of housing transactions in the Scottish housing market. As discussed earlier, a stable economy and a constant growth of the demand for owner-occupied housing may have contributed to the continuous growth of Scotland's house prices during the recession.

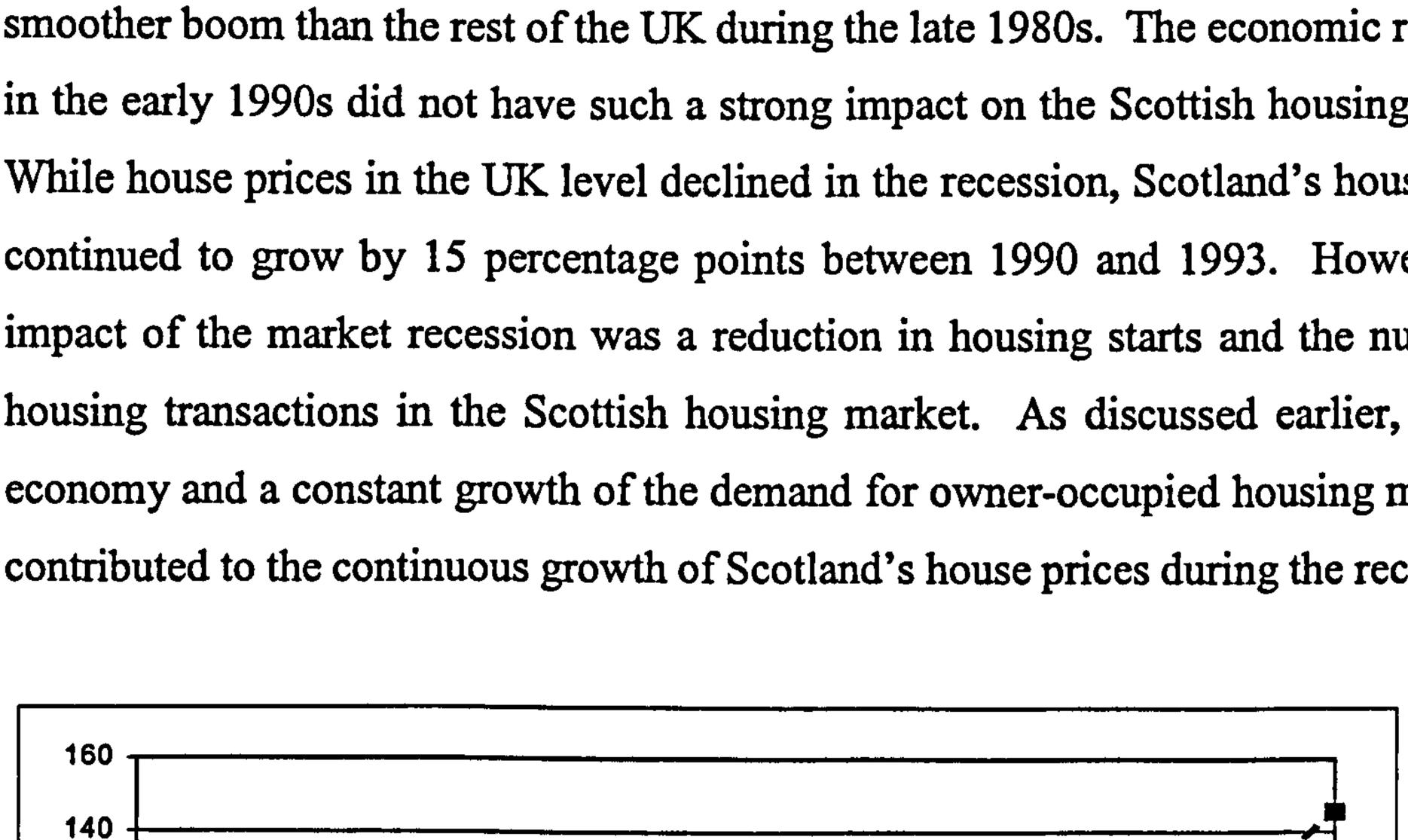

Figure 3.3 Average House Prices in Scotland and the UK, 1980-1999

(Mix adjusted index, 1993=100)

Sources: Compendium of Housing Finance Statistics, Council of Mortgage Lenders, derived from the DOE/BSA 5% sample survey. Based on Wilcox (2000), Table 43b.

After recovering from recession in the early 1990s, house prices in Scotland continued to grow smoothly over the second half of 1990s, while housing markets in the rest of the UK were likely to have another price boom, specifically after 1996. An analysis of CML data suggests that between 1996 and 1999, house prices in Scotland increased nearly 15 percentage points compared to 44 percentage points in the UK as a whole. By 1999, the average house price in Scotland was £69,368 compared to an average of £83, 845 at the UK level (see Table 3.3). With respect to the volatility of house prices, according to CML data, Scotland had the lowest volatility of house prices at around 7%, compared to about 15% at the UK level over the 1968-2000 (Meen et al. 2001).

Table 3.3 also shows a breakdown of prices by dwelling size in Scotland compared to the UK as a whole between 1998 and 1999. In Scotland, the prices for 6 room dwellings had the biggest increase (7.3%), followed by 5 room dwellings with a 5% increase between 1998 and 1999. In contrast, the prices for 3 room dwellings had declined by nearly 8%. In the UK level, the prices for 7 more room dwellings had the biggest increase, by nearly 12%, followed by 6 room dwellings with an 11% increase in prices between 1998 and 1999.

Table 3.3 Average House Prices by Dwelling Size in Scotland and the UK, 1998-1999 (£)

Dwelling Size	Scotland 1998	1999	% change	United Kingdom 1998	1999	% change
2 rooms or less	40,076	46,026	14.8	48,047	51,504	7.2
3 rooms	47,884	44,155	-7.8	53,254	54,660	2.6
4 rooms	52,296	54,269	3.8	56,192	61,191	8.9
5 rooms	64,325	67,686	5.2	64,661	70,343	8.8
6 rooms	79,226	85,001	7.3	76,449	84,689	10.8
7 rooms or more	124,701	129,770	4.1	126,651	141,409	11.7
All type average	64,083	69,386	8.3	81,991	92,717	13.1

Sources: DETR/CML 5% Sample Survey of Mortgage Lenders. Analysis and adopted from Wilcox (1999) and (2000) Tables 43a, 44.
Notes: Figures for 2 room dwellings should be treated with particular caution due to very small sample sizes
Rooms include kitchens but no bathrooms, lobbies, landings or sculleries.
Figures are for sales to all purchasers, with the exception of sitting tenants.

3.2.3 Housing Transactions

In addition to new house building and house prices, housing transactions are also an important indication of housing market conditions. Table 3.4 presents the number of

private housing sales in Scotland and the rest of Great Britain from 1990 to 1997. Unfortunately, the latest data for Scotland is only available up to November 1997. Thus the data can not present recent transaction activities in the Scottish housing market.[6] The economic recession during the early 1990s did not have a strong influence on Scotland's house prices but it did impact on housing transactions. The number of housing transactions in Scotland and the rest of Great Britain reduced significantly in the early 1990s.

Between 1993 and 1996, the number of private housing sales in Scotland and the rest of Great Britain continued to decline but at a slower rate. In 1997 there was a quick increase in housing transactions in Great Britain level. A rapid increase in the number of housing transactions along with rising house prices implies that the housing market in Great Britain, particularly in England would "heat up" to experience another boom like the late 1980s. However, this evidence would not be confirmed until more up-to-date data was collected. In Scotland, the housing market would not be as "hot" as the level in the rest of Great Britain, since the number of housing transactions and house prices increased slowly in 1997.

Table 3. 4 Private Housing Transactions in Great Britain, 1990-1997

Year	Scotland		Great Britain	
	Dwellings (1000)	Index (1993=100)	Dwellings (1000)	Index (1993=100)
1990	142	115	1,425	115
1991	133	107	1,358	110
1992	131	106	1,162	94
1993	124	100	1,238	100
1994	125	101	1,239	100
1995	110	89	1,159	94
1996	100	81	1,223	99
1997	101	82	1,398	113

Source: Wilcox et al. (1998), Table 6.6a

Note: Scotland data for 1997 is only for the eleven months to November.

In summary, the Scottish housing market has shown different conditions from the rest of Great Britain over the last two decades. Housing markets in England and Wales experienced a great fluctuation during the late 1980s and the early 1990s. The picture

[6] According to Gibb's (2001) study of CML data, Scottish private housing transactions were about 123,000 in 1999.

for Scottish housing market was of much greater stability. House prices in Scotland grew steadily without significant fall back during the past two decades. The Scottish housing market was much less affected by the recession beginning in the early 1990s and consequently had negligible negative equity. Housing starts and rates of housing transactions in Scotland were decreased less significantly than the rest of Great Britain during the market recession. In general, Scotland does not show the volatility of the housing market in England and Wales, and the 'ripple effect' stops at the border (Gibb 2001).

Many factors could explain different housing market conditions between Scotland and the rest of Great Britain. One of the most important factors is that the housing market is deeply influenced by local economic activities and by local housing demand and supply. Gibb (2001) indicates that economic, behavioural and institutional reasons can be seen as attributes to the Scottish housing market's stability. Another important factor is housing policy. Connecting to housing tenure, housing market is also viewed as an important policy tool. For example, homeownership supports and underpins area regeneration, while rental housing can provide wider choices other than owner-occupation and support wider housing flexibility (ibid.). Housing policy and the subsidy programmes play important roles in subsidising households as well as housing suppliers or placing constraints in the housing market. The following two sections will discuss rationing and subsidies in the Scottish housing market compared to the rest of Great Britain.

3.3 Rationing in the Housing Market

Rationing in the housing market can generally be divided into price mechanism and non-price mechanism. From an economic viewpoint, price constraints are related to the prices of housing services and the household's budget constraints. Non-price constraints are mainly the administrative rationing imposed by the market controller. In Scotland, as well as the rest of Great Britain, rationing in the housing market mainly consists of price and non-price constraints towards entry into the three main tenures: the owner-occupier sector, the social housing sector and the private rented sector.

3.3.1 Rationing in the Owner-Occupied Sector

As the house is a commodity that is expensive in relation to incomes, most households need to obtain a mortgage to buy their own home. Thus mortgage finance can be seen as the most significant constraint to households who want to be homeowners. In Scotland and the rest of Great Britain, the mortgage lenders, mainly building societies and banks, often impose some rationing to mortgage borrowers in order to secure their loans. The rationing includes price and non-price constraints. Before the 1980s, the most significant constraint was the credit rationing set by building societies.

Before the mid-1980s, the building societies enjoyed tax advantages which allowed them to offer a better net return on saving rates than their banking competitors (Gibb and Munro 1991). Because of these competitive advantages in the saving market, building societies could offer cheaper mortgages to borrowers and, as a result, demand for mortgages was frequently greater than the supply. Therefore, many building societies then implemented credit rationing by reducing the mortgage loan to value ratio, by reducing income to value ratio for potential borrowers, by imposing saving conditions on borrowers and also by tightening up lending rules on older properties and those in less desirable neighbourhoods (ibid.).

Building societies' credit rationing created inflexibility in the financial market and had a significant impact on many potential homebuyers. Many homebuyers, particularly in the marginal income level, found it difficult to obtain a mortgage from building societies. This went against the government's policy to promote homeownership in Great Britain. In the mid-1980s, the government deregulated the mortgage market so that building societies could face more competition from banks and other financial institutions. As Maclennan and Gibb (1990) suggest, the deregulation of the financial sector has had a fundamental effect on the mortgage market. Price competition has removed the historical mortgage rate fixing cartel and quantity constrained queuing for mortgage and, at the same time, has enabled households to borrow more against the value of housing asset (ibid.). In other words, the mortgage constraint since the mid-1980s has been focused on price mechanism, which mainly depends upon house prices, borrowers' incomes, mortgage interest rates and inflation.

In order to safeguard their loans, many building societies and banks have imposed some criteria towards mortgage borrowers. The most common criteria are: house price to income ratio, loan to house price ratio and loan to income ratio. These criteria have been used by the Council of Mortgage Lenders to estimate housing affordability for homebuyers. To some extent, these affordability measures do reflect some conditions of mortgage constraints to homebuyers. Many building societies and banks have used these measures as the norms for their lending criteria. In many cases, these mortgage criteria apply differently to first time buyers and former homeowners. Figure 3.4 to Figure 3.6 present these three common mortgage criteria to first time buyers and former homeowners in Scotland compared to the UK level.

In Scotland and the UK level, the price to income ratio for former homeowners is significantly higher than that for first time buyers. This is probably because former homeowners usually have higher incomes and savings thus they can purchase higher price homes than first time homebuyers and also former homeowners can obtain capital gains from their previous houses. For example, in Scotland 1997, the average house prices purchased by former homeowners were £78,287 and their average annual incomes were £27,197, while the average house prices purchased by first time buyers were far lower at £38,613 and their average annual incomes were £17,827 (Wilcox et al. 1998). Although these figures represent a big gap, the price to income ratio for both first time buyers and former homeowners in Scotland remained stable and was less affected by the house price boom and slump than the rest of the UK in the past two decades. The price to income ratio for former homeowners in the UK level was significantly affected by market boom and recession during the late 1980s and the early 1990s.

With respect to loan to house price ratio (or called loan to value ratio LTV), first time buyers have higher ratio than former homeowners. Over the past fifteen years, the loan to house price ratio for first time buyers in Scotland was similar to the UK average except in recent years. The recent house price boom (between 1997 and 1999) in the UK as a whole has resulted in a quicker reduction in loan to house price ratio than that in Scotland. Compared to former homeowners, the loan to price ratio for first time buyers was likely to be affected by housing market conditions in Scotland and the rest of the UK.

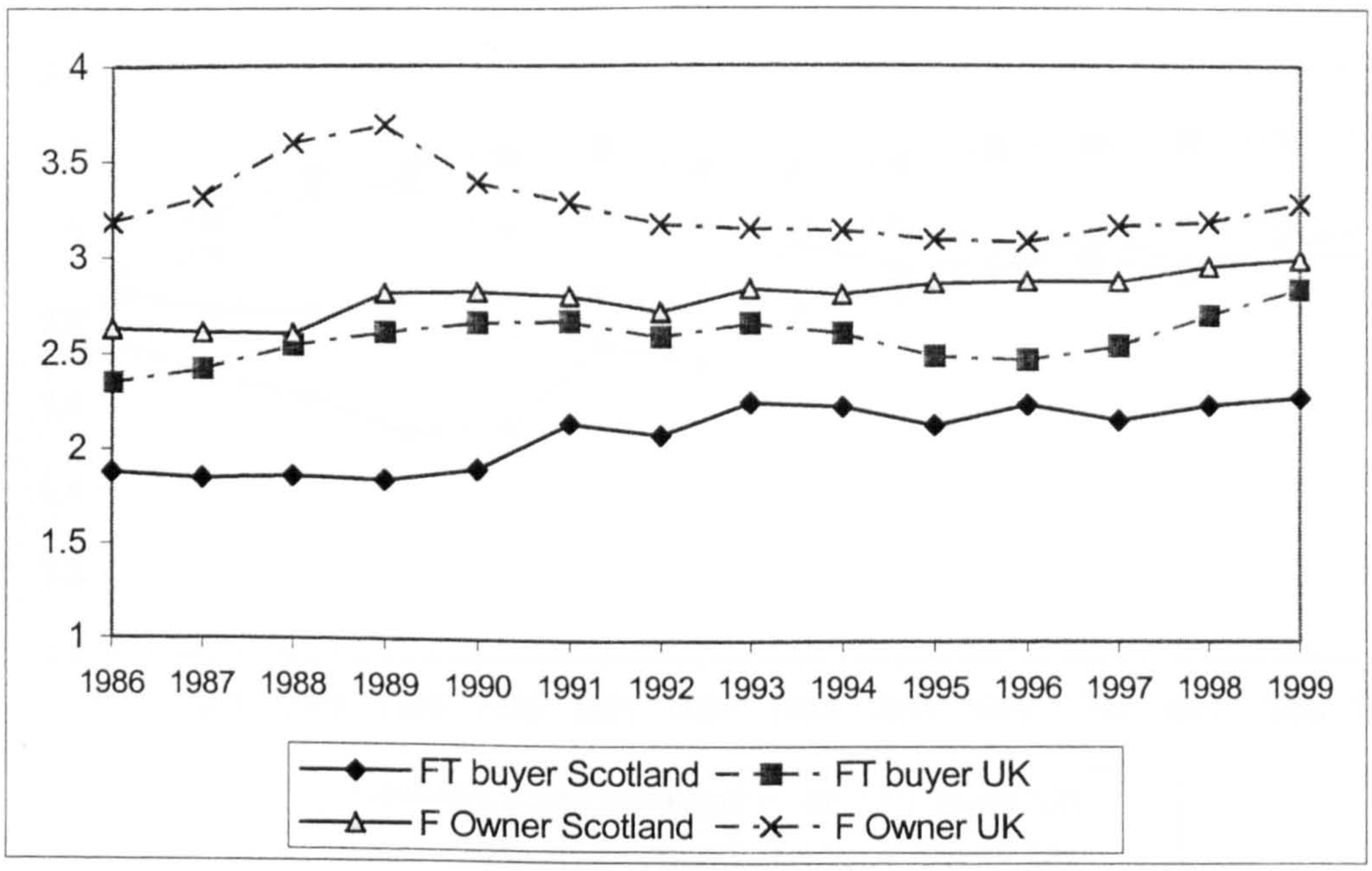

Figure 3.4 House Price to Income Ratio in Scotland and the UK, 1986-1999

FT Buyer: first time buyer; F Owner: former homeowner

Source: Council of Mortgage Lenders, *Housing Finance*

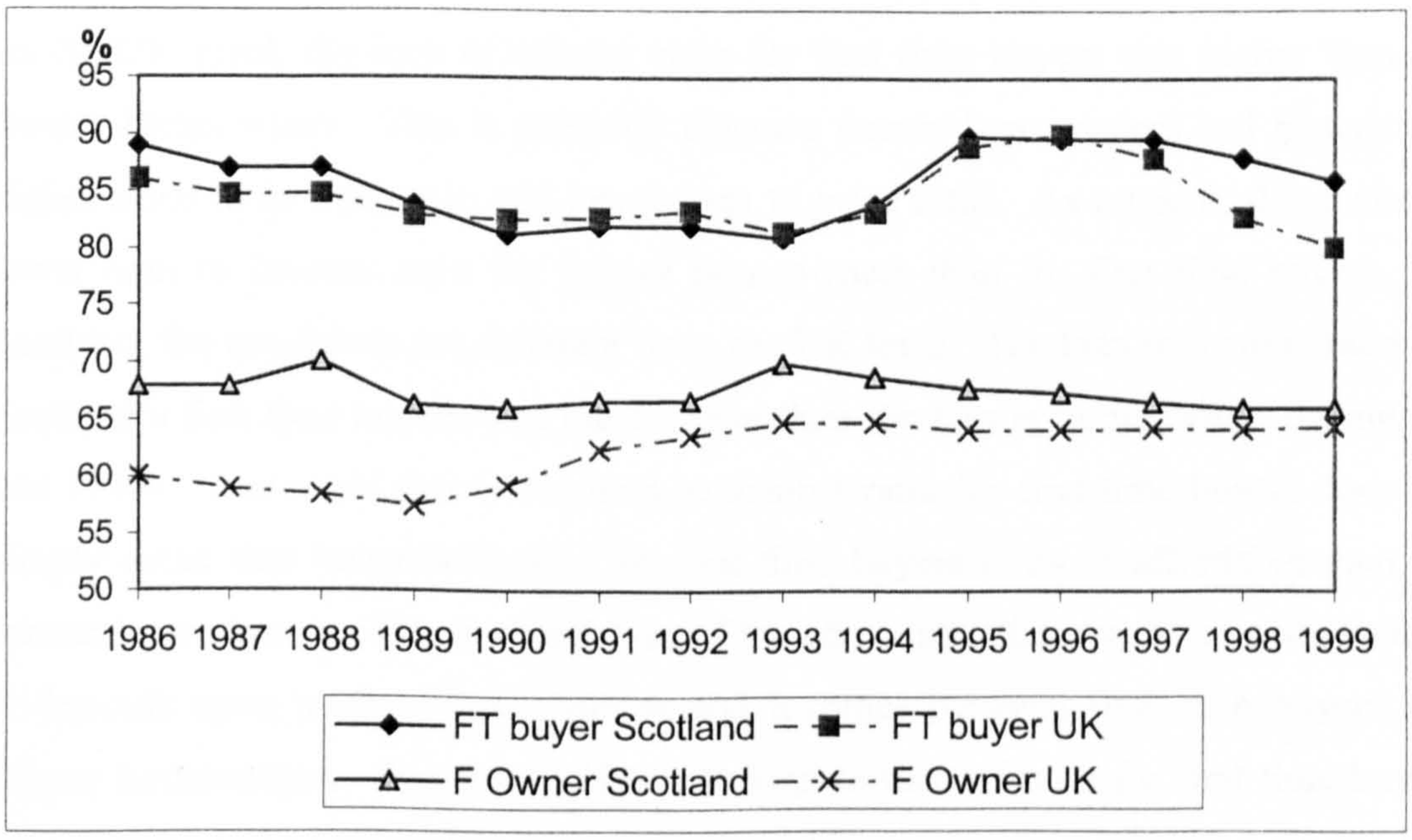

Figure 3.5 Loan to House Price Ratio in Scotland and the UK, 1986-1999

FT Buyer: first time buyer; F Owner: former homeowner

Source: Council of Mortgage Lenders, *Housing Finance*

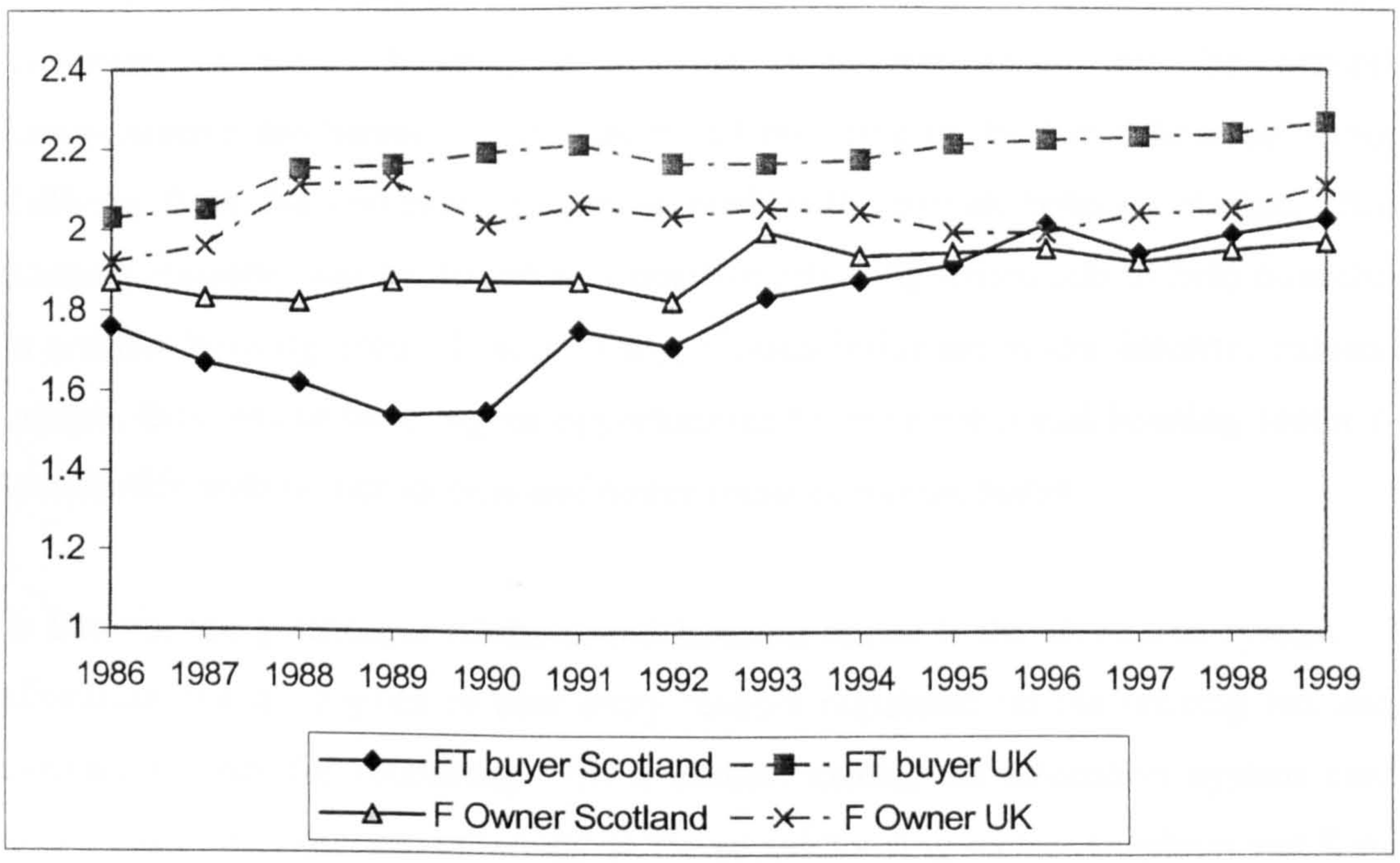

Figure 3.6 Loan to Income Ratio in Scotland and the UK, 1986-1999

FT Buyer: first time buyer; F Owner: former homeowner

Source: Council of Mortgage Lenders, *Housing Finance*

At the UK level, the loan to income ratio for first time buyers was higher than for former homeowners. This is probably because former homeowners had historically higher price to income ratio and lower loan to price ratio. As a result, this makes a lower loan to income ratio for former homeowners than for first time buyers. In Scotland, the conditions are different from the UK level. The loan to income ratio for Scotland's first time buyers was much lower than for former homeowners during the late 1980s. It is noted that lower loan to income ratio for first time buyers does not simply mean that homeownership for first time buyers is more affordable than for former homeowners. The interpretation of the above situation would be complicated. It depends upon average house prices and incomes between first time buyers and former homeowners. Since the 1990s, the loan to income ratio for first time buyers has steadily increased and it has been very close to former homeowners' level in recent years. This raises the possibility that Scotland's first time buyers have found it more difficult to buy their homes in recent years than a decade ago.

3.3.2 Rationing in the Social Rented Sector

As the aim of social housing is to make affordable homes available to households in greatest housing need, the process of obtaining access to the social rented sector is

very different to the private rented sector or the owner-occupied sector. The access constraint to social housing is not the price mechanism but the non-price, administrative mechanism. The concept of rationing in the social housing sector is different from the common concept applied to the private housing market. Social housing rationing can be treated as a positive rationing which sets to help households in greatest housing need. That is to say, if households are in low-income, vulnerable groups, they would have higher opportunities to enter the social housing sector than households with higher income and better socio-economic status.

In Britain, the gatekeeper of the social housing sector is the allocation system. The allocation system applies to new entry tenants registered on the waiting list and to existing tenants for rehousing. To a certain extent, the allocation system can be viewed as a 'bureaucratic rationing' in the social housing sector (Clapham and Kintrea 1984, Somerville 2001). Studies have criticised that the need-based allocation system fails to provide a realistic solution on the conflict between needs and aspirations and inevitably disadvantages those who are least able to choose (Clapham and Kintrea 1986, 1991, and Cowan 2001). The recent English Housing Green Paper in 2000 proposed a reform for the allocation system. The proposal offers a more customer choice based letting system, with an emphasis on the supply of proper information to applicants to ensure housing choices are well informed (Smith 2000). It is expected that the social landlords will move away from entirely needs-based housing allocation system to schemes which offer a degree of flexibility and a local base system (National Housing Federation 2000).

In addition to the allocation system, most social landlords have other restrictions on households who register on the waiting list or apply for rehousing. Table 3.5 presents some restrictions imposed by local authorities and housing associations in Scotland. There is a strong feeling that housing associations were more exclusive in their policies than local authorities because they do not want 'problem tenants' (Scott et al. 2000). Tenants with rent arrears and people involved in anti-social behaviour are the group most restricted by local authorities and housing associations. There are some differences between local authorities and housing associations. In addition to the above two most restricted groups, local authorities are more likely to have restrictions on people living outside the area, probably because of their policy of local connection.

Housing associations are more likely to have eligibility restrictions on homeowners and households who were intentionally homeless. There are almost no restrictions on tenants of other landlords.

Table 3.5 Restrictions on Eligibility for Waiting Lists and for Rehousing in Local Authorities and Housing Associations in Scotland

Group	Local Authorities		Housing Associations	
	Restriction on waiting lists (%)	Restriction on rehousing (%)	Restriction on waiting lists (%)	Restriction on rehousing (%)
Home owners	0	6	1	15
Tenants with rent arrears	15	78	21	59
People living outside the area	33	13	2	1
People responsible for anti-social behaviour	13	39	18	33
People prev. evicted for anti-social behav.	19	59	34	48
Households previous. homeless	3	16	7	17
Tenants of other social landlords	1	0	0	0

Source: Scott et al. (2000).

In contrast to the restrictions on accessing the social rented sector, some types of households are more likely to enter the social housing sector. Generally speaking, households with socio-economic disadvantages are more likely to enter the social housing sector, since the allocation system very often sets priorities for those types of households. A survey by Hardin (1997) found that three types of households: single adults without children, older persons and lone parents, accounted for the majority of new tenants in the Scottish social rented sector. Housing associations had a higher proportion of older persons and single adults without children among their new tenants than local authorities and Scottish Homes. Local authorities and Scottish Homes had a higher proportion of lone parents than housing associations.

Hardin (1997) also found that an average of 30% of new tenants were unemployed in the social rented sector. Scottish Homes had a significant higher proportion of unemployed new tenants (39%) than local authorities (27%) and housing associations

(28%). Local authorities had a higher proportion of new tenants reported to be long-term sick when compared with housing associations and Scottish Homes. Furthermore, households who were previously homeless also accounted for an important proportion of new social tenants. Local authorities had the highest percentage (26%) of new tenants who were previously registered as homeless compared with 14% in Scottish Homes and 10% in housing associations.

3.3.3 Rationing in the Private Rented Sector

The private rented sector in Scotland is relatively small in size but it remains an important part of the housing system, particularly for young people, students, new households and those who need to be mobile (Kemp 2000). Access to private renting is relatively easy compared to owner-occupation and social renting, however, some low-income households have difficulty in entering this sector. Rationing in private renting primarily depends upon the rents and the deposit. In addition to rent and deposit constraints, there are some rationing conditions, such as the regulated tenancy and private landlords' letting preferences, in the Scottish private rented market.

After the deregulation of private renting on 1 January 1989, most private tenants now are either in assured tenancies or new-style short assured tenancies. There are still some tenants in regulated tenancies, however, the number of private regulated tenants only accounted for a small proportion in the private rented sector. By 1998, about 9% of private tenants were in regulated tenancies in England (Wilcox 1999). It is estimated that the percentage of Scotland's private regulated tenants could be close to England's figures. For tenants in regulated tenancies, many of them are elderly people and are on low incomes, paying fair rents, living in old and poor quality accommodation, and renting unfurnished housing (Kemp 2000). Since many older tenants die or leave this tenancy, this sub-segment of the market has gradually declined.

Moreover, some constraints may come from private landlords. For example, private landlords' letting preferences could make it difficult for some households to rent accommodation. According to Kemp and Rhodes' (1994) survey of private landlords in Scotland, private landlords would most prefer to let to households who are in work or self-employed, while they would least prefer to let to unemployed people or

students. With regard to private landlords' preferences on household types (see Table 3.6), 30% of responding landlords would most prefer to let to couples with no children, while 36% of respondents would least prefer young single people. There are also 14% and 11% of responding landlords showing their least preferences on lone parents and couples with young children respectively. However, there are about one third of responding private landlords who do not have any letting preference.

Table 3.6 Private Landlords' Most and Least Preferred Types of Tenants—Household Type

	Most preferred (%)	Least Preferred (%)
No preference	35	29
Young single people	5	36
Middle-aged single people	7	1
Lone parents	0	14
Couple with no children	30	1
Couple with young children	8	11
Couple with older children	8	2
Elderly people	7	6
Sample base	401	401

Source: Kemp and Rhodes (1994).

In addition to preferences on household types, many private landlords have preferred to let to tenants who do not receive Housing Benefit. Kemp and Rhodes (1994) found that 67% of private individuals and 51% of agents prefer tenants who are not on Housing Benefit. In terms of asking the reasons why landlords prefer to let to tenants who are not on Housing Benefits, many landlords experienced that tenants on Housing Benefit did not look after the property, they did not always pay the rent and/or spent the housing benefit money on other things (ibid.).

A recent government policy called 'access schemes' aims to help tenants to gain access to the private rented sector (Rugg 1995). Access schemes can lower the price rationing for low-income tenants or homeless people by way of providing rent in advance or deposit guarantees to landlords (Kemp 2000). In England, access schemes have shown some successful influences on preventing or alleviating homelessness (and hence social exclusion) in a highly cost-effective manner (Randall and Brown 1994). These schemes have lately been introduced in Scotland, and are expected to play a vital role, as they did in England.

In summary, this section discusses the rationing conditions in the three main tenure sectors in Scotland. For most homebuyers, mortgage finance is the main constraint to enter the owner-occupied sector. After the deregulation of the financial market in the mid-1980s, mortgage rationing has been focused on the price mechanism. The price to income ratio, loan to price ratio and loan to price ratio are the three common criteria for many building societies and banks to evaluate mortgage borrowers' liability. To some extent, these three criteria can be seen as a rationing index for homebuyers. It is noted that these ratios only indicate the possibility of households to be constrained by mortgages. In the real world, some households can still obtain a mortgage even if they are disqualified by these ratios. In the social rented sector, the allocation system acts as the gatekeeper for households applying to this sector. Under the allocation system, households with socio-economic disadvantages and with special needs would have priority on the waiting list as well as applying for rehousing. Access to private renting is relatively easy except for regulated tenancy and some tied housing. Rationing in private renting mainly depends upon the rent and deposit. However, some types of households such as young single people or households in receipt of Housing Benefit may find it difficult to rent a home because of private landlords' letting preferences.

3.4 Help with Housing Costs

This section discusses housing subsidies to help with housing costs across tenures in Scotland. Housing subsidies addressed in this section are the government's expenditures on housing subsidy programmes to households and housing suppliers in different tenures.

3.4.1 Housing Subsidies to Owner-Occupiers

Most housing subsidies to owner-occupiers are through the tax system and are called tax expenditures.[7] Since the 1990s, the focus of housing subsidies has been switched from general subsidies to means tested subsidies. The most significant changes are

[7] Tax expenditure is a means by which the government can encourage particular activities without appearing to spend money, and usually by giving a tax allowance, which reduces net tax paid by an equal amount.

phasing out of mortgage interest tax relief and a growth of expenditures on income support for mortgage interest payments.

3.4.1.1 Mortgage Interest Tax Relief

Mortgage interest tax relief, known as MIRAS—mortgage interest relief at source from 1990, was a general subsidy available to all mortgaged owners and gave exemption from paying income tax on any income used to pay the interest payments on a mortgage (on the first £30,000 of the mortgage) (Gibb and Munro 1991). In Scotland, the cost of MIRAS increased dramatically due to a rapid growth of owner-occupation during the late 1980s and reached a peak at £530 millions in 1990/91 (see Table 3.7). After that, the cost of MIRAS rapidly reduced due to the government's policy to drive the cost down and to phase out this programme gradually. In combination with the maximum eligible mortgage of the first £30,000, the British government also reduced the basic rate of tax relief from 25% in 1988/89 to 10% in 1998/99 till its end in April 2000. The average tax relief for Scotland's mortgaged owners was reduced from its peak of £790 in 1990/91 to £170 in 1998/99.

Table 3.7 Recipients and Costs of Mortgage Interest Tax Relief in Scotland, 1988/89-1998/99

Year	Basic rate (%)	Total costs (£m)	Recipients (000s)	Average tax relief (£ per annum)	UK Average tax relief (£ per annum)
1988/89	25	370	640	580	585
1989/90	25	470	660	710	735
1990/91	25	530	670	790	800
1991/92	25	420	680	620	630
1992/93	25	340	700	490	530
1993/94	25	300	720	420	430
1994/95	20	260	780	330	340
1995/96	15	200	830	240	260
1996/97	15	180	840	210	230
1997/98	15	200	860	230	250
1998/99	10	150	870	170	180

Sources: Wilcox et al. (1998), Wilcox (2000)

Since the cutback of the basic rate in the 1990s, MIRAS had had less influence on house prices, especially in response to lower interest rates in recent years (Wilcox 1999). Therefore, the abolition of this tax relief from April 2000 would have less impact on house prices and on most existing owners' mortgaged costs. The only homebuyers likely to face a short-term increase in mortgage costs would be the minority with fixed interest rate mortgages (ibid.). In addition, the abolition of

MIRAS could have an impact on low-income homeowners in Scotland and this will be discussed in Chapter Seven.

3.4.1.2 Income Support for Mortgage Interest Payments

Unlike MIRAS which was available to all mortgaged homeowners, Income Support for Mortgage Interest Payments (ISMI) is a means tested subsidy provided to those on income support — unemployed, elderly, sick, disabled people and other vulnerable groups (Gibb, Munro and Satsangi 1999). In the mid-1990s, the government introduced reforms for ISMI, which reduced the mortgage ceiling to £100,000 and lengthened the waiting period for new and existing borrowers before they are eligible for limited and subsequently full Income Support (ibid.). Under the new rules introduced in October 1995, existing mortgage borrowers who make a new claim for ISMI receive no support for 2 months before moving onto 16 weeks of 50 per cent support (and full support thereafter), while new mortgage borrowers receive no support for 9 months before moving onto 50 per cent support (and a full support only after a further 16 weeks) (ibid.).

Table 3.8 Mortgage Interest Taken into Account for Income Support in Scotland, 1990-1999

Year	Claimants (000s)	£ Per week	£ Per week (Great Britain)
1990	14	32.64	34.33
1991	18	35.33	44.41
1992	19	32.59	44.02
1993	22	27.74	41.92
1994	24	25.51	37.81
1995	24	28.15	39.16
1996	23	26.73	36.98
1997	20	24.27	33.62
1998	20	28.20	37.16
1999	19	25.33	32.93

Source: Wilcox (2000).

After the economic recession and the rise of unemployment in the early 1990s, the number of mortgaged owner-occupiers who claimed ISMI rose significantly. Table 3.8 shows that the number of ISMI claimants in Scotland reached a peak at 24,000 persons in 1994 as well as in 1995. The introduction of new rules after October 1995 had impacts on reducing the number of claimants and the average ISMI. The number of ISMI claimants reduced from 24,000 to 19,000 between 1995 and 1999, and the average subsidy was also cutback from £28.15 to £25.33 per week during the same

period. These new rules may suggest that owner-occupiers will be more vulnerable to repossession if they become unemployed in the future. While the intention of these changes is to improve work incentives, the effect is still being observed.

3.4.1.3 Other Tax Exemptions

Despite the abolished mortgage interest tax relief, homeowners can still benefit from some tax exemptions. The most important one is the exemption from capital gains tax. Since 1988/89 capital gains tax has been levied on realised gains at the appropriate marginal tax rate for income tax on transactions (Hills 1991). Capital gains tax applied in the UK is indexed for inflation, and is thus not applied to the full cash increases in asset values (ibid.) Each taxpayer including each married couple from 1990/91 is allowed his/her first £6,500 (now increased to £7,100 in 1999/00) for exemption (Wilcox 2000).

All these features above have reduced the relative value of owner-occupiers' exemption from the tax. Most homeowners are completely exempt and private landlords pay capital gains tax at a lower effective rate than their ostensible income tax rate (Hills 1991). As a result, capital gains tax exemption on owner-occupied housing represents a significant subsidy. However, as it is a tax exemption rather than a payment, the subsidy cost is difficult to estimate and it fluctuates considerably, depending upon housing market conditions and hence the numbers of homes sold (Holmans and Whitehead 1998). The estimated value of capital gains tax exemption was £1.4 billion in the UK as a whole in 1998/99 (Wilcox 2000).

Moreover, owner-occupiers also benefit from imputed rents which are the returns generated from their properties or called the values of living in the dwelling. While private landlords have been taxed on their income from rents, owner-occupiers' imputed rental values are untaxed since 1963 (Hills 1991). Although it could have some technical difficulty in taxing imputed rents in the current income tax system, the untaxed imputed rental values should be treated as a kind of tax subsidies (in economic term) to owner-occupiers, if we see housing subsidies on the basis of tenure neutrality (see Hills 1991, Holmans and Whitehead 1998). The measurement of untaxed imputed rents as well as the capital gains tax exemption to owner-occupiers in Scotland is discussed in Chapter Five.

3.4.2 Housing Subsidies to Tenants

In the current subsidy system, there are several subsidy schemes available to public and private tenants. Housing Benefit (HB) is undoubtedly the most important subsidy to help with tenants' housing costs. Housing Benefit is a means tested subsidy, so applicants must have relatively low incomes to qualify. The current Housing Benefit scheme was introduced in 1988, following a rationalisation of the means test requirements for different types of benefits. In that year, the means test was made as the same as for income support (for unemployed households) and family credit (for low-income working households) (Harriott and Matthews 1998).

Table 3.9 presents Housing Benefit to tenants in Scotland over the last decade. It clearly shows that Housing Benefit plays an important role in subsidising tenants in terms of the number of claimants and average Housing Benefit. It is undoubtedly the case that the local authority rented sector has the highest number of Housing Benefit claimants since this sector remains the second largest tenure in Scotland. It was found that more than three quarters of new council tenants and about 70% of new housing association tenants received full or partial Housing Benefit between 1995 and 1997 (Hardin 1997, SFHA 1998). Since the 1990s, the number of Housing Benefit claimants in council housing has reduced, probably because many council tenant claimants have been transferred to the housing association sector under the Large Scale Voluntary Transfer scheme. On the other hand, it is partly because the rise in incomes and employment or the age cohort effect in council housing. It is noted that the number of private tenants in receipt of Housing Benefit has steadily reduced after 1996, which Wilcox (2000) claims that because of the introduction of local reference rent and the single room rent in 1996. The local reference rent and single room rent set up the rent ceiling for people who want to claim Housing Benefit in the private rented sector. As a result, many private tenants have a restriction of the amount of new rent that is eligible for Housing Benefit.

In Scotland, the average amount of Housing Benefit received by private tenants is much higher than social tenants. In 1999, eligible council tenants received an average Housing Benefit of £34.4 per week to pay for their rents, which only accounted for two third of the amount (£53.9) received by private tenants. This may indicate a big

rent gap between social renting and private renting as Housing Benefit usually covers partial or full rents. Furthermore the average amount of Housing Benefit received by private tenants has been significantly increased in the 1990s, partly because of a rapid increase in private rents. In addition, a steady increase in the average Housing Benefit to eligible tenants in both the public and the private rented sectors may reflect a fact that the benefit recipients have increasingly depended upon the state benefit.

Table 3.9 Housing Benefit to Tenants in Scotland, 1988-1999

	Number of Recipients (000s)			Average Weekly HB (£)		
Year	Council tenants	HA tenants	Private tenants	Council tenants	HA tenants	Private tenants
1988	496	-	-	13.76	-	-
1989	478	-	-	15.75	-	-
1990	467	-	-	17.71	-	-
1991	466	-	-	19.87	-	-
1992	461	17	61	22.13	25.40	36.90
1993	458	28	57	23.79	27.10	41.20
1994	450	32	68	24.84	31.30	44.00
1995	434	40	70	26.25	32.90	47.30
1996	424	54	68	28.60	33.40	51.80
1997	405	63	65	31.90	34.00	50.30
1998	388	75	57	32.70	35.80	51.60
1999	375	80	52	34.40	38.20	53.90

Sources: Wilcox et al. (1998), Wilcox (1999), (2000).

Notes: Separate statistics for housing association tenants receiving Housing Benefit have only been collected since May 1992.
All figures are for the May of the year. The early figures probably underestimate the number of housing association cases.

In Scotland, the average amount of Housing Benefit received by council tenants is not significantly different from housing association tenants. However, in England, the average Housing Benefit received by housing association tenants is much higher than the benefit received by council tenants. According to the Department of Social Security in 1999, housing association tenants in England received an average Housing Benefit of £54.6 per week compared to £40 for council tenants. In the same year, housing association tenants in Scotland received an average of £38.2 per week compared to £34.2 per week for council tenants. This reflects different rent levels and the different developments of the housing association sector between England and Scotland. While the rent level and the development of the housing association sector

in England have gradually caught up with the private rented sector, Scottish housing associations still retain a close relationship with the local authority rented sector.

In addition to Housing Benefit subsidy to tenants, social tenants also benefit from the below market rent subsidies if we treat housing subsidies on the basis of tenure neutrality. Private regulated tenants also benefit from below market fair rent subsidies under the concept of tenure neutrality. However, it is difficult to measure these subsidies in real terms. The measurement of below market rent subsidies to social tenants and private regulated tenants is discussed in Chapter Five.

3.4.3 Housing Subsidies to Social Housing Suppliers

Housing subsidies to social landlords can primarily be divided into general subsidies to local authority dwellings and capital grants to housing associations.

3.4.3.1 General Subsidies to Local Authority Dwellings

The central government's general subsidies to local authorities are to reduce the cost of local authority rented dwellings. These subsidies primarily go into the Housing Revenue Account (HRA). The 1989 Housing Act introduced a new financial regime to local authorities in England and Wales (activated from 1990/91) which gives more controlling power to local authorities over their rents and expenditures on their dwellings (Gibb, Munro and Satsangi 1999). On the other hand, central government withdrew general subsidies to local authority dwellings. The gap due to the subsidy cutback was bridged by local authorities' revenue income primarily through increasing council rents. Therefore we have seen a sharp reduction in central government's general subsidies (though exchequer subsidy and rate fund transfer) in England and Wales, specifically subsidies have become negative (refund from local authorities' revenue account) after 1994/95 (see Table 3.10).

However, the new financial regime for local authorities did not apply to Scottish local authorities. In Scotland, there has been no reform for the local authority financial regime to date. The Scottish local authority financial system currently operating bears more similarity to the English system of the 1980s than that of the 1990s (Gibb, Munro and Satsangi 1999). The central government continued to provide a large amount of funding to subsidise Scottish council dwellings. Even though the central

government's general subsidies have rapidly reduced since mid-1990, these subsidies still remained positive subsidies (expenditures) in Scotland rather than negative subsidies (refund) in England. By 1999/2000, Scottish local authorities received £11 million from the central government to subsidise their dwellings compared to -£960 millions to English local authorities.

Table 3.10 General Subsidies to Local Authority Housing in Scotland, Compared to England, 1988/89-1999/00

(£m)

	Scotland			England		
Year	Exchequer subsidy	Rate fund transfer	Total net subsidy	Exchequer subsidy	Rate fund transfer	Total net subsidy
1988/89	55	25	80	535	309	844
1989/90	65	10	76	636	83	719
1990/91	58	8	67	1,156	-19	1,137
1991/92	56	-1	55	873	-19	852
1992/93	47	-1	47	508	-25	483
1993/94	36	-2	34	121	-17	104
1994/95	24	-2	23	-108	-19	-127
1995/96	22	-3	19	-408	-28	-436
1996/97	19	-2	17	-481	-44	-525
1997/98	16	0	16	-563	-47	-610
1998/99	13	0	13	-740	-65	-805
1999/00	11	0	11	-884	-76	-960

Source: Wilcox (2000)

3.4.3.2 Subsidies to Housing Associations

Subsidies to housing associations are mainly through capital funding. The most important capital grant to housing associations is known as the housing association grant (HAG) in Scotland (now called the Social Housing Grant in England and Wales following the 1996 Housing Act). The Housing Act 1988 and Housing (Scotland) Act 1988 introduced a new financial regime to housing associations. Under the new regime, the amount of HAG is determined before the housing association scheme development, and would not cover the over-run costs. The grant rate also is set up as a fixed percentage of the development costs. In other words, housing associations need to manage risks in their schemes and need to seek private funds to bridge the gap between the public funds and the operating costs (Best 1997).

In Scotland, housing associations registered with Scottish Homes are eligible for applying Housing Association Grant. Housing associations usually bid for HAG on the basis of costs against agreed limits for certain types of development and an

acceptable rent level (Gibb et al. 1999). The capital funds need to be scrutinised by Scottish Homes, and the amount of scrutiny is based on housing associations' performance and regulation ratings (ibid.). Then the rest of the capital cost for housing associations' development scheme needs to be raised from private financial institutions, such as banks and building societies. In England, housing associations registered with Housing Corporation are eligible for Social Housing Grant. The process for housing associations' bidding for SHG is similar to Scotland, except for some small housing associations and associations located south of the border (ibid.).

Table 3.11 Capital Grants to Housing Associations in Scotland, Compared to England, 1989/90-1998/99

	Scotland		England	
Year	Programme £m	Grant rate %	Programme £m	Grant rate %
1989/90	203	-	1,034	75
1990/91	195	-	1,234	75
1991/92	220	-	1,732	73
1992/93	255	85	2,369	72
1993/94	263	84	1,843	67
1994/95	268	81	1,530	62
1995/96	279	79	1,183	58
1996/97	256	74	1,068	56
1997/98	174	70	702	56
1998/99	165	66	621	54

Sources: Wilcox et al. (1998), Wilcox (2000).
Notes: Consistent Scottish figures for the year to 1991/92 are not available.
In Scotland no separate HAG rent figures exist before 1992.

In order that housing associations can be self-sufficient in their development schemes, the HAG (and SHG) rate has reduced annually since 1990s. Between 1992/93 and 1998/99, the target HAG rate was reduced from 85% to 66% in Scotland and from 72% to 54% in England, thus the capital funding has been sharply cut back in both countries (see Table 3.11). In other words, many Scottish housing associations needed to borrow one third of capital costs from the private sector in 1998/99. To cover rising private loans, many housing associations have increased their rents, and this may explain why there has been a rapid increase in housing association rents in the 1990s.

3.4.4 Subsidies to Private Housing Suppliers

The government's subsidies to private housing providers have primarily depended upon tax incentives and capital grants. In Scotland, two main subsidies have been provided to private housing suppliers to help with their rented dwellings over the last decade. These two subsidy schemes are the Business Expansion Scheme (BES) and Grants for Rent and Ownership (GRO).

The Business Expansion Scheme was originally set up to help new manufacturing companies to raise venture capital. From 1988 to 1993, the BES was extended to unquoted companies letting assured tenancies, thus providing tax incentives for individuals to buy shares in companies letting in the newly deregulated market (Crook and Kemp .1996). Under the BES, assured tenancy companies can raise up to £5 million in a tax year. Individuals who buy shares in these assured tenancy companies can get income tax relief up to £40,000 in any one tax year and are eligible for capital gains tax relief on any chargeable real gains arising from the disposal of their shares in the future (ibid.). The BES also has regulations for shareholders as well as assured tenancy companies. Shareholders must hold their shares for at least five years and the companies must let on assured tenancies for at least four years (ibid.). Between 1988 and 1993, there were £119 million invested in BES assured tenancy companies in Scotland (Wilcox et al. 1998).

GRO grant, introduced in 1990, is a deficit subsidy for private operating in Scotland and the grant is available through Scottish Homes that has no parallel in England. GRO grant is designed to provide private builders with a secured and pre-determined rate of return on agreed projects so that they will build in areas that they would not otherwise consider to be attractive (Gibb, Istephan and Kemp 1997). In other words, the grant is used to correct problems of market failure in declining areas. The grants are mainly used to support three types of projects (Munro and Gibb 1996, p. 100):

- In rural areas, where speculative building has been seen as too risky or as too costly;
- To provide low-cost housing in pressured market areas where new houses are generally beyond the reach of lower income purchases;
- To contribute towards tenure diversification in large estates and renewal in urban areas, through either new-build or rehabilitation.

The GRO grant for market rented housing is now discontinued. The grant for owner-occupation has been suspended. Between 1990/91 and 1995/96, Scottish Homes funded 211 projects (2,126 dwellings) for market rented sector through the GRO grant (Gibb, Istephan and Kemp 1997).

3.4.5 A Comparison of Housing Subsidies across Tenures

A review of public expenditures on housing subsidies in the 1990s shows a clear picture of a reduction in fiscal support for general subsidies but a large increase in means tested assistance towards housing costs, principally in the form of Housing Benefit and also through income support for mortgage interest payments. These changes have significantly influenced housing subsidies to households across tenures in Scotland (see Figure 3.7).

Due to a diminishing mortgage interest tax relief, the average amount of subsidies to owner-occupiers have been sharply reduced. Meanwhile income support help with mortgage interest payments has fallen since the mid-1990s. This has been partly the result of falling unemployment and interest rates, and partly due to the new restrictions to ISMI introduced in October 1995 (Wilcox 1999). On the contrary, the cost of Housing Benefit to council tenants and private tenants has steadily increased. In particular, the growth rate of Housing Benefit to private tenants was faster than that to council tenants. This is partly a result of a rapid increase in private rents in recent years. In 1997 and 1998, average subsidies (mainly ISMI) to owner-occupiers were lower than to council tenants in receipt of Housing Benefit, let alone the higher Housing Benefits received by private tenants. For example, in 1998, eligible owner-occupiers received average subsidies £31.5 per week (£28.2 from ISMI) compared to £32.7 and £51.6 per week of Housing Benefit to eligible council tenants and private tenants respectively. However, one should note that the number of ISMI claimants only accounted for a very small proportion (2% in 1998) of total mortgaged homeowners compared to more than half of social tenants and one third of private tenants in receipt of Housing Benefit.

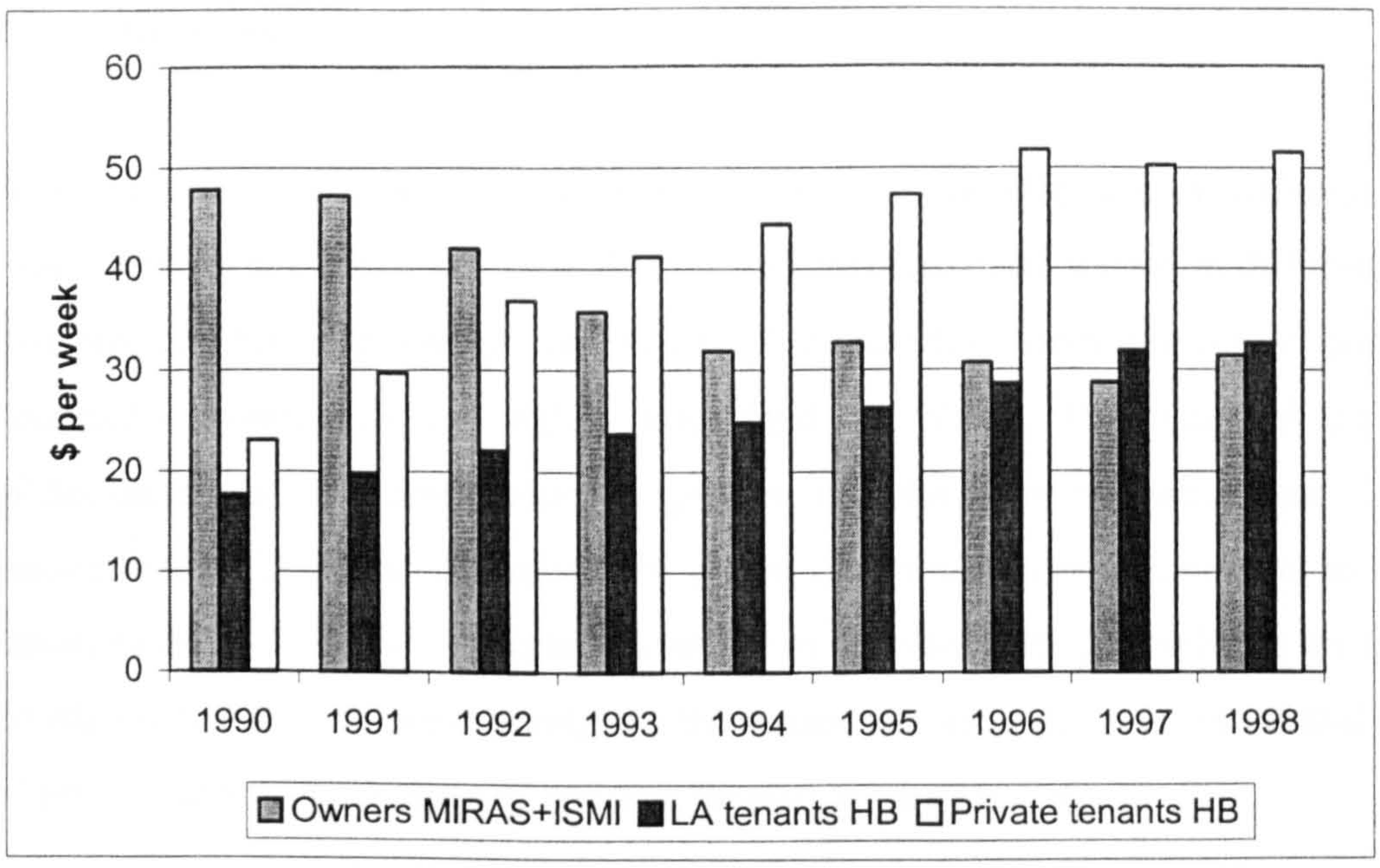

Figure 3.7 Housing Subsidies to Households across Tenures, 1990-1998

Sources: Wilcox et al. (1998), Wilcox (2000)

Notes: MIRAS: mortgage interest relief at source; ISMI: income support for mortgage interest; HB: Housing Benefit

Moreover, the housing subsidies presented above are the government expenditures direct to households to reduce their housing costs. To some extent, these subsidies can be called cash-flow subsidies, as Hancock and Munro (1992) suggest. In a discussion of the distributional effect of housing subsidies between tenures, studies have emphasised economic subsidies rather than cash flow subsidies (see for example Rosenthal 1977, Robinson 1981, Hills 1991, Maclennan, Gibb and More 1991, and Hancock and Munro 1992). As Hills suggests, economic subsidies to owner-occupiers consist of capital gains tax exemption and untaxed imputed rents. For social tenants, economic subsidies include the below market rent subsidies. The concept of economic subsidies is used in this thesis to model the subsidy effect on households' tenure decisions. As O'Sullivan (1984) suggests, the definition of formal subsidy (or called economic subsidy in this thesis) is theoretically more acceptable, and the measures of (economic) subsidy have more effective impacts on housing finance system. Also, these measures are consistent with household reallocation decisions as well as tenure shift. The distributional effect of economic subsidies as well as cash flow subsidies between tenures will be discussed in detail in Chapter Seven.

3.5 Summary

Over the last two decades, housing in Scotland has developed in a different pattern from housing in the rest of Great Britain, and this has been shown in different tenure structure and housing market conditions. The growth of owner-occupied housing in Scotland is significantly faster than in England and Wales. The historical importance of Scotland's public rented sector is greater than the other two countries. Housing associations in Scotland are relatively young and small in size compared to housing associations in England. Scotland's share of private renting dwellings to the total housing stock is the lowest among the three nations, and there is a substantial number of private unfurnished and tied housing located in rural Scotland.

The change in tenure pattern in Scotland has influenced its housing market. Unlike the housing market in England and Wales, which suffered a great fluctuation during the late 1980s and early 1990s, the Scottish housing market had much greater stability. We have seen a steady growth of private new house building over the last two decades. A stable economy and continuously growing demand for owner-occupied housing have led the Scottish housing market to be less fluctuating than the housing markets in England and Wales. House prices in Scotland grew steadily and housing transactions remained more stable than in the other two countries.

In addition, there are some rationing factors which influence households' tenure preferences and housing market conditions. In the owner-occupied sector, mortgage finance is the main constraint for most homebuyers. After deregulation of the financial market, the mortgage rationing has been focused on price mechanism. The price to income ratio, loan to price ratio and loan to income ratio are the three common criteria for building societies and banks to evaluate mortgage borrowers' liability. Since Scotland has a stable housing market, these three ratios have been less fluctuating than those in the rest of the UK. The allocation system acts as the gatekeeper of the social rented sector. Scotland's social housing allocation system presents its unique characteristics to mainly house people with socio-economic disadvantages and in special needs. Rationing in the private rented sector mainly depends upon the rent and deposit. However, due to some private landlords' certain

letting preferences, young and single people or households in receipt of Housing Benefit may have difficulty in renting a home in Scotland.

Housing subsidies also play an important role in the changes in tenure mix and housing market conditions. There has been a switch of the government's housing subsidy policy from general subsidies to means tested subsidies in the last decades. The most significant changes have been the phasing out mortgage interest tax relief and a rapid increase in Housing Benefit expenditures. In Scotland, the average Housing Benefit to social tenants was higher than the average mortgage interest tax relief and income support for mortgage payments to owner-occupiers in recent years. The unique financial system in the Scottish social rented sector also continues to benefit social tenants. It is noted that the use of economic subsidies rather than cash flow subsidies is more appropriate in estimating the household's tenure decision as well as the distributional effect of housing subsidies between tenures.

The discussions above provide us with an analysis of the Scottish tenure structure and the housing market conditions which differ from the rest of Great Britain. These unique characteristics in the Scottish housing market should help to construct the explanatory variables of the tenure choice models in Chapter Five. In particular, the three mortgage ratios can be used to construct the mortgage rationing variable; the criteria of the allocation system can apply to the social housing rationing variable in the tenure choice models. In economic terms, housing subsidies are more suitable in estimating the housing subsidy effect on households' tenure choice behaviour than housing subsidies in cash terms. Moreover, the analysis of Scottish tenure patterns and the housing market conditions in this chapter can provide some expectations to the estimation results of Scottish households' tenure choice behaviour as discussed in Chapter Six and also to the outcome of policy analysis derived from the 1996 Scottish House Condition Survey covered in Chapter Seven. Further chapters will focus on tenure choice model development, data and variables applied to the tenure choice models and an analysis of the model results.

CHAPTER FOUR TENURE CHOICE MODELS

In this chapter, two models with different structures are developed in order to estimate the household's tenure choice behaviour. The first model discusses a one-level choice model analysing the household's tenure choice and its determining factors. The second model consists of a hierarchical choice structure to estimate the household's move-stay decision and tenure choice. This chapter is organised into three sections. The first section discusses the one-level choice model of tenure choice. The second section is the hierarchical choice model of mobility and tenure choice, and a brief summary forms the last section.

4.1 The Model of Tenure Choice

As discussed in chapter two, tenure choice theory is derived from the theories of consumer choice and housing demand. The structure of the tenure choice model in this chapter is based on a consumer choice and housing demand model. The first part of this section discusses the theoretical framework of the tenure choice model. The multiple tenure choice function is then derived and, finally, a multinomial logit functional form is selected to estimate household tenure choice behaviour

4.1.1 Theoretical Framework

The theoretical framework of the tenure choice model is illustrated in Figure 4.1. In this structure, a household's housing demand decision and its tenure choice are interdependent, which has been discussed in detail in Chapter Two. More attention will be paid to tenure choice in this chapter. The choice of tenure in Britain can simply be classified into three main groups: owner-occupation, social renting, and private renting.

The household's tenure choice is influenced by a variety of factors. Summarised from Chapter Two and Chapter Three, this framework suggests that a household's tenure decision is influenced by the household's socio-economic characteristics, expected mobility, previous tenure status, location, neighbourhood quality, the user cost of capital, housing subsidies and rationing factors. The household's socio-economic

characteristics generally include the household head's age, sex, marital status, employment, income and also the size of household. The user cost of capital is the relative cost of owning or renting. Moreover, in Britain the household's tenure choice is deeply influenced by housing policy and subsidy programmes. For example, income related assistance would change households' housing costs and their budget constraints, thus altering their tenure decisions. The detailed measurement of these variables will be discussed in Chapter Five.

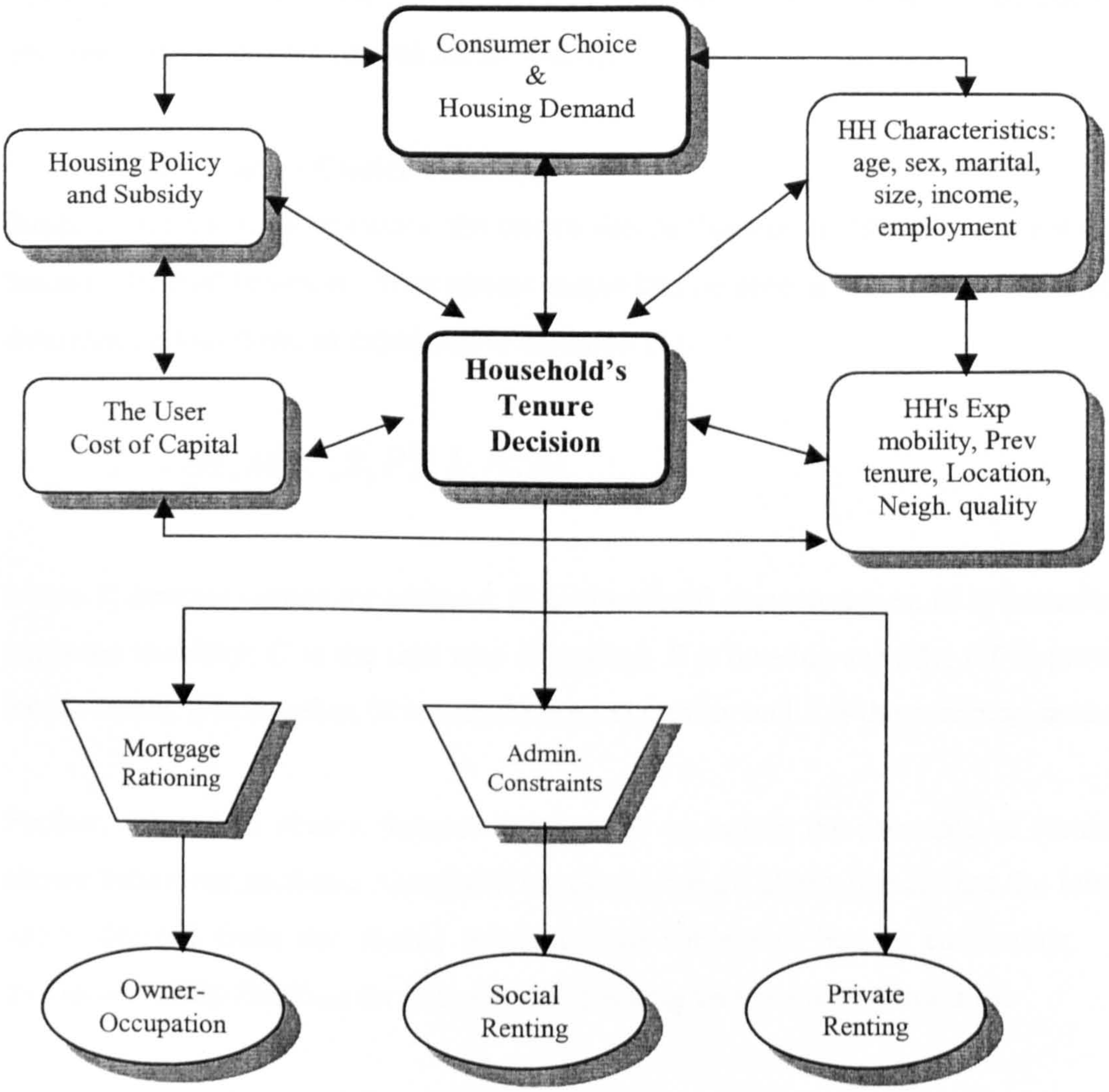

Figure 4.1 The Structure of the Tenure Choice Model

In addition to those factors, households could face some constraints in accessing different tenures. As discussed in previous chapters, mortgage rationing factors, for example the loan-to-value ratio, the loan-to-income ratio and price-to-income ratio imposed by banks and building societies, are the most common constraints to

homebuyers in Britain. Administrative rationing factors, such as the waiting list and the allocation schemes applied in the social rented sector, constrain some household's ability to access this sector. As stated in Chapter Three, the allocation system in the social rented sector is to encourage households in low-income and in special needs to have more opportunities to live in affordable homes. In certain contexts, administrative rationing does set priorities to limit some households' access to social housing. Compared to owner-occupation and social renting, households are less constrained to enter or leave the private rented sector, except for the rent and deposit constraints. In Britain, the private rented sector plays an important transitional role between owner-occupation and social renting.

4.1.2 Tenure Choice Function

Based on the model framework, the tenure choice function is derived from a standard housing demand function. Thus tenure choice can be seen as a function of a vector of determining variables, as expressed in equation (1).

$$T_j = [H, M, C, S, PT, L, N, R] \tag{1}$$

where T_j denotes choice for tenure j; H is household characteristics; M is household's expected mobility; C is the user cost of capital; S is housing subsidy, PT is previous tenure status, L is location, N is neighbourhood quality and R is the rationing factor.

Further, the tenure choice function is assumed to satisfy the principle of consumer choice behaviour so that a household chooses a tenure alternative in that the level of utility derived from the choice is maximised subject to budget constraints. The maximum utility function for household i choosing tenure j is expressed as:

$$U_{ij} = V_{ij}[H, M, C, S, PT, L, N, R] + \varepsilon_{ij} \tag{2}$$

$$= V^*_{ij} + \varepsilon_{ij} \tag{3}$$

where V^*_{ij} is the deterministic component of the utility of household i choosing tenure j alternative, and ε_{ij} is an error term. The model of tenure choice is formulated on the basis of equation (3).

Then, based on the random utility function, the probability of a household *i* choosing tenure alternative *j* can be expressed as:

$$P_{ij} = \Pr\left(U_{ij} > U_{ij'}\right) \qquad (4)$$

$$for \quad j \neq j', j, j' \in J$$

Where, *j* and *j*'=1,...*J*. *J* denotes the set of alternatives available to household *i*. In this case *J*=3, denoting three main tenures.

Substitution of equation (3) into equation (4) yields:

$$\begin{aligned} P_{ij} &= \Pr\left(V_{ij} + \varepsilon_{ij} > V_{ij'} + \varepsilon_{ij'}\right) \\ &= \Pr\left(\varepsilon_{ij'} < V_{ij} + \varepsilon_{ij} - V_{ij'}\right) \end{aligned} \qquad (5)$$

Subject to the logical condition assuming that the sum of all *J* choice probabilities should be exactly equal to 1, denoting as $\sum_{j}^{J} P_{ij} = 1$.

The actual calculation of the choice probabilities depends heavily upon the assumption of the probability distribution of the error term ε_{ij} (Maddala 1983). Based on above conditions, it is necessary to find a suitable discrete choice model in order to analyse the multiple tenure choice function.

4.1.3 The Discrete Choice Model

The model of tenure choice in this chapter contains a multiple-choice function and also the choice for tenure is a discrete choice rather than a continuous choice. Therefore, a discrete choice model is employed to estimate the probability of a household choosing a tenure alternative among three tenures. The model selection and the derivation of model functional form and the test of independence of irrelevant alternative property are discussed below.

4.1.3.1 The Selection of Discrete Choice Model

As stated in Chapter Two, a wide range of discrete choice models have been developed to estimate tenure choice behaviour during the past two decades. Among discrete choice models, the multinomial logit model (MNL), the multinomial probit model (MNP), and the nested multinomial logit model (NMNL) are the most widely used models in housing decision and tenure choice analysis, as discussed in Chapter Two. Among these three types of models, the MNL model provides a convenient simple form for the probabilities without any requirement of multivariate integration. Furthermore, the likelihood function for the multinomial logit specification is globally concave, which allows for an easy computation (McFadden 1973). Because of its simple structure, the interpretation of the MNL model is more straightforward than the NMNL model and the MNP model.

However, the MNL model has a widely known limitation which regards the violation of independence from irrelevant alternative (IIA) property. According to Hausman and McFadden (1984), the IIA property states that "the ratio of the probabilities of choosing any two alternatives is independent of the attributes of any other alternatives in the choice set" (p. 1219). Many housing researchers have pointed out that the IIA property can easily be violated in the MNL model of housing choice (see for example, Boehm 1982, Quigley 1985, Börsch-Supan and Pitkin 1988, and Tu and Goldfinch 1996). They indicate that in the housing choice analysis, the relative probability of a buyer choosing two dwelling alternatives might be influenced by the existence of the third dwelling, and thus it violates the IIA property of using the MNL model.

The multinomial probit (MNP) model is an alternative model which satisfies the IIA assumption. But the use of the MNP model has been limited due to the requirement that multivariate normal integrals must be evaluated to estimate the unknown parameters (Hausman and McFadden 1984). Because of its complexity, the MNP model does not provide a specification test as convenient as the MNL model. Another model maintaining the IIA property is the nested multinomial logit model (NMNL), which has been widely applied to many housing choice studies (see Quigley 1985, Börsch-Supan and Pitkin 1988, Tu and Goldfinch 1996). The NMNL model requires an assumption of a hierarchy level (two or more levels) of choice alternatives, which is only suitable for a model with a hierarchical choice framework.

In this chapter, the first model of tenure choice aims to interpret the household's choice behaviour among three tenures. Thus this model contains a one-level choice framework and it does not require an assumption of hierarchical choices. As a result, the multinomial logit model is suitable for the first model of tenure choice. However, this model needs to overcome the IIA problem.

4.1.3.2 Multinomial Logit Model Functional form

The functional form of the multinomial logit model can be derived on the basis of equation (5). According to Maddala (1983), if the residuals ε_{ij} are identically and independently distributed, the cumulative distribution function (CDF) of ε_{ij} is expressed as:

$$F(\varepsilon_{ij} < \varepsilon_{ij'}) = \exp(-e^{-\varepsilon_{ij'}}) \tag{6}$$

the probability density function (PDF) is as:

$$f(\varepsilon_{ij}) = \exp(-\varepsilon_{ij} - e^{-\varepsilon_{ij'}}) \tag{7}$$

Then equation (5) can be written as:

$$\begin{aligned} P_{ij} &= \Pr(\varepsilon_{ij'} < \varepsilon_{ij} + V_{ij} - V_{ij'}) \text{ for all } j \neq j' \\ &= \int_{-\infty}^{\infty} \prod_{j' \neq j} F(\varepsilon_{ij} + V_{ij} - V_{ij'}) \cdot f(\varepsilon_{ij}) d\varepsilon_{ij} \end{aligned} \tag{8}$$

where $F(\cdot)$ and $f(\cdot)$ are given by equation (6) and (7), respectively. Now

$$\begin{aligned} \prod_{j' \neq j} F(\varepsilon_{ij} + V_{ij} - V_{ij'}) \cdot f(\varepsilon_{ij}) &= \prod_{j' \neq j} \exp(-e^{-\varepsilon_{ij} - V_{ij} + V_{ij'}}) \exp(-\varepsilon_{ij} - e^{-\varepsilon_{ij}}) \\ = \exp\left[\varepsilon_{ij} - e^{-\varepsilon_{ij}} \left(1 + \sum_{j' \neq j} \frac{e^{V_{ij'}}}{e^{V_{ij}}}\right)\right] \end{aligned} \tag{9}$$

If we let

$$\lambda_{ij} = \log\left(1 + \sum_{j' \neq j} \frac{e^{V_{ij'}}}{e^{V_{ij}}}\right) = \log\left(\sum_{j=1}^{J} \frac{e^{V_{ij'}}}{e^{V_{ij}}}\right) \tag{10}$$

then equation (8) can be expressed as:

$$\begin{aligned} P_{ij} &= \int_{-\infty}^{\infty} \exp\left(-\varepsilon - e^{-(\varepsilon_{ij} - \lambda_{ij})}\right) d\varepsilon_{ij} \\ &= \exp(-\lambda_{ij}) \int_{-\infty}^{\infty} \exp\left(-\varepsilon^*_{ij} - e^{-\varepsilon^*_{ij}}\right) d\varepsilon^*_{ij} \\ &= \exp(-\lambda_{ij}) \\ &= \frac{e^{V_{ij}}}{\sum_{j=1}^{J} e^{V_{ij'}}} \end{aligned} \tag{11}$$

where $\varepsilon^*_{ij} = \varepsilon_{ij} - \lambda_{ij}$

Equation (11) is the general functional form of the MNL model. Where, V_{ij} is a vector of explanatory variables describing tenure choice and J represents all tenure choice alternatives. In this thesis, $J = 3$ denoting three tenures. Equation (11) is interpreted as the probability of household i when faced with J choice set with V vector of explanatory variables, will choose j tenure alternative.

The general functional form of the MNL model in equation (11) can also be expressed as:

$$P_{ij} = \left[\exp(V_{ij})\right] \Big/ \left[\sum_{j'=1}^{J} \exp(V_{ij'})\right] \tag{12}$$

$$for\ j, j' = 1 \ldots . J$$

If we let

$$V_{ij} = \beta_{jk} X_{ik} \tag{13}$$

where X_{ik} denotes a variable of kth attribute specific to household i, and β_{jk} is a corresponding taste parameter to be estimated, then equation (12) can be rewritten as:

$$P_{ij} = \left[\exp\left(\sum_{k}\beta_{jk}X_{ik}\right)\right] \Big/ \left[\sum_{j'=1}^{J}\exp\left(\sum_{k}\beta_{j'k}X_{ik}\right)\right] \qquad (14)$$

for all j,j'=1...J.

The log likelihood method is employed to estimate the multinomial logit model as presented in equation (15). According to Greene (2000), the log likelihood function can be derived by defining, for each household, d_{ij}=1 if tenure alternative j is chosen by household i, and d_{ij}=0 if not, for the J+1 possible outcomes. Then, for each i, one and only one of the d_{ij}'s is one.

$$\ln L = \sum_{i}\sum_{j=0}^{J} d_{ij} \ln P_{ij} \qquad (15)$$

Then the first derivatives are:

$$\frac{\partial \ln L}{\partial \beta_j} = \sum_{i=1}\left[d_{ij} - P_{ij}\right]x_i \qquad \text{for } j=1,\ldots J \qquad (16)$$

The second derivative matrix has J^2 blocks, each K by K.

$$\frac{\partial^2 \ln L}{\partial \beta_j \partial \beta_l} = -\sum_{i=1}^{n} P_{ij}\left[1(j=l) - P_{il}\right]x_i x'_l \qquad (17)$$

where $1(j=l)$ equals 1 if j equals l and 0 if not.

4.1.3.3 Testing the Independence of Irrelevant Alternative Property

The functional form of the MNL model implies the necessary and sufficient characterisation, termed the independence of irrelevant alternative property, which means that the ratio of probabilities of choosing any two alternatives is independent of the attributes or the availability of a third alternatives, presented as follows: (Hausman and McFadden 1984)

$$P(i|z,C,\beta) \equiv P(i|z,S,\beta)P(S|z,C,\beta) \tag{18}$$

where $i \in S \subseteq C$ and

$$P(S|z,C,\beta) = \sum_{j \in A} P(j|z,C,\beta) \tag{19}$$

where $C = \{1,...J\}$ is a full choice set; S is a subset of C; *i,j*, are alternatives in C; *z* is a *K*-vector of explanatory variables describing tenure choice; β is a *K*-vector parameters to be estimated.

With respect to testing the IIA property, Hausman and McFadden (1984) suggest an alternative specification-error test for the IIA property. They indicate:

> If a subset of the choice set truly is irrelevant, omitting it from the model altogether will not change parameter estimates systematically. Inclusion of these choices will be inefficient but will not lead to inconsistency. But the remaining odds ratios are not truly independent of these alternatives, the parameter estimates obtained when these choices are eliminated will be inconsistent (quoted from Greene 2000, p. 865)

Greene (2000) states that assuming *c* is the full choice set, and *s* is a proper subset of *c*. Let $\hat{\beta}_c$ be the parameter estimate obtained by maximum likelihood estimation on the full choice set *c*, and $\hat{V}_c$ denotes the estimate covariance matrix. Let $\hat{\beta}_s$ and $\hat{V}_s$ be the corresponding estimates for maximum likelihood estimation applied to the restricted choice set *s*. Under the null hypothesis that the IIA property holds, $\hat{\beta}_s - \hat{\beta}_c$ is a consistent estimator of zero. Under the alternative specification where the IIA fails, it is not zero. Under the null hypothesis, $\hat{\beta}_s - \hat{\beta}_c$ has an estimated covariance matrix $\hat{V}_s - \hat{V}_c$. Thus, the statistic is:

$$\chi^2 = \left(\hat{\beta}_s - \hat{\beta}_c\right)' \left(\hat{V}_s - \hat{V}_c\right)^{-1} \left(\hat{\beta}_s - \hat{\beta}_c\right) \tag{20}$$

The statistic is asymptotically distributed as chi-square with degree of freedom equal to the rank of $\hat{V}_s - \hat{V}_c$.

Another specification test of IIA property suggested by Hausman and McFadden is to apply the nested logit model (currently called nested multinomial logit model). The nested multinomial logit model provides an optimal test procedure for IIA property. Studies like Hausman-McFadden (1984) and Quigley (1985) indicate that the parameter of inclusive values can be used to test the IIA property in the nested multinomial logit model. The test of IIA property in the nested multinomial logit model will be discussed in the next section.

In summary, this section introduces a model to analyse the household's tenure choice behaviour. In Britain, the household's tenure choice can be simply classified into three alternatives: owner-occupation, social renting and private renting. Based on this structure, a multinomial logit model is employed to estimate the multiple tenure choice function. The multinomial logit model provides a simple functional form and allows for easy computation. Because of its simple structure, the interpretation of the multinomial logit model is more straightforward than other discrete choice models. As a result, the multinomial logit model is suitable for the first model to directly interpret the influence of the determinants on tenure choice. However, the multinomial logit model has its weakness in terms of violating the IIA assumption. Therefore, the multinomial logit functional form of tenure choice model needs to be improved. A model with more complex functional form than the MNL model is introduced in the following section.

4.2 The Model of Mobility and Tenure Choice

As an improvement of the first model, the second model provides a decision tree to analyse the household's tenure choice behaviour given its moving/stay decision. The theoretical framework, the hierarchical level of mobility and tenure choice function and the selection of the hierarchical choice model and its functional form are discussed in turn.

4.2.1 Theoretical Framework

As discussed in Chapter Two, the relationship between the household's decision to move and the choice of tenure is interdependent. Some studies have suggested that the household's mobility decision and tenure choice is a joint choice (see for example Boehm 1981, Zorn 1988, Ioannides and Kan 1996). Some applied a hierarchical choice function to estimate the mobility decision and tenure choice (see Clark and Onaka 1985, Deurloo, Dieleman and Clark 1987). This chapter assumes that a household's mobility decision and tenure choice can be seen as a hierarchical choice function. The structure of the mobility decision and tenure choice is illustrated in Figure 4.2. In this framework, a household's mobility decision and tenure choice can be divided into two levels. The upper level is the household's decision to move or stay; the lower level is the choice for three alternative tenures, and the stay. It is noted that the stay in the lower level is a degenerated branch from the upper level.

The household's mobility decision is influenced by a variety of factors. Summarised from Chapter Two, housing dissatisfaction is one of the most important factors triggering households to move (Clark and Onaka 1985). For many households, the housing dissatisfaction may come from their dissatisfaction with housing and neighbourhood quality. Households in different life-cycle stages would have different housing demand, thus triggering them to move and sometime to change their tenure status (Clark and Dieleman 1996). As a result, this thesis assumes that, from a cross-sectional perspective, households' socio-economic characteristics, such as age, sex, marital status, household size, income and employment status, as well as neighbourhood quality have important effects on households' likeliness to move or stay. Furthermore, as stated in Chapter Two, searching and moving costs are also important factors while households consider moving. However, searching and moving costs to some degree are difficult to identify from housing costs. Again, the detailed measurement of variables affecting mobility and tenure choice will be discussed in Chapter Five.

With respect to the tenure choice level, this framework assumes that a household's choice for a tenure alternative is made following its decision to move. This shows that the decision to move and the choice of a tenure alternative are interrelated. In other words, the variables influencing mobility decisions are interrelated with the variables

of tenure choice. In this model, the variables affecting households' tenure choice are the same as the first model which not only includes the household socio-economic characteristics but also includes the housing and neighbourhood attributes such as location, dwelling type, and neighbourhood quality. More importantly, housing subsidy and rationing effects will be examined in this model. It is assumed that some variables could affect both the decision to move and the choice of tenure, and this will be examined in the later chapters.

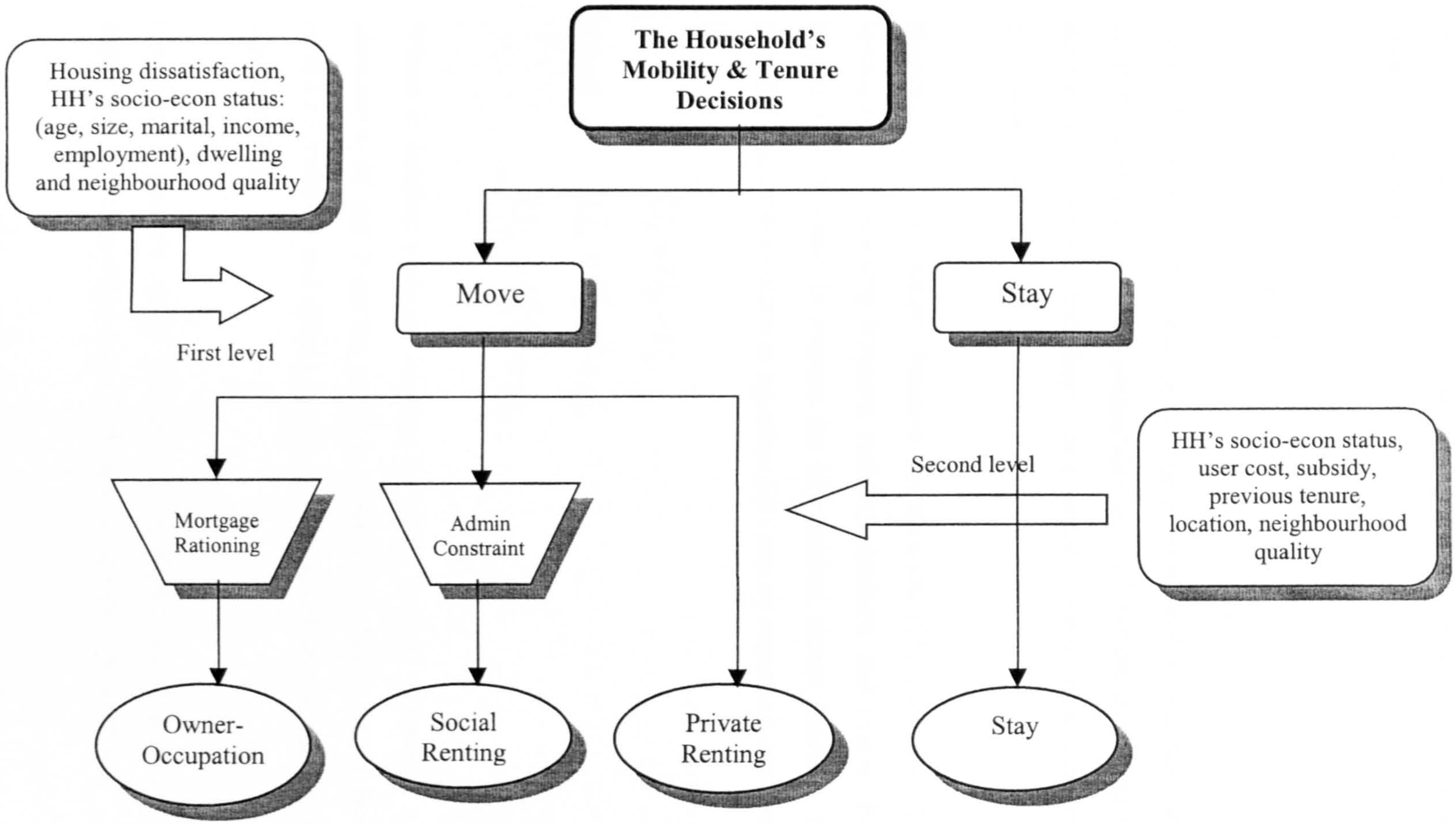

Figure 4.2 The Structure of the Mobility and Tenure Choice Model

4.2.2 Mobility and Tenure Choice Function

It is assumed that the household's mobility and tenure decision is derived from the housing demand function. Thus the utility function of mobility and tenure choice is presented in equation (21).

$$U_{ij} = V[M,T] + \varepsilon_{ij} \tag{21}$$

where U_{ij} denotes the total utility for a household to choose moving and choose alternative tenure j; V is the measurable utility function; M is a vector of variables to determine household's mobility; T is a vector of variables to determine tenure choice; ε_{ij} is an error term.

However, the total utility function in equation (21) does not exactly express the hierarchical relationship between mobility decision and tenure choice, as shown in Figure 4.2. In order to express the hierarchical choice function, the total utility of mobility and tenure choice in equation (21) can be separated into two utility functions, as:

$$U_{ij} = U_{ik} + U_{in} \tag{22}$$

where

$$U_{ik} = V[M] + \pi_{ik} \tag{23}$$

$$U_{in} = V[T] + \varphi_{in} \tag{24}$$

Where k denotes a choice whether to move or stay, n denotes a choice of tenure alternative, M and T are the same as in equation (21), π and φ are error terms. The model of mobility and tenure choice is formulated on the basis of equation (23) and equation (24).

Based on a random utility function, the probabilities of a household i choosing to move/stay and choosing a tenure alternative can be expressed as:

$$P_{ik} = \Pr\left(U_{ik} > U_{ik'}\right) \text{ for all } k \neq k',\ k \text{ and } k' \in K \tag{25}$$

$$P_{in} = \Pr\left(U_{in} > U_{in'}\right) \text{ for all } n \neq n',\ n \text{ and } n' \in N \tag{26}$$

where K denotes a set of mobility decision; N denotes a set of tenure choice.

4.2.3 Hierarchical Choice Model

The model contains a two-level decision tree, thus a hierarchical choice model is employed to estimate the probability of the household's move/stay decision and tenure choice. The selection of the hierarchical model, the derivation of the model functional form and the test of independence from irrelevant alternative property are discussed as follows.

4.2.3.1 The Selection of Hierarchical Choice Model

Among hierarchical choice models, the nested multinomial logit (NMNL) model has been widely applied to housing choice study, as discussed in Chapter Two. Compared with the multinomial logit model, the nested multinomial logit model does not need an assumption about the error terms, which allows the nested multinomial logit model to have a variety of applications (Tu 1994). Maddala (1983) indicates that the nested multinomial logit model can be derived from the assumption that the residuals (or error terms) have a generalised extreme-value distribution. Therefore, the NMNL model allows for a general pattern of dependence among the choices and avoids the problem of the IIA property that occurred in the MNL model. In simple terms, the NMNL model contains two or more levels of choice sets and the choices between different levels or between different branches within the same level are independent from other alternatives, and thus satisfying the IIA property. Referring to our model, the choice to stay and the choice of tenure alternatives are independent and irrelevant, and therefore satisfy the IIA property. On the other hand, it is necessary to test the IIA property for the choice among three tenures.

However, one critical weakness of the NMNL model is that the structure contains a strong assumption in terms of the hierarchical choice level. For instance, Zorn (1988) and Ioannides and Kan (1996) have argued that a household's mobility decision and tenure choice is made simultaneously rather than a hierarchical choice set. Therefore, it should be noted that the hierarchical framework of mobility decision and tenure choice is just an analytical device that reflects the relative degree of similarity among choice alternatives (Fischer and Aufhauser 1988).

4.2.3.2 The Nested Multinomial Logit Model Functional Form

The nested multinomial logit model functional form is derived on the basis of equation (23) and (24), and these two equations can be rewritten as:

$$U_{nk} = V_{nk} + \varepsilon_{nk} \tag{27}$$

where U_{nk} denotes the utility for a household's decision to move or stay (k) and to chose a tenure alternative (n); V_{nk} is a function of all the measurable characteristics and ε_{nk} is an error term. According to Greene (2000), if it is assumed that ε_{nk} is independently and identically distributed with CDF given in equation (6) and (7), then the probability for a household choosing to move/stay (k) and choosing a tenure alternative (n) is expressed as:

$$P_{nk} = e^{V_{nk}} \Big/ \sum_{k=1}^{K} \sum_{n=1}^{N_k} e^{V_{nk}} \tag{28}$$

where K and N denote a set of mobility decisions and a set of tenure choices, respectively. Equation (28) is the general functional form of the nested multinomial logit model of mobility and tenure choice.

Further, it is assumed that

$$V_{nk} = \beta' x_{nk} + \alpha' y_k \tag{29}$$

where x_{nk} denotes a vector of observed attributes that vary with both mobility and tenure choice; y_k is a vector of attributes that vary only with mobility; α' and β' are vectors of parameters to be estimated.

It can be written

$$P_{nk} = P_{n/k} \cdot P_k$$

$$= \left(\frac{e^{\beta' x_{nk}}}{\sum_{n=1}^{N} e^{\beta' x_{nk}}} \right) \left(\frac{e^{\alpha' y_k}}{\sum_{k=1}^{K} e^{\alpha' y_k}} \right) \frac{\left(\sum_{n=1}^{N_k} e^{\beta' x_{nk}} \right) \left(\sum_{k=1}^{K} e^{\alpha' y_k} \right)}{\left(\sum_{k=1}^{K} \sum_{n=1}^{N_k} e^{\beta' x_{nk} + \alpha' y_k} \right)} \tag{30}$$

The inclusive value for the *k*th branch is defined as:

$$I_k = \ln \left(\sum_{n=1}^{N_k} e^{\beta' x_{nk}} \right) \tag{31}$$

Then, after cancelling terms and using this result, the equation (30) follows as:

$$P_{n/k} = e^{\beta' x_{nk}} / e^{I_k} \tag{32}$$

$$P_k = e^{\alpha' y_k + \tau_k I_k} \Big/ \sum_{k=1}^{K} e^{\alpha' y_k + \tau_k I_k} \tag{33}$$

where τ_k is the parameter to be estimated in the inclusive value. Greene (2000) indicates that τ_k equals to one, the NMNL model reduces to the MNL model. The NLML model arises if $0 < \tau_k < 1$. In fact, the parameter τ_k can be used to test the IIA property and this will be discussed in the next part of this section.

With respect to the estimation method, the full information maximum likelihood (FIML) method is a better approach to estimate the nested multinomial logit model. As Greene (2000) indicates, in the FIML estimation, the entire NMNL model is estimated in a single pass instead of a two-step estimation. The joint, full-information maximum likelihood approach is more efficient than the two-step, limited information maximum likelihood approach. The FIML estimates are obtained by maximising the full log likelihood for the NMNL model. The log likelihood is:

$$\ln L = \sum_t \ln P_{nk} = \sum_t \ln P_{n/k} + \ln P_k \tag{34}$$

4.2.3.3 Testing the Independence of Irrelevant Alternative Property

There are two methods to test the IIA property in the nested multinomial logit model. The first method is to apply the Hausman-McFadden's statistic of the IIA property, as shown in equation (20). In the model of mobility and tenure choice, the inclusive value parameter τ_k is fixed equal to one in the stay branch(shown in equation (33)), then the nested multinomial logit form would reduce to multinomial logit form (or so called condition logit form in Greene (2000)). Then the Hausman-McFadden's statistic can apply to test the IIA property in the tenure choice branch. This method is an alternative way to test the IIA property in the MNL model of tenure choice.

The second method is to estimate the inclusive value parameter τ_k. Studies such as Hausman-McFadden (1984), Quigley (1985) and Greene (2000) suggest that in the NMNL model, the inclusive value parameter τ_k should be between 0 and 1 to satisfy the random utility property, and also if $0<\tau_k<1$ and statistically significant, the NMNL model satisfies both random utility property and the IIA property.

In summary, this section introduces a hierarchical choice model to analyse the household's mobility decision and tenure choice. The two-level choice model of mobility and tenure choice provides a substitute for the multinomial logit model of tenure choice, and it also relaxes the problem of IIA property occurred in the MNL model. Among the hierarchical choice models, the nested multinomial logit model has been widely applied to housing and tenure choice studies. The full information maximum likelihood (FIML) method is employed to estimate the parameters of the NMNL model. With respect to the test of IIA property, the Hausman-McFadden's statistic can be applied to test this assumption in the NMNL model. The inclusive value parameter can also be used to test the IIA property. While the inclusive value lies between 0 and 1, the NMNL model satisfies both the IIA property and the random utility function.

4.3 Summary

Two tenure choice models with different structures are developed in this chapter. The first model contains a simple one-level choice set. The tenure choice splits into three choices: owner-occupation, social renting and private renting. A multinomial logit (MNL) model is chosen to estimate the three-choice function. The MNL model provides a simple and convenient functional form to estimate the choice probabilities. The maximum log likelihood approach is applied to estimate the parameters of the MNL model. However, the MNL model has a widely known weakness in terms of violating the IIA property. The rejection of the IIA property in the MNL model implies that the estimation of tenure choice could be bias (Greene 2000). As a result, the MNL model should be treated with caution.

The second model estimates the household's mobility decision and tenure choice. This model contains a two-level choice structure, which assumes that the household's choice for different tenures is made under its decision to move. The hierarchical choice model of mobility and tenure choice provides an alternative way to relax the IIA problem and without breaking the tenure choice structure presented in the first model. Thus, the two-level choice model can be seen as a substitute of the first model. A nested multinomial logit (NMNL) model is selected to estimate the probability of a household choosing to move/stay and the probability of choosing a tenure alternative. The full information maximum likelihood approach is applied to estimate the parameters of the NMNL model. In the NMNL model, the inclusive value parameter is an indication for the IIA property. Since the inclusive value parameter is between 0 and 1, the NMNL model satisfies both the IIA property and the random utility function.

Due to the IIA problem in the MNL model, it is expected that the NMNL model would provide robust results in the estimation of the household's mobility decision and tenure choice. The MNL model in this thesis can be treated as a pilot model to test the initial influence of the explanatory variables on tenure choice. Unlike the NMNL model requiring specific data arrangement and variable interactions in the specification, the MNL model is useful to estimate the direct relationship between the explanatory variables and the choice alternatives. Then the initial results in the MNL

model are examined in the NMNL model. The data and variables applied to the two tenure choice models and an analysis of estimation results of the two models will be discussed in Chapter Five and Chapter Six respectively.

CHAPTER FIVE DATA AND VARIABLES

This chapter discusses the empirical data and variables applied to the two tenure choice models. This chapter is organised into five sections. The first section introduces the data used in the two tenure choice models. The second section describes the variables applied to the multinomial logit form of tenure choice model. The third section discusses the variables applied to the nested multinomial logit form of mobility and tenure choice model. The fourth section analyses the properties of the data and variables applied to the two tenure choice models including the selection of the explanatory variables and the correlation analysis of these explanatory variables. The last section is a brief summary.

5.1 The Data

In this section, the data selection, the content of the chosen data set, and the strengths and the weaknesses of applying the chosen data set to the two tenure choice models are discussed in turn.

5.1.1 Data Selection

Two types of quantitative data are generally applied in research: primary data and secondary data. The selection of these two types of data sets depends upon a variety of factors, for instance, the scope, objectives, and methodology of the research. In the field of housing and tenure choice, many studies have used secondary data set to examine their choice models because it saves much time and money compared to using primary data. More importantly, many secondary data sets are carried out by the public sector or by large private organisations which usually have sufficient financial ability to provide a large, detailed and better quality data set. However, the main weakness of using secondary data set is that it is not designed for the research. It is very often the case that the data set does not contain all of the information the research needs. Therefore, it is important to select a data set to meet the research objectives and an imputation of the data set is necessary under this circumstance.

To model the household's tenure choice, it is expected that the empirical data set should contain a variety of household attributes. Also, the data set containing a larger sample size would be better to examine the tenure choice model. As a result, this thesis adopts secondary data set applied to the two tenure choice models. Several points should be noted in the selection of secondary data set. First, in order to examine the household's tenure choice behaviour, the chosen data set should be a household survey data set containing the household's tenure status, social-economic attributes, and the dwelling and neighbourhood conditions in which the household resides. For example, the household's social-economic characteristics are important variables to interpret the households' tenure decision behaviour, while the physical dwelling and neighbourhood conditions are important factors to estimate the capital value of the property.

Second, to estimate the household's choice between three tenures, the data set should contain information on three tenures and also the tenure structure should represent a normal distribution to the population in a defined area. Third, the sample size of the data set should be large enough in order to provide the maximum degree of freedom in the two tenure choice models. The data for the multinomial logit model and the nested multinomial logit model should be divided into several subgroups by tenures and by move-stay mode. Each subgroup should reach a minimum number of valid observations in order to avoid sampling bias.

Based on above criteria, this thesis chooses the 1996 Scottish House Condition Survey (SHCS) to be the empirical data set for the two tenure choice models. The discussion of the SHCS 1996 is as follows.

5.1.2 The 1996 Scottish House Condition Survey

The 1996 Scottish House Condition Survey (SHCS) is the second national comprehensive survey of house conditions in Scotland, which is directed by a steering group chaired by Communities Scotland, previously known as Scottish Homes. The first survey was carried out in 1991. The 1996 SHCS is a cross sectional survey, which aims to describe both the physical condition of the dwelling stock and the socio-economic characteristics of the household residing in the dwelling. Thus, this survey consists of two important components: an internal and external physical

dwelling inspection and a socio-economic interview with a member of the household in the dwelling. Through the comprehensive survey, the results offer both the public sector and the private sector a better understanding of the relationship between the characteristics of resident households and house conditions in Scotland.

The 1996 SHCS for socio-economic interviews began in February 1996 and finished in August 1996. The fieldwork for the physical inspection started in May 1996 and ended in September 1996. Some important components of the survey methodology are discussed as follows.

- *Sampling*

The 1996 SHCS was based on several discrete samples of addresses. The main elements of the sample consisted of a systematic random sample drawn from the December 1995 Postal Address File (PAF) and a systematic random sample drawn from all core addresses sampled from the SHCS 1991 (the longitudinal or panel component). In addition to these two core components, there were boosted samples in eight local authority areas, an additional boosted sample of housing association properties and boosted samples from private rented dwellings.

- *Response Rates*

In the socio-economic interview, a total of 31,795 addresses were issued to the interviewers, of which 28,573 were found to be valid addresses. Of the 28,573 valid addresses, 19,892 addresses had responses, accounting for 70 per cent of the total valid addresses. The overall response rate for the physical inspection was 81 per cent. A total of 17,918 full dwelling inspections were achieved, of which 16,481 dwellings also completed a full household interview.

- *Sample Size*

The 1996 SHCS data set contains a total of 18,158 cases of household socio-economic interview, accounting for 91 per cent of the total samples (19,892). According to the 1996 SHCS main report, cases issued from the special local authority boost samples and from the private rented boost samples were not included in the current data set. On this basis, the number of cases for which a full physical inspection and a full

household interview are available is 15,105, accounting for 92 per cent of the total dwelling samples (16,481).

- *Imputation*

The 1996 SHCS data set inevitably contains missing value cases in both the socio-economic interview and the physical inspection. Therefore, imputation was carried out to make up the missing value cases. According to the 1996 SHCS user guide, when the level of missing data was 1 per cent or less, the missing data was not then combined with other responses to produce compound measures. Where the level of missing data was more than 1 per cent, imputation was carried out. In the 1996 SHCS data set, imputation was applied to the main financial variables such as income, rent, mortgage and fuel payments. The specific methods used in the survey were hot deck imputation, defined as "where the sample is divided into subgroups (imputation classes) based on the relevant characteristics, and predictive mean matching where a statistical model was constructed and the value selected from those with a similar predicted value" (1996 SHCS User Guide, p. 20). The advantage of imputation is that it provides a complete data set without too many missing value cases. However, the drawback is that the data imputation may not reflect the real household information and dwelling conditions.

- *Weighting*

There are several weighting procedures in the 1996 SHCS. The weighting samples provide information about the total stock and vacancy rate estimated from the survey. This thesis does not need to present this kind of information in the tenure choice models. As a result, this thesis uses unweighted data to estimate the household's tenure choice behaviour in Scotland.

5.1.3 Applying the 1996 SHCS into Tenure Choice Analysis

The 1996 SHCS data set contains more than 18,000 cases, and this survey inevitably contains missing value cases and inappropriate cases, which would be excluded in our sample. Furthermore, this thesis also excludes 320 private rent free cases from the data set. In the 1996 SHCS, most rent-free cases in the private rented sector were tied accommodation provided by employers, thus these cases should not be included in our sample, otherwise the average private rental value in the sample could be

underestimated. After excluding those missing value cases and inappropriate cases, a total of 13,114 observations are available for the sample of MNL tenure choice model. The number of observations available for the sample of NMNL mobility and tenure choice model reduces to 13,012 due to a different type of data arrangement required by this model. The two tenure choice models contain different functional forms, thus involving different types of data arrangement. The data arrangement and the variable interactions for the two tenure choice models will be discussed in the second and the third sections.

The main advantage of applying the 1996 SHCS data to the two tenure choice models is that the survey contains a large sample size with rich information about the household's socio-economic characteristics and dwelling conditions. Generally, the larger the sample size of a data set, the less sampling bias occurs. The 1996 SHCS contains variables from various aspects, which provide important information to analyse the household's tenure decision behaviour. The socio-economic interview contains variables describing the household's tenure status, income, age, gender, ethnic origin, employment and household size. These are basic variables in the tenure choice model. Further, the interview contains information about households' tenure aspiration, previous tenure and mobility aspiration and also the date of the household moving into the current address. These variables are useful in estimating households' tenure preferences and mobility decisions. The house purchase prices, gross rents and housing costs are also important variables to construct the housing user cost, housing subsidy and rationing variables. The physical dwelling inspection contains a variety of dwelling attributes and neighbourhood variables. These are important to estimate capital values of the property.

The 1996 SHCS data set, of course, is not specifically designed for tenure choice analysis. There are some weaknesses in applying the data to the two tenure choice models. One of the most serious problems is that it lacks sufficient locational data. Although the 1996 SHCS provides Post Address File (PAF) containing the current and the previous postcode addresses for each surveyed household, there are many missing value cases in the previous location variable, thus making it difficult to analyse households' mobility behaviour. Further, the survey does not contain location-distance data, such as the distance from home to city centre and to working place.

These distance variables are important factors in estimating the hedonic price index of the dwelling (see for example Rosen 1974, Linneman 1980, Quigley 1982).

In addition to locational data, the survey does not contain the information about the changes in household attributes, for instance the changes in household size, employment, and income. As stated in Chapter Two, the changes in household attributes have substantial influences on the household's mobility decision (also see Boehm 1981 and Ioannides 1987). Such data containing the changes in household attributes may not be collected in a cross-sectional survey like the 1996 SHCS. It has raised an argument as to whether longitudinal data or cross sectional data is more suitable for tenure choice analysis. As discussed in Chapter Two, the use of longitudinal data or cross sectional data in tenure choice analysis mainly depends upon the purpose of the study. Some studies have used time series data to estimate the influences of changes in determinants over time on the household's tenure choice. Some other studies have assumed that the household's tenure decision is made solely on the basis of the contemporary period, thus emphasising the influence of determinants on tenure choice (in the contemporary period) by using cross sectional data, as this thesis intends to do. The cross sectional analysis of tenure choice indeed provides a simple approach to estimate the household's tenure decision behaviour in a given time period which avoids a complicated process of data matching and the autocorrelation problem happening in time series data (Koop 2000).

Although there has been increasingly used panel data in tenure choice analysis in Britain (see for example, Ermisch and Di Salvo 1996, Di Salvo and Ermisch 1997, Andrew 2000), a cross sectional analysis of tenure choice in Scotland remains the best alternative approach in a short term. In particular, there is no appropriate panel data in Scotland now suitable for tenure choice analysis. Under this circumstance, the 1996 SHCS is the best alternative data to be used in this thesis. From a long-term viewpoint, the use of 1996 SHCS data to estimate Scottish households' tenure decisions is a start. Further steps will connect the 1996 SHCS with the 1991 SHCS or the forthcoming 2002 SHCS to analyse the change in Scottish households' tenure choice behaviour during these periods.

5.2 The Variables of the Tenure Choice Model

The variables applied to the multinomial logit form of tenure choice model consist of original variables and derived variables from the 1996 SHCS and, also, some variables are imputed by this thesis. The dependent variable to be estimated in the tenure choice model is the household's existing tenure status, which is grouped into three tenures: owner-occupation, social renting, and private renting. Table 5.1 presents the household's tenure composition to be analysed in the model. About 52 per cent of households in the sample are owner-occupiers, while 42.5 per cent of households are social tenants. Private tenants only account for 5.4 per cent of the sample.

Table 5.1 The Household's Tenure Composition

Tenure	No. of Valid Observation	Percentage (%)
Owner-Occupation	6,829	52.1
Social Renting	5,578	42.5
Private Renting	707	5.4
Total	13,114	100.0

Source: Sampled from the 1996 SHCS

The explanatory variables of the tenure choice model come from several categories including the household's demographic characteristics, employment status, previous tenure, expected mobility, location, dwelling type, neighbourhood quality, income, user cost, subsidy and rationing variables. The descriptive statistics and expected signs of these variables are reported in Table 5.2. The full definition of variables used in this chapter is listed in Appendix A.5.1

Table 5.2 Descriptive Statistics and Expected Signs of Explanatory Variables for the Tenure Choice Model

Variable	Mean	Standard Deviation	Exp. Sign O-O	Exp. Sign SR	Exp. Sign PR
Age	51.28	17.72	+	+	–
Agesq	2943.45	1898.49	–	–	+
Ndepch	0.58	0.96	+	+	–
Marry	0.58	0.49	+	+	–
Male	0.69	0.46	+	–	+
Fullwork	0.45	0.50	+	–	–
Partwork	0.05	0.21	+	–	–
Unemploy	0.06	0.24	–	+	+
House	0.63	0.48	+	–	?
Prevown	0.29	0.45	+	–	–
Prevsoc	0.37	0.48	–	+	?
Prevprv	0.15	0.35	?	?	+
Likmov2	0.12	0.33	–	–	+
Urban	0.80	0.40	?	?	?
Affown	0.12	0.32	+	–	–
Prvtcity	0.11	0.31	–	–	+
Poorcnl	0.10	0.30	–	+	–
Lnperinc	9.20	0.46	+	–	–
Lnucc_1	7.88	0.52	–	–	–
Lnuccn_1	7.28	0.80	–	–	–
Ratmort	0.45	0.50	–	+	+
Ratsoc	0.62	0.48	+	–	+

Notes: Number of observations: 13114.

OO: Owner-Occupation; SR: Social Renting; PR: Private Renting.

"+": Positive Effect; "–": Negative Effect; "?": Cannot Determine

Source: Sampled from the 1996 SHCS.

- *Household Demographic Characteristics*

Household characteristics such as household heads' age, sex, race, marital status and household size are found to be important determinants of tenure choice (see Struyk and Marshall 1976, Li 1977, Henderson and Ioannides 1986, Kleinman and Whitehead 1987, Gyourko 1998, and McNabb and Wass 1999). In the MNL tenure choice model, household characteristics include the household head's age (AGE), marital status (MARRY=1), gender (MALE=1), and the number of dependent

children in a household (NDEPCH). The household size and the number of dependent children in the household are correlated. This thesis adopts the number of dependent children in the household because this variable can not only present the household size but also implies different levels of housing demand at the household's life cycle than the household size variable does. The household head's race has been an important determinant of tenure choice in American studies (Struyk and Marshall 1976 and Gyourko and Linneman 1997). However, in our sample, nearly 99 per cent of household heads were white. In this case, we would ignore this variable in the tenure choice model. In Table 5.2, the average age of the head of household was around 51 years old. Married household heads accounted for 58 per cent of the sample, while the average number of dependent children in a household was only 0.58. This reveals that the majority of households in the sample were married couples with an average of less than one dependent child. In addition, male household heads accounted for 70 per cent of the sample.

A number of North American studies have indicated that the homeownership rate is found to increase with the age of household head (see Struyk and Marshall 1976 and Fallis 1985). However, in Britain, Kleinman and Whitehead (1985) point out that there is a significant non-linear relationship between homeownership and the age of the household head in the cross sectional analysis. This result partly comes from a cohort effect. The homeownership rate declines in older generations because many older households can obtain a secure tenancy from the social rented sector. Therefore, to capture the non-linear relationship between the household head's age and tenure, the age-squared of the household head is included in the model. It is expected that the age-square of household heads has an opposite sign to the age of household heads.

In the household's life cycle, married households with children tend to have stronger likelihood to choose secure tenancies (see Clark and Onaka 1983, Dieleman and Everaers 1994, and Clark and Dieleman 1996). In Britain, owner-occupation and social housing are considered to be more secure tenures than private renting. As a result, it is expected that married household heads with dependent children would like to choose owner-occupation and social renting. In contrast, younger and single household heads and adult-only households have relatively unstable incomes and employment, and that makes them more likely to change their residing places.

Therefore, these types of households would like to choose lower transaction costs and shorter terms of tenancy, such as private renting. Moreover, it is often the case that male household heads may have higher incomes and better economic status than female household heads. Hence, it is expected that male household heads would have stronger likelihood to be owner-occupiers, while female household heads are more likely to choose the lower costs of social housing. However, it could be difficult to tell whether male or female household heads are more likely to choose private renting.

- *Employment Status and Expected Mobility*

The household head's employment status is also an important determinant of tenure choice. Household heads having better jobs usually imply that they have higher incomes, thus making them more capable homeowners. To examine the impact of employment status on tenure choice, this thesis uses three dummy variables to present three types of employment status: full-time work (FULLWORK=1), part-time work (PARTWORK=1), and unemployment (UNEMPLOY=1). The selection of the employment status variables from the original variables in the 1996 SHCS is discussed in the fourth section of this chapter. Table 5.2 shows that 45 per cent of household heads in the sample had a full-time job; only 5 per cent of household heads had a part time job. The unemployed household heads accounted for 6 per cent of the sample. It is expected that household heads who have full-time or part-time jobs would have stronger likelihood (positive sign) to choose owner-occupation. In contrast, unemployed household heads would be more likely to be tenants in either the social housing sector or the private rented sector.

With regard to the household's expected mobility, it is very often the case that households who expect to move in the future are more likely to choose renting than owning. Owner-occupation generally has higher transaction costs than social renting or private renting. Therefore, households who are likely to move in the short run would be more likely to choose the lower transaction costs of renting. In Britain, studies have indicated that households in the social housing sector are less likely to move partly because the existing allocation system makes it difficult for social tenants to relocate their homes (see Kintrea and Clapham 1986, Harriot and Matthews 1998). As a result, households who are likely to move in the future would be more likely to choose private renting than social renting. To examine the impact of the household's

expected mobility on tenure choice, this thesis uses a dummy variable to present the household head's likeliness to move within two years (LIKEMOV2=1). Table 5.2 shows that the majority of household heads in the sample were likely to stay, while only 12 per cent of household heads were likely to move within two years. It is expected that household heads who are likely to move within two years would be more likely to choose private renting than the other two tenures.

- *Previous Tenure and Location*

The household's previous tenure status has an important influence on their current tenure decision. This thesis uses three dummy variables to present the household's previous tenure status: previous owner-occupation (PREVOWN=1), previous social renting (PREVSOC=1), and previous private renting (PREVPRV=1). The selection of the previous tenure status variables from the original variables in the 1996 SHCS is discussed in the fourth section of this chapter. It is noted that according to the user guide of the 1996 SHCS, Table 5.2 shows average 29 per cent of households in the sample were previously owner-occupiers, while 37 per cent of households were previously social tenants and 15 per cent of households were previously private tenants. In the sample, households who were previously social tenants have higher percentage points than households who were previously owners. This properly matches the trend of tenure changes in Scotland over the past two decades. As discussed in Chapter Three, the Right To Buy policy is the major driving force for the tenure changes from social renting to owner-occupation over the last two decades. It is expected that households who were previously owners or social tenants would be more likely to stay in the same tenure while making a tenure decision. As many households see private renting as a transitional tenure between social renting and owner-occupation, it would be difficult to tell the expected sign in terms of households who were previously private tenants on tenure choice.

Location is also an important determinant of the household's tenure choice. In Britain, there exist spatial concentrations of certain tenure types of dwellings. For example, a large number of owner-occupied dwellings are located in suburban areas due to the result of suburbanisation. In contrast, many social rented and private rented dwellings are located in the inner city area where it is convenient to access public transport and other public facilities. Meanwhile, in some cities such as Glasgow, there are large

housing estates located in the periphery. Therefore households are likely to consider location while making their tenure choice. Due to data limitations, this thesis uses a simple urban-rural indicator (URBAN=1) to proxy location variable in the tenure choice model. Table 5.2 shows that 80 per cent of households live in urban areas. Due to data limitations, it would be difficult to tell the expected sign of the urban-rural indicator to the three alternative tenures. The use of an urban/rural indicator would be too simple to interpret the complex spatial concentration of certain tenure types of dwellings in Scotland.

- *Dwelling Type and Neighbourhood Quality*

Dwelling type and neighbourhood quality are also important determinants of tenure choice. In Britain, dwelling type is usually associated with tenure type. The relationship between dwelling type and tenure is interdependent. For example, owner-occupied dwellings are predominately houses, while most social rented dwellings are flats. Therefore, from the tenure choice perspective, a household's tenure choice is deeply influenced by dwelling type. To examine the effect of dwelling type on tenure choice, this thesis uses a dummy variable to present a simple dwelling type, house or flat (HOUSE=1). It is expected that households who live in houses would be more likely to choose owner-occupation. In contrast, households who live in flats would be more likely to choose social renting or private renting. However, there are many privately rented houses located in rural Scotland, as discussed in Chapter Three.

Similar to dwelling type, the relationship between neighbourhood quality and tenure type is interdependent. It is very often the case that high quality neighbourhoods predominately consist of owner-occupied housing. In contrast, many council estates are located in low quality neighbourhoods. In the 1996 SHCS data set, the most suitable variable to present the neighbourhood quality is the ACORN group variable. The ACORN group variable presents different levels of neighbourhood quality which are associated with tenure types. Drawn from the ACORN group variable, this thesis therefore constructs three dummy variables to represent three different levels of neighbourhood quality: whether the household is in high quality neighbourhood predominated by affluent owners (AFFOWN=1); whether in medium quality neighbourhoods predominated by private tenants in the inner city (PRVTCITY=1); and whether in low quality neighbourhoods predominated by the poorest council

tenants (POORCNL=1). The selection of the neighbourhood quality variables from the ACORN group variable is discussed in the fourth section of this chapter. It should be noted that the neighbourhood quality is not necessarily associated with tenure types. These variables are the best alternative variables used in the 1996 SHCS data. Since the neighbourhood quality variables connected to tenure types, it is expected that households in high quality neighbourhoods (predominately affluent owners) would be likely to choose owner-occupation. Households in medium quality neighbourhoods (predominantly inner city private tenants) would be likely to choose renting, specifically private renting rather than owner-occupation, since most dwellings in the neighbourhood are privately rented. Households in lower quality neighbourhoods (predominantly the poorest council tenants) would be more likely to choose social renting. It would be important to identify the impact of the neighbourhood quality variables which are not predominant in the neighbourhood.

- *Household Income*

As discussed earlier, the 1996 SHCS data set does not contain all the variables needed for the analysis. Therefore, this thesis needs to construct some variables. The first variable to be estimated is household income. Previous research has indicated that the household's tenure decision is based on long term and multiple periods rather than current and single period (see Struyk and Marshall 1974, Fallis 1985, Clark and Dieleman 1996). For the household income variable, the long term income has a stronger influence on tenure decision than the current income. This model thus adopts the household long-term income as the household income variable which is presented by log value (LNPERINC). A multiple linear regression function is established to estimate household long term income. The estimation results are shown in Table 5.3.

The dependent variable is log annual household income. In the 1996 SHCS, the household income was defined as the annual net income of the head of household and partner. The log annual household income is explained by household heads' demographic characteristics, whether in long term illness, self-employment, socio-economic group and location. The household head's demographic variables include age, age square (explaining non-linear relationship between income and age), marital status, sex, race and the number of dependent children. According to the 1996 SHCS user guide, the socio-economic group is established for the head of household only

and can only be estimated for those individuals who were in or had been in employment during the interview period. The household head's socio-economic group is classified into six different subgroups: professional/managerial jobs; employers and managers; intermediate/junior non-manual jobs; skilled manual workers; semi-skilled manual workers; and non-skilled manual workers. Unfortunately, the 1996 SHCS data set does not contain the household head's education variable, which has been indicated by many studies as an important variable in order to explain the household's permanent income (see for example Struyk and Marshall 1974 and Laakso and Loikkanen 1995). The use of the household's head's socio-economic group to some degree can represent the household head's educational level in the household long-term income model.

Table 5.3 Estimation Results of the Household Long Term Income Model

Variable	Coefficient	t-stat
Constant	8.193	155.9
Age	0.018	13.65
Agesq	-0.0002	-19.55
Marry	0.514	48.28
Ethnics	0.166	4.09
Male	0.056	4.87
Ndepchgp	0.055	12.36
Sick	-0.101	-10.69
Selfemp	0.173	7.61
Prof	0.761	33.46
Empman	0.488	27.15
Interjun	0.368	22.91
Skill	0.197	11.99
Semiskil	0.09	5.38
Unskill	0.057	2.93
Urban	0.022	2.35
Adjusted R^2	0.47	
F value	1053.4	
No. of obs	18,040	

Notes: The sample size is based on the total observations (18,158) of the 1996 SHCS excluding missing value cases. The definition of variables is listed in Appendix A.5.1

The estimation results shown in Table 5.3 are then used to calculate the predicted household long-term income applied to the tenure choice model. The predicted

household long term income by tenures is shown in Table 5.4. It is clear that owner-occupiers have the highest average long term income, while social tenants had the lowest average long term income. The average long-term income of private tenants is shared between owner-occupiers and social tenants. The household long-term income is expected to have a positive effect on owner-occupation. This means that while household long-term income increases, households are more likely to own rather than to rent their homes.

Table 5.4. Predicted Household Long Term Income by Tenures

Tenure	Average Annual Amount (£)	No. of Valid Observation
Owner-Occupation	12,762	6,829
Social Renting	8,731	5,578
Private Renting	10,223	707
Total	10,911	13,114

- *User Cost of Capital*

The second important variable to be measured is the user cost of capital, which is also presented by log value (LNUCC_1). The user cost in this thesis is measured in nominal terms.[8] For owner-occupiers, user cost is to calculate the capital cost of the property. Based on Gibb and Mackay (1999), the user cost for owner-occupiers is defined as:

$$UC_o = \left[(1-t)*i + d + \alpha - g\right]* P^h \tag{35}$$

where t denotes a household's marginal tax rate, i is the nominal mortgage interest rate, d is the depreciation rate, α is the property tax rate, g is the expected annual rate of nominal house price increase and P^h is the current market value of the property. Here, the household's marginal tax rate is assumed to be zero[9] and the property tax rate is based on the council tax rate. The average nominal mortgage interest rate in 1996 is 6.7%. Based on Hills' (1991) estimation, the depreciation rate is set at 1.2%,

[8] The use of nominal user cost would be convenient to calculate the user cost for tenants (the rent) since the 1996 SHCS data set only identifies the gross rent for tenants.

and the long term nominal house price increase rate is set at 3.7%[10] annually. The current market value of the dwelling is measured by the hedonic price index. The estimation results of the hedonic price model are reported in Table 5.5.

Table 5.5 Estimation Results of the Hedonic Price Model

Variable	Coefficient	t-stat
Constant	6.580	47.85
Detach	0.347	17.54
Dwage1	-0.123	-5.95
Dwage3	-0.096	-3.55
Dwage5	0.073	3.47
Lntfa	0.875	28.04
Fullheat	0.110	5.19
Urban	0.110	5.46
Prospown	0.074	4.34
Poorcnl	-0.240	-4.11
Graff	-0.135	-4.66
Dparking	0.039	1.99
Vacsite	-0.097	-3.60
Yr94	0.038	1.99
Yr95	0.058	2.98
Adjusted R^2	0.53	
F value	175.55	
No. of obs.	2,596	

Notes: The sample size is based on owner-occupiers who moved within recent five years. The definition of variables is listed in Appendix A.5.1

In the hedonic price model, the dependent variable is log house purchase price. The log house purchase price is explained by dwelling conditions, location, neighbourhood conditions and the year of purchase of the current dwelling. The dwelling conditions include dwelling type, age, total floor area and heating condition. The locational variable is presented by the urban/rural indicator. The neighbourhood conditions include whether or not the property has graffiti and vandalism, vacant site, adequate parking space and two different levels of neighbourhood quality (i.e. whether the neighbourhood is dominated by prosperous owners or by the poorest council tenants).

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[9] As Gibb and Mackay (1999) suggested, due to its erosion in the 1990s and recent termination, the MIRAS is treated as a "lump sum" tax relief to mortgaged owners, which does not affect their user costs at the margin but only affects their disposable income.

[10] The 3.7 per cent of annual nominal capital gains increase rate is estimated on the accrual basis.

Unfortunately, the 1996 SHCS data set does not contain the distance variable such as the distance to the Central Business District (CBD), nor does it contain some dwelling condition variables such as the number of bathrooms. In fact, studies have suggested that the distance variable and the number of bathrooms in the dwelling are important variables to estimate the hedonic price (see for example, Rosen 1974, Linneman 1980 and Quigley 1982). Therefore, it may affect the goodness-of-fit of the hedonic price model.

It is noted that the sample selection in the hedonic price model is identified as owner-occupiers and those who have been moved in recent five years. Therefore, the model could contain a dual sample selection bias as suggested by Ermisch, Findlay and Gibb (1996). According to a study by Ermisch, Findlay and Gibb, the difference between the hedonic house price adjusted for sample selection bias and the unadjusted hedonic house price is about 3.75%. In this thesis, the difference could not significantly affect the results of the tenure choice models because, after deflated by natural log, the difference between adjusted hedonic prices and unadjusted hedonic prices is minimised. In the hedonic price model, it is found that the year of moving into current dwelling, specifically the last two years, have important influences on our hedonic price index. The estimation results of hedonic price model are then applied to all three tenure sample base (13,114). The break down of the hedonic price by tenures is presented in Table 5.6.

Table 5.6 Hedonic Prices of the Property by Tenures

Tenure	Average Hedonic Price (£)	No. of Valid Observation
Owner-Occupation	52,630	6,829
Social Renting	33,911	5,578
Private Renting	42,556	707
Total	44,125	13,114

Moreover, the estimated market value for social rented property could be overestimated if it is based on the purchase price of owner-occupied property. For example, it may not be certain that the estimated hedonic price would take adequate account on very poor council housing neighbourhoods. In addition, there are different

demand characteristics between social renting and owner-occupation (Hancock and Munro 1992). Several studies have attempted to make this adjustment. For instance, Maclennan, Gibb and More (1991) adopt the bottom half of hedonic prices applying to social rented property; Hills (1991) uses 20 per cent discount of hedonic prices applying to local authority property. This thesis is aware of this issue and makes adjustment by putting the neighbourhood quality variables into the hedonic price model. As discussed earlier, the neighbourhood quality variables are the ACORN group variables which are associated with tenure types. Therefore, the estimated hedonic price can be distinguished in different quality levels of neighbourhoods.

The housing user cost for renters is usually the gross rent. However, the rent in the social rented sector is subsidised and cannot represent the true cost of rented dwellings. Therefore, this thesis measures the user cost of social renting on the basis of the economic rent, that is, the rent is assumed to be charged at the open market level. Based on Hills' (1991) definition, the economic rent in the social rented sector is estimated as follows:

$$UC_r = (m + r + d - g) * P^h \tag{36}$$

where m denotes maintenance and repair costs; r is the nominal rate of return on property; d, g, and P^h are defined as the same as in equation (35). However the maintenance and repair costs in Hills' calculation for local authority tenants is based on real costs. Due to data restrictions, this thesis sets the maintenance and repair costs as a certain percentage of the rented property value. In this case, $m + r$ is set at 7.8% of property values, which is based on the average index of private rents and yields to the private landlords in Scotland, in the fourth quarter of 1996, as measured by the Joseph Rowntree Foundation (see Rhodes and Kemp 1997).

The user cost for private renters is the gross rent at the market level. The breakdown of the average user cost by tenures is reported in Table 5.7. Owner-occupiers had the highest user cost, as owning a home was expensive. In contrast, the user cost for social tenants was the lowest because it reflected the property value of the social rented stock. With respect to the expected sign, the user cost is expected to have a negative effect to each tenure.

Table 5.7 User Costs by Tenures

User Costs \ Tenures	Average Annual Amount (£)	Percentage of Capital Value (%)	No. of Valid Observations
Owner-occupiers	3,531	6.7	6,829
Social tenants	2,374	7.0	5,578
Private tenants	3161	7.4	707

- *Housing Subsidy*

The third important variable to be estimated is the housing subsidy. The form of housing subsidy in this thesis is estimated in economic terms. The definition of the housing subsidy in economic terms (from now on called economic subsidy) is based on O'Sullivan's (1984) formal subsidy or Hills' (1991) first round subsidy. According to O'Sullivan's interpretation, the formal subsidy is defined as 'the amount of the original purchase price of a commodity an economic unit (normally the state) undertakes to fund itself if another economic unit (the consumer) purchases it' (1984, p. 120). The economic subsidy in this thesis is also based on a tenure neutrality framework, which treats housing as both a consumption and an investment commodity in all tenures equivalently. Under the tenure neutrality concept, the economic subsidy for owner-occupiers is defined as the difference of tax expenditures between owner-occupiers and private landlords. As Hills suggests, compared to private landlords, the tax advantage to owner-occupiers comes from untaxed imputed rents and untaxed capital gains, as shown in equation (37):

$$S_o = (CG + IR) * t_1 \tag{37}$$

where CG denotes the nominal capital gains, IR is the imputed rent and t_1 is the marginal income tax rate. The capital gains (CG) are calculated as the long term annual nominal capital gains rate (3.7%) multiplied by hedonic prices (Hills 1991). For mortgaged owners, the imputed rent (IR) is set as the net equity multiplied by the long-term rate of net return on property. The net equity is defined as the purchase price minus mortgage debts. The net rate of return on property is set at 5.5%, which is based on the long-term government bond rate. For outright owners, the imputed rent (IR) is estimated as the economic rent. The definition of economic rent is the same as

in equation (36). The marginal rate of income tax (t_1) is set at the benchmark income tax rate (24%) in 1996/97.

Based on the tenure neutrality framework, the economic subsidy to social tenants is defined as the difference between the rent charged in the open market and the below market rent charged by the social landlords, as shown in equation (38):

$$S_s = ER - GR \tag{38}$$

where *ER* denotes the economic rent, as defined in equation (36); *GR* is the gross rent charged by the social landlords.

Renters in the private rented sector do not receive any economic subsidy if they pay the market rent. The subsidy stems from tenants paying below market fair rents in the regulated tenancy. In this case, the economic subsidy to tenants in the regulated tenancy is the difference between the market rent (estimated economic rent) and the fair rent, as shown in equation (39).

$$S_p = ER - FR \tag{39}$$

where *ER* denotes the economic rent, as defined in equation (36); *FR* is the fair rent. Unfortunately, the 1996 SHCS does not identify whether a household is paying a fair rent or not. Therefore, this thesis attempts to impute the fair rent variable. According to the advice of the experts[11], private tenants could possibly pay fair rents under the following conditions, if private tenants are:

1. more than 45 years old
2. living in unfurnished properties
3. living in tenement or four-in-a-block dwellings
4. living in urban areas.

The annual average amount of economic subsidy broken down by tenures is reported in Table 5.8. The economic subsidy tends to reduce the user cost. Thus, the net user

[11] It is difficult to find the document or reports for the characteristics of households in regulated tenancy in Scotland. Therefore, this thesis asks for the advice of the experts.

cost (presented by log value LNUCCN_1) is derived by the user cost subtracting the economic subsidy. In other words, the economic subsidy effect can be expressed on the difference between the user cost and the net user cost. In the tenure choice model, the intention is to estimate the subsidy effect between the user cost and the net user cost. The economic subsidy effect by tenures is shown in Table 5.9.

Table 5.8. Economic Subsidies by Tenures

Subsidy	Average Annual Amount (£)	Percentage of Capital Value (%)	No. of Valid Observations
Owner-occupiers	834	1.6	6,829
Social tenants	638	1.9	5,578
Private tenants (all)	21	0.05	707
Private tenants in un-regulated tenancy	0	0.0	662
Private tenants in regulated tenancy	472	1.1	45

Table 5.8 shows that owner-occupiers received the highest amount of economic subsidies. In contrast, most private tenants do not receive any economic subsidies. However, the economic subsidies to private tenants in the regulated tenancy are higher than the subsidies to social tenants. Furthermore, it is of interest to see the impact of economic subsidies on the user cost among the three tenures. Under the economic subsidy effect, the difference between owner-occupiers' net user costs and social tenants' net user costs is reduced. In contrast, private tenants have the highest net user cost than the other two tenures. Thus, the changes in user costs under the economic subsidy effect could have important impacts on households' tenure decisions.

Table 5.9 Economic Subsidy Effect by Tenures
(£ per annum)

	User Cost	UC/CV (%)	Economic Subsidy	Net User Cost	NUC/CV (%)
Owner-occupiers	3,531	6.7	834	2,697	5.1
Social tenants	2,374	7.0	638	1,735	5.1
Private tenants	3,161	7.4	21	3,140	7.3

UC = user cost; NUC =net user cost; CV= capital value.

- *Rationing Variables*

Rationing variables are measured by two types of constraints: mortgage rationing (RATMORT=1) and social housing rationing (RATSOC=1). The construction of the proxy variable of mortgage rationing is based on three criteria: price-to-income ratio (PTI), loan-to-value ratio (LTV), and loan-to-income ratio (LTI), which are the most common criteria set by banks and building societies, as stated in Chapter Three. In this thesis, the house price or the house value is measured as the hedonic price. The household income is measured as the household long term income. Mortgaged owners, if they have more than two of the following conditions, could find it difficult to get a mortgage.

1. PTI>3.0
2. LTV>0.9
3. LTI>2.23

Potently, renters in both the social rented sector and the private rented sector, if their price-to-income ratio (PTI) is greater than 3.0, could be constrained by mortgages. These constraint conditions are based on the average ratio for first time buyers in Scotland 1996 (see Council of Mortgage Lenders 1997). The results of the mortgage constraint by tenures are shown in Table 5.10. It shows that 17% of existing owner-occupiers were not qualified for these mortgage ratios and were potentially constrained from mortgages. In contrast, more than three quarters of public and private tenants were potentially constrained from mortgages. It is noted that Table 5.10 only shows the general information of the mortgage constraint breaking down by tenures. In fact, the mortgage constraint not only varies by tenures but also varies by some other household demographic characteristics, such as the household head's age and gender. Since the intention is to estimate the impact of the mortgage constraint on tenure choice, the focus here is on tenure rather than other factors. In this case, it can be assumed that, if households were constrained from mortgages, they would be constrained to choose either social renting or private renting.

Table 5.10 Mortgage Rationing by Tenures

	Rationed	Not Rationed	Total
Owner-occupiers	1,121 (16.4%)	5,708 (83.6%)	6,829 (100%)
Social Tenants	4,228 (75.8%)	1,350 (24.2%)	5,578 (100%)
Private Tenants	555 (78.5%)	152 (21.5%)	707 (100%)
Total	5,904 (45%)	7,210 (55%)	13,114 (100%)

The social housing rationing can be treated as a reverse concept of rationing, which is different from common rationing. The aim of social housing is to provide affordable homes to low income households with special needs. That is to say, households with socio-economic disadvantages should not be rationed from this sector. In other words, households who have higher income and better socio-economic status could be rationed from social housing. Drawing from Chapter Three, this thesis establishes five reverse rationing criteria as follows. Whether the household is/has:

1. experienced long term illness,
2. unemployment
3. retired
4. a lone parent
5. more than 50% of incomes from state benefits

If a household had more than one of the above conditions, the household could not be constrained from entering the social rented sector, otherwise it is constrained from this sector. These rationing variables can be treated as a simulation applying to households in all three tenures. The results of social housing rationing are shown in Table 5.11. It shows that about 80% of owner-occupiers and 70% of private tenants are potentially constrained from entering the social housing sector. In contrast, most social tenants (60%) qualify for the rationing conditions and are not potentially constrained from accessing this sector. Furthermore, it is assumed that if households are rejected by social renting, they would choose either owner-occupation or private renting.

Table 5.11 Social Housing Rationing by Tenures

	Rationed	Not Rationed	Total
Owner-occupiers	5,449 (79.8%)	1,380 (20.2%)	6,829 (100%)
Social Tenants	2,228 (39.9%)	3,350 (60.1%)	5,578 (100%)
Private Tenants	483 (68.3%)	224 (31.7%)	707 (100%)
Total	8,160 (62.2%)	4,954 (37.8%)	13,114 (100%)

In summary, this section describes the variables applied to the multinomial logit form of the tenure choice model. The household's demographic attributes, employment status, previous tenure status, expected mobility, and dwelling and neighbourhood conditions can be derived from the data set. These variables are expected to have substantial influences on tenure choice. This thesis also constructs some variables including household long term income, user cost, housing (economic) subsidy and rationing variables. The use of long term income implies that the household's tenure decision is based on long term, multiple periods rather than a current and single period. The user cost presents the relative cost of owning and renting. The economic subsidy effect is expressed as the difference between the user cost and the net user cost, while the rationing effect is a simulation of households' access constraints to different tenures.

5.3 The Variables of Mobility and Tenure Choice Model

The variables applied to the NMNL mobility and tenure choice model are drawn from the last MNL tenure choice model. However, the mobility and tenure choice model contains a two-level nested multinomial logit form that requires specific data arrangement and variable interactions. In the mobility and tenure choice model, each individual household in the sample faces four possible choices: to stay; to move and choose owner-occupation; to move and choose social renting; and to move and choose private renting. For each household, the choice which the household has made is observed. Thus, the data of each household observation is expanded to four rows —

one row for each possible choice. In our case, the data matrix for the mobility and tenure choice model consists of 52,048 rows with 13,012 household observations.[12]

The model of mobility and tenure choice consists of a two-level decision tree, thus the variables also split into two levels—the mobility decision level and the tenure choice level, described as follows.

- *Variables in the Mobility Decision Level*

In the mobility decision level, the sample firstly is divided into recent movers and stayers. The recent movers are defined as households who moved in the last two years. The results of recent movers and stayers by tenures are reported in Table 5.12. Of the total 13,012 household observations, 1,425 households moved in the last two years, accounting for 11 per cent of the sample. Among recent movers, social tenants account for 44 per cent of the movers; owner-occupiers also account for 37 per cent of the movers. Private tenants only account for less than 20 per cent of the movers. Regarding the mover/stayer distribution between tenures, only 8 per cent of owner-occupiers and 11 per cent of social tenants moved in the last two years. As discussed in Chapter Three, it is not surprising to see that owner-occupation and social renting are the two stable tenures in Scotland. In contrast, households in the private rented sector are highly mobile. Around 40 per cent of private tenants in the sample moved in the last two years.

Table 5.12 Movers and Stayers by Tenures

	Movers	Stayers	Total
Owner-occupation	525 (7.7%) (36.8%)	6,258 (92.3%) (54%)	6,783 (100%) (52.1%)
Social renting	620 (11.2%) (43.5%)	4,902 (88.8%) (42.3%)	5,522 (100%) (42.4%)
Private renting	280 (39.6%) (19.6%)	427 (60.4%) (3.7%)	707 (100%) (5.5%)
Total	1,425 (11.0%) (100%)	11,587 (89.0%) (100%)	13,012 (100%) (100%)

[12] The sample originally has 13,114 observations, the same as in the MNL tenure choice model but some observations were excluded in the variable interactions. Thus the total number of observations in the mobility and tenure choice model reduces to 13,012.

Note: the first percentage is the row percentage; the second percentage is the column percentage.

The dependent variable to be estimated in the mobility and tenure choice model is the household's move-stay and tenure status (ACHOICE). Based on the model structure (see Figure 4.2 in Chapter Four), the dependent variable contains four different statuses: stay, move to choose owner-occupation; social renting; and private renting. For each individual household, if the household is a stayer, it is marked as "stayer". If the household is a recent mover, it is specifically assigned to its current tenure status. According to Table 5.12, the dependent variable contains 11,587 stayers, 525 mover-owners, 620 mover-social tenants, and 280 mover-private tenants.

The explanatory variables in the mobility decision level come from several categories including the household's demographic characteristics, employment status, income, and neighbourhood quality conditions. In fact, these variables may influence both the mobility decision and tenure choice. As discussed in previous chapters, the household's demographic and socio-economic characteristics such as age, sex, marital status, number of dependent children, employment and income data would represent different household life cycle stages, thus generating different housing demand. The household characteristics can also be used to present housing attributes such as the dissatisfaction of housing size, type and quality. As a result, these variables would influence the household's likeliness to move. It is noted that these explanatory variables in the mobility decision level interact with the "stay" choice, denoting the relationship between these variables and stay choice and thus separating from the tenure choice level. The expected signs of these interacted variables are reported in Table 5.13. The descriptive statistics and the definition of the original variables are reported in Table 5.2 and Appendix A.5.1, respectively.

Table 5.13 The Expected Sign of Explanatory Variables in the Mobility Decision Level

Original Variable: Interacted Variable	Expected Sign
Age (interacted with stay): Ageheads	+
Marry (interacted with stay): Marrys	+
Male (interacted with stay): Males	+
Ndepch (interacted with stay): Ndepchs	+
Unemploy (interacted with stay): Unemps	–
Lnperinc (interacted with stay): Lnincs	+
Affown (interacted with stay): Affowns	+
Prvtcity (interacted with stay): Pvcitys	–
Poorcnl (interacted with stay): Porcnls	?

A number of studies have indicated that older and married household heads with dependent children are less likely to move than younger and single individuals and adult-only couples (see Clark and Onaka 1985, Zorn 1988, Clark and Dieleman 1996). As a result, it is expected that while age increases, household heads' would be more likely to stay rather than to move. Married household heads and male household heads are also expected to be likely to stay. Households with more dependent children would be more likely to stay. While income increases, the household would be more stable and thus it is likely to stay, given other conditions in constant. It is expected that unemployed household heads would be more likely to move. Since unemployed households are likely to have lower incomes, they would be more mobile.

Regarding the neighbourhood quality, it is expected that households located in high quality neighbourhoods in which affluent owners predominate, would be more likely to stay. In contrast, households located in inner city neighbourhoods where they are predominated by private tenants could be influenced by their neighbour households and thus would be expected to be more mobile. Households located in the lowest quality council housing neighbourhoods would be less likely to stay. However, it is very often the case that households in the lowest quality neighbourhood may not be able to afford to move.

- *Variables in the Tenure Choice Level*

The explanatory variables in the tenure choice level are drawn from the MNL tenure choice model. As a requirement of the nested multinomial logit model, the explanatory variables in the tenure choice level are interacted with three choices: owner-occupation, social renting and private renting in order to estimate the coefficients among three tenure alternatives. According to Greene (1998), if the rule is set as if the explanatory variable is measured for the individual, such a variable can only be incorporated in the nested multinomial logit model by using the equivalent of dummy variable interaction terms. Otherwise, the variable is the same for all choices, and its coefficients cannot be estimated.

In the mobility and tenure choice model, the explanatory variables of households' demographic characteristics, employment status, income, previous tenure, location, dwelling type, neighbourhood quality and rationing variables are all measured for the individual, which means that these variables are not different across tenures. Therefore, these variables need to be interacted with three dummy variables of tenure alternatives. One exception is that the user cost in the model is measured as an attribute across tenures not for the individual. In the data matrix, each household observation faces four possible choices — three tenure alternatives and stay, and therefore each choice would be assigned to its specific user cost in order to examine the effect on each tenure. Since the data matrix is unable to specify the user cost for each individual, this thesis considers that the user cost not only varies across tenures but also varies across areas in Scotland. As a result, the user cost in the model is measured by the average cost across tenures and across all 32 unitary authorities in Scotland. The estimation results of the user cost, the net user cost and the economic subsidy across tenures and across all 32 unitary authorities are reported in Appendix A.5.2.

Moreover, this thesis sets owner-occupation as the default tenure in estimating the household's comparative choice behaviour between social renting and owner-occupation, and between private renting and owner-occupation.[13] As a result, the

[13] The default tenure can be changed in the model. This thesis sets owner-occupation as the default tenure because most households see homeownership as the ideal tenure, compared to social renting and private renting. Furthermore, in the pre-test model, this thesis found that the estimation results based

variables interacted with owner-occupation will not be shown in the model. The expected sign of the explanatory variables (interacted with social renting and with private renting) is reported in Table 5.14.

Table 5.14 the Expected Sign of Explanatory Variables in the Tenure Choice Level

Original Variables: Interacted Variables	Expected Sign
Lntcost (log user cost): attribute	–
Lnatcost (log net user cost): attribute	–
Age (interacted with social renting): Agehsoc	–
Age (interacted with private renting): Agehprv	–
Ndepch (interacted with social renting): Ndepsoc	?
Ndepch (interacted with private renting) Ndepprv	–
Marry (interacted with social renting): Marrysoc	?
Marry (interacted with private renting): Marryprv	–
Male (interacted with social renting): Malesoc	–
Male (interacted with private renting): Maleprv	?
Fullwork (interacted with social renting): Fullsoc	–
Fullwork (interacted with private renting): Fullprv	–
Partwork (interacted with social renting): Partsoc	–
Partwork (interacted with private renting): Partprv	–
Unemploy (interacted with social renting): Unempsoc	+
Unemploy (interacted with private renting): Unempprv	?
Prevown (interacted with social renting): Pvownsoc	–
Prevown (interacted with private renting): Pvownprv	–
Prevsoc (interacted with social renting): Pvsocsoc	+
Prevsoc (interacted with private renting): Pvsocprv	?
Prevprv (interacted with social renting): Pvprvsoc	?
Prevprv (interacted with private renting): Pvprvprv	+
House (interacted with social renting): Housoc	–
House (interacted with private renting): Housprv.	?

on owner-occupation as the default tenure are more reliable than the results based on other two tenures as the default tenures.

Urban (interacted with social renting): Urbansoc	?
Urban (interacted with private renting): Urbanprv	?
Affown (interacted with social renting): Afownsoc	–
Affown (interacted with private renting): Afownprv	–
Poorcnl (interacted with social renting): Pocnlsoc	+
Poorcnl (interacted with private renting): Pocnlprv	–
Prvtcity (interacted with social renting): Pvctysoc	?
Prvtcity (interacted with private renting): Pvctyprv	+
Lnperinc (interacted with social renting): Lnincsoc	–
Lnperinc (interacted with private renting): Lnincprv	–
Ratmort (interacted with social renting): Mratsoc	+
Ratmort (interacted with private renting): Mratprv	+
Ratsoc (interacted with private renting): Sratprv	?

The expected sign of these explanatory variables in the tenure choice level is drawn from the MNL tenure choice model. The variable interacted with social renting and private renting denotes the relationship between the variable and the choice of social renting or private renting respectively. As stated earlier, the user cost is an attribute varying across tenures and it is expected that the user cost would have a negative effect on households' tenure choice under the moving decision. With respect to household demographic variables, it is expected that when age increases, the household would be less likely to choose social renting and private renting, compared to owner-occupation, when considering moving. Married households with dependent children would be less likely to choose social renting and private renting, compared with owner-occupation. Female household heads are expected to be more likely to choose social renting, while it could be hard to tell whether the male or female household heads would be likely to choose private renting or owner-occupation when making decisions about moving.

With respect to employment status, it is expected that households who have full time or part time jobs would be more likely to choose owner-occupation than the other two tenures, given their decisions to move. In contrast, unemployed households would prefer social renting or private renting. When a household considers moving, the

household's previous tenure status may have an important influence on its current tenure decision. It is expected that households who were previously owners or social tenants would be more likely to remain at the same tenure when making a moving decision. As discussed earlier, many households see private renting as a transitional tenure between owner-occupation and social renting. Therefore, it would be difficult to decide those households who were previously private tenants in choosing between social renting and owner-occupation.

As discussed in the last section, dwelling type is usually associated with tenure type. In Britain, it is very often the case that owner-occupied dwellings are dominated by houses, while social rented dwellings are dominated by flats or tenements. Therefore, it is expected that households who live in houses would be likely to choose owner-occupation than social renting, when considering moving. However, as discussed in Chapter Three, there are also a number of privately rented houses located in rural areas of Scotland. Thus, it could be difficult to tell the sign in terms of the dwelling type and the choice between private renting and owner-occupation. With respect to the location variable, as discussed in the last section, the over-simple definition of the urban/rural indicator would not be suitable to interpret the relationship between tenure and location.

Households who live in a high quality neighbourhood such as the area predominated by affluent owners is expected to be more likely to choose owner-occupation than the other two tenures, when they consider moving. In contrast, households in a poor quality council housing neighbourhood would be more likely to stay in the social rented sector and it is very often the case that those households may not be able to afford to choose other tenures. It would be difficult to anticipate those households in the private rented inner city neighbourhoods who would choose social renting or owner-occupation.

Household income would have an important impact on tenure choice when making moving decisions. It is expected that when long term income increases, households would be more likely to choose owner-occupation than the other two tenures, when they consider moving. In addition, if households are rationed from mortgages, they could be forced to choose between social renting and private renting. On the other

hand, if households were constrained from the social rented sector, they would choose between owner-occupation and private renting when considering moving.

In summary, the variables of the NMNL mobility and tenure choice model are drawn from the MNL tenure choice model. The nested logit model requires the explanatory variables to be interacted with four possible choices — stay, owner-occupation, social renting and private renting in order to estimate the coefficients of these choices. The user cost in this model is treated as an attribute across tenure. It is measured by the average cost across tenures and across all 32 unitary authorities in Scotland. Since the mobility decision and tenure choice are interdependent, this thesis expects that some variables such as the household's age, sex, marital status, the number of dependent children, employment, income and neighbourhood quality would have influences on both mobility decision and tenure choice. The model results will be shown in the next chapter.

5.4 The Properties of the Data

This section discusses the properties of the data and variables applied to the two tenure choice models. The first part of this section discusses the selection of the explanatory variables of the two tenure choice models; the second part is the correlation analysis of these explanatory variables.

5.4.1 The Selection of the Explanatory Variables

As discussed in the second section, most explanatory variables of the two tenure choice models are recoded or imputed from the original variables of the 1996 SHCS. The development of some important variables including household long term income, the user cost, economic subsidies and rationing variables has been discussed in the second section. This part emphasises the process of selecting the explanatory variables recoded from the original variables of the 1996 SHCS data. Among these explanatory variables, household demographic variables such as household age, gender, marital status and the number of dependent children, can adopt the original variables in the 1996 SHCS data with only a slightly recoding.[14] It is noted that the

[14] The recoding process involves a simply change of codes of the variable into dummy code (0 or 1) and a recode of invalid data into missing value data.

original variables here mean that the variables listed in the 1996 SHCS data set are used without any recoding or imputation by this thesis. Some dummy variables like dwelling type (house or flat), location (urban or rural) and likelihood of moving within 2 years can also be directly recoded from the original variables of the 1996 SHCS data. However, some variables such as employment status, previous tenure status, and neighbourhood quality variables involve some complicated recoding exercises. The selection of these variables is discussed as follows.

- *Employment Status*

The employment status variables are recoded from the ESHOH96 variable of the 1996 SHCS data. The ESHOH96 contains seven conditions of employment status as shown in Table 5.15. The first four conditions are the most common conditions describing the household head's employment status which have been adopted by some tenure choice studies (see for example Struyk and Marshall 1974, Clark and Dieleman 1996). The condition of households with long term sickness or disability is included in the development of the social housing rationing variable, therefore, it will not be repeated in the employment status variables. Under this circumstance, this thesis recodes the most common four conditions—full time paid work, part time paid work, unemployed and retire into four separate dummy variables. These four dummy variables describe whether or not the household head has/is (1) full time paid work (FULLWORK=1), (2) part time paid work (PARTWORK=1), (3) unemployed (UNEMPLOY=1), and (4) retired (RETIRE=1). The frequency table of these four dummy variables are shown in Table 5.16.

Table 5.15 Frequency Table of the ESHOH96 Variable

	Frequency (No.)	Percent (%)	Valid Percent (%)	Cumulative Percent (%)
1. Full time paid work	8499	46.8	46.8	46.8
2. Part time paid work	801	4.4	4.4	51.2
3. Unemployed	1097	6.0	6.0	57.3
4. Retire	4957	27.3	27.3	84.6
5. Long term sick/disabled	1348	7.4	7.4	92.0
6. Looking after home	1023	5.6	5.6	97.6
7. Other	433	2.4	2.4	100.0
Total	18158	100.0	100.0	

Table 5.16 Frequency Table of the Four Dummy Variables of Employment Status—FULLWORK, PARTWORK, UNEMPLOY and RETIRE

	Frequency (No.)	Percent (%)	Valid Percent (%)	Cumulative Percent (%)
FULLWORK				
0 No	9659	53.2	53.2	53.2
1 Yes	8499	46.8	46.8	100.0
Total	18158	100.0	100.0	
PARTWORK				
0 No	17357	95.6	95.6	95.6
1 Yes	801	4.4	4.4	100.0
Total	18158	100.0	100.0	
UNEMPLOY				
0 No	17061	94.0	94.0	94.0
1 Yes	1097	6.0	6.0	100.0
Total	18158	100.0	100.0	
RETIRE				
0 No	13201	72.7	72.7	72.7
1 Yes	4957	27.3	27.3	100.0
Total	18158	100.0	100.0	

- *Previous Tenure Status*

Previous tenure status variables are recoded from the variable of PREVTEN in the 1996 SHCS data. The frequency table of the PREVTEN variable is shown as Table 5.17. Then PREVTEN variable is recoded into three separate dummy variables based on the three main tenures adopted in this thesis. These three dummy variables are (1) previous owner-occupiers (PREVOWN=1), (2) previous social tenants (PREVSOC=1), and (3) previous private tenants (PREVPRV=1). The frequency tables of these three dummy variables are shown in Table 5.18.

Table 5.17 Frequency Table of the Previous Tenure Variable (PREVTEN)

	Frequency (No.)	Percent (%)	Valid Percent (%)	Cumulative Percent (%)
1. Owner occupier	5327	29.3	29.5	29.5
2. LA/NT/SH/Other public	6248	34.4	34.6	64.1
3. HA/Housing coop	315	1.7	1.7	65.8
4. Private renter	2666	14.1	14.8	80.6
5. Other	2932	16.1	16.3	96.9
-9. Not applicable	555	3.1	3.1	100.0
Subtotal	18043	99.4	100.0	
Missing Value	115	0.6		
Total	18158	100.0		

Table 5.18 Frequency Table of Three Dummy Variables of Previous Tenure—PREVOWN, PREVSOC and PREVPRV

	Frequency (No.)	Percent (%)	Valid Percent (%)	Cumulative Percent (%)
PREVOWN				
0 No	12161	67.0	69.5	69.5
1 Yes	5327	29.3	30.5	100.0
Subtotal	17488	96.3	100.0	
Missing Value	670	3.7		
Total	18158	100.0		
PREVSOC				
0 No	10925	60.2	62.5	62.5
1 Yes	6563	36.1	37.5	100.0
Subtotal	17488	96.3	100.0	
Missing Value	670	3.7		
Total	18158	100.0		
PREVPRV				
0 No	14822	81.6	84.8	84.8
1 Yes	2666	14.7	15.2	100.0
Subtotal	17488	96.3	100.0	
Missing Value	670	3.7		
Total	18158			

- *Neighbourhood Quality*

Neighbourhood quality variables are recoded from the ACORN group variable in the 1996 SHCS data. As discussed in the second section, the ACORN group variable is the best alternative variable to proxy the neighbourhood quality in the 1996 SHCS data. The ACORN group variable divides neighbourhood quality into eight different groups associated with different tenure types as shown in Table 5.19. The explanation of these groups in the ACORN group variable describes whether or not the neighbourhood is predominated by (1) affluent owners or by seven other different groups listed in Table 5.19.

Table 5.19 Frequency Table of ACORN Group Variable

	Frequency (No.)	Percent (%)	Valid Percent (%)	Cumulative Percent (%)
1. Affluent owners	2132	11.7	11.7	11.7
2. Prosperous owners	3237	17.8	17.8	29.6
3. Agricultural	801	4.4	4.4	34.0
4. Private inner city tenant	2049	11.3	11.3	45.3
5. Better off council tenants	3611	19.9	19.9	65.2
6. Less well off council tenants	2774	15.3	15.3	80.4
7. Older council tenants	1816	10.0	10.0	90.4
8. Poorest council tenants	1735	9.6	9.6	100.0
9. Unallocated	2	0.0001	0.0	100.0
Subtotal	18157	100.0	100.0	
Missing Value	1	0.00006		
Total	18158	100.0		

Because of a lack of clear description of these neighbourhood conditions in the ACORN group variable, it is difficult for this thesis to distinguish a significant quality difference between these neighbourhood conditions.[15] Therefore, this thesis adopts three dummy variables—whether or not the neighbourhood is predominated by (1) affluent owners (AFFOWN=1), (2) private inner city tenants (PRVTCITY=1), and (3) poorest council tenants (POORCNL=1), as shown in Table 5.20. These three dummy variables present a clear and significantly different neighbourhood quality, respectively, and also are associated with different tenure types. Thus, it is significant

to examine the household's tenure choice behaviour when facing these three extremely different neighbourhood qualities.

Table 5.20 Frequency Table of Three Dummy Variables of Neighbourhood Quality—AFFOWN, PRVTCITY and POORCNL

	Frequency (No.)	Percent (%)	Valid Percent (%)	Cumulative Percent (%)
AFFOWN				
0 No	16023	88.3	88.3	88.3
1 Yes	2132	11.7	11.7	100.0
Subtotal	18155	100.0	100.0	
Missing Value	3	0.0002		
Total	18158	100.0		
PRVTCITY				
0 No	16106	88.7	88.7	88.7
1 Yes	2049	11.3	11.3	100.0
Subtotal	18155	100.0	100.0	
Missing Value	3	0.0002		
Total	18158	100.0		
POORCNL				
0 No	16420	90.4	90.4	90.4
1 Yes	1735	9.6	9.6	100.0
Subtotal	18155	100.0	100.0	
Missing Value	3	0.0002		
Total	18158	100.0		

Based on above analysis and the discussion in the second section, a total of 23 explanatory variables are initially selected for the two tenure choice models. The descriptive statistics of these explanatory variables are shown in Table 5.21. It is noted that the figures in Table 5.21 present row descriptive statistics of these variables where each variable has its different number of valid observations. The bottom of the second column shows the total valid observations of the sample are 13114. This means that after knocking out all missing value cases of each household in the sample,

[15] For example, it is difficult to draw a clear line between affluent owners and prosperous owners and also between better off council tenants and less well off council tenants.

there are 13114 observations containing full valid values of these explanatory variables. This figure is also the total sample cases of the two tenure choice models.

Table 5.21 Descriptive Statistics of Initial Explanatory Variables of the Tenure Choice Models

	N	Minimum	Maximum	Mean	Std. Deviation
AGE	18064	16.00	102.00	50.9779	17.6175
AGESQ	18064	256.00	10404.00	2909.1003	1889.6365
NDEPCH	18158	0	7	.58	.97
MARRY	18158	.00	1.00	.5752	.4943
MALE	18158	.00	1.00	.6967	.4597
FULLWORK	18158	.00	1.00	.4681	.4990
PARTWORK	18158	.00	1.00	4.411E-02	.2054
UNEMPLOY	18158	.00	1.00	6.041E-02	.2383
RETIRE	18158	.00	1.00	.2730	.4455
PREVOWN	17488	.00	1.00	.2952	.4562
PREVSOC	17488	.00	1.00	.3637	.4811
PREVPRV	17488	.00	1.00	.1478	.3549
HOUSE	17705	.00	1.00	.6249	.4842
LIKMOV2	18158	.00	1.00	.1290	.3352
URBAN	18158	.00	1.00	.7935	.4048
AFFOWN	18155	.00	1.00	.1174	.3219
PRVTCITY	18155	.00	1.00	.1128	.3164
POORCNL	18155	.00	1.00	9.556E-02	.2940
LNPERINC	18040	7.73	10.43	9.2038	.4628
LNUCC_1	15037	5.34	9.55	7.9589	.3654
LNUCN_1	13847	4.82	9.55	7.6562	.3994
RATMORT	14450	.00	1.00	.4487	.4974
RATSOC	18158	.00	1.00	.6398	.4801
Valid N (listwise)	13114				

5.4.2 Correlation Analysis

It is common to find that explanatory variables such as those shown above have some degree of correlation. If some explanatory variables are highly correlated, then it is very difficult to separate the individual effects of these variables (Greene 2000). In this case, the multicollinearity problem becomes severe and the estimation results of the tenure choice models are spurious. As Green (2000) states, since nonexperminental data will never be completely orthogonal (no correlation between

variables), to some extent multicollinearity will always exist. To cope with the multicollinearity problem, one remedy is to obtain more data and another is to drop variables suspected of causing the multicollinearity problem (ibid.). Due to data limitations, the approach used in this thesis to improve multicollinearity of the tenure choice models is to drop variables which are highly correlated. A correlation analysis of these explanatory variables can help us to point out some suspected variables.

In a correlation analysis, the correlation coefficient itself has the following range of values: (1) +1.0 denotes a perfect positive correlation, (2) 0.0 denotes no correlation, (3) –1.0 denotes perfect negative correlation (Williams 1992). With respect to the degree of correlation between variables, Guilford (1956) suggests a rough guide of the correlation coefficients as follows: (quoted from Williams 1992, p. 137)

0.20<	slight; almost negligible relationship
0.20-0.40	low correlation; definite but small relationship
0.40-0.70	moderate correlation; substantial relationship
0.70-0.90	high correlation; marked relationship
>0.90	very high correlation; very dependable relationship

Table 5.22 Correlation Analysis of Some Explanatory Variables with Moderate to High Correlation

	Age	Marry	Male	Fullwork	Retire	Lnperinc
Fullwork	-0.503*	0.402*	0.358*	1.00	-0.575*	0.599*
Retire	0.743*	-0.201*	-0.176*	-0.575*	1.00	-0.461*
Lnperinc	-0.489*	0.797*	0.586*	0.599*	-0.461*	1.00
Ratsoc	-0.417*	0.323*	0.253*	0.603*	-0.518*	0.516*
Ratmort	-0.008	-0.404*	-0.291*	-0.241*	0.028*	-0.421*

Notes: the correlation coefficient is the Pearson Product-Moment Correlation Coefficient.
* significant at 5% level.

Table 5.22 shows the correlation analysis of some explanatory variables, which are moderately or highly correlated. A full correlation table of all explanatory variables is shown in Appendix A.5.3. Apparently, the household head's age and retired household heads are highly correlated. The correlation between married household head and household long term income is remarkably high. It is reasonable to see that

household long term income has a moderate correlation to some of the household head's demographic variables and employment variables since the estimation of household long term income is based on these variables as discussed in the second section. In the meantime, the social housing rationing variable is derived from household income and employment variables. As a result, the social housing rationing variable has a moderate degree of correlation to these variables.

As Green (2000) suggests, when some explanatory variables are perfectly or highly correlated, multicollinearity becomes a serious problem to the model. Therefore, the focus is on explanatory variables with high correlation. In this sense, there are four explanatory variables: the household head's age, marital status, retired household heads and household long term income, all of which could possibly be dropped in order to cope with a severe problem of multicollinearity in the specification. Among these four variables, the household head's age and marital status are the basic determinants of tenure choice and also household long term income is an important determinant. Under this circumstance, the dummy variable of whether the household head is retired or not is dropped out of the tenure choice models to minimise the multicollinearity problem. However, it should be noted that multicollinearity can still be a problem distorting the estimation results of the tenure choice models, since it still exhibits a high degree of correlation between household long term income and the household head's marital status.

Finally, after dropping the dummy variable of retired household heads, a total of 22 explanatory variables are selected to estimate their influences on households' tenure choice behaviour. The descriptive statistics of these explanatory variables are reported in Table 5.23.

Table 5.23 Descriptive Statistics of Explanatory Variables of the Tenure Choice Models

	N	Minimum	Maximum	Mean	Std. Deviation
AGE	13114	16.00	97.00	51.2778	17.7229
AGESQ	13114	256.00	9409.00	2943.4499	1898.4888
NDEPCH	13114	0	7	.58	.96
MARRY	13114	.00	1.00	.5778	.4939
MALE	13114	.00	1.00	.6925	.4615
FULLWORK	13114	.00	1.00	.4455	.4970
PARTWORK	13114	.00	1.00	4.598E-02	.2095
UNEMPLOY	13114	.00	1.00	6.001E-02	.2375
HOUSE	13114	.00	1.00	.6257	.4839
PREVOWN	13114	.00	1.00	.2926	.4550
PREVSOC	13114	.00	1.00	.3730	.4836
PREVPRV	13114	.00	1.00	.1462	.3533
LIKMOV2	13114	.00	1.00	.1246	.3303
URBAN	13114	.00	1.00	.7989	.4008
AFFOWN	13114	.00	1.00	.1150	.3190
PRVTCITY	13114	.00	1.00	.1071	.3093
POORCNL	13114	.00	1.00	9.989E-02	.2999
LNPERINC	13114	7.81	10.43	9.1981	.4568
LNUCC_1	13114	5.34	9.49	7.9451	.3596
LNUCCN_1	13114	4.82	9.49	7.6690	.3796
RATMORT	13114	.00	1.00	.4502	.4975
RATSOC	13114	.00	1.00	.6222	.4848

5.5 Summary

This chapter discusses the empirical data and variables used in the two different structures of tenure choice models. The 1996 Scottish House Condition Survey data set contains large samples and rich information about households' socio-economic characteristics and dwelling conditions, which are useful to estimate the Scottish households' tenure choice behaviour. Inevitably, the 1996 SHCS data set does not contain all the variables needed for the two tenure choice models. Some important variables are constructed in this chapter.

In the MNL tenure choice model, the dependent variable is the household's current tenure status including owner-occupation, social renting and private renting. The

explanatory variables come from several categories including the household's demographic characteristics, employment status, previous tenure status, location, expected mobility, dwelling type and neighbourhood quality variables. These variables are expected to have important impacts on tenure choice. This thesis also constructs household long-term income, the user cost, housing (economic) subsidy and rationing variables to estimate households' tenure decisions. The use of long term income implies the household's tenure decision is based on long term and multiple periods instead of the current and single period. The housing user cost presents the relative cost of owning, social renting and private renting. The economic subsidy reduces the user cost, thus the effect can be expressed by estimating the difference between the user cost and the net user cost. The mortgage rationing and social housing rationing variables are developed by simulating households' access constraints into the owner-occupied sector and the social rented sector respectively.

In the NMNL mobility and tenure choice model, the dependent variable is the household's move-stay and tenure status including stay, owner-occupation, social renting and private renting. If a household has moved within two years, the household is defined as a recent mover and is assigned to its current tenure status. The explanatory variables of the mobility and tenure choice model are drawn from the first tenure choice model. As a requirement of the nested logit model, the explanatory variables need to be interacted with four possible choices in order to estimate the interactive coefficients of these four alternative choices. One exception is the user cost variable which is treated as an attribute across tenures. To emphasise the area variation, the user cost in the model is measured by the average cost across tenures and across all 32 unitary authorities in Scotland.

The household's mobility decision and tenure choice are interdependent. Hence, it is expected that some variables such as the household's age, sex, marital status, the number of dependent children, employment, household long-term income and neighbourhood quality would have influences on both mobility decision and tenure choice. These variables will be examined in the next chapter. Moreover, in the discussion of the properties of the data, this thesis explains the process of selecting the explanatory variables, in particular the employment status variables, previous tenure status variables and the neighbourhood quality variables which are recoded from the

original variables in the 1996 SHCS. A correlation analysis of these explanatory variables is also discussed in this chapter. In order to minimise the multicollinearity problem, this thesis drops some improper variables which involve a high degree of correlation. Thus, it would help to select appropriate explanatory variables applied to the two tenure choice models. Finally, it would be of interest to analyse the influences of these appropriate explanatory variables on the household's tenure choice and also to compare the estimation results of the two tenure choice models. The next chapter is the analysis of model results.

CHAPTER SIX ANALYSIS OF MODEL RESULTS

This chapter analyses the estimation results of the two tenure choice models. There are three sections in this chapter. The first section interprets the estimation results of the multinomial logit form of tenure choice model. The second section analyses the estimation results of the nested multinomial logit form of mobility and tenure choice model. The last section is an overall analysis of the two model results.

6.1 Estimation Results of the Tenure Choice Model

The multinomial logit form of the tenure choice model is run by the LIMDEP software programme.[16] As discussed in Chapter Four, the multinomial logit model is estimated by the maximum likelihood approach. In order to analyse the economic subsidy effect and the rationing effect, this thesis examines three separate models containing different combinations of explanatory variables. Model One is the basic model without economic subsidy and rationing variables. Model Two estimates the economic (housing) subsidy effect and contains all the variables in the first model except for the net user cost variable. As discussed in the last chapter, the economic subsidy effect is expressed as the difference between the user cost and the net user cost. Model Three estimates both the economic subsidy effect and the rationing effect, and contains all the variables of the second model and adds mortgage rationing and social housing rationing variables. The estimation results of these three models are discussed below. The full estimation results of these three models run by LIMDEP programme are reported in Appendix A.6.1.

6.1.1 Model One

The estimation results of model one are reported in Table 6.1. The default tenure in the MNL tenure choice model is owner-occupation, the coefficient estimates in the second column and the fourth column of Table 6.1 are the probabilities of choosing social renting and private renting, compared to owner-occupation respectively. It is important to note that the coefficient estimates are the comparative coefficients, which

[16] LIMDEP is a flexible computer programme for estimating a variety of models. Specifically it is very powerful for discrete choice models, such as the MNL model and the NMNL model.

are compared to the default tenure — owner-occupation. Table 6.1 shows that most coefficient estimates in model one are statistically significant at 1% level, which means that most explanatory variables have statistically significant influences (in the 99% confidence interval) on households' tenure decisions. The model's overall predicted level (goodness-of-fit) is nearly 80%, indicating that the model is quite reliable and the explanatory variables have good predictions on tenure choice.

Table 6.1 Estimation Results of the MNL Tenure Choice Model—Model One.

Dependent Variable = Tenure
Default tenure = Owner-Occupation
OO = Owner-Occupation; SR = Social Renting; PR = Private Renting

	SR:OO		PR:OO	
Variable	Coefficients	Significant Level	Coefficients	Significant Level
Constant	50.25	***	27.32	***
Age	0.047	***	-0.098.	***
Agesq	-0.0008	***	0.0005	***
Ndepch	0.617	***	0.270	***
Marry	1.093	***	-0.378	**
Male	-0.103	Insig	0.296	**
Fullwork	-1.007	***	-0.886	***
Partwork	-0.136	Insig	-0.868	***
Unemploy	0.986	***	0.809	***
House	-0.483	***	0.160	Insig
Prevown	-1.228	***	-0.405	***
Prevsoc	0.722	***	0.489	***
Prevprv	0.289	***	1.124	***
Likmov2	0.197	**	1.310	***
Urban	0.066	Insig	-0.808	***
Affown	-1.712	***	0.274	*
Prvtcity	-1.775	***	0.573	***
Poorcnl	1.145	***	0.307	Insig
LnPerinc	-3.201	***	-1.169	***
LnUcc_1	-2.710	***	-1.921	***
Log Likelihood	-6703.9			
Predicted Level	79.2%			
N	13114			

Notes: *** : Significant at 1 per cent level.
** : Significant at 5 per cent level.
* : Significant at 10 per cent level.

Insig : Insignificant.

With regard to the choice between social renting and owner-occupation, it is surprising to see that the household head's age has a positive effect on social renting compared to owner-occupation. The coefficient of the household head's age is interpreted as when the household head's age increases, say one year, the probability of the household head choosing social renting increases 5%, compared to owner-occupation, holding other variables constant. Similar interpretation applies to other explanatory variables. The negative effect of the age-square of household heads explains that the probability of choosing social renting increases at a slower rate.

However, it is not expected that households who have more dependent children are more likely to choose social renting rather than owner-occupation. Nor is it expected that married household heads are more likely to choose social renting than owner-occupation. To some degree, the positive effects of the household head's age, marital status and number of dependent children on choosing social renting suggest that, in this sample, older and matured households are more likely to stay in the social rented sector, compared to owner-occupation. According to the 1996 SHCS main report, published by Scottish Homes (1997), more than 40% of older households and single pensioners stay in the social rented sector. In contrast, more than 40% of single and small adult households are homeowners.

With respect to the household head's employment status, the results show that household heads who have full-time jobs have a strongly negative coefficient of choosing social renting compared to owner-occupation. In other words, households having full time jobs are much more likely to choose owner-occupation rather than social renting. In contrast, unemployed household heads have a strongly positive coefficient of choosing social renting than owner-occupation. In general, unemployed household heads have lower incomes, thus they are more likely to choose lower costs of social housing than owner-occupation.

As expected, the model results show that households who live in houses are more likely to choose owner-occupation than social renting. As discussed in Chapter Three, most houses in Scotland are owner-occupied. Therefore, it is most likely the case that

households who live in or want to live in houses could only be owner-occupiers. With respect to previous tenure status, the results show that the household's previous tenure status has statistically and numerically significant influences on tenure decision. Household heads who were previously homeowners have a strongly negative coefficient of choosing social renting compared to owner-occupation. In contrast, household heads who were previously social tenants are more likely to continue to stay in social housing. These results together suggest that households are more likely to continue to choose the same tenure as their previous one when making their tenure decisions. In the choice between social renting and owner-occupation, the results show that households who were previously private tenants are more likely to choose social renting compared to owner-occupation.

With regard to expected mobility, it was found that households who expect to move within two years are more likely to choose social renting compared to owner-occupation. This implies that owner-occupiers could be less mobile than social tenants in Scotland. In addition, the results show that the urban/rural indicator does not have a statistically significant influence on households' choice between social renting and owner-occupation. As discussed in Chapter Four, the simple definition of the urban/rural indicator in the 1996 SHCS cannot present the spatial concentration of certain tenure type of dwellings in Scotland. For instance, the spatial concentration of owner-occupied dwellings in the suburbs and social rented dwellings in the inner city and periphery could all be defined as in the urban area in this urban/rural indicator. Thus, it does not show a clear relationship between location and households' tenure decisions.

Neighbourhood quality is also found to have a significant influence (numerically and statistically) on the household's tenure decision. As discussed in Chapter Five, since the neighbourhood quality variables are associated with tenure types, it is not surprising to see that households in high quality neighbourhoods predominated by affluent owners have a strongly negative coefficient of choosing social renting, compared to owner-occupation. In general, households living in the neighbourhood predominated by owner-occupied dwellings may not have choices to other two tenures. In this sense, households in the poorest council housing neighbourhood may not have choices or may not afford to other two tenures. Therefore, the results show that

households in poor quality neighbourhoods which are predominated by the poorest council tenants have a strongly positive likelihood of choosing social renting compared to owner-occupation. More importantly, it is of interest to examine the effect of the neighbourhood quality variable on other tenures, which are not the predominant tenure in the neighbourhood. The results show that households in medium quality inner city neighbourhood predominated by private tenants are more likely to choose owner-occupation rather than social renting.

It was found that household long-term income has the most substantively negative impact on choosing social renting compared to owner-occupation, and its coefficient magnitude is the biggest among the explanatory variables. In other words, when income increases, households have the strongest probability of choosing owner-occupation than social renting. The user cost, as expected, has a strongly negative coefficient of choosing social renting compared to owner-occupation. Although each household has its individual user costs associated with its current tenure, the results of the user cost can generally be interpreted as in the choice between social renting and owner-occupation, households in all three tenures are more likely to choose owner-occupation when the household's individual user costs increase. Moreover, if we look at the coefficient magnitudes of these two explanatory variables, the results indicate that household long-term income and the user cost are the most important determinants of tenure choice in Scotland.

Regarding the choice between private renting and owner-occupation, the results show that the probability of choosing private renting declines with an increase in the age of the household head. Married household heads are less likely to choose private renting compared to owner-occupation. These results together suggest that younger and single households are more likely to choose private renting rather than owner-occupation. As Scottish Homes (1997) indicate, younger and single households have shorter length of occupancy and have higher propensity to move than older and large family households. In this sense, younger and single households are more likely to choose the lower transaction costs of private renting rather than owner-occupation. However, it is not expected that male household heads and households having more dependent children are more likely to choose private renting than owner-occupation.

The causes of incorrect effects are complicated.[17] The multicollinearity problem, as discussed in Chapter Five, could be the primary cause of these incorrect effect.

The results show that household heads who have full time or part time jobs are less likely to choose private renting compared to owner-occupation. In contrast, unemployed household heads are more likely to choose private renting rather than owner-occupation. In general, households in better employment status have higher incomes, thus it is more likely for them to choose secure tenure like owner-occupation rather than private renting. In this sense, unemployed households are more likely to choose the lower costs of private renting than owner-occupation.

In respect of the household's previous tenure status, the results suggest that households are more likely to choose the same tenure as their previous one when making a tenure decision. Households who were previously private tenants have a numerically and statistically strong probability of staying in private renting. The results also show that households who are likely to move within two years have a strong probability of choosing private renting rather than owner-occupation. This result also supports an earlier interpretation that younger and single household heads are more mobile. Therefore, they are more likely to choose likely to choose lower transaction costs of private renting rather than owner-occupation.

With regard to the urban/rural location, the results show that households living in urban areas are less likely to choose private renting compared to owner-occupation. According to Scottish Homes (1997), there is a substantial number of privately rented dwellings located in rural areas of Scotland, thus households in rural areas would have higher propensity to live in private renting dwellings. As expected, households who live in neighbourhoods which are predominated by inner city private tenants are more likely to choose private renting than owner-occupation. In general, households in the neighbourhood dominated by private renting dwelling may not have many choices to other tenures. However, it is not expected that households living in neighbourhoods predominated by affluent owners have a positive coefficient of choosing private renting rather than owner-occupation. However, the coefficient is barely statistically

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[17] In addition to the multicollinearity problem, this thesis found that the Limdep computer programme is very sensitive in specification of the discrete choice models. Therefore, a smaller sample size such as

significant (at the 10% level). Households living in the poorest council housing neighbourhoods are found to have statistically insignificant coefficient of choosing owner-occupation or private renting. As discussed above, the poorest council tenants may not have any choices or afford to other tenures.

The household long-term income and the user cost are found to have strongly negative coefficients of choosing private renting compared to owner-occupation. The results suggest that when income increases, households are more likely to choose owner-occupation than private renting. To some extent, the strongly negative effect of the user costs on private renting implies that households in the private rented sector are more sensitive to increases in the user costs than owner-occupiers. In this sense, when the user cost increases, households are more likely to choose owner-occupation compared to private renting. Again, if the coefficient magnitude is examined, the results suggest that household long-term income and the user cost are the most important determinants of tenure choice.

6.1.2 Model Two

Model Two aims to estimate the economic (housing) subsidy effect on households' tenure decisions. In model Two, the user cost variable is replaced by the net user cost. As stated in Chapter Five, the net user cost is derived by the user cost subtracting the economic subsidy. Other explanatory variables are the same as Model One. The goodness-of-fit of Model Two is better than model one indicating that the economic subsidy effect has a significant influence on the household's tenure decision. Furthermore, since the only one variable to be replaced in Model Two is the net user cost, the change in the user cost would alter coefficients of some other explanatory variables in the model. This indicates that the changes in coefficient estimates of other explanatory variables are affected by the economic subsidy. The estimation results of Model Two are reported in Table 6.2.

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private tenants or a small piece of difference in sample could derive a significantly different result.

Table 6.2 Estimation Results of the MNL Tenure Choice Model—Model One and Model Two.

Dependent Variable = Tenure
Reference tenure = Owner-Occupation
OO = Owner-Occupation; SR = Social Renting; PR = Private Renting

	Model One				***Model Two***			
	SR:OO		PR:OO		SR:OO		PR:OO	
Variable	Coefficients	Sig. Level	Coefficients	Sig. Level	Coefficients	Sig. Level	Coefficients	Sig Level
Constant	50.25	***	27.32	***	56.31	***	14.489	***
Age	0.047	***	-0.098	***	0.016	Insig	-0.098	***
Agesq	-0.0008	***	0.0005	***	-0.0005	***	0.0005	***
Ndepch	0.617	***	0.270	***	0.620	***	0.226	***
Marry	1.093	***	-0.378	**	1.113	***	-0.253	**
Male	-0.103	Insig	0.296	**	-0.159	*	0.232	*
Fullwork	-1.007	***	-0.886	***	-0.890	***	-0.671	***
Partwork	-0.136	Insig	-0.868	***	-0.128	Insig	-0.720	***
Unemploy	0.986	***	0.809	***	1.067	***	0.911	***
House	-0.483	***	0.160	Insig	-0.606	***	-0.221	*
Prevown	-1.228	***	-0.405	***	-1.053	***	-0.577	***
Prevsoc	0.722	***	0.489	***	0.793	***	0.484	***
Prevprv	0.289	***	1.125	***	0.300	***	0.972	***
Likmov2	0.197	**	1.310	***	0.159	*	1.167	***
Urban	0.066	Insig	-0.808	***	0.016	Insig	-0.917	***
Affown	-1.712	***	0.274	*	-1.662	***	0.052	Insig
Prvtcity	-1.775	***	0.572	***	-1.764	***	0.300	**
Poorcnl	1.145	***	0.308	Insig	1.361	***	0.435	*
LnPerinc	-3.201	***	-1.169	***	-3.142	***	-1.401	***
LnUcc_1	-2.710	***	-1.921	***				
LnUccn_1					-3.583	***	-0.831	Insig
Log Likelihood	-6703.9				-6366.5			
Predicted Level	79.2%				81.8%			
N	13114				13114			

Notes: *** : Significant at 1 per cent level.
** : Significant at 5 per cent level.
* : Significant at 10 per cent level.
Insig : Insignificant.

Affecting by the economic subsidy effect, several variables have changed their statistical significance. The household head's age has become statistically insignificant in choosing between social renting and owner-occupation. Compared to

Model One, female household heads have stronger positive coefficient of choosing social renting than owner-occupation but the coefficient is barely significant. In general, low-income households and vulnerable groups are more likely to choose the lower cost of social renting rather than to be homeowner. According to Scottish Homes (1997), female household heads have lower incomes than male household heads. In this sense, female household heads are more likely to choose social renting than owner-occupation.

It was found that economic subsidy has a (statistically and numerically) significant influence on the user cost. After subsidy, the net user cost turns out to have a stronger negative coefficient when choosing social renting than the user cost does. Moreover, influenced by the economic subsidy effect, more than half of explanatory variables in Model Two have increased their coefficient magnitudes. These results together indicate that economic subsidy has a substantive effect on the user cost as well as on the household's choice between social renting and owner-occupation.

Regarding the household's choice between private renting and owner-occupation, Influenced by the economic subsidy effect, male household heads have less statistical and numerical effects on choosing private renting compared to owner-occupation. After the subsidy effect, households who live in houses have increased their probability of choosing owner-occupation compared to private renting but the coefficient is barely statistically significant. The results show that the net user cost has become statistically insignificant in choosing between private renting and owner-occupation. As discussed in Chapter Five, after subsidy, the net user cost for private tenants is higher than the net user cost for owner-occupiers (see Table 5.9). This dramatic change has impacts on reducing the statistical and numerical effect of the net user cost on choosing between private renting and owner-occupation.

6.1.3 Model Three

Model Three examines both the economic subsidy effect and the rationing effect on households' tenure decisions. The mortgage rationing and the social housing rationing variables are included in this model, other explanatory variables are the same as Model Two. The goodness-of-fit in Model Three is better than Model Two, which suggests that Model Three has a better prediction on tenure choice than Model

Two. This also suggests that the two rationing factors have statistically significant influences on tenure choice. The estimation results of Model Three are reported in Table 6.3.

Table 6.3 Estimation Results of the MNL Tenure Choice Models—Model Two and Model Three.

Dependent Variable = Tenure
Reference tenure = Owner-Occupation
OO = Owner-Occupation; SR = Social Renting; PR = Private Renting

	Model Two				***Model Three***			
	SR:OO		PR:OO		SR:OO		PR:OO	
Variable	Coefficients	Sig. Level	Coefficients	Sig. Level	Coefficients	Sig. Level	Coefficients	Sig. Level
Constant	56.31	***	14.489	***	43.87	***	8.709	***
Age	0.016	Insig	-0.098	***	0.049	***	-0.065	***
Agesq	-0.0005	***	0.0005	***	-0.0006	***	0.0004	**
Ndepch	0.620	***	0.226	***	0.649	***	0.263	***
Marry	1.113	***	-0.253	**	1.361	***	0.128	Insig
Male	-0.159	*	0.232	*	-0.229	**	0.212	Insig
Fullwork	-0.890	***	-0.671	***	-0.280	***	-0.514	***
Partwork	-0.128	Insig	-0.720	***	0.430	*	-0.410	Insig
Unemploy	1.067	***	0.911	***	1.178	***	1.033	***
House	-0.606	***	-0.221	*	-0.812	***	-0.336	**
Prevown	-1.053	***	-0.577	***	-1.299	***	-0.979	***
Prevsoc	0.793	***	0.484	***	0.656	***	0.279	**
Prevprv	0.300	***	0.972	***	0.117	Insig	0.762	***
Likmov2	0.159	*	1.167	***	0.339	***	1.428	***
Urban	0.016	Insig	-0.917	***	-0.185	**	-1.077	***
Affown	-1.662	***	0.052	Insig	-1.848	***	-0.165	Insig
Prvtcity	-1.764	***	0.300	**	-1.913	***	0.202	Insig
Poorcnl	1.361	***	0.435	*	1.462	***	0.557	**
LnPerinc	-3.142	***	-1.401	***	-1.486	***	-0.352	Insig
LnUcc_1								
LnUccn_1	-3.583	***	-0.831	Insig	-4.248	***	-0.801	***
Ratmort					3.289	***	2.920	***
Ratsoc					-0.713	***	-0.261	*
Log Likelihood	-6366.5				-5022.8			
Predicted Level	81.8%				86.4%			
N	13114				13114			

Notes: *** : Significant at 1 per cent level.

** : Significant at 5 per cent level.
* : Significant at 10 per cent level.
Insig. : Insignificant.

With respect to the choice between social renting and owner-occupation, once the mortgage rationing and social rationing variables have been included, most explanatory variables have increased their coefficient magnitudes. This suggests that the two rationing variables have substantive influences on other explanatory variables, which strengthen their influences on tenure choice. In particular, influenced by the rationing effect, the coefficient magnitude of the net user cost has significantly increased, which turns out to have a stronger negative probability of choosing social renting compared to owner-occupation. Two variables, male household heads and households in urban areas also have significantly increased their coefficient magnitudes and statistical significance after the rationing effect.

Some variables, however, have significantly reduced their coefficient magnitudes and the statistical significance level after the rationing effect. Influenced by the rationing effect, household heads having full time jobs have a less negative probability of choosing social renting compared to owner-occupation. Households who have part time jobs turns to have a barely significant effect on choosing social renting after the rationing effect. Households who were previously private tenants have also become statistically insignificant in choosing between social renting and owner-occupation after the rationing effect. In particular, household long-term income has significantly reduced its coefficient magnitude after the rationing effect. To some extent, the changes in coefficients of the employment status and the household long-term income are probably affected by the mortgage rationing variable rather than by social housing rationing. As discussed in Chapter Four, the mortgage rationing variable is primarily derived from household income and hedonic house prices. Further, there is a moderate degree of correlation between household income and the employment status variables as discussed in Chapter Five.

More importantly, the two rationing variables are found to have statistically and numerically significant influences on tenure choice. Mortgage rationing has a strong and significant role in constraining households who are potentially not qualified for mortgages. In this sense, households who are constrained from mortgages are more

likely to choose social renting. On the other hand, social housing rationing plays an opposite role in filtering out households with higher income and better economic status thus enabling low-income households and vulnerable groups to enter the social rented sector. In this sense, households who are potentially constrained from the social housing sector are more likely to choose owner-occupation.

Regarding the choice between private renting and owner-occupation, the results show that because of the influence of the rationing effect, several variables have significantly reduced their coefficient magnitudes and also the statistical significance level. The household head's gender and marital status and household heads having part time jobs have become statistically insignificant in determining whether private renting or owner-occupation after the rationing effect. In contrast, households living in houses have become more significant and have stronger negative coefficient of choosing private renting than owner-occupation after the rationing effect. Further, the two rationing variables also significantly affect the neighbourhood quality variables. Households living in medium quality inner city neighbourhoods predominated by private tenants have become statistically insignificant in choosing between private renting and owner-occupation. However, households in the poorest council housing neighbourhoods have a stronger probability of choosing private renting compared to owner-occupation after the rationing effect. As discussed earlier, influenced by the two rationing variables (primarily the mortgage rationing variable), household long-term income has reduced its coefficient magnitude and statistical significance level of choosing between private renting and owner-occupation.

As stated earlier, the mortgage rationing plays a strong role in filtering out households who could potentially not obtain mortgages. In this case, households who are potentially constrained from mortgages have a statistically significant and strong probability of choosing private renting. However, households who are potentially constrained from the social rented sector are more likely to choose owner-occupation than private renting but the coefficient is barely statistically significant (at the 10% level).

6.1.4 Summary

Among these three models, Model Three provides the best prediction on the household's tenure choice behaviour. Most explanatory variables in these three models have statistically significant influences on tenure choice, indicating that tenure choice is influenced not only by households' demographic and socio-economic attributes but also by housing attributes such as dwelling type, location and neighbourhood quality. In particular, the household long-term income and the user cost are the most important determinants of tenure choice since the coefficient magnitudes of these two variables are bigger than other explanatory variables. When income increases, households have a statistically significant and strong likelihood of choosing owner-occupation rather than social renting or private renting. As the user cost increases, households have a strongly negative likelihood of choosing social renting or private renting, compared to owner-occupation. To some extent, this implies that social tenants and private tenants are more sensitive to increases in the user cost than owner-occupiers.

Housing subsidy in economic terms is found to have important influences on tenure choice. After subsidy, the net user cost turns to have a stronger negative likelihood of choosing social housing compared to owner-occupation. In contrast, after subsidy, the net user cost for private tenants is higher than that for owner-occupiers. This change has reduced the influence (the coefficient magnitude and statistical significance level) of the net user cost on households' choosing between private renting and owner-occupation. Furthermore, the two rationing factors have significant effects on households' tenure decisions. Mortgage rationing and social housing rationing play an important role in filtering ineligible households from becoming homeowners and social tenants respectively.

The multinomial logit form of tenure choice model however, has its limitations in terms of violating the IIA assumption. As a result, the MNL model results should be treated with caution as discussed in Chapter Four. Unlike the NML model, the nested multinomial logit model holds the IIA assumption. The next section will analyse the results of the NMNL form of mobility and tenure choice model.

6.2 Estimation Results of the Mobility and Tenure Choice Model

The nested multinomial logit form of mobility and tenure choice model is estimated by the full information maximum likelihood approach, as stated in Chapter Four. Like the last section, three separate models containing different combinations of explanatory variables are examined in this section in order to estimate the economic subsidy effect and the rationing effect on the household's mobility and tenure decision. The estimation results of these three models are discussed in turn. The full estimation results run by the LIMDEP programme are listed in Appendix A.6.2.

6.2.1 Model One

Model One is the basic model without subsidy and rationing variables. The estimation results of Model One are reported in Table 6.4. The mobility and tenure choice model contains a two-level decision tree. The default tenure in the tenure choice level is owner-occupation, and in the mobility decision level is stay. The overall prediction level of the model is 81.69%, indicating the model has a good prediction percentage on the household's mobility and tenure choice behaviour. The coefficient estimates shown in the second column of Table 6.4 are the probabilities of the household being influenced by the explanatory variables to choose social renting (the variable interacting with social renting) and private renting (the variable interacting with private renting), compared to owner-occupation. Greene (1998) states that the interpretation of the NMNL model results is complicated since the explanatory variables are interacted with different possible choices. As a result, the interpretation of the model results focuses on the 'sign' (does it have a negative or a positive impact on the relevant probability) and the statistical significance of the explanatory variables.

The analysis of the model results begins at the lower level of the model — the tenure choice level. Before analysing the coefficient estimates of explanatory variables, the IIA property in the tenure choice level is firstly examined. As stated in Chapter Four, if the inclusive value parameter lies between 0 and 1 and is statistically significant, the IIA property holds in this branch. In our model, the inclusive value parameter in the mover branch (tenure choice branch) is 0.24 and is statistically significant, which indicates that the IIA property holds in the tenure choice level. Moreover, this thesis also applies the Hausman-McFadden's statistical test for the IIA property to the tenure

choice level. The results show that the chi-square value of the Hausman-McFadden's test is 429.6 and is statistically significant, which means that the IIA property holds in the tenure choice branch. The full results of the IIA test are also listed in Appendix A.6.2.

Table 6.4 Estimation Results of the NMNL Mobility and Tenure Choice Model—Model One

Dependent Variable = Achoice

Default Tenure = "Owner-occupation" in the tenure choice level; "stay" in the mobility decision level

Lower Level—Tenure Choice		
Variable	Coefficient	Significant Level
Constant	-10.505	***
Lntcost	-0.494	***
Agehsoc	-0.011	*
Agehprv	-0.055	***
Ndepchsoc	0.312	***
Ndepchprv	0.176	*
Marrysoc	-0.802	***
Marryprv	-0.582	***
Malesoc	-0.411	*
Maleprv	0.377	Insig
Fullsoc	-1.759	***
Fullprv	-1.584	***
Partsoc	-1.217	***
Partprv	-2.237	***
Unempsoc	0.781	*
Unempprv	0.681	Insig
Pvownsoc	-1.142	***
Pvownprv	-0.153	Insig
Pvsocsoc	1.604	***
Pvsocprv	0.314	Insig
Pvprvsoc	0.688	***
Pvprvprv	1.218	***
Houssoc	-1.480	***
Housprv	-0.102	Insig

Urbansoc	-0.501	**
Urbanprv	-0.876	***
Afownsoc	-1.086	***
Afownprv	0.050	Insig
Pvctysoc	-1.676	***
Pvctyprv	1.133	***
Pocnlsoc	1.484	***
Pocnlprv	-0.231	Insig
Lnincsoc	-0.312	***
Lnincprv	-0.850	***
Upper Level—Mobility Decision		
Variables	Coefficients	Significant Level
Ageheads	0.055	***
Marrys	-0.156	Insig
Ndepchs	0.196	***
Males	-0.145	Insig
Unemps	0.115	Insig
Lnincs	0.534	***
Affowns	-0.017	Insig
Pvcitys	-0.197	*
Porcnls	0.272	**
Inclusive values I_1 (Stayer)	1.00	fixed
Inclusive values I_2 (Mover)	0.243	***
Log Likelihood	-4893.7	
Predicted Level	81.69%	
No. Obs	52048	

Notes: *** : Significant at 1 per cent level.
** : Significant at 5 per cent level.
* : Significant at 10 per cent level.
Insig. : Insignificant.

With regard to the coefficient estimates of the explanatory variables in the tenure choice level, the user cost, as expected, has a negative effect on tenure choice. This indicates that, when an increase in the user cost of certain tenure, households are less likely to choose that tenure. As discussed in Chapter Five, the user cost in this model is measured by the average cost between tenures across all 32 unitary authorities. The results suggest that the user cost is significantly different between tenures and across

unitary authorities. The age of the household head has a negative coefficient of choosing social renting and private renting compared to owner-occupation. This suggests that the probability of the household's choosing owner-occupation increases with the household head's age.

The results show that the probability of choosing social renting increases with the number of dependent children. According the 1996 SHCS sample, households having less than three dependent children have a higher percentage of staying owner-occupation than in social renting. In contrast, households having four and more dependent children have a higher percentage of staying in social renting than in owner-occupation. In this case, it is reasonable to see the model results showing that households having more dependent children are more likely to choose social renting than owner-occupation. However, it is not expected that households having more dependent children are more likely to choose private renting than owner-occupation but the coefficient is barely statistically significant at the 10% level. The results show that married household heads are more likely to choose owner-occupation rather than social renting or private renting. In addition, female household heads are likely to choose social renting but the coefficient is barely statistically significant. If the influences of the household's demographic variables on tenure choice are examined, it is clear to see that older households, married couples and adult-only households are more likely to choose owner-occupation rather than social renting or private renting.

Household heads who have full time or part time jobs have strongly negative coefficients of choosing social renting or private renting compared to owner-occupation. In other words, household heads having full time or part time jobs are much more likely to choose owner-occupation rather than other tenures. In contrast, unemployed household heads are more likely to choose social renting but the coefficient is barely statistically significant. Households' previous tenure status is found to have an important impact on tenure choice. The results show that households have a statistically significant and strong coefficient of choosing the same tenure as their previous one when making a moving and tenure decision.

Households living in houses also have a statistically significant and strong coefficient of choosing owner-occupation rather than social renting but the coefficient is

statistically insignificant in choosing between private renting and owner-occupation. As discussed in the last section, houses are the dominant dwelling type in the owner-occupied sector. As a result, in many cases, households who live in or want to live in houses could only be owner-occupiers than tenants. Scottish Homes (1997) also indicate that there is a substantial number of private rented houses located in the rural areas of Scotland. In this case, households living in houses may not have a statistically significant effect on choosing between private renting and owner-occupation. Regarding the urban/rural location, the results show that households living in urban areas are more likely to choose owner-occupation than social renting or private renting. As stated in the last section, the simple urban/rural location variable cannot reflect the spatial concentration of social rented and owner-occupied dwellings in the inner city, periphery and suburban areas. As expected, households in rural areas are more likely to choose private renting than owner-occupation. As stated above, there is a substantial number of private rented dwellings located in rural areas, compared to owner-occupied dwellings.

Neighbourhood quality is found to have an important influence on tenure choice. Since the neighbourhood quality variables in this thesis connect to tenure types, it is not surprising to see the results that households living in high quality neighbourhoods predominated by affluent owners are more likely to choose owner-occupation than social renting. Households living in medium quality inner city neighbourhoods predominated by private tenants are more likely to choose private renting than owner-occupation. More importantly, households living in inner city neighbourhoods have a statistically significant and strong coefficient of choosing owner-occupation rather than social renting. On the other hand, households living in the poorest council housing neighbourhoods are expected to have a strong likelihood of choosing social renting. The household long-term income is found to have a statistically significant effect on tenure choice. When income increases, households are more likely to choose owner-occupation than social renting or private renting.

It is noteworthy that the household's tenure choice and mobility decision are interdependent. This indicates that some variables could influence both mobility decision and tenure choice. In the mobility decision level, the results show that the household head's age and the number of dependent children have statistically

significant effects on households' mobility decisions. The results suggest that older household heads and households having more dependent children are more likely to stay. Moreover, the household long-term income also has a remarkable impact on mobility decision. When income increases, households are more likely to stay. As expected, households living in the inner city neighbourhood predominated by private tenants are more likely to move than to stay. In contrast, households living in the poorest council housing neighbourhoods are more likely to stay. In general, private renting has lower transaction costs and shorter term of tenancy than social renting or owner-occupation. These characteristics are more likely to attract lower income households, and younger and single households who are more mobile. Households in the social rented sector are usually bounded by the allocation system, therefore, it is difficult for social tenants to relocate, compared with private tenants.

6.2.2 Model Two

Model Two aims to estimate the economic subsidy effect. In this model, the only one variable replaced from Model One is the net user cost. The estimation results are reported in Table 6.5. In the tenure choice level, the net user cost in Model Two has a stronger negative coefficient than the user cost in Model One. This indicates that economic subsidy has a significant effect on the user cost as well as on tenure choice. A couple of variables have their statistical significance level altered once the economic subsidy variable is included. Influenced by the economic subsidy effect, married household heads have less statistically significant likelihood of choosing owner-occupation rather than social renting after the economic subsidy effect. In contrast, unemployed household heads turn out to have stronger coefficient of choosing private renting than owner-occupation. Besides that, other explanatory variables do not have significant changes in their coefficient magnitudes after the economic subsidy effect. This is probably because the net user cost is an attribute measured for tenures not measured for the individual household like other explanatory variables do. Therefore, the change in the user cost may not have a significant impact on other explanatory variables.

Table 6.5 Estimation Results of the NMNL Mobility and Tenure Choice Model—Model One and Model Two

Dependent Variable = Achoice

Default Tenure = "Owner-occupation" in the tenure choice level; "stay" in the mobility decision level

Lower Level—Tenure Choice				
	Model One		Model Two	
Variable	Coefficient	Sig. Level	Coefficient	Sig. Level
Constant	-10.505	***	-12.962	***
Lntcost	-0.494	***		
Lnatcost			-0.830	***
Agehsoc	-0.011	*	-0.011	*
Agehprv	-0.055	***	-0.055	***
Ndepchsoc	0.312	***	0.308	***
Ndepchprv	0.176	*	0.186	*
Marrysoc	-0.802	***	-0.786	***
Marryprv	-0.582	**	-0.429	*
Malesoc	-0.411	*	-0.411	*
Maleprv	0.377	Insig	0.376	Insig
Fullsoc	-1.759	***	-1.761	***
Fullprv	-1.584	***	-1.519	***
Partsoc	-1.217	***	-1.196	***
Partprv	-2.237	***	-2.212	***
Unempsoc	0.781	*	0.811	**
Unempprv	0.681	Insig	0.719	*
Pvownsoc	-1.142	***	-1.134	***
Pvownprv	-0.153	Insig	-0.114	Insig
Pvsocsoc	1.604	***	1.609	***
Pvsocprv	0.314	Insig	0.305	Insig
Pvprvsoc	0.688	***	0.680	***
Pvprvprv	1.218	***	1.197	***
Houssoc	-1.480	***	-1.476	***
Housprv	-0.102	Insig	-0.090	Insig
Urbansoc	-0.501	**	-0.488	**
Urbanprv	-0.876	***	-0.865	***
Afownsoc	-1.086	***	-1.090	***

Afownprv	0.050	Insig	0.075	Insig
Pvctysoc	-1.676	***	-1.754	***
Pvctyprv	1.133	***	1.054	***
Pocnlsoc	1.484	***	1.442	***
Pocnlprv	-0.231	Insig	-0.309	Insig
Lnincsoc	-0.312	***	-0.295	***
Lnincprv	-0.850	***	-1.111	***
Upper Level—Mobility Decision				
	Model One		Model Two	
Variables	Coefficients	Sig. Level	Coefficients	Sig. Level
Ageheads	0.055	***	0.054	***
Marrys	-0.156	Insig	-0.152	Insig
Ndepchs	0.196	***	0.192	***
Males	-0.145	Insig	-0.139	Insig
Unemps	0.115	Insig	0.137	Insig
Lnincs	0.534	***	0.510	***
Affowns	-0.017	Insig	0.018	Insig
Pvcitys	-0.197	*	-0.153	Insig
Porcnls	0.272	**	0.242	*
Inclusive values I_1 (Stayer)	1.00	fixed	1.00	Fixed
Inclusive values I_2 (Mover)	0.243	***	0.274	***
Log Likelihood	-4893.7		-4881.3	
Predicted Level	81.69%		81.73%	
No. Obs	52048		52048	

Notes: *** : Significant at 1 per cent level.
** : Significant at 5 per cent level.
* : Significant at 10 per cent level.
Insig. : Insignificant.

In the mobility decision level, influenced by the economic subsidy effect, households living in the inner city neighbourhood predominated by private tenants have become statistically insignificant in the mobility decision. Households living in the poorest council housing neighbourhoods have become less statistically significant in choosing stay. As discussed earlier, the explanatory variables in the mobility decision level are interrelated to the variables in the tenure choice level. Therefore, the changes in the coefficient magnitude and statistical significance level of the explanatory variables in

the mobility level could be affected by both the net user cost and the changes of other explanatory variables in the tenure choice level.

6.2.3 Model Three

Model Three estimates both the economic subsidy effect and the rationing effect. The mortgage rationing and social housing rationing variables are included in this model. Other explanatory variables are the same as in Model Two. The estimation results of model three are reported in Table 6.6. The goodness-of-fit of this model still remains at a good prediction level (81.74%), and is slightly better than Model Two. In the tenure choice level, a few variables have their statistical significance altered after the two rationing variables are included. The age of the household head has become statistically insignificant in choosing between social renting and owner-occupation but it still remains a significantly negative effect on choosing private renting. The household head's marital status also turns out to be statistically insignificant in choosing three tenure alternatives. In addition, the two rationing variables have substantial influences on the household head's employment status. Influenced by the rationing effect, household heads who have full time or part time jobs have a stronger coefficient of choosing owner-occupation rather than private renting. Unemployed household heads have a stronger and more significant likelihood of choosing private renting rather than owner-occupation.

The household long-term income still has a negative effect on social renting, compared with owner-occupation but the coefficient magnitude reduces after the rationing effect. More importantly, the results show that mortgage rationing and social housing rationing have statistically and numerically significant effects on tenure choice. Households who are potentially constrained from mortgages have a strong coefficient of choosing private renting or social renting. On the other hand, households who are potentially constrained from social housing are more likely to choose private renting than owner-occupation.

With regard to the mobility decision level, household long-term income becomes statistically insignificant in the mobility decision after the rationing effect. As stated earlier, the changes in household long-term income's statistical significance level and the coefficient magnitude in the mobility decision level could be influenced by both

the two rationing variables and the changes in other explanatory variables in the tenure choice level.

Table 6.6 Estimation Results of the NMNL Mobility and Tenure Choice Model—Model Two and Model Three

Dependent Variable = Achoice

Default Tenure = "Owner-occupation" in the tenure choice level; "stay" in the mobility decision level

Lower Level—Tenure Choice				
	Model Two		Model Three	
Variable	Coefficient	Sig. Level	Coefficient	Sig. Level
Constant	-12.962	***	-6.182	***
Lntcost				
Lnatcost	-0.830	***	-0.892	***
Agehsoc	-0.011	*	-0.006	Insig
Agehprv	-0.055	***	-0.044	***
Ndepchsoc	0.308	***	0.297	***
Ndepchprv	0.186	*	0.184	*
Marrysoc	-0.786	***	-0.251	Insig
Marryprv	-0.429	*	-0.322	Insig
Malesoc	-0.411	*	-0.381	Insig
Maleprv	0.376	Insig	0.303	Insig
Fullsoc	-1.761	***	-1.631	***
Fullprv	-1.519	***	-1.938	***
Partsoc	-1.196	***	-1.119	***
Partprv	-2.212	***	-2.523	***
Unempsoc	0.811	**	0.925	**
Unempprv	0.719	*	0.967	**
Pvownsoc	-1.134	***	-1.150	***
Pvownprv	-0.114	Insig	-0.301	Insig
Pvsocsoc	1.609	***	1.481	***
Pvsocprv	0.305	Insig	0.239	Insig
Pvprvsoc	0.680	***	0.626	***
Pvprvprv	1.197	***	1.131	***
Houssoc	-1.476	***	-1.510	***
Housprv	-0.090	Insig	-0.204	Insig

Urbansoc	-0.488	**	-0.524	***
Urbanprv	-0.865	***	-0.924	***
Afownsoc	-1.090	***	-1.116	***
Afownprv	0.075	Insig	-0.053	Insig
Pvctysoc	-1.754	***	-1.705	***
Pvctyprv	1.054	***	0.998	***
Pocnlsoc	1.442	***	1.348	***
Pocnlprv	-0.309	Insig	-0.335	Insig
Lnincsoc	-0.295	***	-0.185	***
Lnincprv	-1.111	***	-0.496	**
Mratsoc			1.037	***
Mratprv			1.141	***
Sratprv			0.718	***
Upper Level—Mobility Decision				
	Model Two		Model Three	
Variables	Coefficients	Sig. Level	Coefficients	Sig. Level
Ageheads	0.054	***	0.051	***
Marrys	-0.152	Insig	0.110	Insig
Ndepchs	0.192	***	0.225	***
Males	-0.139	Insig	-0.125	Insig
Unemps	0.137	Insig	0.217	Insig
Lnincs	0.510	***	-0.051	Insig
Affowns	0.018	Insig	0.044	Insig
Pvcitys	-0.153	Insig	-0.141	Insig
Porcnls	0.242	*	0.286	*
Inclusive values I_1 (Stayer)	1.00	Fixed	1.00	Fixed
Inclusive values I_2 (Mover)	0.274	***	0.334	***
Log Likelihood	-4881.3		-4858.7	
Predicted Level	81.73%		81.74%	
No. Obs	52048		52048	

Notes: *** : Significant at 1 per cent level.
** : Significant at 5 per cent level.
* : Significant at 10 per cent level.
Insig. : Insignificant.

6.2.4 Summary

Although the goodness-of-fit of the three models is very close, the third model is slightly better than other two models. In the tenure choice level, some variables have significant and determining influences. As expected, the user cost has a negative effect on tenure choice, indicating that the probability of choosing a certain tenure reduces with an increase in the user cost of that tenure. Moreover, a statistically significant coefficient of the user cost also indicates that the user cost in our sample is significantly different between tenures and across unitary authority areas. Economic subsidy plays an important role in reducing the housing user cost and also has a substantive influence on tenure choice. The employment variables have the most determining influences on tenure choice since their coefficient magnitudes are the biggest among the explanatory variables. Household heads who have full time or part time jobs have the strongest likelihood of choosing owner-occupation. In contrast, unemployed household heads are much more likely to choose social renting or private renting.

The household long-term income also has an important influence on tenure choice. When income increases, households are more likely to choose owner-occupation than social renting or private renting. As expected, the mortgage rationing and the social housing rationing have robust effects on tenure choice. Households who are potentially constrained from mortgages are forced to choose private renting or social renting. Households who are potentially constrained from the social rented sector are more likely to choose private renting rather than owner-occupation.

In the mobility decision level, the results show that the household head's age and the number of dependent children are two important determinants. The results suggest that older households and households having more dependent children are more likely to stay. The household long-term income also plays an important role in the mobility decision. When their incomes increase, households are more likely to stay. Households living in poor council housing neighbourhoods are more likely to stay and, in many cases, these households may not afford to move. In fact, above variables not only play an important role in determining the household's mobility but also have statistically and numerically significant influences on tenure choice.

6.3 Overall Analysis

This chapter analyses the estimation results of the two tenure choice models. The MNL tenure choice model provides a basic analysis of the determinants of tenure choice and the household's tenure choice behaviour. As discussed in Chapter Four, due to the rejection of the IIA assumption, the MNL tenure choice model should be treated with caution. In this thesis, the MNL model can be treated as a pilot model to test the initial influences of the explanatory variables on the household's tenure choice behaviour. Unlike the NMNL model which requires complicated data arrangement and variable interactions, the MNL model provides a simple approach to estimate the influences of the explanatory variables on the three tenure alternatives. With respect to the model results, the MNL model has a good prediction level and most explanatory variables are statistically significant. This indicates that these explanatory variables have substantial influences on the household's tenure choice behaviour in Scotland, and also these explanatory variables are examined in the NMNL model to estimate the household's tenure choice and mobility decision behaviour.

Compared to the MNL model, the NMNL model provides robust results in estimating Scottish households' tenure decisions. Due to its two level hierarchical structure, the NMNL model not only interprets the relationship between mobility decision and tenure choice but also examines the household's tenure choice behaviour once its mobility decision is made. As a result, Scottish households' tenure choice behaviour can be concluded as follows.

The household demographic variables have substantial influences on tenure choice. The results show that older and married households are more likely to choose owner-occupation, while younger and single households are likely to choose private renting. Households having more dependent children are found to have a statistically significant likelihood of choosing social renting. Female household heads are likely to choose social renting. In addition, the household head's employment variables have determining impacts on tenure choice. Household heads who have full time or part time jobs are strongly likely to choose owner-occupation, while unemployed household heads are more likely to choose social renting. These results draw a clear picture that households in better socio-economic positions are more likely to be

homeowners, while households with socio-economic disadvantages are more likely to choose social renting.

Furthermore, households' previous tenure has a statistically and numerically significant influence on their current tenure decision. It is more likely the see that households will choose the same tenure as their previous one when making a tenure decision. Similar results also apply to the neighbourhood quality variables. As expected, households' tenure decisions are strongly influenced by their current neighbourhood environments. Therefore they are more likely to choose the dominant tenure in the neighbourhood. In particular, it is of interest to see that households living in inner city neighbourhoods have a stronger coefficient of choosing owner-occupation rather than social renting.

Dwelling type and location are usually associated with tenure. In Scotland, most houses are owner-occupied. Therefore, households who live in or want to live in houses could only be homeowners. In this sense, it is not surprising to see that households living in houses are more likely to choose owner-occupation than social renting or private renting. Moreover, as Scottish Homes (1997) indicate, there is a substantial number of private renting dwellings located in rural Scotland. In this case, the model results show that households living in rural areas are more likely to choose private renting rather than owner-occupation. However, it would be difficult to estimate the household's decision on whether social renting or owner-occupation based on the simple definition of the urban area in the 1996 SHCS. It needs more specific location variables to present the spatial concentration of social housing and owner-occupied housing in the inner city, the periphery and the suburban areas.

The household long-term income and the user cost has determining influences on the household's tenure decisions. When income rises, the household is more likely to choose owner-occupation than social renting or private renting. The user cost has a significantly negative impact on the household's tenure choice which indicates that when the user cost of a certain tenure increases, households are less likely to choose that tenure. Further, the statistically significant of the user cost in the NMNL model also suggests that the user cost is significantly different between tenures and across 32 unitary authorities. Meanwhile, the economic subsidy plays a distinct role in reducing

the housing user cost and also has a substantial effect on tenure choice. As expected, mortgage rationing and social housing rationing variables have statistically and numerically significant effects on tenure choice. Mortgage rationing and social rationing play an important role as gatekeeper, filtering the household's access to the owner-occupied sector and to the social rented sector.

In addition to tenure decision, the household head's age, the number of dependent children and the household long-term income have the most determining influences on the household's mobility decision. Older households and households having more dependent children are more likely to stay at the current status. When income rises, households are more likely to stay rather than to move. It is noted that these variables not only have significant impacts on mobility decision but also have remarkable influences on tenure choice.

Finally, the two models provide us with a good simulation of Scottish households' tenure choice behaviour. More importantly, the NMNL model presents robust results in estimating households' mobility decisions and tenure choice. The NMNL model results also provide solid answers to the main research questions of this thesis: what are the important determinants of tenure choice in Scotland, and to what extent do these determinants influence Scottish households' tenure decisions? Furthermore, the model results, to a certain extent, imply some issues related to housing policy development. The next chapter will discuss the policy issues and implications emerging from the tenure choice model results.

CHAPTER SEVEN POLICY ISSUES AND IMPLICATIONS

The last chapter presents the robust results of Scottish households' tenure choice behaviour. This chapter analyses some policy issues and implications emerging from the results of the tenure choice models. This chapter is organised into four sections. The first section discusses some simulations regarding the influences of changes in the income tax rate and changes in the mortgage rationing criteria on the household's tenure choice behaviour. The second section analyses the outcome of tenure choice and income distribution emphasising income inequality and tenure polarisation. The third section analyses the distribution of housing subsidy arising from the outcome of tenure choice addressing the balance of housing subsidies between tenures and income levels. The last section discusses some implications of these issues for current housing policy development.

7.1 Simulations

The results of the two tenure choice models provide clear and detailed information about the important determinants of tenure choice and their influences on Scottish households' tenure decisions. From a policy perspective, it is equally important to discuss an issue concerning the influence of a change in policy or scheme, such as the tax policy and the mortgage finance scheme, on the household's tenure choice behaviour. To discuss this issue, this section emphasises two changes in policy or schemes and simulates their influences on tenure choice. The first simulation analyses the effect of altering income tax rate on tenure choice; the second simulation examines the effect of changes in the mortgage rationing criteria on tenure choice. To some extent, the simulations can be used to examine the robustness or sensitivity of the two tenure choice models.

7.1.1 Altering the Income Tax Rate

A number of studies have indicated that the income tax effect plays an important role in tenure choice, especially in the homeownership decision (see for example, Englund and Persson 1982, Linneman 1985, Capone 1995). Englund and Persson (1982) suggest that a change in the income tax schedule affects housing demand in two ways.

First, an income tax change directly affects disposable income. Second, the income tax change also alters the marginal tax rate, therefore it affects the user cost of housing. As discussed in Chapter Six, the user cost of housing has a statistically and numerically significant impact on the household's tenure decision. Thus, a change in the user cost, for example, due to a change in the income tax rate, would have an impact on tenure choice. As a result, a simulation in this section analyses the effect of altering income tax schedule on the user cost of housing and also on tenure choice.

As stated in Chapter Five, a change in the income tax rate has a direct impact on the user cost of owner-occupiers (see Equation 35). The user cost of social renting or private renting is based on the economic rent. Therefore, this thesis assumes that a change in the income tax rate does not have a direct impact on the user cost of these two tenures. Under this circumstance, the influence of a change in the income tax rate focuses on the user cost of owner-occupiers. With respect to the user cost of owner-occupiers, as discussed in Chapter Five, the marginal income tax rate is set to be zero because this thesis assumes that mortgage interest tax relief is treated as a lump sum tax relief, which does not affect the user cost but only affects disposable income for mortgaged homeowners. Therefore, a simulation in this section applies a different income tax rate, 24%--the benchmark income tax rate in 1996, then to analyse the influences of applying a different income tax rate on the user cost of housing and on tenure decision. The equation of the new user cost of owner-occupiers is shown in Equation (40):

$$UC_o = [(1-0.24)*i + d + \alpha - g]*P^h \tag{40}$$

where the household's marginal tax rate now is changed to 0.24, i is the nominal mortgage interest rate, d is the depreciation rate, α is the property tax rate, g is the expected annual rate of nominal house price increase and P^h is the current market value of the property. The figures of i, d, α, g and P^h are same in Chapter Five.

Table 7.1 User Costs by Tenures—Before and After Applying 24% of the Income Tax Rate

	Before App. 24% ITR		After App. 24% ITR	
User Costs \ Tenures	Average Annual Amount (£)	% of Capital Value	Average Annual Amount (£)	% of Capital Value
Owner-occupiers	3,531	6.7	2,689	5.1
Social tenants	2,237	7.0	2,237	7.0
Private tenants	3,161	7.4	3,161	7.4

Table 7.1 shows the user cost of owner-occupiers before and after applying 24% of income tax rate. After applying 24% of income tax rate, the user cost of owner-occupiers reduces from £3,531 to £2,689 per annum. A part of the user cost of owner-occupiers has been deducted by the increase in the marginal income tax rate. The new user cost of owner-occupiers after applying 24% of income tax rate is lower than the user cost of private renting and is close to the user cost of social renting. In this sense, the reduction in the user cost of owner-occupiers could lead to homeownership becoming more attractive. Moreover, if we take account of economic subsidies within the user cost, the net user cost of owner-occupier after applying 24% of income tax rate is very close to the net user cost of social renting. In contrast, the cost gap between owner-occupiers and private tenants becomes wider (see Table 7.2). These changes in the user cost between tenures are examined in the tenure choice models.

Table 7.2 Net User Costs by Tenures—Before and After Applying 24% of the Income Tax Rate

	Before App. 24% ITR			After App. 24% ITR		
Tenures	User Cost	Econ. Subsidy	Net User Cost	User Cost	Econ. Subsidy	Net User Cost
Owner-occupiers	3,531	834	2,697	2,689	834	1,855
Social tenants	2,237	638	1,735	2,237	638	1,735
Private tenants	3,161	21	3,140	3,161	21	3,140

Theoretically, it is expected that a reduction in the user cost of owner-occupier due to an increase in the marginal income tax rate would lead to households preferring owner-occupation. Unfortunately, the MNL model does not provide expected results

in estimating the effect of the change in the user cost on tenure choice. In a simulation of the MNL model, the user cost of housing and some important explanatory variables, such as household long term income and employment variables, have either become statistically insignificant or have presented a wrong sign. Again, this indicates that the MNL model does not provides robust results in estimating tenure choice in this thesis. The non-robust results in the MNL model may be driven by the multicollinearity problem or by the IIA problem as discussed in previous chapters. Under this circumstance, the NMNL model is the best alternative.

Table 7.3 shows two simulation results of the NMNL model of mobility and tenure choice. The first simulation estimates the effect of changes in the user cost, which are affected by a change in the marginal income tax rate, on tenure choice and mobility decisions. The second simulation emphasises the effect of changes in the net user cost on tenure choice and mobility decisions. Model One is the same basic model as in Chapter Six. The full estimation results of these simulation models run by the LIMDEP programme are reported in Appendix A.7.1. In the first simulation, the user cost of housing shows statistically significant effects on tenure choice but the magnitude of the coefficient becomes smaller than that in the original model one. This suggests that after applying a different income tax rate (24%) to the user cost of owner-occupiers, the new user cost of housing has become a less significant influence (statistically and numerically) on the household's tenure decision. The new user cost terms between tenures and across 32 unitary authorities are also reported in Appendix A.5.2.

The simulation results are unlikely to fit into our expectation that owner-occupation would become more attractive since an increase in the income tax rate reduces the user cost of owner-occupiers. One should note that the user cost of housing in the NMNL model is an attribute of tenure which is estimated on the basis of tenures, not on the individual household. Therefore, the effect of the user cost in the NMNL model is more likely to reflect the general influence on tenure choice (whether or not the user cost is statistically and numerically significant between three tenures) rather than to show the household's preference for a specific tenure (i.e. either owner-occupation or social renting). In this case, one reasonable explanation is that an increase in the income tax rate reduces the user cost of owner-occupiers. The

reduction in the user cost of owner-occupiers has decreased the cost difference among three tenures, particularly between owner-occupiers and social tenants. As a result, the new user cost of housing has less statistically and numerically significant effects on tenure decision than that in the original Model One.

In the second simulation, the net user cost of housing remains a statistically significant influence on tenure choice, and the coefficient magnitude becomes bigger than the first simulation. It seems that the increase in the magnitude of the coefficient is more likely to be driven by an economic subsidy effect rather than the effect of a change in the income tax rate. Moreover, in both simulations, the coefficient estimates of other explanatory variables do not show significant changes in terms of their statistical significance level and their coefficient magnitudes. This suggests that the changes in the user cost of housing due to the subsidy effect or the effect of a change in income tax rate have minimum influences on other explanatory variables in the NMNL model.

Table 7.3 The NMNL Mobility and Tenure Choice Model Results—Simulations of the User Cost and the Net User Cost

Dependent Variable = Achoice

Default Tenure = "Owner-occupation" in the tenure choice level; "stay" in the mobility decision level

Lower Level—Tenure Choice						
	Model One		Simulation One		Simulation Two	
Variable	Coefficient	Sig. Level	Coefficient		Coefficient	Sig. Level
Constant	-10.505	***	-9.181	***	-10.427	***
Lntcost	-0.494	***	-0.181	**		
Lnatcost					-0.290	**
Agehsoc	-0.011	*	-0.011	*	-0.011	*
Agehprv	-0.055	***	-0.054	***	-0.055	***
Ndepchsoc	0.312	***	0.307	***	0.308	***
Ndepchprv	0.176	*	0.167	Insig	0.175	*
Marrysoc	-0.802	***	-0.764	***	-0.744	***
Marryprv	-0.582	**	-0.632	**	-0.553	**
Malesoc	-0.411	*	-0.411	*	-0.411	*
Maleprv	0.377	Insig	0.371	Insig	0.373	Insig
Fullsoc	-1.759	***	-1.760	***	-1.764	***

Fullprv	-1.584	***	-1.616	***	-1.592	***
Partsoc	-1.217	***	-1.224	***	-1.210	***
Partprv	-2.237	***	-2.250	***	-2.228	***
Unempsoc	0.781	*	0.755	*	0.760	*
Unempprv	0.681	Insig	0.655	Insig	0.670	Insig
Pvownsoc	-1.142	***	-1.129	***	-1.119	***
Pvownprv	-0.153	Insig	-0.162	Insig	-0.143	Insig
Pvsocsoc	1.604	***	1.588	***	1.578	***
Pvsocprv	0.314	Insig	0.320	Insig	0.309	Insig
Pvprvsoc	0.688	***	0.695	***	0.695	***
Pvprvprv	1.218	***	1.224	***	1.222	***
Houssoc	-1.480	***	-1.503	***	-1.505	***
Housprv	-0.102	Insig	-0.114	Insig	-0.111	Insig
Urbansoc	-0.501	**	0.457	**	-0.447	**
Urbanprv	-0.876	***	-0.860	***	-0.850	***
Afownsoc	-1.086	***	-1.092	***	-1.090	***
Afownprv	0.050	Insig	0.042	Insig	0.052	Insig
Pvctysoc	-1.676	***	-1.602	***	-1.619	***
Pvctyprv	1.133	***	1.126	***	1.101	***
Pocnlsoc	1.484	***	1.487	***	1.461	***
Pocnlprv	-0.231	Insig	-0.238	Insig	-0.280	Insig
Lnincsoc	-0.312	***	-0.296	***	-0.283	***
Lnincprv	-0.850	***	-0.719	***	-0.860	***

Upper Level—Mobility Decision

	Model One		Simulation One		Simulation Two	
Variables	Coefficients	Sig. Level	Coefficients	Sig. Level	Coefficients	Sig. Level
Ageheads	0.055	***	0.056	***	0.055	***
Marrys	-0.156	Insig	-0.185	Insig	-0.192	Insig
Ndepchs	0.196	***	0.191	***	0.187	***
Males	-0.145	Insig	-0.147	Insig	-0.145	Insig
Unemps	0.115	Insig	0.098	Insig	0.102	Insig
Lnincs	0.534	***	0.620	***	0.641	***
Affowns	-0.017	Insig	0.012	Insig	0.038	Insig
Pvcitys	-0.197	*	-0.178	*	-0.151	Insig
Porcnls	0.272	**	0.318	**	0.310	**
Inclusive values I_1 (Stayer)	1.00	fixed	1.00		1.00	Fixed

Inclusive values I_2 (Mover)	0.243	***	0.257	***	0.276	***
Log Likelihood	-4893.7		-4899.5		-4897.3	
Predicted Level	81.69%		81.66%		81.69%	
No. Obs	52048		52048		52048	

Notes: *** : Significant at 1 per cent level.
** : Significant at 5 per cent level.
* : Significant at 10 per cent level.
Insig. : Insignificant.

In this simulation, an increase in the income tax rate reduces the user cost of owner-occupiers, and it thus reduces the cost difference between tenures, particularly between owner-occupiers and social tenants. In the NMNL model, the decreased user cost between tenures has a less statistical and numerical influence on tenure choice than the original user cost. On the other hand, it is expected that a reverse situation with a decrease in the income tax rate, would increase the user cost of owner-occupiers and thus also enlarge the cost difference between tenures. As a result, the increased user cost between tenures would have a stronger influence on tenure choice.

7.1.2 Altering Mortgage Rationing Criteria

As discussed in Chapter Six, mortgage rationing has a statistically and numerically significant influence on tenure choice. This part of the section aims to simulate the effect of changes in mortgage rationing criteria on the household's tenure decision. The construction of mortgage rationing criteria in Chapter Five is based on three ratios: price-to-income ratio, loan-to-value ratio, and loan-to-income ratio. This thesis reduces 20% of these three mortgage rationing ratios and then examines the effect of these changes on tenure choice. The original three mortgage rationing ratios and a 20% reduction in mortgage rationing ratios are shown in Table 7.4. Based on these new mortgage rationing ratios, the new mortgage rationing assumptions are as follows. For mortgaged homeowners, if they have qualified for more than two of these new mortgage rationing ratios (in Table 7.4), they may find it difficult to obtain a mortgage. For social tenants or private tenants, if their price to income ratio is greater than 2.4, they could potentially be constrained by mortgages. Outright owners are assumed not to be constrained by mortgage rationing.

Table 7.4 Mortgage Rationing Ratios and 20% Release of Mortgage Rationing Ratios

Mortgage Rationing Ratios	20% Reduction in Mortgage Rationing Ratios
PTI > 3.0	PTI > 2.4
LTV > 0.9	LTV > 0.72
LTI > 2.23	LTI > 1.78

Table 7.5 Mortgage Rationing by Tenures—A Simulation of 20% Release of Mortgage Rationing Ratios

Tenures	Original MRR		20% Reduction in MRR		Total
	Rationed	Not Rationed	Rationed	Not Rationed	
Owner-occupiers	1,121 (16.4%)	5,708 (83.6%)	1,856 (27.2%)	4,973 (72.8%)	6,829 (100%)
Social Tenants	4,228 (75.8%)	1,350 (24.2%)	5,063 (90.8%)	515 (9.2%)	5,578 (100%)
Private Tenants	555 (78.5%)	152 (21.5%)	645 (91.2%)	62 (8.8%)	707 (100%)
Total	5,904 (45%)	7,210 (55%)	7,564 (57.7%)	5,550 (42.3%)	13,114 (100%)

Based on the new mortgage rationing assumptions, a simulation of the mortgage constraint broken down by tenures is shown in Table 7.5. It is clear that a 20% reduction in the three mortgage rationing ratios leads more households to be constrained by mortgages. After applying the new mortgage rationing ratios, the percentage of owner-occupiers who could find it difficult to get a mortgage increases from 16.4% to 27.2%. Meanwhile, more than 90% of social tenants and private tenants would potentially be constrained by mortgages after applying the new mortgage rationing ratios. Moreover, it is expected that the changes in the mortgage rationing ratios would have substantive impacts on the household's tenure choice behaviour. The simulation results of the NMNL mobility and tenure choice model are reported in Table 7.6.

Table 7.6 The NMNL Mobility and Tenure Choice Model Results—Simulation of Mortgage Rationing Effect

Dependent Variable = Achoice

Default Tenure = "Owner-occupation" in the tenure choice level; "stay" in the mobility decision level

Lower Level—Tenure Choice				
	Model Three		Simulation Three	
Variable	Coefficient	Sig. Level	Coefficient	Sig. Level
Constant	-6.182	***	-6.151	***
Lnatcost	-0.892	***	-0.885	***
Agehsoc	-0.006	Insig	0.0003	Insig
Agehprv	-0.044	***	-0.037	***
Ndepchsoc	0.297	***	0.337	***
Ndepchprv	0.184	*	0.216	**
Marrysoc	-0.251	Insig	-0.268	Insig
Marryprv	-0.322	Insig	-0.474	*
Malesoc	-0.381	Insig	-0.358	Insig
Maleprv	0.303	Insig	0.338	Insig
Fullsoc	-1.631	***	-1.743	***
Fullprv	-1.938	***	-2.117	***
Partsoc	-1.119	***	-1.119	***
Partprv	-2.523	***	-2.569	***
Unempsoc	0.925	**	0.950	**
Unempprv	0.967	**	1.004	**
Pvownsoc	-1.150	***	-1.163	***
Pvownprv	-0.301	Insig	-0.274	Insig
Pvsocsoc	1.481	***	1.540	***
Pvsocprv	0.239	Insig	0.289	Insig
Pvprvsoc	0.626	***	0.613	**
Pvprvprv	1.131	***	1.101	***
Houssoc	-1.510	***	-1.586	***
Housprv	-0.204	Insig	-0.249	Insig
Urbansoc	-0.524	***	-0.652	***
Urbanprv	-0.924	***	-1.041	***
Afownsoc	-1.116	***	-1.070	**

Afownprv	-0.053	Insig	-0.038	Insig
Pvctysoc	-1.705	***	-1.768	***
Pvctyprv	0.998	***	0.950	***
Pocnlsoc	1.348	***	1.396	***
Pocnlprv	-0.335	Insig	-0.304	Insig
Lnincsoc	-0.185	***	-0.091	*
Lnincprv	-0.496	**	-0.567	***
Mratsoc	1.037	***	1.856	***
Mratprv	1.141	***	1.707	***
Sratprv	0.718	***	0.786	***
Upper Level—Mobility Decision				
	Model Three		Simulation Three	
Variables	Coefficients	Sig. Level	Coefficients	Sig. Level
Ageheads	0.051	***	0.051	***
Marrys	0.110	Insig	0.127	Insig
Ndepchs	0.225	***	0.227	***
Males	-0.125	Insig	-0.108	Insig
Unemps	0.217	Insig	0.205	Insig
Lnincs	-0.051	Insig	-0.061	Insig
Affowns	0.044	Insig	0.048	Insig
Pvcitys	-0.141	Insig	-0.156	Insig
Porcnls	0.286	*	0.249	*
Inclusive values I_1 (Stayer)	1.00	Fixed	1.00	Fixed
Inclusive values I_2 (Mover)	0.334	***	0.300	***
Log Likelihood	-4858.7		-4826.9	
Predicted Level	81.74%		94.45%	
No. Obs	52048		52048	

Notes: *** : Significant at 1 per cent level.
** : Significant at 5 per cent level.
* : Significant at 10 per cent level.
Insig. : Insignificant.

In Table 7.6, Model Three adds two rationing variables as in Chapter Six. Simulation Three presents the estimation results of the effect of changes in mortgage rationing criteria on tenure choice and mobility decisions. In the simulation model, the coefficient magnitudes of two mortgage rationing variables have significantly increased, compared to Model Three. This suggests that a 20% reduction in the

mortgage rationing ratios has squeezed the mortgage constraint conditions to the households. As a result, it leads to mortgage rationing having stronger (numerical) effects on the household's tenure choice.

Moreover, the changes in the mortgage rationing criteria have substantive influences on other explanatory variables. Given the influence of the new mortgage rationing variables, the coefficient magnitudes of most explanatory variables have increased. This means that most explanatory variables have stronger numerical influences on tenure choice under the effect of applying tighter mortgage rationing conditions to households. In contrast, household long term income has a less influence (statistical and numerical) on the choice between owner-occupation and social tenants. This could be affected by the multicollinearity problem. As discussed in Chapter Five, there is some moderate degree of correlation between the mortgage rationing variable and household long term income. Furthermore, in the mobility decision level, most explanatory variables do not have significant changes in their coefficient magnitudes and the statistical significance level under the effect of changes in mortgage rationing criteria.

In summary, this section has discussed two simulations works in the tenure choice model. The first simulation has examined the effect of applying a different income tax rate to the user cost of owner-occupiers on the household's tenure choice. The second simulation has analysed the effect of changes in the mortgage rationing criteria on the household's tenure decision. It was found that an increase in the marginal income tax rate reduces the user cost of owner-occupiers. The reduction in the user cost of owner-occupiers has decreased the cost differences between tenures (especially between social renting and owner-occupation). As a result, the influence of the user cost of housing becomes less significant (statistically and numerically) on tenure choice. Moreover, a 20% reduction in the mortgage rationing ratios presses more constraints on households, thus it leads to the mortgage rationing having a stronger numerical influence on the household's tenure choice. From a policy perspective, the first simulation implies that a change in the income tax schedule would have substantial influences on the user cost of housing, thus affecting the household's tenure choice. The simulation results provide a direction of these influences on the user cost of housing and tenure choice. The results in the second simulation also

imply a clear direction of a change in the mortgage finance condition (tighten or loosen) in affecting (increase or decrease the mortgage rationing effect) the household's tenure decision behaviour.

7.2 Income Inequality and Tenure Polarisation

In the last chapter, our model results show that household income is one of the most determinants of tenure choice. While income rises, a household is more likely to choose owner-occupation than renting. This implies that households with higher incomes would favour owner-occupation, while low-income households are more likely to choose renting, especially social renting. From a policy perspective, it is of interest to discuss the tenure preferences of households in different income levels, and to explore some issues related to tenure choice and income distribution. One important issue is the growth of income inequality between tenures and tenure polarisation, which has been discussed by many studies over the last two decades (see for example, Bentham 1986, Atkinson 1993, and Hills 1995, 1998).

The first part of this section discusses income inequality between tenures and the second part analyses tenure polarisation between income levels. The analysis is primarily based on the whole Scottish average and it also looks at the urban level by comparing the differences between four major cities — Aberdeen, Dundee, Edinburgh and Glasgow.

7.2.1 Income Inequality between Tenures

The analysis of income inequality starts with the definition and measurement of income for individuals or for households. The classic definition of individual income is by Simons (1938)[18], which includes non-pecuniary incomes and expected future incomes. A simple definition of lifetime consumption is that "income in a given period is the amount a person could have spent while maintaining his wealth intact" (Atkinson 1983, p. 39). These income definitions involve the unrealised capital gains, imputed rents, the long run incomes and expected expenditures. All of these items are

[18] The Simons, also called Haig-Simons definition of individual income is that "personal income may be defined as the algebraic sum of (1) the market value of rights exercised in consumption and (2) the change in the value of the store of property rights between the beginning and the end of the period" (Simons 1938, p. 50).

important and are connected with housing consumption. However, it is unlikely to use unrealised and expected incomes as the measuring resources to examine the current problem of income inequality. Therefore, it is appropriate to adopt the current monetary income as the measuring resource.

The above income definitions focus on individual income. Due to data limitations, the income used in this chapter is household income drawn from the 1996 Scottish House Condition Survey (SHCS), which is defined as "weekly net income received by the head of household and spouse/partner (where relevant) received from wages and salaries, from benefit payments and from other sources such as non-state pensions, alimony or maintenance payments" (Scottish Homes 1997, p. 346). In measuring the household income distribution, it is necessary to consider households' different income patterns drawn from their different household sizes and age-consumption. Equivalence scales are commonly used to "calculate ratios of incomes required by different household types to achieve a similar standard of living, taking into account the economies possible in the larger households from sharing of facilities such as heating and lighting" (Central Statistics Office 1987, p. 112). The approach taken is, given the information about the number of people living in the household together with the numbers and ages of dependent children, to calculate the number of 'equivalent adults' in the household and to work with measures of income per equivalent adult (Hancock 1993).

In Britain, there are commonly three sets of equivalence scales to be applied in examining the extent of poverty and income inequality (Central Statistics Office 1987). The McClements scale is one of the three scales and is applied to this chapter The McClements' equivalence ratios for different members of the household are listed in Appendix A.7.2. Equivalent income is obtained by dividing the household income by the equivalence scale. A comparison table of the average household income and the equivalent household income broken down into income quintiles and into tenures is reported in Appendix A.7.3.

7.2.1.1 Income Quintile Shares between Tenures

In the analysis of income inequality, a simple way is to look at the percentage of income distribution in quantile groups, called quantile shares (Marsh 1988). The

quantile shares conventionally considered are the quartiles, the quintiles and the deciles (ibid.). This thesis adopts the quintile group since it is adopted by most government statistical reports (see Central Statistics Office 1987). Table 7.7 shows the quintile shares of the equivalent household income broken down into five different tenures in Scotland, 1996. It is clear that, for all tenures, the income shares rise with income quintile groups. This means that the income distribution was concentrated on higher income quintile groups, especially the top income quintile group in Scotland. On the other hand, it shows a significant income inequality in the bottom quintile group, where the income shares were not more than 10 per cent for all tenures.

Between owner-occupiers, outright owners had wider ranges of income shares than mortgaged owners. This explains that income inequality in outright owners was greater than in mortgaged owners, especially between the fourth and the top quintile groups. This implies that there exists a wider income inequality in older age of outright owners since many outright owners are elderly people. Further, between renters, income inequality in private tenants was greater than in social tenants. In the social rented sector, there was no significant difference of income inequality between local authority tenants and housing association tenants. Nevertheless, in the top income quintile group, the income share of housing association tenants was slightly higher than that of local authority tenants.

Table 7.7 Quintile Shares of Equivalent Household Income by Tenures in Scotland, 1996

Quintile	Percentage of total income received by the quintile				
	Outright Owners (%)	Mortgaged Owners (%)	LA Tenants (%)	HA Tenants (%)	Private Tenants (%)
Bottom	6.9	8.2	10.0	9.7	6.6
2nd	11.0	13.6	15.0	14.1	12.4
3rd	15.5	18.1	18.5	17.9	17.0
4th	22.2	23.4	22.5	22.1	23.3
Top	44.3	36.8	34.0	36.2	40.7

Source: 1996 Scottish House Condition Survey (own analysis)

Notes: LA: Local Authority; HA: Housing Association

The above discussion presents the results of income inequality on the basis of the Scottish average. In fact, the results of income and tenure distribution based on the average figures of the whole Scotland cannot reflect the local differences. Therefore, it is of interest to compare the income inequality between tenures at the city level, especially in Scotland's four major cities — Aberdeen, Dundee, Edinburgh and Glasgow. Table 7.8 shows the quintile shares of the equivalent household income by tenures in the four cities. It is noted that in Table 7.8, social tenants are not split into local authority tenants and housing association tenants because the sample cases of housing association tenants are too small in Aberdeen City and Dundee City.

Table 7.8 Quintile Shares of Equivalent Household Income by Tenures in Four Cities of Scotland, 1996

Quintile group	Percentage of total income received by the quintile			
	Outright Owners (%)	Mortgaged Owners (%)	Social Tenants (%)	Private Tenants (%)
Aberdeen				
Bottom	7.6	8.6	9.9	4.5
2nd	11.2	14.0	15.7	9.4
3rd	15.0	18.3	18.7	16.0
4th	22.4	22.4	23.0	25.1
Top	43.8	36.7	32.7	45.0
Dundee				
Bottom	7.1	7.1	9.6	4.6
2nd	11.1	13.3	15.1	10.3
3rd	17.1	18.7	18.3	18.7
4th	23.0	23.8	22.6	24.0
Top	41.7	37.1	34.4	42.4
Edinburgh				
Bottom	7.2	7.5	10.0	4.8
2nd	11.1	12.8	15.4	10.6
3rd	15.2	17.4	19.1	16.3
4th	22.5	22.4	22.9	24.0
Top	44.0	39.9	32.6	44.3
Glasgow				
Bottom	6.9	6.7	9.5	5.0
2nd	11.5	13.0	14.5	12.0
3rd	15.7	17.2	18.4	17.7
4th	23.2	24.1	22.7	23.2
Top	42.7	39.0	34.9	42.1

Source: 1996 Scottish House Condition Survey (own analysis)

Similar to the results in the Scottish average, income shares rose with income quintile groups in all four cities. Again, this implies that the income distribution is concentrated in higher income quintile groups and that there exists a significant income inequality in the bottom income quintile group in each tenure of all four cities. Between tenures, income inequality in outright owners was greater than in mortgaged owners, while income inequality in private tenants was greater than in social tenants. The income shares in each tenure were similar between the four cities. This indicates that the four cities could have a similar problem of income inequality between tenures, although the average income by tenures is different between the four cities (see Appendix A.7.3). However, the results need careful consideration. Since the results are drawn from the tenure-base income distribution, it could raise the question: what other household characteristics, such as household type or the household head's age, are shaping the distribution of income across cities? In addition, the housing policy and the allocation system could have substantial impacts on the tenure-base distribution of income across cities. All of these need further investigation.

7.2.1.2 Gini Coefficients between Tenures

Another measurement of income inequality emphasises the cumulative income shares. The results of cumulative income distribution are usually displayed by a graphical form known as a Lorenz curve. The Gini coefficient is a summary measure of income inequality, expressed on the Lorenz curve. The Gini coefficient is one of the most important measures of income and wealth distributions in Britain (Atkinson 1983). The Gini coefficient lies between 0 (prefect equality) and 1 (perfect inequality), although it is sometimes multiplied by 100 to express the coefficient in percentage form. In other words, the greater the Gini coefficient is, the larger amount of inequality. Table 7.9 shows the Gini coefficients for equivalent household income between tenures in Scotland.

The Gini coefficient for all households in Scotland in 1996 is 0.33. For owner-occupiers only, the Gini coefficient is 0.32, which is not altogether different from the all household average. This suggests that the income distribution of owner-occupiers is similar to that of the all household average. In the owner-occupied sector, the Gini coefficient for outright owners is greater than for mortgaged owners, which indicates that outright owners have greater inequality of income distribution than mortgaged

owners. As mentioned earlier, this is probably because many outright owners are elderly people who could have wider ranges of income distribution than mortgaged owners. For example, many older outright owners' income sources primarily depend upon their pensions, while some outright owners are very rich to be in the top income group. Social tenants have the lowest Gini coefficient, compared to owner-occupiers and private tenants. On one hand, this explains that social tenants have the least income inequality. On the other hand, social tenants have the lowest average household income and the smallest income ranges. These together reflect the fact that more uniformly poor households are in social housing, compared to private renting. In the social rented sector, housing association tenants have a greater Gini coefficient than local authority tenants, although the quintile shares of income are not much different between these two tenures. This implies that housing association tenants have wider ranges of income distribution than local authority tenants.

Table 7.9 Gini Coefficients for Equivalent Household Income by Tenures in Scotland, 1996

Tenures	Equiv. Household Income (Gini Coefficients)
All Households	0.33
Owner-Occupiers	0.32
Outright Owners	*0.37*
Mortgaged Owners	*0.29*
Social Tenants	0.24
LA Tenants	*0.24*
HA Tenants	*0.27*
Private Tenants	0.34

Source: 1996 Scottish House Condition Survey (own analysis)

Notes: LA: Local Authority; HA: Housing Association

At the four city level, private tenants have much higher Gini coefficients than the Scottish average (see Table 7.10). This explains that the income inequality for private tenants is very significant at the city level, particularly in Aberdeen City where the Gini coefficient for private tenants is the highest in the four cities. On the other hand, this may reflect the fact that households in the private rented sector are more heterogeneous at the urban level in terms of the income distribution and other

household characteristics. Among the four cities, Edinburgh City have the highest Gini coefficient for all household average and also for owner-occupiers. This reveals that income inequality in the City of Edinburgh is more significant than the other three cities. In the last two decades, Edinburgh has experienced a steady growth of population and socio-economic activities making it one of the most prosperous cities in Britain (Bailey et al. 1999). Together, these draw a picture that Edinburgh City could have more diverse development in terms of tenure and income distributions than the other three cities.

Table 7.10 Gini Coefficients for Equivalent Household Income by Tenures in Four Cities of Scotland, 1996

Cities and Tenures	Equiv. Household Income (Gini Coefficients)
Aberdeen	
All Households	0.34
Outright Owners	0.36
Mortgaged Owners	0.28
Social Tenants	0.23
Private Tenants	0.43
Dundee	
All Households	0.33
Outright Owners	0.36
Mortgaged Owners	0.31
Social Tenants	0.25
Private Tenants	0.40
Edinburgh	
All Households	0.37
Outright Owners	0.37
Mortgaged Owners	0.33
Social Tenants	0.23
Private Tenants	0.40
Glasgow	
All Households	0.33
Outright Owners	0.37
Mortgaged Owners	0.32
Social Tenants	0.25
Private Tenants	0.37

Source: 1996 Scottish House Condition Survey (own analysis)

7.2.2 Tenure Polarisation

The above analysis of income inequality has addressed the income distribution between tenures. Another angle in the interpretation of tenure and income

relationship is to look at the tenure distribution between and within income groups, emphasising the issue of tenure polarisation.

The concept of tenure polarisation is derived from social polarisation. Hamnett's (1996) definition of social polarisation[19] can be used to interpret tenure polarisation. Tenure polarisation can simply be referred to as a change in tenure distribution where there is growth of the bottom and top ends of income groups concentrating in certain tenures, compared to middle income groups. Based on the above interpretation, a comparison of multiple periods of tenure distribution in different income groups would be the best way to analyse tenure polarisation (see for example, Bentham 1986, Hills 1998). Due to data limitations, this thesis can only use single year (1996) household survey data. Thus, the analysis of tenure polarisation in this part focuses on tenure distribution between and within income quintile groups.

Table 7.11 Tenure Distributions between Equivalent Income Quintile Groups in Scotland, 1996 (Percentage of households)

Income quintile group	Outright Owners (%)	Mortgaged Owners (%)	LA Tenants (%)	HA Tenants (%)	Private Tenants (%)
Bottom	26	8	27	23	28
2nd	19	10	31	27	20
3rd	17	16	25	26	18
4th	17	28	13	18	20
Top	21	38	4	7	14
Total Obs.	3,288	6,312	5,911	1,222	1,297

Source: 1996 Scottish House Condition Survey (own analysis)

Table 7.11 shows the tenure distributions between equivalent income quintile groups in Scotland, 1996. The equivalent income ranges in each quintile are reported in Appendix A.7.3. In the owner-occupied sector, outright owners are relatively concentrated in the bottom quintile groups and in the top quintile group. Mortgaged owners are significantly concentrated in the top two quintile groups, accounting for 66

[19] According to Hamnett's interpretation, social polarisation can be referred as 'a change in certain social distributions such that there is a shift away from a statistically normal or egg-shaped distribution towards a distribution where the bottom and top ends of the distribution are growing, relatively and possibly absolutely, at the expense of the middle' (1996, p. 1407).

per cent of total mortgaged owners. In contrast, only 8 per cent of mortgaged owners are located in the bottom quintile group.

Social tenants have apparently different patterns of income polarisation from mortgaged owners. Nearly 60 per cent of local authority tenants and a half of housing association tenants are located in the bottom two quintile groups, and there also is a quarter of social tenants distributed in the third quintile group. In contrast, only 4 per of local authority tenants and 7 per cent of housing association tenants are located in the top quintile group respectively. Compared to social tenants, private tenants did not show a significant income polarisation.

Furthermore, if the tenure distributions within income quintile groups are examined, the pattern of tenure polarisation would be more significant. Figure 7.1 shows a clear picture of tenure polarisation, specifically for mortgaged owners and social tenants, within income quintile groups. The annex table to Figure 7.1 is listed in Appendix A.7.4. Social tenants, especially local authority tenants, are significantly concentrated in the bottom two quintile groups and the percentage rapidly reduces in the upper income quintile groups. In contrast to social tenants, mortgaged owners are apparently concentrated in the top two quintile groups and the percentage rapidly declines in the lower income quintile groups.

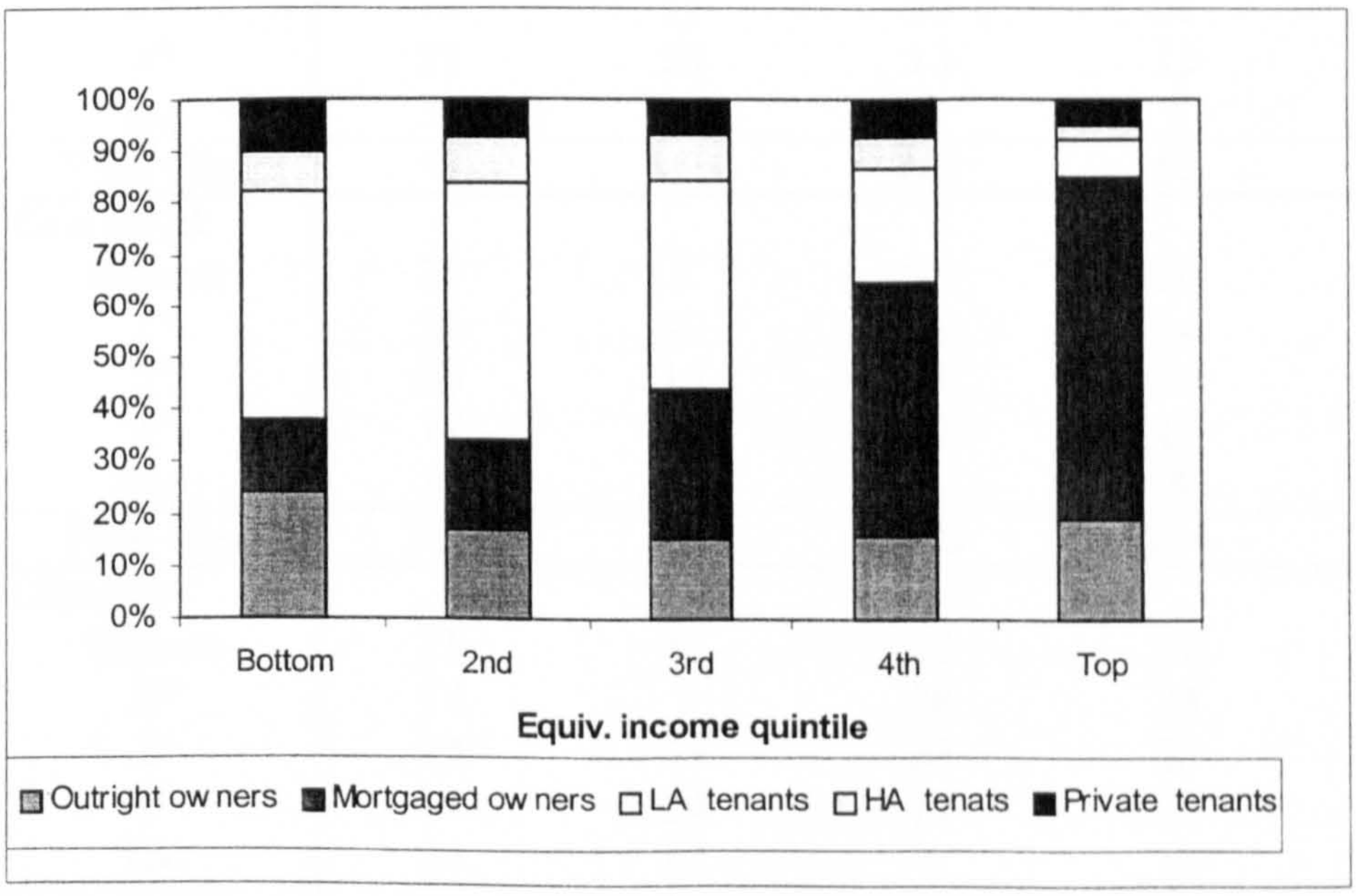


Figure 7.1 Tenure Polarisation in Scotland, 1996

Source: 1996 Scottish House Condition Survey (own analysis)

At the city level, the patterns of income and tenure polarisation are slightly different from the Scottish average, partly because of the sample selection and partly reflecting the local differences, as stated earlier. Table 7.12 shows the tenure distributions between income quintiles in four cities. For all four cities, it shows a clear pattern that mortgaged owners are significantly concentrated in the top two income quintile groups, while social tenants are concentrated in the bottom two quintile groups. In addition, there is a substantial proportion of local authority tenants distributed in the third quintile group, particularly in Dundee City and Edinburgh City.

Table 7.12 Tenure Distributions between Equivalent Income Quintile Groups in Four Cities of Scotland, 1996 (Percentage of households)

Income quintile group	Outright Owners (%)	Mortgaged Owners (%)	LA Tenants (%)	HA Tenants (%)	Private Tenants (%)
Aberdeen					
Bottom	21	6	30	21	38
2nd	17	5	35	38	19
3rd	28	18	22	17	9
4th	11	33	13	17	13
Top	23	39	1	8	21
Total Obs.	87	210	211	24	47
Dundee					
Bottom	16	14	24	21	35
2nd	16	13	24	37	14
3rd	14	12	30	21	14
4th	23	28	13	13	24
Top	32	32	9	8	14
Total Obs.	57	157	165	52	37
Edinburgh					
Bottom	24	8	20	26	43
2nd	22	10	35	34	17
3rd	20	16	31	24	15
4th	17	30	12	12	15
Top	18	37	2	4	10
Total Obs.	301	477	209	134	170
Glasgow					
Bottom	21	11	26	17	28
2nd	17	7	28	25	15
3rd	22	11	23	23	21
4th	17	24	17	22	21
Top	24	47	6	13	15
Total Obs.	215	485	739	386	130

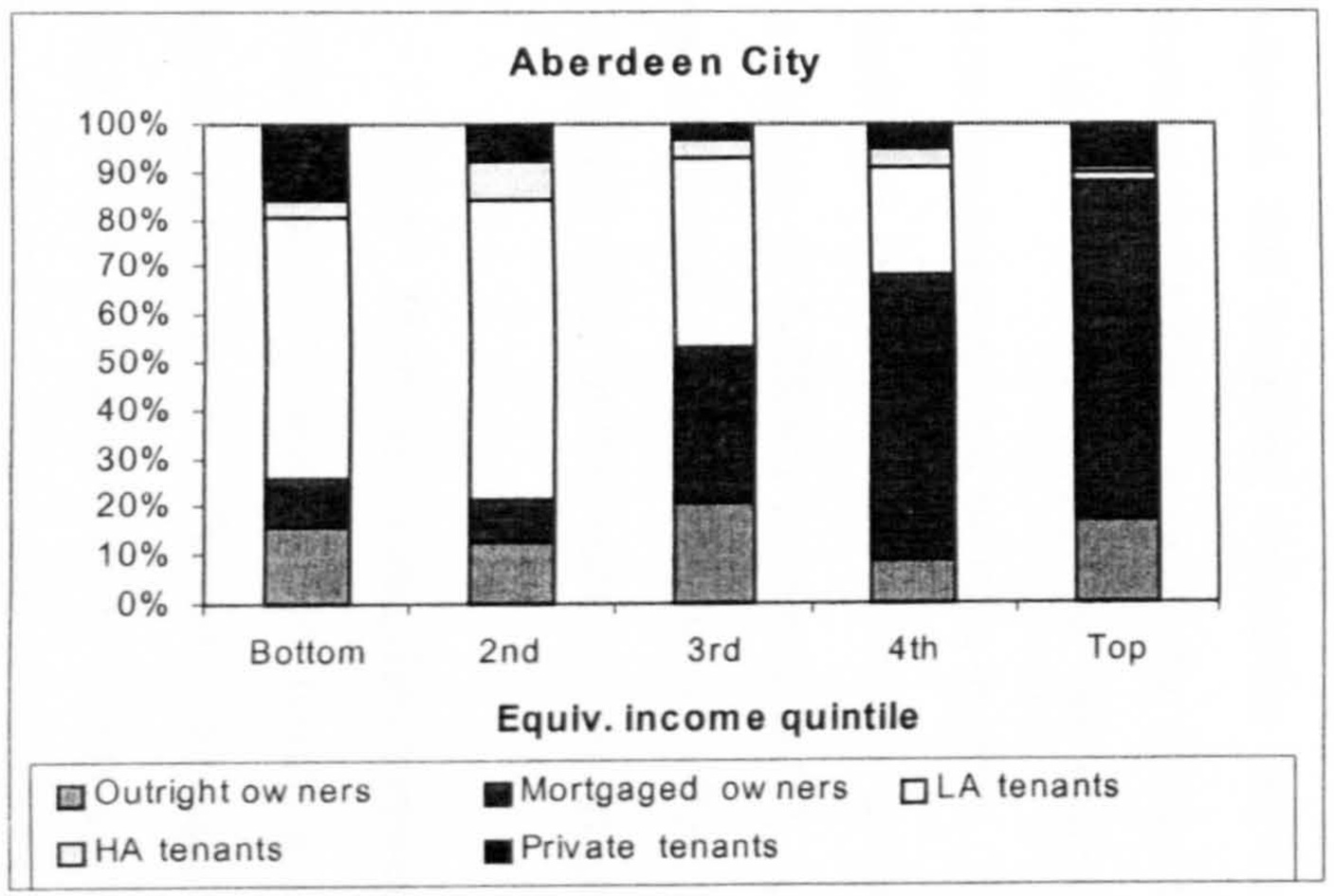
Source: 1996 Scottish House Condition Survey (own analysis)

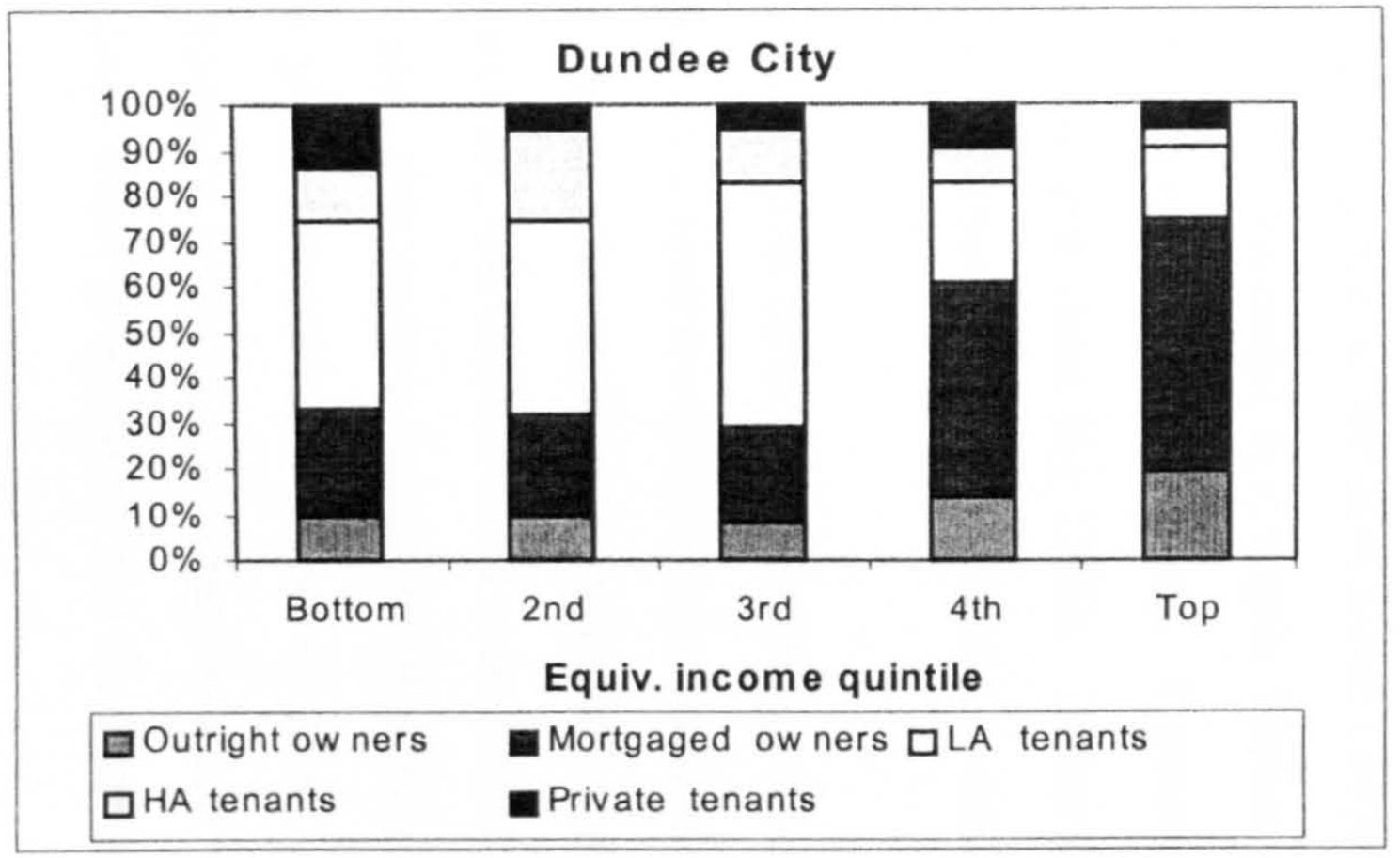
Notes: LA: Local Authority; HA: Housing Association

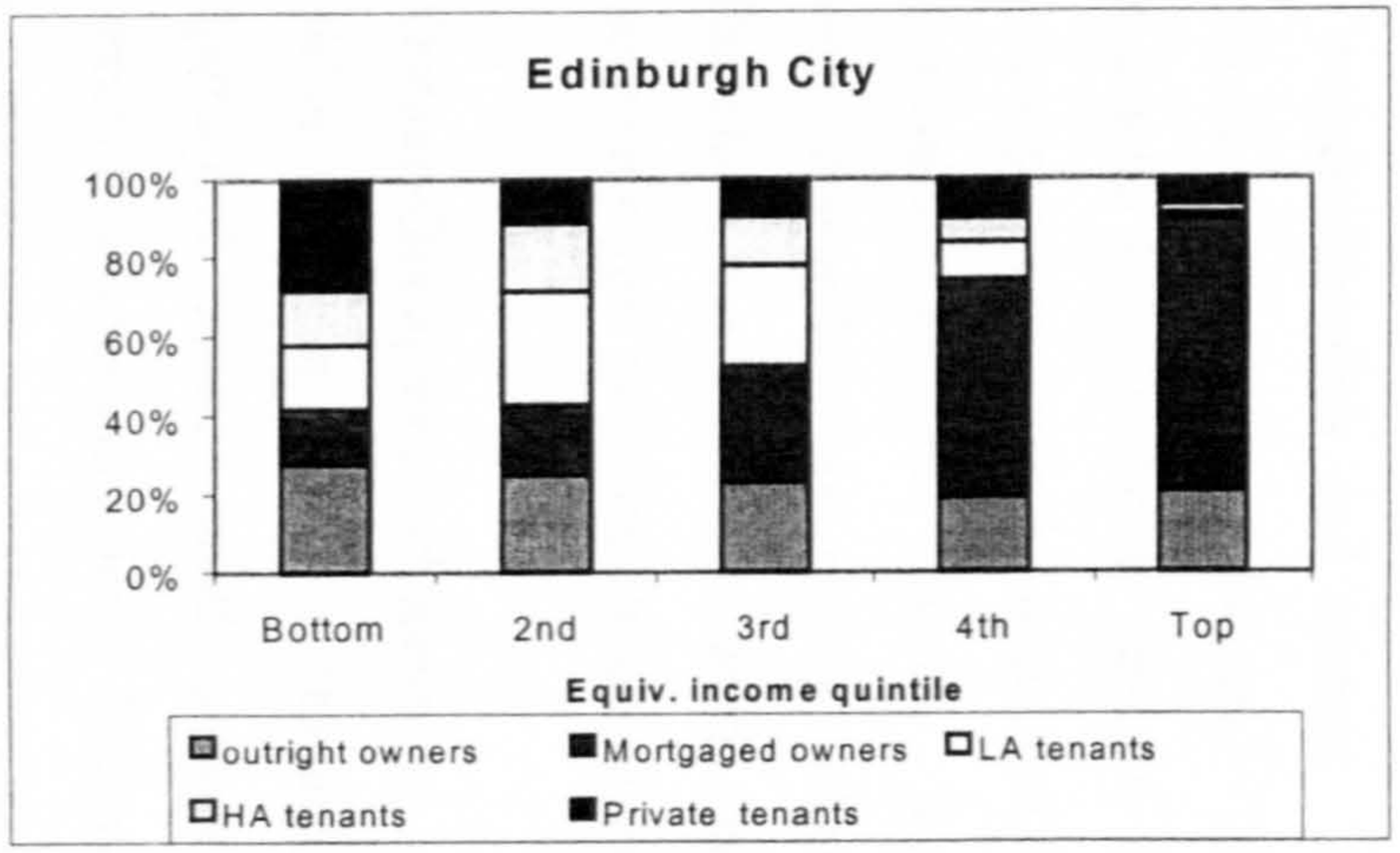
In both Aberdeen City and Glasgow City, outright owners do not have significant income polarisation between tenures. In Dundee City and Edinburgh City, the pattern is the opposite. Outright owners in Dundee City are relatively concentrated in the top two quintile groups. In contrast, outright owners in Edinburgh City are concentrated in the lower quintile groups. The interpretation of this result is complicated, and it is related to the demographic structure and socio-economic development between these two cities. Simply stated, the result may reflect the fact that outright owners in Edinburgh City have lower incomes than the other tenures in the city. In contrast, outright owners in Dundee City have higher incomes than the other tenures. Further, in all four cities, there are substantial private tenants in the bottom income quintile. In particular, in Edinburgh City, 43 per cent of private tenants are in the bottom quintile.

Moreover, Figure 7.2 shows a clear picture of tenure polarisation between the four cities. The annex table to Figure 7.2 is listed in Appendix A.7.4. In all four cities, mortgaged owners are significantly concentrated in the top two quintile groups. For social tenants, the pattern of polarisation varies by cities. In Aberdeen and Dundee, social tenants are significantly concentrated in the bottom three quintile groups. But in Edinburgh, social tenants are relatively concentrated in the second and the third quintile groups, while many outright owners are distributed in the bottom quintile group. In Glasgow, social tenants are significantly distributed in all quintile groups except the top quintile group. As stated earlier, the city's demographic structure, socio-economic development and housing policy have substantial influences on households' tenure and income distribution. For example, Edinburgh City experienced a steady growth of population and economic activities in the last twenty years, and it is the result of having more heterogeneous tenure and income distribution as well as other household characteristics in the city. Glasgow City has a historically strong social housing sector. Also, this city has experienced a decline of population and a change in economic development from manufacturing industries to service-oriented activities in the last three decades (Bailey et al. 1999). The characteristics and changes in demographic and economic developments have had significant impacts on the household's tenure and income distribution in Glasgow City.

In summary, this section analyses the income inequality between tenures and the tenure polarisation in Scotland and the four major cities. The results show that income inequality in mortgaged owners is relatively smaller than in outright owners. Income inequality in social tenants is smaller than in private tenants. However, if tenure distributions between and within income quintile groups are examined, a significant tenure polarisation is identified in that mortgaged owners are concentrated in the upper income quintile groups, while social tenants are concentrated in the lower income groups. Together, these indicate that higher income households are most likely to be owner-occupiers with mortgages, while low-income households are concentrated in the social rented sector. In addition, it implies a big income gap between mortgaged owners and social tenants.







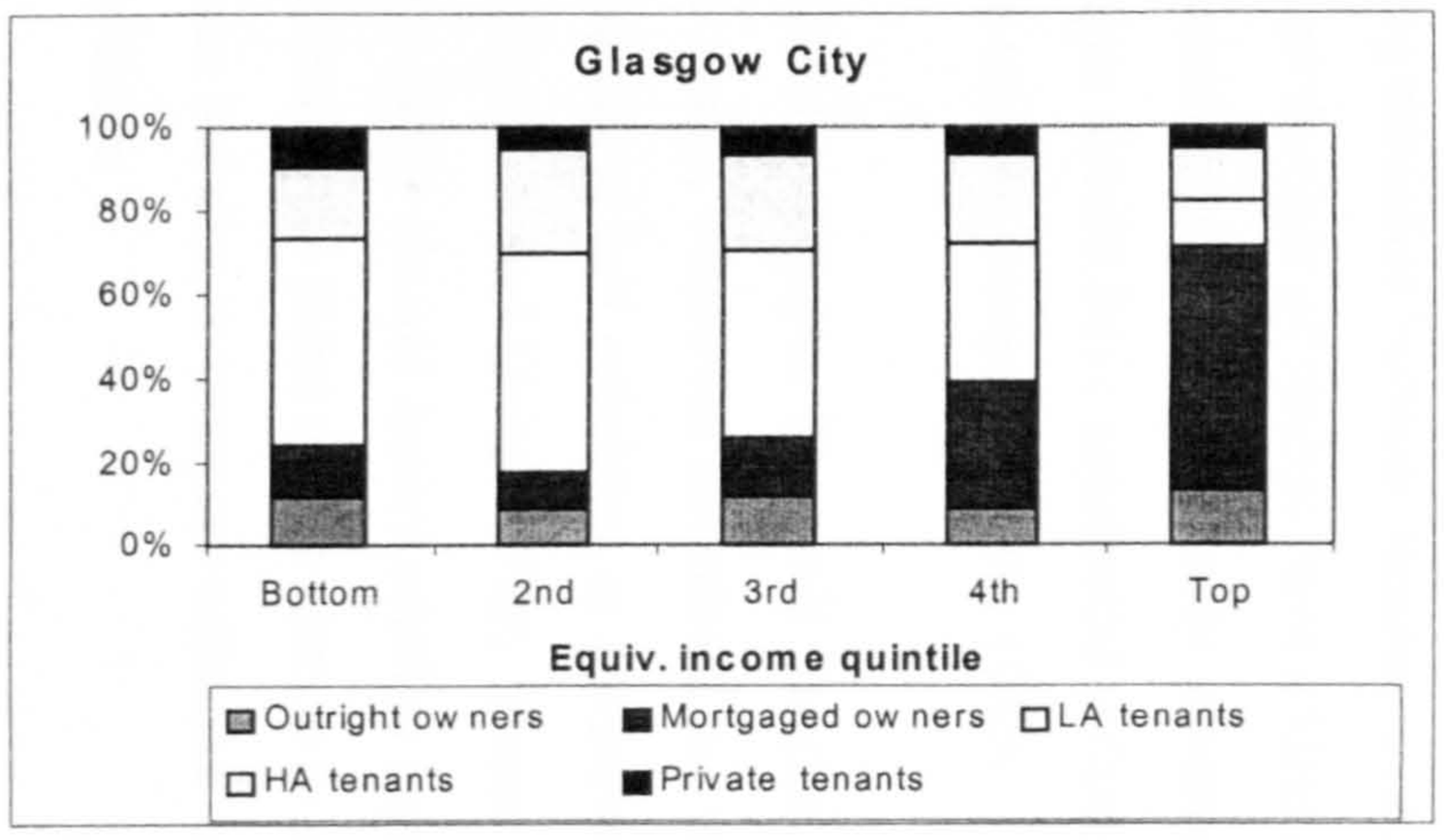


Figure 7.2 Tenure Polarisation in Four Cities of Scotland, 1996

7.3 The Balance of Housing Subsidies between Tenures

This section analyses the distribution of housing subsidies between tenures. From a policy perspective, the distribution of housing subsidies between tenures is not a new issue. As discussed in Chapter Three, a large number of studies have addressed this issue in the last two decades. However, housing policy and subsidy schemes have been changed since the 1990s. These changes should have substantial influences on the distribution of housing subsidies between tenures, compared to the 1980s.

The definition of housing subsidy, as discussed in Chapter Five and Chapter Six, is based on a tenure-neutral framework, that is to say, where the household has to shape the choice, the assistance including tax advantages and subsidies in economic or in cash terms, has to be neutral across tenures (Hancock and Munro 1992). Based on this concept, this section considers that housing subsidy should ensure relative equality at any given income level across tenures. As a result, the focus of this section is not only to compare housing subsidies between tenures but also to compare subsidies between income levels in Scotland and the four major cities.

In analysing the distribution of housing subsidies between tenures, this section first compares the housing subsidies between owner-occupiers and renters. It then compares the subsidies between outright owners and mortgaged owners. The third part of this section compares the subsidies among local authority tenants, housing association tenants and private tenants. The final part simulates the impact of MIRAS withdrawal on the distribution of housing subsidies between tenures. Since the termination of MIRAS in April 2000, academic researchers and policy makers have been interested in its withdrawal effect. Therefore, the simulation work (using the 1996 SHCS data) in this section would give some insights to current housing policy.

7.3.1 Housing Subsidies between Owner-Occupiers and Renters

As discussed in Chapter Five, housing subsidies to owner-occupiers primarily come from tax advantages. The untaxed capital gains and imputed rental incomes can be seen as the housing subsidies in economic terms to owner-occupiers. The mortgage interest relief at source (MIRAS) used to be a significant tax advantage to mortgaged owners. In addition, the income support to mortgage interest (ISMI) has increasingly

become an important subsidy to low-income and unemployed mortgaged owners, as discussed in Chapter Three. Unfortunately, the SHCS does not contain the ISMI information.[20] Therefore, this chapter will not include ISMI in the analysis.

In economic terms, housing subsidies to tenants primarily come from the rent gap between market rents and actual rents paid by tenants. For social tenants, the rent gap subsidies exist from the differences between estimated market rents and social rents. For private tenants with regulated tenancy, the rent gap subsidies come from the differences between estimated market rents and fair rents. In addition to rent gap subsidies, Housing Benefit also plays an important role in the housing subsidy to tenants. These housing subsidies are included in our analysis.

Table 7.13 shows the housing subsidies to owner-occupiers by income quintiles in Scotland in 1996. The tax advantages are apparently progressive. In the bottom quintile, economic subsidies account for 21 per cent of the average income, while the subsidies account for 3 per cent in the top quintile. MIRAS was also progressive, however it only accounted for a small proportion of household income, and the average value was not much different between income quintiles. The results, however, suggest that the effect of MIRAS was significantly limited.

Table 7.13 Housing Subsidies to Owner-Occupiers in Scotland, 1996 (Weekly £)

Equivalent income quintile	Mean Income	Economic Subsidies	% of E. Sub. to Mean Income	Average MIRAS [a]	% of MIRAS to Mean Income	% of Total Sub. to Mean Income
Bottom	88.88	18.55	20.9%	3.44	3.9%	24.7%
(No. of obs.)	(1368)	(962)		(350)		
2nd	145.43	17.05	11.7%	3.64	2.5%	14.2%
(No. of obs.)	(1226)	(887)		(437)		
3rd	195.11	15.75	8.1%	3.91	2.0%	10.1%
(No. of obs.)	(1589)	(1118)		(768)		
4th	270.73	14.78	5.5%	4.35	1.6%	7.1%
(No. of obs.)	(2359)	(1667)		(1388)		
Top	482.70	15.62	3.2%	4.88	1.0%	4.2%
(No. of obs.)	(3058)	(2214)		(1952)		
Total Avg	283.82	16.03	5.6%	4.36	1.5%	7.2%
(No. of obs.)	(9600)	(6848)		(4895)		

Source: 1996 Scottish House Condition Survey (own analysis)
Note a: for mortgaged owners only

[20] According to Wilcox (2000), there were about 3% of mortgaged owners in Scotland who received ISMI, and the average weekly ISMI was about £26.73 in 1996.

Economic subsidies to tenants are also progressive (see Table 7.14). The rent gap subsidies account for about 15 per cent of average income in the bottom quintile, while the subsidies are reduced to less than 2 per cent of average income in the top income quintile. Housing Benefit is the most significant subsidy to tenants, especially in lower income levels. In Table 7.14, Housing Benefit accounts for about 30.8 per cent and 19.2 per cent of household income in the bottom and the second quintiles respectively, while in the top income quintile, Housing Benefit only accounts for 8.3 per cent of average housing income. Although the amount of Housing Benefit rises with income quintiles, the number of benefit recipients significantly reduces in the upper income quintiles.

Table 7.14 Housing Subsidies to Tenants in Scotland, 1996 (Weekly £)

Equivalent Income Quintile	Mean Income	Economic Subsidies	% of E. Sub to Mean Income	Average HB	% of HB to Mean Income	% of Total Sub. to Mean Income
Bottom	90.57	13.37	14.8%	27.90	30.8%	45.6%
(No. of obs.)	(2225)	(1821)		(1163)		
2nd	144.61	12.94	8.9%	27.75	19.2%	28.1%
(No. of obs.)	(2398)	(1987)		(1454)		
3rd	190.61	11.50	6.0%	29.94	15.7%	21.7%
(No. of obs.)	(2013)	(1688)		(1134)		
4th	262.73	9.79	3.7%	34.00	12.9%	16.7%
(No. of obs.)	(1266)	(1010)		(417)		
Top	434.03	7.68	1.8%	36.00	8.3%	10.1%
(No. of obs.)	(528)	(419)		(115)		
Total Avg	177.20	12.11	6.8%	29.20	16.5%	23.3%
(No. of obs.)	(8430)	(6925)		(4283)		

Source: 1996 Scottish House Condition Survey (own analysis)

In a comparison of subsidies between owner-occupiers and tenants, Figure 7.3 shows that the economic subsidies to tenants are lower than owner-occupiers in lower quintile groups but are very close in upper quintile groups. After adding MIRAS to owner-occupiers (mortgaged owners only) and Housing Benefit to tenants, the subsidies gap is widened between the two tenures, especially in lower income quintile groups. Apparently, Housing Benefit has a significant effect on subsidising low-income tenants and, in a certain aspect, it plays an important role in reducing income inequality (Gibbs and Kemp 1993), while the effect of MIRAS was no longer significant to owners (mortgaged owners). Counting on the total subsidies, tenants in the bottom quintile group receive the highest proportion of subsidies accounting for 46

per cent of their average income, while owner-occupiers in the bottom quintile receive subsidies which account for a quarter of their average income.

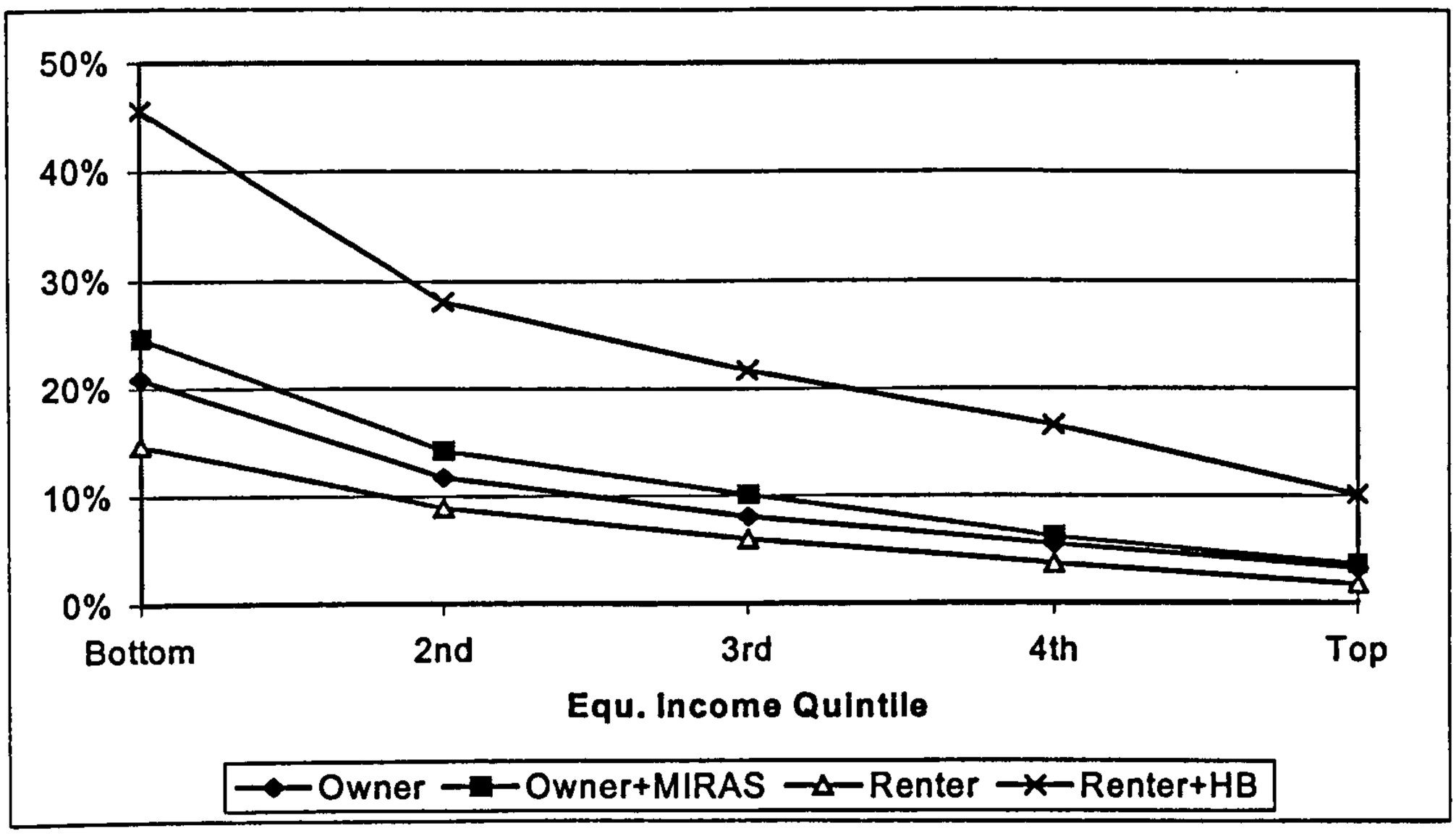
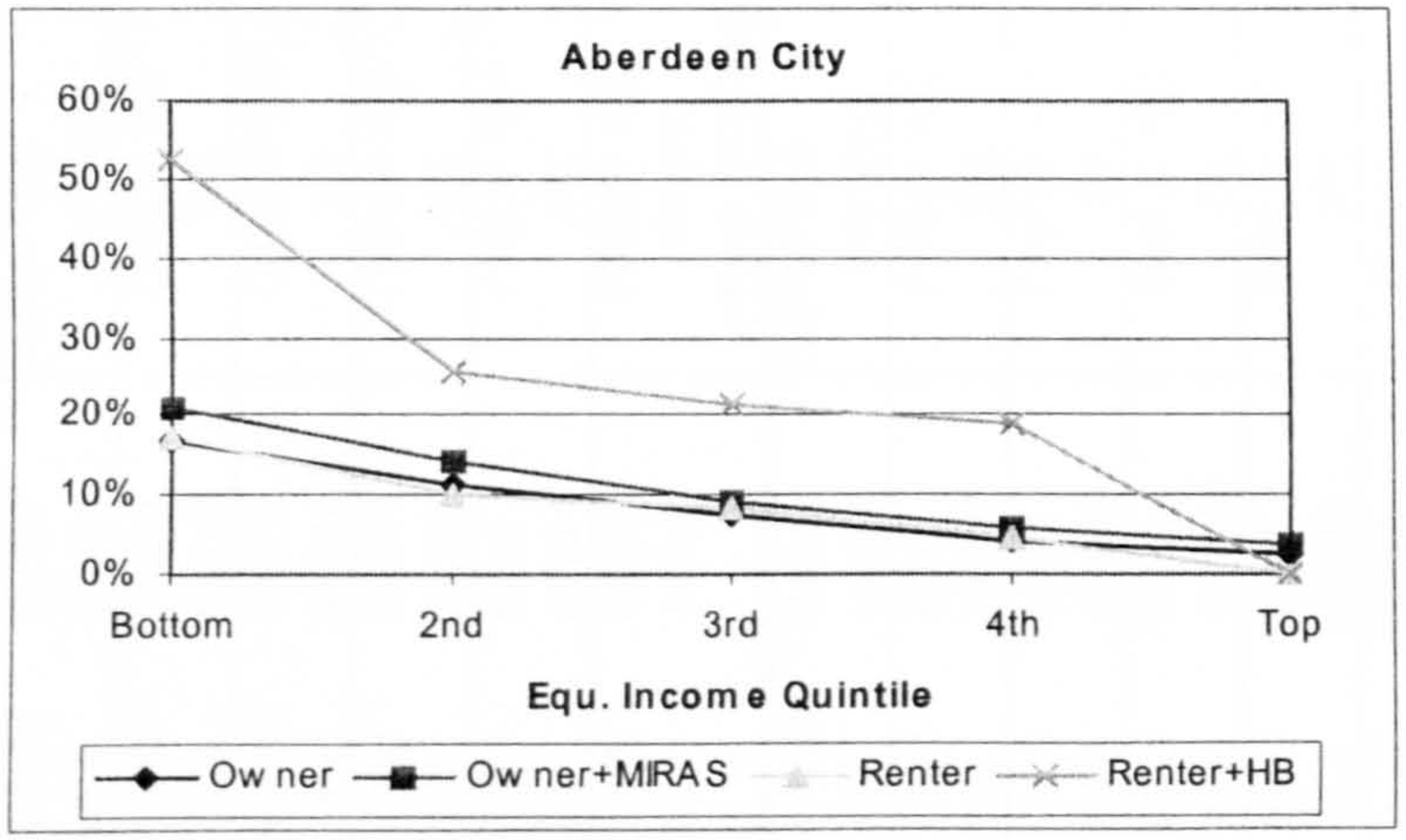
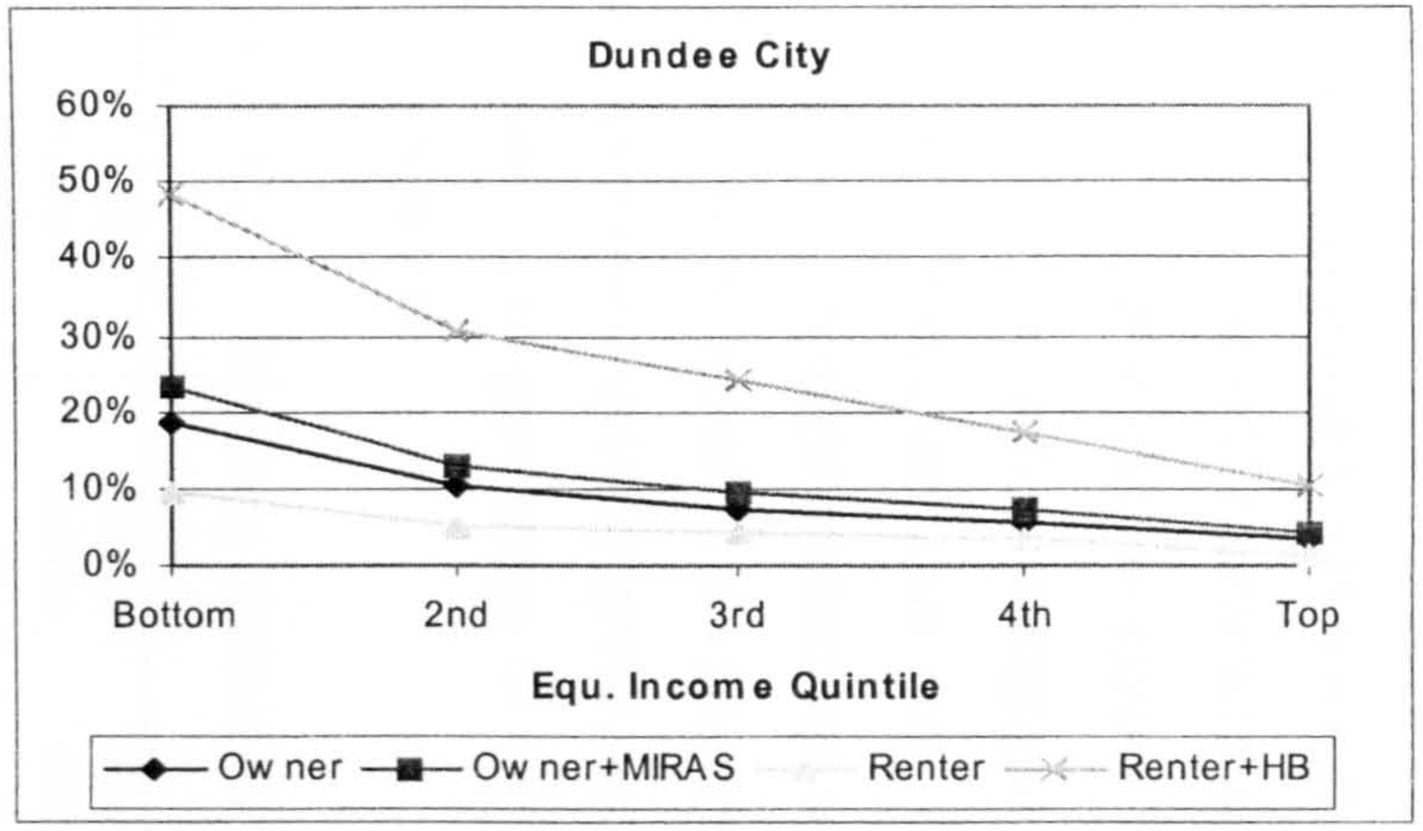


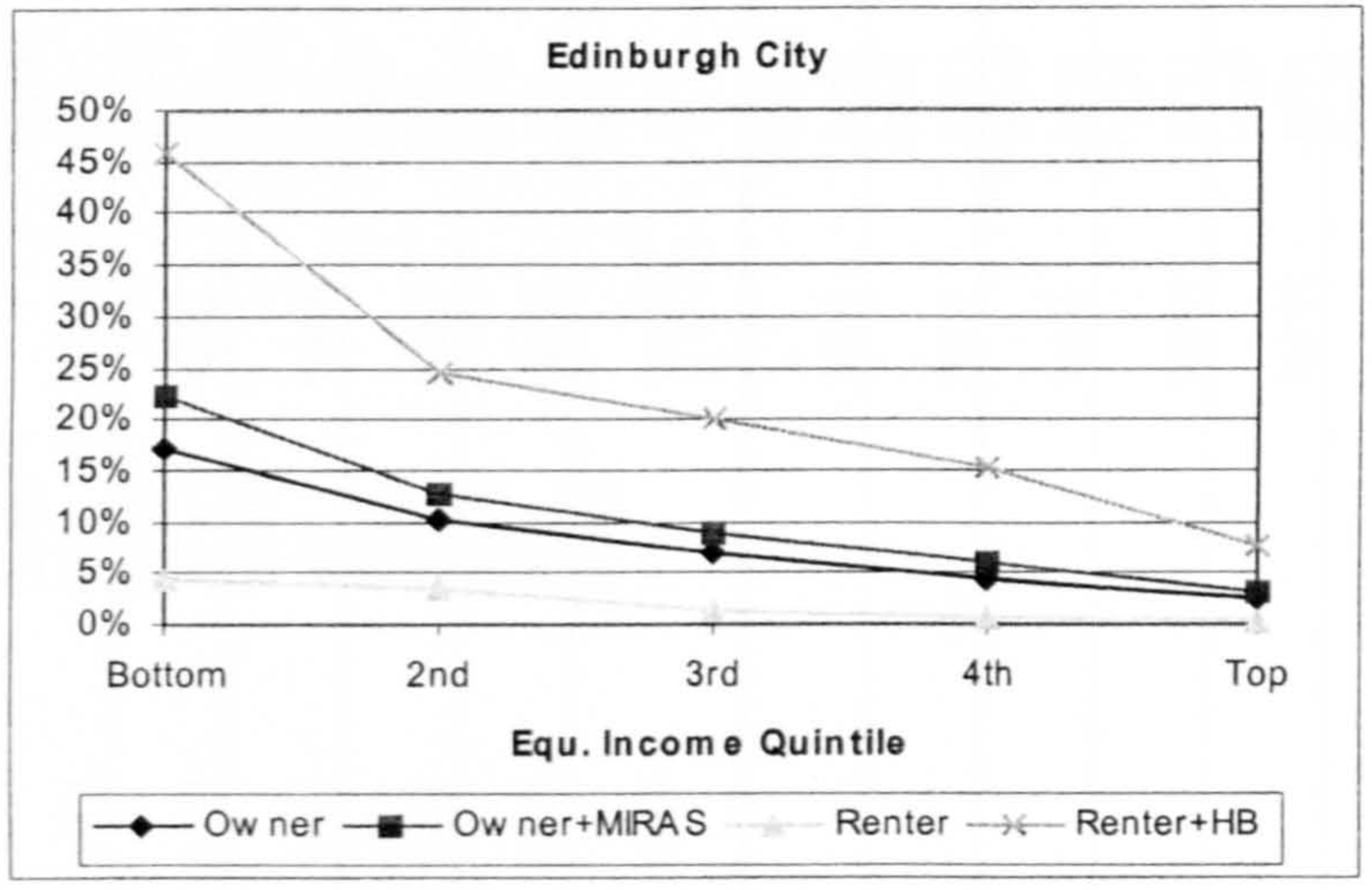
Figure 7.3 Housing Subsidies to Owners and Tenants in Scotland, 1996 (Percentage to mean income)

Note: the subsidy base is the economic subsidy

At the city level, the patterns of subsidies to owners and tenants are similar to the Scottish average (see Figure 7.4, and annex tables are presented in Appendix A.7.5). It is clear that Housing Benefit plays a great role in subsidising low-income tenants at the city level. In the bottom income quintile, tenants received a higher proportion of subsidies than owner-occupiers. Among the four cities, economic subsidies to tenants in Edinburgh City are significantly lower than in the other three cities. This may reveal the fact that the social rent level and the fair rent level in Edinburgh City are catching up with the market rent level. In Aberdeen City, the subsidies to tenants show a big gap between income quintile groups. Tenants in the bottom quintile of this city receive the highest subsidies accounting for 53 per cent of their average household income, while there is no subsidy to tenants in the top quintile group. The result could be affected by sample selection, as there are only seven valid observations of renter households in the top quintile group in Aberdeen City (see annex table in Appendix A.7.5). On the other hand, it reveals a concentration of tenants in lower income quintile groups in Aberdeen City.







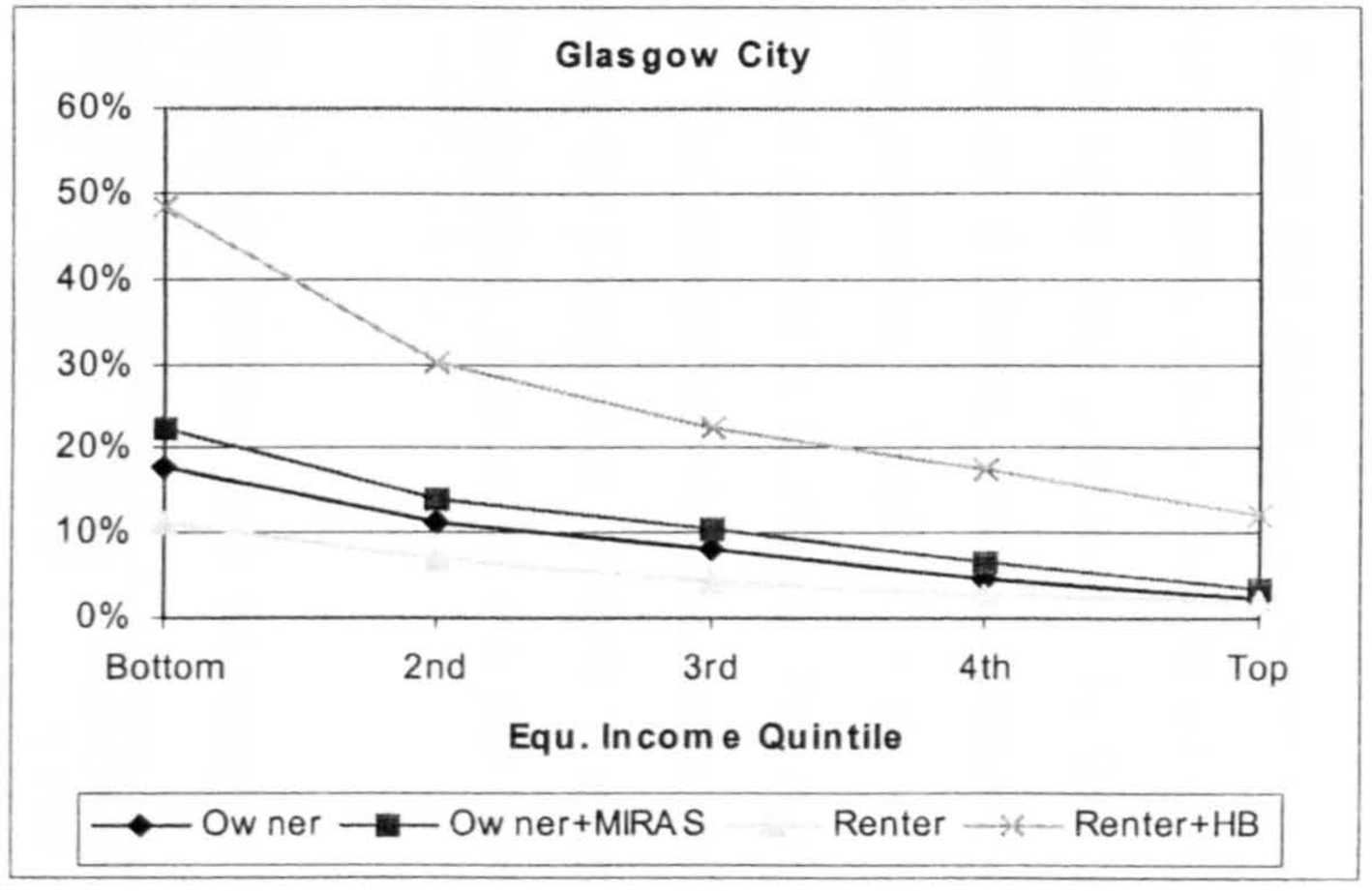


Figure 7.4 Housing Subsidies to Owners and Tenants in Four Cities of Scotland, 1996 (Based on Economic Subsidies) (Percentage to Mean Income)

7.3.2 Subsidies between Outright Owners and Mortgaged Owners

In the previous section, we have seen that there are significantly different tenure and income distributions between outright owners and mortgaged owners because of their different household characteristics. For instance, many outright owners are elderly people and their income mainly depends upon their pensions. In fact, subsidies to outright owners and to mortgaged owners are different, which is primarily because of the capital value and user costs of their properties. Table 7.15 shows the housing subsidies to outright owners and mortgaged owners in Scotland. For outright owners, the economic subsidies are progressive. The economic subsidies are significant in the bottom income quintile group, accounting for 23 per cent of their average household incomes. The percentage of economic subsidies reduces to 4.8 per cent in the top quintile group.

Table 7.15 Housing Subsidies to Outright Owners and Mortgaged Owners in Scotland, 1996 (Weekly £)

Equivalent Income Quintile	Mean Income	Econ. CGT	Subsidies IRT	% of E Sub to Mean Income	Average MIRAS	% of MIRAS to Mean Income	% of Total Sub. to M Income
Outright Owners							
Bottom	90.86	5.88	15.04	23.0%	-		23.0%
(No. of obs.)	(862)	(674)	(674)				
2nd	143.50	5.70	14.58	14.1%	-	-	14.1%
(No. of obs.)	(617)	(511)	(511)				
3rd	193.85	5.94	15.21	10.9%	-	-	10.9%
(No. of obs.)	(551)	(451)	(451)				
4th	266.33	6.17	15.80	8.2%	-	-	8.2%
(No. of obs.)	(573)	(491)	(491)				
Top	519.63	7.02	17.97	4.8%	-	-	4.8%
(No. of obs.)	(685)	(566)	(566)				
Total Avg	237.90	6.15	15.74	9.2%	-	-	9.2%
(No. of obs.)	(3288)	(2693)	(2693)				
Mortgaged Owners							
Bottom	85.51	5.76	7.37	15.4%	3.44	4.0%	19.4%
(No. of obs.)	(506)	(288)	(288)		(350)		
2nd	147.38	5.62	7.07	8.6%	3.64	2.5%	11.1%
(No. of obs.)	(609)	(376)	(376)		(437)		
3rd	195.78	5.63	6.52	6.2%	3.91	2.0%	8.2%
(No. of obs.)	(1038)	(667)	(667)		(768)		
4th	272.15	5.87	6.01	4.4%	4.35	1.6%	6.0%
(No. of obs.)	(1786)	(1176)	(1176)		(1388)		
Top	472.04	6.60	5.85	2.6%	4.88	1.0%	3.7%
(No. of obs.)	(2373)	(1648)	(1648)		(1952)		
Total Avg	307.74	6.07	6.22	4.0%	4.36	1.4%	5.4%
(No. of obs.)	(6312)	(4155)	(4155)		(4895)		

Source: 1996 Scottish House Condition Survey (own analysis)
Notes: CGT: untaxed capital gains; IRT: untaxed imputed rents.

The results show that mortgaged owners receive less economic subsidies than outright owners. This is because outright owners have higher imputed rental incomes than mortgaged owners. For mortgaged owners, part of their imputed rental incomes is deducted by mortgaged debts. Between income quintiles, the subsidy effect is significant in the bottom quintile group, accounting for 15 per cent of average household income, while the percentage reduces to less than 3 per cent in the top quintile group. In addition to economic subsidies, mortgaged owners also receive mortgage interest tax relief but outright owners did not. As shown in Table 7.15, the average MIRAS is £4.36 per week, accounting for 1.4 per cent of the average household income for mortgaged owners. Therefore, as shown in Figure 7.5, after adding MIRAS to mortgaged owners, the total subsidies to mortgaged owners are less than the subsidies to outright owners. Apparently, the difference is in the imputed rental income.

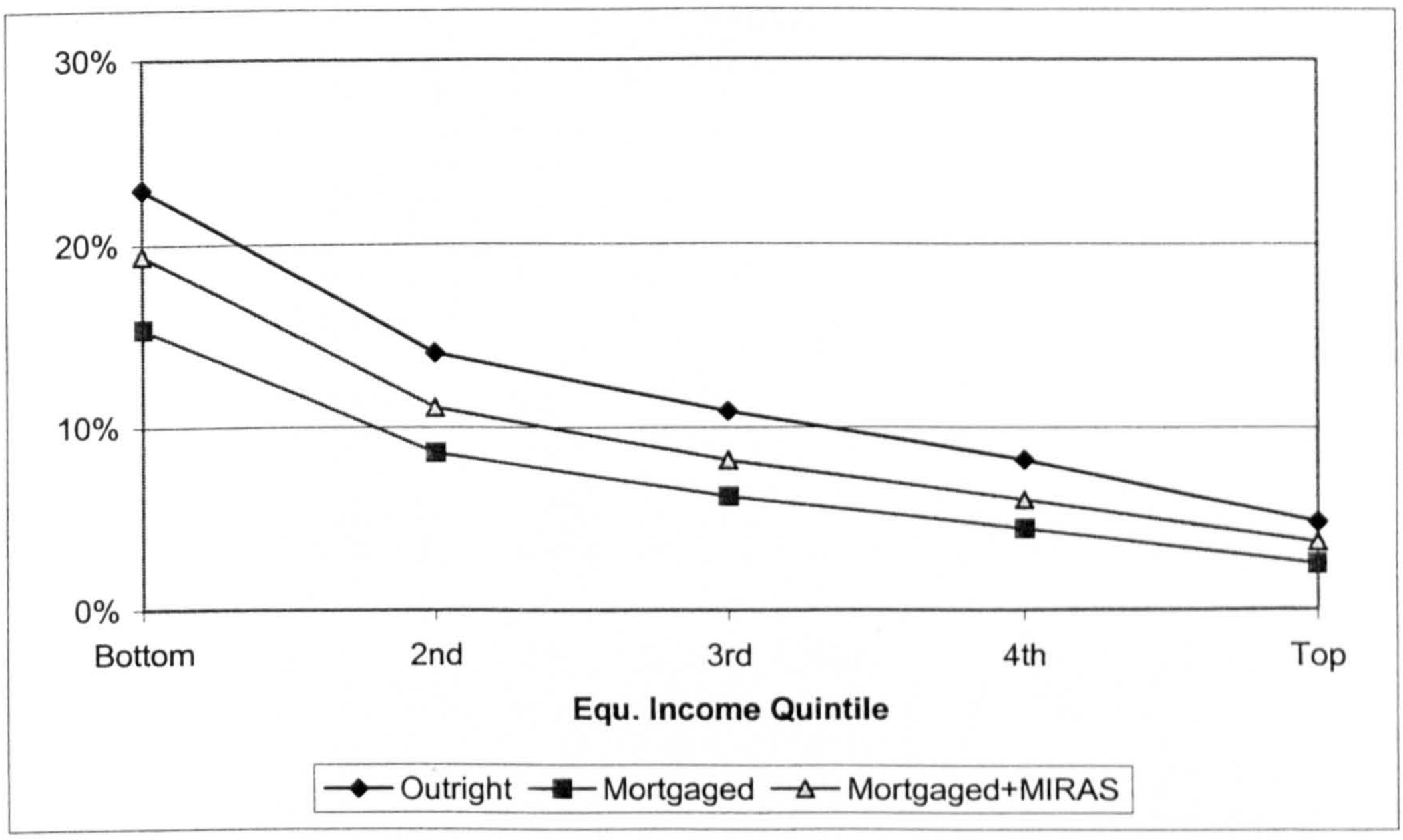
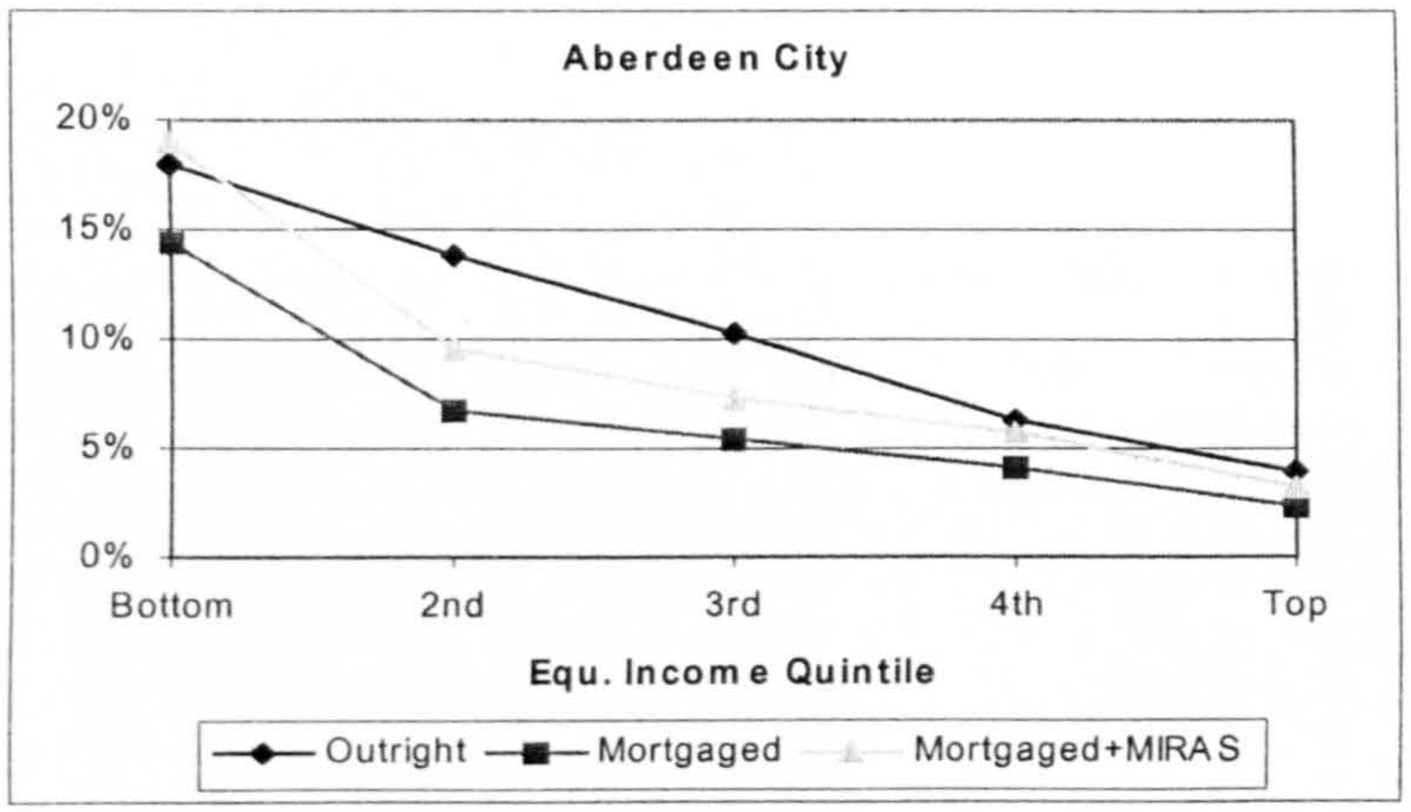


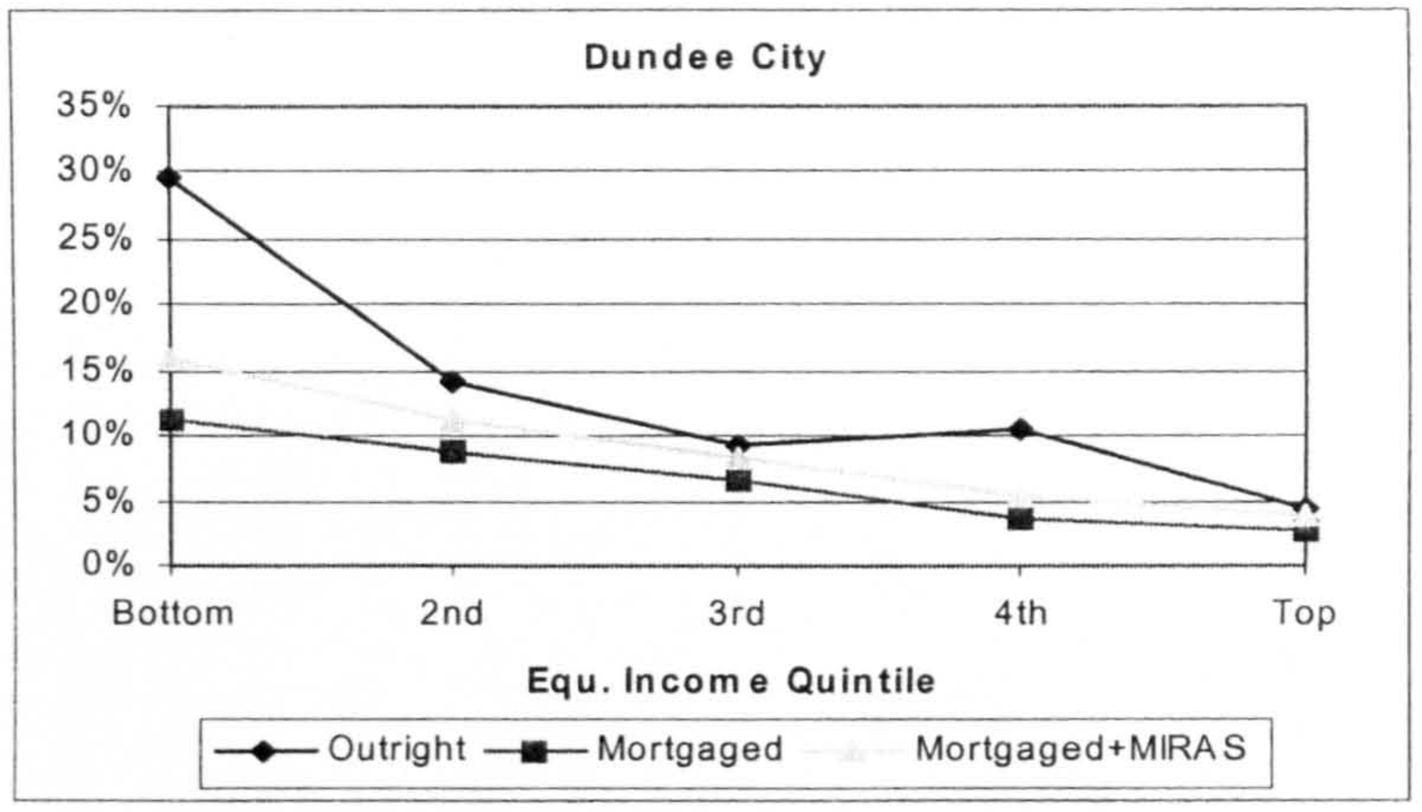
Figure 7.5 Housing Subsidies to Outright Owners and Mortgaged Owners in Scotland, 1996 (Percentage to mean income)

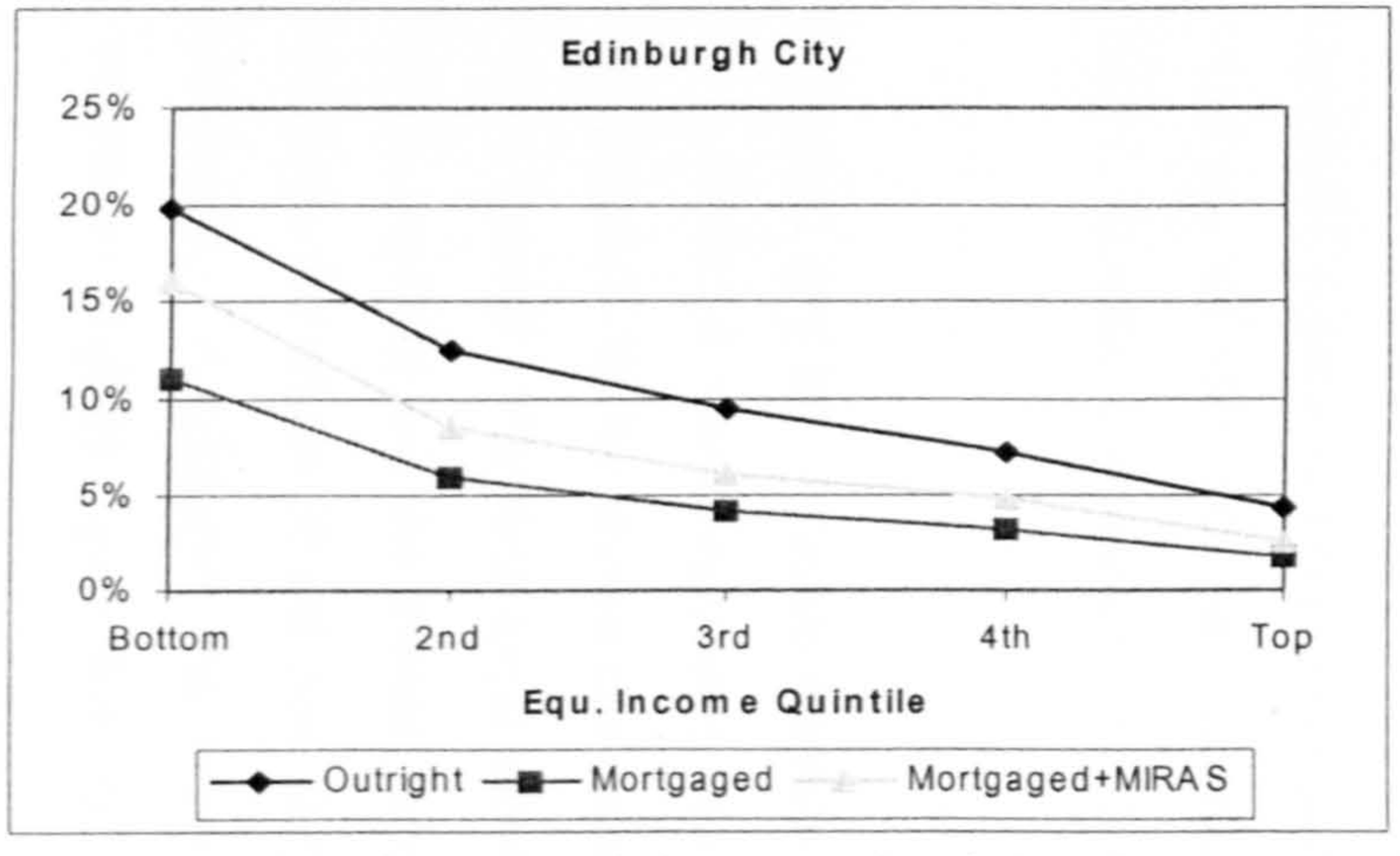
Note: The subsidy base in the economic subsidy

Moreover, Figure 7.6 shows a comparison of subsidies to outright owners and to mortgaged owners between the four cities (the annex tables are shown in Appendix A.7.5). In both Edinburgh City and Glasgow City, housing subsidies to outright owners and to mortgaged owners are similar to the Scottish level, while the subsidy

pattern is dramatically different between Aberdeen City and Dundee City. For outright owners in Aberdeen City, the subsidy gap between income quintiles is the smallest among the four cities. This suggests that the housing subsidies are not significantly different between outright owners and mortgaged owners and between income levels in Aberdeen City. In contrast, there exists the biggest subsidy gap for outright owners between income quintiles in Dundee City. In this city, outright owners in the bottom quintile receive the highest subsidies accounting for about 30 per cent of their average household incomes, while in the top quintile group, the subsidies only account for less than 5 per cent of their average household incomes (also see Appendix Table A.7.5.3). The results imply that there could be a big gap for outright owners in terms of their property values and user costs between income quintiles in Dundee City.







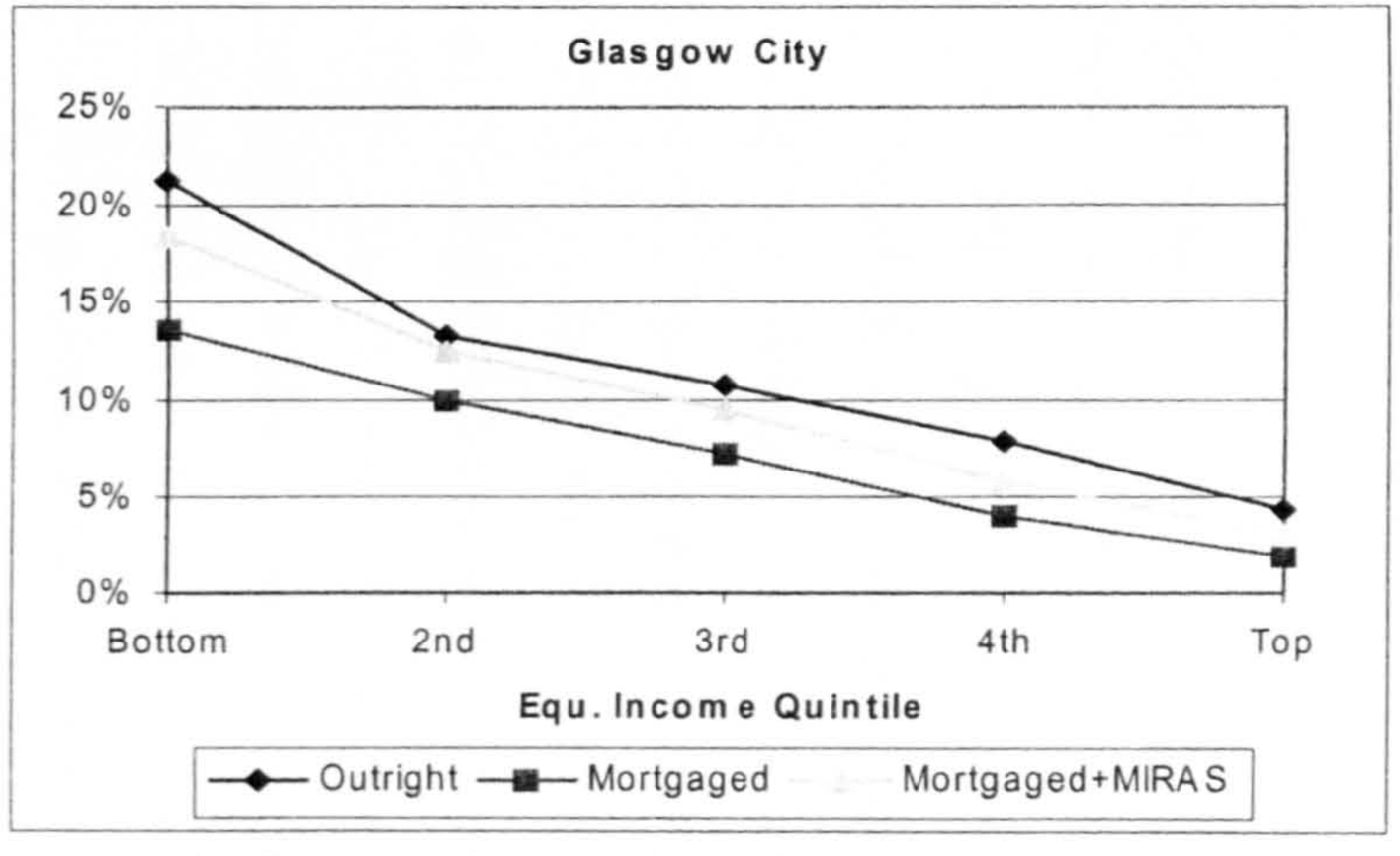


Figure 7.6 Housing Subsidies to Outright Owners and Mortgaged Owners in Four Cities of Scotland, 1996 (based on Economic Subsidies) (Percentage to Mean Income)

7.3.3 Subsidies between Social Tenants and Private Tenants

In the social rented sector, as stated earlier, economic subsidies come from the rent gap between estimated market rents and social rents charged by social landlords. In fact, rent gap subsidies between local authority tenants and housing association tenants are different because of their property quality and social rent levels. Table 7.16 shows that the economic subsidies to both local authority tenants and housing association tenants are progressive with income rises. However, economic subsidies to local authority tenants are slightly higher than the subsidies to housing association tenants in terms of the average value and the proportion to average household income. These results can be explained from several aspects. Firstly, the average quality and property value of housing association dwellings could be higher than council houses because there have been many new dwellings in the housing association sector since 1989. Hence, this implies that average estimate market rents for housing association dwellings could be higher than the estimated market rents for council houses. Secondly, housing associations are free to set up their rents after 1989 and since then the rent level in the housing association sector has risen rapidly, compared to the rent level in the local authority rented sector. Based on the conditions above, housing association tenants receive less rent gap subsidies than local authority tenants. Thirdly, the average household income of local authority tenants is lower than that of housing association tenants and, as a result, the rent gap subsidy has more influence on local authority tenants than housing association tenants, particularly in lower income quintile groups.

Housing Benefit has become the most important subsidy to social tenants. Table 7.16 shows that more than half of tenants in both the local authority sector and the housing association sector are in receipt of Housing Benefit. It also shows that tenants in lower income groups depend heavily upon this state benefit. For both local authority tenants and housing association tenants in the bottom quintile and the second quintile groups, the average amount of Housing Benefit accounts for about 30 per cent and 20 per cent of their average household income respectively. In addition, the average Housing Benefit received by housing association tenants is slightly higher than that received by local authority tenants. This is probably because the average rent level in the housing association sector is higher than that in the local authority rented sector so that housing association tenants would receive more benefits to cover their rents.

Table 7.16 Housing Subsidies to Local Authority Tenants and Housing Association Tenants in Scotland, 1996 (Weekly £)

Equivalent income Quintile	Mean Income	Economic Subsidies	% of E. Sub. to Mean income	Average HB	% of HB to Mean Income	% of Total Sub. to Mean income
LA Tenants						
Bottom	92.22	15.74	17.1%	26.79	29.0%	46.1%
(No. of obs.)	(1589)	(1325)		(935)		
2nd	144.55	14.40	10.0%	26.34	18.2%	28.2%
(No. of obs.)	(1812)	(1530)		(1140)		
3rd	189.93	13.66	7.2%	27.90	14.7%	21.9%
(No. of obs.)	(1464)	(1236)		(856)		
4th	262.63	13.55	5.2%	28.40	10.8%	16.0%
(No. of obs.)	(787)	(645)		(272)		
Top	396.06	12.59	3.2%	30.29	7.6%	10.8%
(No. of obs.)	(259)	(217)		(72)		
Total Avg	168.46	14.38	8.5%	27.13	16.1%	24.6%
(No. of obs.)	(5911)	(4962)		(3275)		
HA Tenants						
Bottom	94.63	14.43	15.2%	29.63	31.3%	46.6%
(No. of obs.)	(278)	(226)		(164)		
2nd	144.09	13.10	9.1%	28.18	19.6%	28.6%
(No. of obs.)	(327)	(275)		(223)		
3rd	192.00	9.69	5.0%	30.68	16.0%	21.0%
(No. of obs.)	(316)	(274)		(204)		
4th	260.98	8.17	3.1%	36.04	13.8%	16.9%
(No. of obs.)	(218)	(178)		(99)		
Top	477.00	10.09	2.1%	43.21	9.1%	11.2%
(No. of obs.)	(83)	(65)		(35)		
Total Avg	188.69	11.42	6.1%	31.01	16.4%	22.5%
(No. of obs.)	(1222)	(1018)		(725)		

Source: 1996 Scottish House Condition Survey (own analysis)

As defined in Chapter Five, private tenants receive rent gap subsidies only if they are in regulated tenancy and pay fair rents. Private tenants in the non-regulated tenancy are supposed to pay market rents so that they do not receive any rent gap subsidies. Table 7.17 presents the housing subsidies to private regulated tenants and to non-regulated tenants. Derived from Chapter Five, there are 57 private tenants in the sample who were possibly in the regulated tenancy. Most of these regulated tenants are concentrated in lower income quintile groups and only two of them are distributed in the top income quintile group. Therefore, the effect of fair rent subsidies is much more significant in lower income groups. The average economic subsidies to private regulated tenants account for about 17 per cent of household income in the bottom

quintile group and about 14 per cent in the second quintile group, while the percentage reduces to less than 1 per cent in the top quintile group.

Table 7.17 Housing Subsidies to Private Tenants in Scotland, 1996 (Weekly £)

Equivalent income Quintile	Mean Income	Economic Subsidies	% of E. Sub. to Mean Income	Average HB	% of HB to Mean Income	% of Total Sub. To Mean Income
Private Reg. Ten.						
Bottom	83.56	14.13	16.9%	20.31	24.3%	41.2%
(No. of obs.)	(16)	(16)		(7)		
2nd	144.66	20.33	14.1%	25.41	17.6%	31.6%
(No. of obs.)	(18)	(18)		(9)		
3rd	191.93	15.30	8.0%	13.06	6.8%	14.8%
(No. of obs.)	(11)	(11)		(4)		
4th	253.16	14.99	5.9%	44.31	17.5%	23.4%
(No. of obs.)	(10)	(10)		(2)		
Top	427.90	0.67	0.2%	0.00	0.0%	0.2%
(No. of obs.)	(2)	(2)		(0)		
Total Avg	165.61	16.22	9.8%	23.32	14.1%	23.9%
(No. of obs.)	(57)	(57)		(22)		
Prv. Non-Reg. Ten.						
Bottom	76.04	-	-	42.05	55.3%	55.3%
(No. of obs.)	(254)			(56)		
2nd	146.40	-	-	47.39	32.4%	32.4%
(No. of obs.)	(164)			(78)		
3rd	192.75	-	-	53.32	27.7%	27.7%
(No. of obs.)	(167)			(64)		
4th	264.01	-	-	65.22	24.7%	24.7%
(No. of obs.)	(168)			(40)		
Top	475.86	-	-	55.86	11.7%	11.7%
(No. of obs.)	(135)			(8)		
Total Avg	207.33	-	-	50.89	24.5%	24.5%
(No. of obs.)	(888)			(246)		

Source: 1996 Scottish House Condition Survey (own analysis)

Table 7.17 shows that about one third of private tenants are in receipt of Housing Benefit. Apparently, private tenants in lower income quintiles depend heavily upon this state benefit. For private non-regulated tenants, the average amount of Housing Benefit accounts for 55 per cent of their average household income in the bottom quintile, and accounted for 32 per cent of their average household income in the second quintile. In addition, the average Housing Benefit received by regulated tenants is less than half of the amount received by non-regulated tenants. This is

probably because the fair rent level is much lower than the market level, thus regulated tenants receive fewer benefits to cover their rents than non-regulated tenants do.

Figure 7.7 shows a comparison of housing subsidies to social tenants (including local authority tenants and housing association tenants) and private tenants. With regard to economic subsidies, private regulated tenants in lower income quintiles apparently receive slightly higher rent gap subsidies than local authority tenants and housing association tenants. In the social rented sector, local authority tenants receive slightly higher rent gap subsidies than housing association tenants receive in all income quintiles except the top quintile. Housing Benefit plays a significant role in subsidising tenants in lower income quintile groups. After adding Housing Benefit, the total subsidy to local authority tenants and housing association tenants is about the same between income quintiles. On the other hand, private tenants in the third and the fourth quintile groups receive a slightly higher proportion of housing subsidies (compared to their average household income) than social tenants.

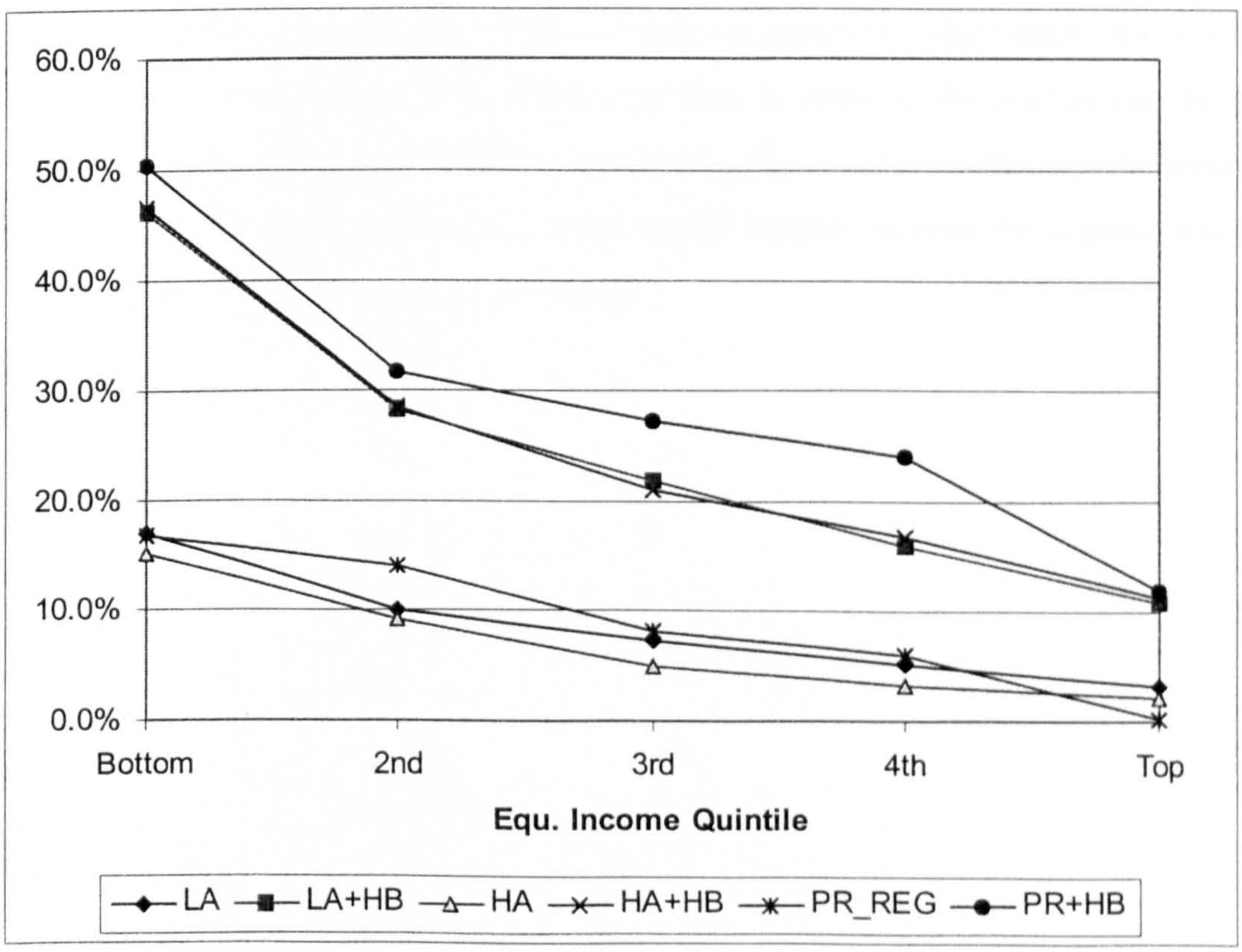
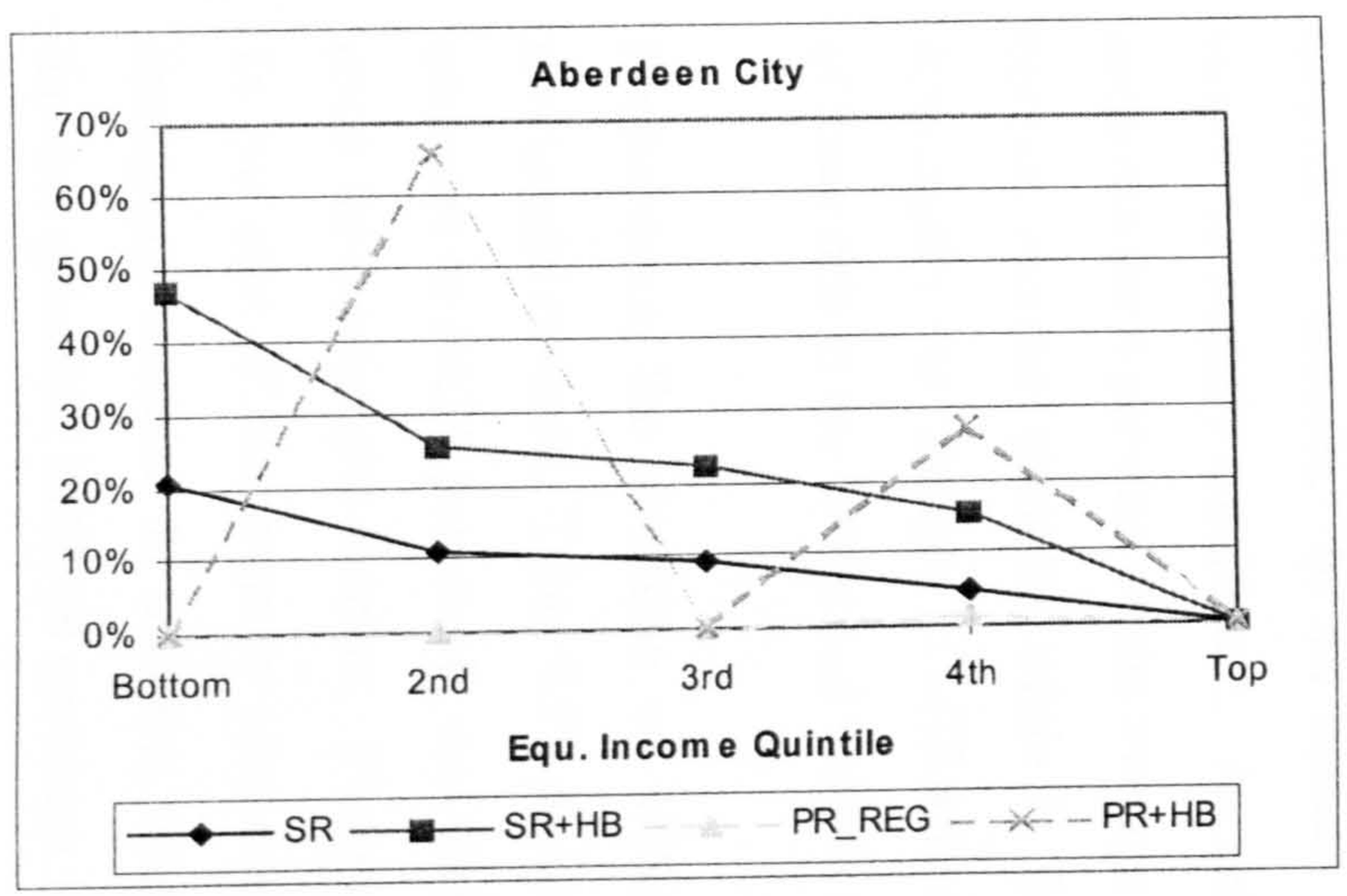


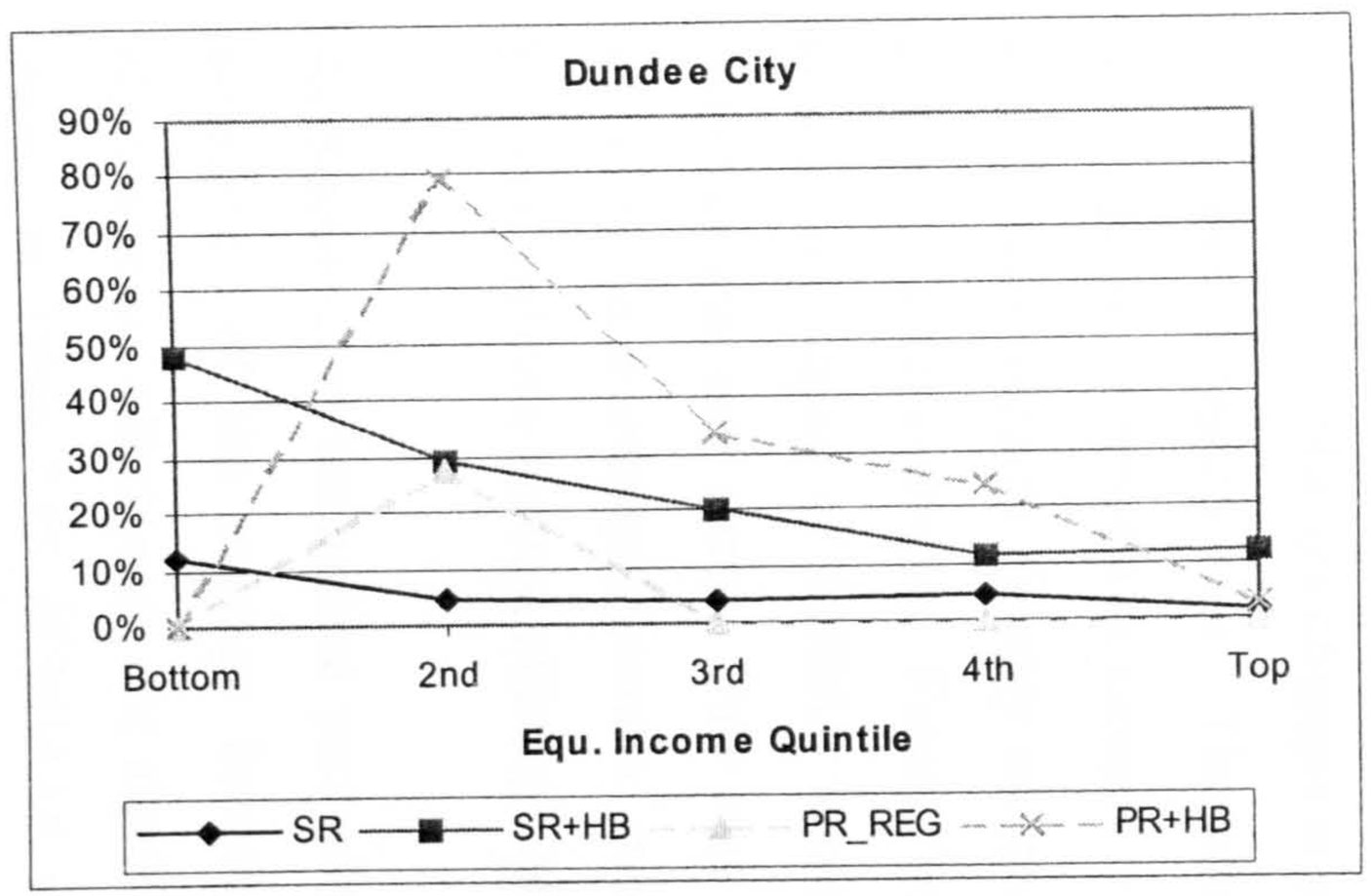
Figure 7.7 Housing Subsidies to LA Tenants, HA Tenants and Private Tenants in Scotland, 1996 (Percentage to mean income)

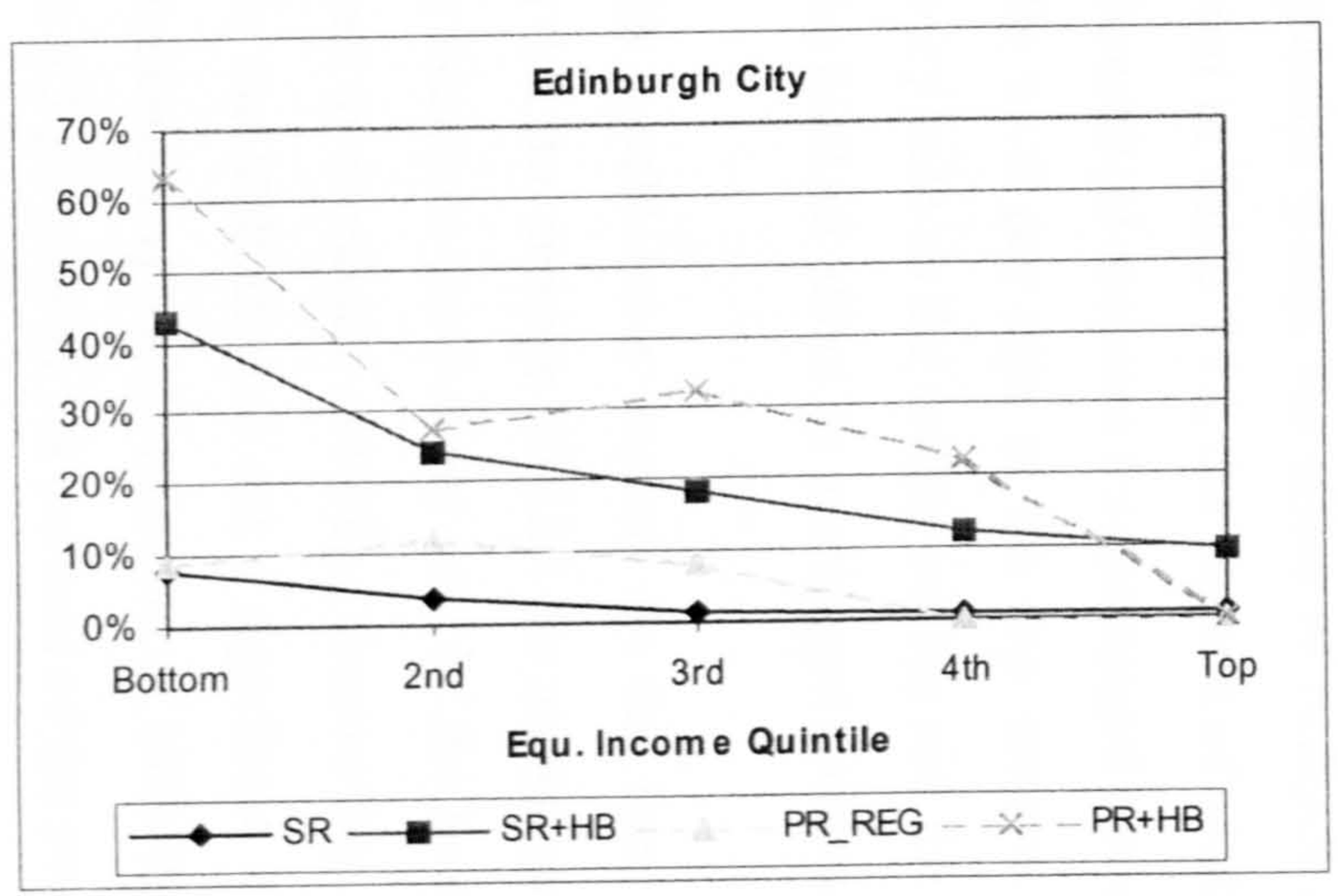
Notes: the subsidy base in the economic subsidy; LA: local authority; HA housing association; PR: private renting; PR_REG: private renting in regulated tenancy; HB: Housing Benefit

At the city level, the results of housing subsidies to private tenants would not be as reliable as at the whole Scotland level because of a lack of sufficient observations. Therefore, in Figure 7.8, subsidies to private tenants are presented by broken lines (the annex tables are listed in Appendix A.7.5). In spite of unreliable results, it can be identified that private regulated tenants are concentrated in Edinburgh City and Glasgow City. Of the estimated total 57 private regulated tenants in the sample of Scotland, 34 of them are located in Edinburgh City and Glasgow City.

The patterns of housing subsidies to social tenants are slightly different between the four cities. In Edinburgh City, the average economic subsidies to social tenants are the lowest among the four cities. It also shows that social tenants in Edinburgh City have the biggest gap between total subsidies (economic subsidies plus Housing Benefit) and economic subsidies, particularly in lower income quintiles. The results may reveal the fact that the social rent level in Edinburgh City is close to the market rent level. In contrast, social tenants in Aberdeen City have the smallest difference between total subsidies and economic subsidies. Also, social tenants receive the highest amount of economic subsidies among the four cities.







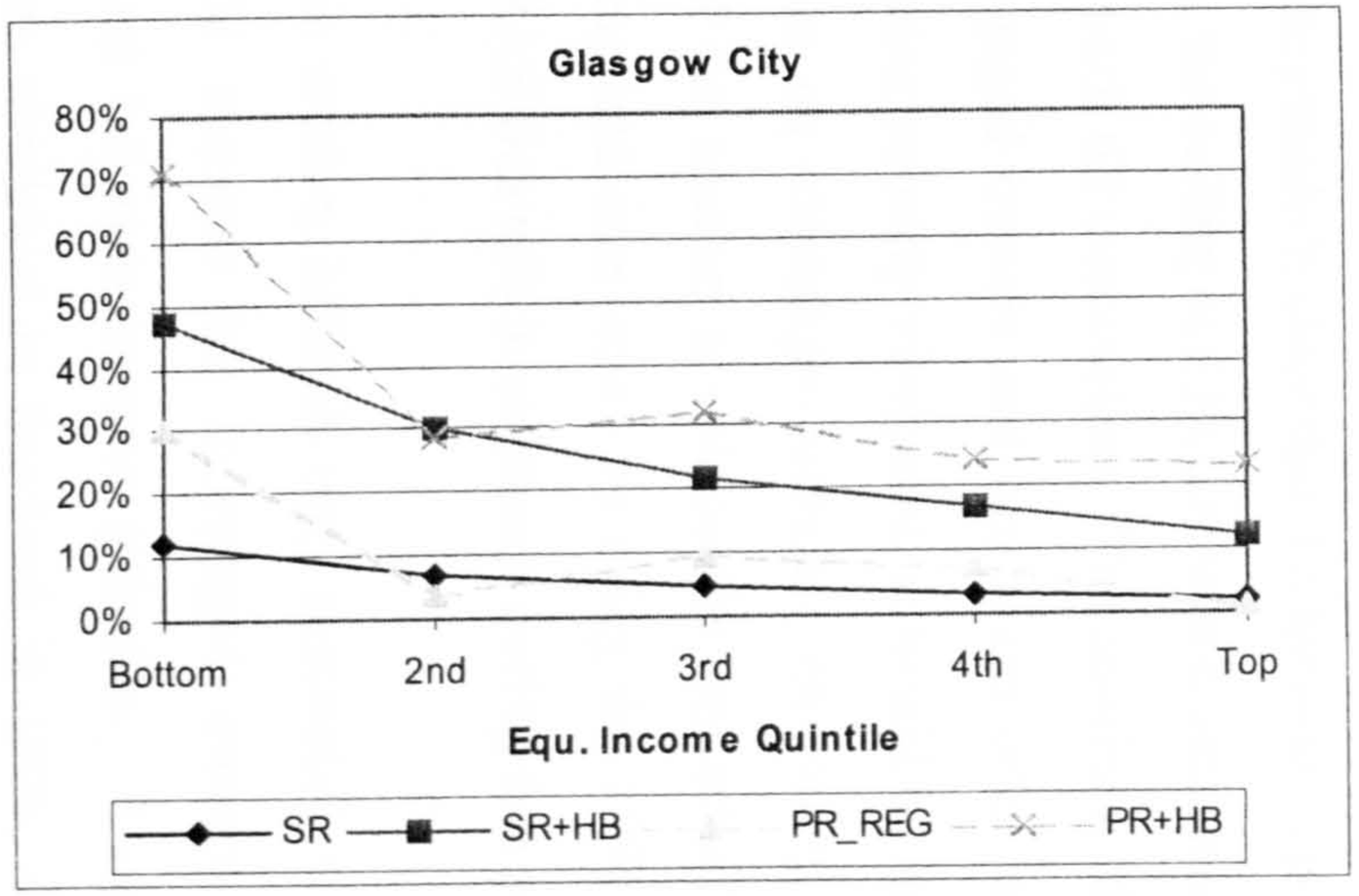


Figure 7.8 Housing Subsidies to Social Tenants and Private Tenants in Four Cities of Scotland, 1996 (Percentage to mean income)

7.3.4 The Impacts of MIRAS Abolition

The mortgage interest relief at source (MIRAS) was terminated in April 2000. Before its abolition, MIRAS was an important tax advantage for mortgaged owners during the 1980s. In the 1990s, the changes in policy made it clear that the long-term policy aim was to abolish the tax relief. Therefore, the ceiling of £30,000 was maintained and the basic rate of tax relief was steadily cut back till termination. The abolition of MIRAS would have impacts directly on mortgaged owners and on house price and other housing market activities. From a housing subsidy viewpoint, it would be interesting to see the impact of MIRAS abolition on mortgaged owners, especially on their incomes and user costs. This part of the section simulates the impact of MIRAS abolition on mortgaged owners' income and user costs by using the 1996 Scottish House Condition Survey, although MIRAS was still in existence during that period.

As discussed in the second part of this section, MIRAS only accounted for a small proportion of the average household incomes for mortgaged owners and the distributional effect was not significant between income quintiles. Therefore, as shown in Table 7.15, if MIRAS were abolished in Scotland in 1996, mortgaged owners would lose the tax advantages accounting for average 1.4 per cent of their household incomes. In the bottom quintile group, the effect of MIRAS abolition would be slightly significant. As shown in Table 7.15, the amount of MIRAS only accounts for 4 per cent of the average household incomes for mortgaged owners in the bottom income quintile, while it falls to 1 per cent in the top income quintile. Apparently, the changes in MIRAS policy such as the ceiling setting and the cut back of basic rate in the 1990s had limited the MIRAS effect on mortgaged owners.

Furthermore, the abolition of MIRAS would have impacts on the user costs of mortgaged owners. Table 7.18 shows that the average MIRAS for mortgaged owners amounts to £4.36 per week, and only accounts for 6.4 per cent of the average user costs for mortgaged owners. Compared to economic subsidies, accounting for about 18 per cent of the average user costs, the MIRAS was not a significant subsidy to mortgaged owners. In addition, when examining the distribution of MIRAS between income quintiles, MIRAS accounts for 5.3 per cent to 5.8 per cent of the average user costs from the bottom quintile to the top quintile. The distributional effect of MIRAS is also not significant between income quintiles. As a result, if MIRAS were abolished

in 1996, the impact would be very limited on the user costs for mortgaged owners in any given income quintile.

Compared to outright owners, the abolition of MIRAS would have impacts on increasing the gap of actual net user costs between mortgaged owners and outright owners. Table 7.18 shows that the average user costs for mortgaged owners are not much different to outright owners but outright owners receive more economic subsidies than mortgaged owners do. Therefore, net user costs for mortgaged owners are higher than for outright owners in each income quintile. Mortgaged owners, however, receive MIRAS so it narrows the gap of user costs between these two tenures. With MIRAS subsidy, the average actual user costs for mortgaged owners (see Column g in Table 7.18) are about 10 per cent higher than the user costs for outright owners. Without MIRAS subsidy, the average net user costs for mortgaged owners are about 20 per cent higher than the user costs for outright owners.

At the city level, as shown in Figure 7.6, MIRAS only accounts for a small proportion of household income and there is no significant difference between the four cities. This suggests that the abolition of MIRAS would not have much effect on mortgaged owners between income levels in the four cities.[21] With respect to the impact on user costs, mortgaged owners in Glasgow City would face higher impacts of MIRAS abolition on their user costs among the four cities and this is probably because mortgaged owners in Glasgow City have the lowest average user costs (see Table 7.19). On the other hand, the lowest user costs for mortgaged owners in Glasgow City indicate that mortgaged owners in the city could have lower average property values compared to the other three cities. Finally, the abolition of MIRAS increases the gap of actual net user costs between mortgaged owners and outright owners. However, the gap is not significant between the four cities, although the average level of user costs for owner-occupiers is significantly different between the four cities (the user costs and subsidies for outright owners are reported in Appendix A.7.5).

In summary, this section analyses the distribution of housing subsidies between tenures and income levels. At both the whole of Scotland level and the city level, the

results indicate that housing subsidies are progressive with income rises. Households in lower income groups receive a greater proportion of housing subsidies to their income than households in upper income groups. Compared to 1980s, the focus of housing subsidy is switched from owner-occupiers to tenants, particularly to social tenants. Housing Benefit is the most significant subsidy to tenants in both the social rented and the private rented sectors. The average amount of Housing Benefit received by tenants is much higher than the rent gap subsidy to tenants. In the owner-occupied sector, the difference of economic subsidies between outright owners and mortgaged owners primarily comes from the imputed rental income where part of mortgaged owners' imputed rental income is deducted by their mortgage debts. MIRAS only accounts for a very small proportion of household income for mortgaged owners, thus the abolition of this tax relief would not have significant impacts on the household income and the user costs of mortgaged owners at any income level.

[21] It is noted that, in the four cities, the figures in each income quintiles may not be reliable because of a lack of sufficient observations between income quintiles. Thus, I refer to the figures in total average of the city rather than to the figures in each income quintile.

Table 7.18 The Impacts of MIRAS Abolition on User Costs for Owner-Occupiers in Scotland 1996 (Weekly £)

Tenures and Income Quintile	a User Costs	b Economic Subsidies	c=a-b Net User Costs	d=b/a Econ. Subsidies/ User Costs	e Average MIRAS	f=e/a MIRAS/ User Costs	g=c-e Actual Net User Costs	h=b+e Total Subsidies	i=h/a Tot. Sub./ User Costs
Outright owners									
Bottom	65.98	21.88	44.10	33.2%	-	-	44.10	21.88	33.2%
(No. of obs)	(674)	(674)	(674)	(674)					
2nd	64.07	20.28	43.79	31.7%	-	-	43.79	20.28	27.3%
(No. of obs)	(511)	(511)	(511)	(511)					
3rd	66.55	21.15	45.50	31.8%	-	-	45.40	21.15	27.3%
(No. of obs)	(451)	(451)	(451)	(451)					
4th	68.88	21.97	46.91	31.9%	-	-	46.91	21.97	27.4%
(No. of obs)	(491)	(491)	(491)	(491)					
Top	77.47	24.99	52.48	32.3%	-	-	52.48	24.99	27.5%
(No. of obs)	(566)	(566)	(566)	(566)					
Total Avg.	68.669	21.88	46.78	31.9%	-	-	46.78	21.88	27.4%
(No. of obs)	(2693)	(2693)	(2693)	(2693)					
Mortgaged owners									
Bottom	64.72	13.13	51.59	20.3%	3.44	5.3%	48.15	16.57	25.6%
(No. of obs)	(413)	(413)	(413)	(413)	(350)				
2nd	63.30	12.96	50.34	20.5%	3.64	5.8%	46.70	16.60	26.2%
(No. of obs)	(513)	(513)	(513)	(513)	(437)				
3rd	63.42	12.15	51.27	19.2%	3.91	6.2%	47.36	16.06	25.3%
(No. of obs)	(886)	(886)	(886)	(886)	(768)				
4th	65.81	11.88	53.93	18.1%	4.35	6.6%	49.58	16.23	24.7%
(No. of obs)	(1509)	(1509)	(1509)	(1509)	(1388)				
Top	73.32	12.45	60.78	17.0%	4.88	6.7%	55.99	17.33	23.6%
(No. of obs)	(1979)	(1979)	(1979)	(1979)	(1952)				
Total Avg.	67.88	12.29	55.59	18.1%	4.36	6.4%	51.23	16.65	24.5%
(No. of obs)	(5300)	(5300)	(5300)	(5300)	(4895)				

Table 7.19 The Impacts of MIRAS Abolition on User Costs for Mortgaged Owners in Four Cities of Scotland, 1996 (Weekly £)

	a	b	c=a-b	d=b/a	e	f=e/a	g=c-e	h=b+e	i=h/a
	User Costs	Economic Subsidies	Net User Costs	Econ. Subsidies/ User Costs	Average MIRAS	MIRAS/ User Costs	Actual Net User Costs	Total Subsidies	Tot. Sub./ User Costs
Aberdeen									
Bottom	64.57	11.41	53.16	17.7%	3.61	5.6%	49.55	15.02	23.3%
(No. of obs)	(11)	(9)			(10)				
2nd	58.04	10.65	47.39	18.3%	4.27	7.4%	43.12	14.92	25.7%
(No. of obs)	(8)	(5)			(5)				
3rd	61.15	11.32	49.83	18.5%	3.88	6.3%	45.95	15.20	24.9%
(No. of obs)	(34)	(23)			(25)				
4th	69.20	11.88	57.32	17.2%	4.64	6.7%	52.68	16.52	23.9%
(No. of obs)	(59)	(47)			(54)				
Top	74.13	12.03	62.10	16.2%	5.00	6.7%	57.10	17.03	23.0%
(No. of obs)	(59)	(49)			(67)				
Total Avg.	68.48	11.76	56.72	17.2%	4.60	6.7%	52.12	16.36	23.9%
(No. of obs)	(171)	(133)			(161)				
Dundee									
Bottom	47.27	8.39	38.88	17.7%	3.50	7.4%	35.38	11.89	25.2%
(No. of obs)	(14)	(12)			(18)				
2nd	57.47	11.91	45.56	20.7%	3.45	6.0%	42.11	15.36	26.7%
(No. of obs)	(19)	(17)			(18)				
3rd	59.66	11.73	47.93	19.7%	3.58	6.0%	44.35	15.31	25.7%
(No. of obs)	(18)	(16)			(17)				
4th	53.49	9.56	43.93	17.9%	3.95	7.4%	39.98	13.51	25.3%
(No. of obs)	(36)	(26)			(32)				
Top	70.88	11.51	59.37	16.2%	4.85	6.8%	54.52	16.36	23.1%
(No. of obs)	(42)	(35)			(42)				
Total Avg.	59.93	10.78	49.15	18.0%	4.06	6.8%	45.09	14.84	24.8%
(No. of obs)	(129)	(106)			(127)				

Table 7.19 (continued) Impacts of MIRAS Abolition on User Costs for Mortgaged Owners in Four Cities of Scotland, 1996 (Weekly £)

	a	b	c=a-b	d=b/a	e	f=e/a	g=c-e	h=b+e	i=h/a
	User Costs	Economic Subsidies	Net User Costs	Econ. Subsidies/ User Costs	Average MIRAS	MIRAS/ User Costs	Actual Net User Costs	Total Subsidies	Tot. Sub./ User Costs
Edinburgh									
Bottom	62.65	9.99	52.66	15.9%	4.55	7.3%	48.11	14.54	23.2%
(No. of obs)	(30)	(22)			(27)				
2nd	59.25	9.16	50.09	15.5%	4.10	6.9%	45.99	13.26	22.4%
(No. of obs)	(40)	(29)			(34)				
3rd	52.76	8.75	44.01	16.6%	4.17	7.9%	39.84	12.92	24.5%
(No. of obs)	(64)	(46)			(54)				
4th	62.34	9.82	52.52	15.8%	4.68	7.5%	47.84	14.50	23.3%
(No. of obs)	(121)	(97)			(111)				
Top	68.67	10.22	58.45	14.9%	5.13	7.5%	53.32	15.35	22.4%
(No. of obs)	(149)	(127)			(146)				
Total Avg.	62.88	9.78	53.10	15.6%	4.72	7.5%	48.38	14.50	23.1%
(No. of obs)	(404)	(321)			(372)				
Glasgow									
Bottom	56.42	10.63	45.79	18.8%	3.81	6.8%	41.98	14.44	25.6%
(No. of obs)	(45)	(32)			(37)				
2nd	59.35	12.20	47.15	20.6%	3.22	5.4%	43.93	15.42	26.0%
(No. of obs)	(30)	(19)			(22)				
3rd	53.39	9.39	44.00	17.6%	3.75	7.0%	40.25	13.14	24.6%
(No. of obs)	(47)	(37)			(42)				
4th	53.35	8.68	44.67	16.3%	4.19	7.9%	40.48	12.87	24.1%
(No. of obs)	(93)	(77)			(94)				
Top	60.28	8.52	51.76	14.1%	5.01	8.3%	46.75	13.53	22.4%
(No. of obs)	(180)	(155)			(190)				
Total Avg.	57.32	9.09	48.23	15.9%	4.45	7.8%	43.78	13.54	23.6%
(No. of obs)	(395)	(320)			(385)				

7.4 Summary and Implications

Three issues have been discussed in this chapter. The first issue has concerned some simulations regarding the effects of changes in the income tax rate and the mortgage rationing criteria on the household's tenure decision behaviour. The simulation results suggest that an increase in the marginal income tax rate (24%) reduces the user cost of owner-occupiers. The reduction in the user cost of owner-occupiers reduces the cost difference between tenures. Therefore, the influence of the new user cost of housing becomes less statistically and numerically significant on tenure choice. The simulation results also indicate that a 20% reduction in the mortgage rationing ratios creates more constraints on households, therefore, it leads to the new mortgage rationing variable having a stronger numerical effect on tenure choice.

From a policy perspective, the simulation results provide a clear indication of the influences of changes in policy or schemes on households' tenure decisions. In particular, the government's housing proposals aim to continue to encourage homeownership in Scotland. To some extent, the research findings imply that an increase in the income tax rate reduces the user cost of owner-occupiers, thus giving advantages to increase the homeownership rate. Moreover, an increase in the mortgage rationing ratios creates fewer mortgage constraints on homebuyers and thus promotes the owner-occupied sector.

The second issue has concerned the outcome of tenure choice and income distribution, emphasising income inequality and tenure polarisation. The results show clearly that mortgaged owners have a smaller income inequality than outright owners. Income inequality in social tenants is lower than in private tenants. However, there is a significant concentration of mortgaged owners in upper income quintile groups and a polarisation of social tenants in lower income quintile groups. For social tenants, the results imply that more uniformly poor households are concentrated in the social rented sector. In fact, the concentration of unemployed and economically inactive people in social housing could not only cause a problem of social exclusion but also a problem of failure to meet what social tenants want and their aspirations (Hills 2000). As stated in Chapter Six, many low-income council tenants may not be able to afford to move or to choose their council dwellings.

To some degree, the sale of council housing via the Right to Buy scheme could be associated with residualisation and income polarisation in the social rented sector. It is the higher income tenants who would be in a better position to buy council houses thereby leaving the local authority sector increasingly concentrated by low-income households (Bentham 1986). Furthermore, the rigid allocation system is associated with tenure polarisation. Social tenants receive a rationed allocation of housing with a fixed quality and price. Ability to move between areas is highly constrained except through very occasional transfers, or through leaving and losing the subsidy from the social tenancy, or through exercising the Right to Buy and then selling at a later date (Hills 2000). In this sense, tenure polarisation exists in the way that social tenants can not make choices over their housing and location.

Therefore, the policy proposal to reform the allocation system would address a strong customer focus with an emphasis on the supply of proper information to social tenants as stated in the DETR Housing Green Paper (DETR 2000). As Smith (2000) indicates, the concept of choice is the core of new allocation and letting proposals where social landlords should provide better information to applicants, and where the application system should be simple and accessible in order to ensure that applicants should have an opportunity to express their opinions when seeking housing.

In addition to the social rented sector, the income and tenure polarisation in the owner-occupied sector implies a lack of choice for people who are owners or want to be owners. Hills (2000) indicates that, for people who want to be owners, the polarisation of choice exists in that the only way for people to get into the owner-occupied housing market is by buying the whole property except for a small number of shared ownership schemes. Compared with the level of Housing Benefit offered to tenants, there is little support for low-income owners to help them with their housing costs. Furthermore, it is difficult for elderly owners to realise part of their housing equity to provide either regular incomes or to pay for care costs (ibid.). Thus, for poor elderly owners, the only way to get someone to care and organise repairs for them is by becoming a tenant. As a result, the policy to assist low income or elderly owners would set out towards providing a flexible tenure which allows households with shared ownership or allows elderly owners on low incomes with houses in poor

condition to become tenants or shared owners with a housing association, as stated in the Scottish House Green Paper (Scottish Office 1999).

Moreover, the problem of tenure polarisation is associated with the small size of the private rented sector. As Holmans (1978) indicates, the diminishing size of the private rented sector has resulted in the housing market becoming polarised between the owner-occupied and social rented sectors. The logic of the argument is that the private rented housing market is so small that it is less effective in meeting people's particular life cycle needs (Hills 2000). For example, there is a great need for younger people who are in insecure incomes and employment to look for shorter term private rented housing rather than owner-occupation or social housing. However, the small size of the private rented housing market may not meet the housing needs of younger people. As a result, it pushes more people into marginal owner-occupation and increases the pressure on the social rented sector. The long-term policy would set out to promote the private rented sector through capital and tax incentives. As proposed by the Housing Green Paper, a 100 per cent capital allowance for creating flats over shops for letting and a reform for VAT to encourage additional conversion of properties for residential use would be possible approaches.

In the third section, the results show that the housing subsidy effect is progressive. Households in lower income groups receive more subsidies than households in upper income groups do. With respect to the distribution of housing subsidies between tenures, social tenants receive greater amount of subsidies than owner-occupiers. This result is significantly different from that in the 1980s, when owner-occupiers were favoured by the government's housing policy, and a series of policy and subsidy schemes were set up to promote homeownership (see Hills 1991).

The housing policy and subsidy schemes have been changed dramatically in the 1990s. One of most significant changes for subsidy schemes was phasing out the mortgaged interest tax relief. It has been seen that the government's expenditures on mortgaged interest tax relief was cut back sharply in the 1990s and the scheme abolished in April 2000. As a result, subsidies to owner-occupiers, particularly to mortgaged owners have reduced sharply. The results also show that the total amount of subsidies to

mortgaged owners is less than that outright owners receive in each income quintile group.

Another important change for housing subsidy in the 1990s was a rapid increase in Housing Benefit expenditures (see Wilcox 1999). As discussed in Chapter Three, a rapid increase in rents in the social rented sector, particularly the housing association sector after 1989, has resulted in increasing the number of social tenants depending upon Housing Benefit to cover their rents, thus enhancing a sharp increase in Housing Benefit expenditures. The results in the third section show that about two thirds of social tenants in Scotland in 1996 were in receipt of Housing Benefit. In particular, social tenants in lower income groups depended heavily upon this state benefit. As discussed earlier, under the current system, Housing Benefit covering 100 per cent of rents gives tenants, especially private tenants, no shopping incentives to look for cheaper accommodation. This could be one of major reasons why the average amount of Housing Benefit rises with income. The introduction of a local reference rent limit in the Housing Benefit scheme since January 1996 has allegedly had substantial effects on reducing the number of Housing Benefit claimants, particularly private tenants, in upper income levels (see Wilcox et al. 1998). In addition, some academic researchers suggest that the long term reform approach to enhance the shopping incentive to Housing Benefit receipts should set out to reduce the 65 per cent rent taper and to introduce a flat rate of contribution based on 20 per cent of average local rents (see for example Hill 1991, Kemp 1994, 2000).

Another concern arising from the results in the third section is housing subsidies to low-income homeowners. The results in the third section show that the distribution of housing subsidies to owner-occupiers is progressive between income levels. Owner-occupiers in lower income groups receive more subsidies than those in upper income groups. Although the results in the third section do not contain the Income Support for Mortgage Interest (ISMI) data, as discussed in Chapter Three, ISMI has played an increasingly important role in subsidising low income mortgaged owners in unemployment (see for example Gibb et. al 1999, Pryce and Keoghan 1999, Wilcox 2000). However, the ISMI subsidy declined sharply in the late 1990s, partly because of falling interest rates and lower levels of unemployment but also because of a series

of restrictions on this scheme [22] (Burrows, Ford and Wilcox 2000). On the other hand, there is no scheme in the UK to provide a means tested subsidy to low-income homeowners in employment. If we consider the equity of subsidy, low-income owners in employment or in unemployment should be included in the subsidy programme. This should be an agenda in the government's housing subsidy reform in the future.

The final concern is the impact of MIRAS abolition. The results of the third section indicate that the termination of MIRAS would not have significant impact on mortgaged owners in terms of their user costs. However, the abolition of MIRAS could have influences on other things such as mortgaged interest rate, housing price, and the dynamics of the housing market. These need to be investigated in the future.

In summary, the simulation results have suggested a direction of changes in the income tax rate and the mortgage rationing ratios in supporting homeownership. The results of the distribution of income and housing subsidies between tenures also have implications for current housing policy reform. For Housing Benefit reform, the emphasises are not only to provide work incentives to working welfare recipients but also to provide more shopping incentives to benefit recipients to look for cheaper accommodation. In the social rented sector, the implication addresses the allocation system which should provide more choices to tenants and should encourage cross boundary and cross tenure applications. In the owner-occupied sector, the focus is to assist low-income and elderly homeowners either to secure their homeownership or to offer flexible options to share ownership or to sell properties to repay their housing costs. Finally, in the private rented sector, the reform addresses provision of tax concessions to encourage new investment and the conversion of properties for rented residential uses.

[22] After October 1995, existing mortgage borrowers who make a new claim for ISMI receive no support for 2 months before moving onto 16 weeks of 50 per cent support (and full support thereafter). New mortgage borrowers receive no support for 9 months before moving onto 50 per cent support (and a full support only after a further 16 weeks. Borrowers are encouraged to take out private mortgaged protection payment insurance (MPPI) to cover their mortgage costs over such a period.

CHAPTER EIGHT CONCLUSIONS

8.1 Summary

Over the last several decades, housing in Scotland has developed in a different pattern from housing in the rest of Great Britain. It has been seen that the growth of owner-occupied housing in Scotland is significantly faster than in England and Wales. The historical importance of Scotland's public rented sector is greater than in the other two nations. Housing associations in Scotland are relatively young and small in size compared to housing associations in England. The percentage of private rented dwellings in Scotland is the lowest among the three countries. The tenure pattern to some degree reflects the outcome of the household's tenure decision behaviour. Scotland's unique tenure pattern implies that the Scottish household's tenure decision behaviour is different from the household's in the rest of Britain and it also inspires the study of housing tenure choice in Scotland.

To analyse the household's tenure choice in Scotland, this thesis attempts to answer three questions: what is the nature of tenure choice and its determinants in Scotland? To what extent do these determinants influence the household's tenure decision in Scotland? What policy issues emerge from the model results and what are implications for current housing policy?

The nature of housing tenure choice can be interpreted from a variety of aspects depending upon who is using it and the purpose of the research. This thesis starts to define housing tenure choice from a broader perspective. As Barlow and Duncan (1988) indicated, housing tenure can be seen as a whole range of financial, social, political and economic relations surrounding housing. In the sociological perspective, the choice of housing tenure implies the housing class and social relations to different tenures (Rex and Moore 1967, and Gray 1982). In the economic perspective, housing tenure choice presents a consumer's choice behaviour by maximising his/her utility on different tenures and choosing the tenure that yields the maximum utility subject to the budget constraint (Fallis 1985). The interpretation of housing tenure choice in this thesis emphasises the economic approaches.

The economic theory of tenure choice is based on the consumer choice theory and housing demand theory. The consumer's decision for housing demand can be seen as a bundle of choices which, for example, include the decisions of tenure, dwelling type, neighbourhood quality and location. Previous studies have suggested that these choices are interrelated and that hierarchy is a way to organise these choices. In a hierarchical housing choice model, a household, for instance, may first choose tenure and then dwelling type and so on, to choose neighbourhood and location. However, it is noted that the hierarchical framework of housing choice is just an analytical device that reflects the relative degree of similarity among choice alternatives. Therefore, it does not imply that a household should necessarily follow this kind of decision tree while making a housing decision. Moreover, in a series of housing decisions, tenure choice would be more important when a household faces a choice between public and private housing. In the public housing sector particularly, the tenure is usually attached to certain dwelling type, neighbourhood and location (Clapham and Kintrea 1986).

In tenure choice analysis, previous studies have indicated that the household's tenure choice is not only influenced by the household attributes but also influenced by housing attributes. The household attributes generally include household demographic characteristics, household socio-economic characteristics and the user cost of housing. The household demographic characteristics generally include the household head's age, gender, marital status and the household size. The household socio-economic characteristics consist of the household income, employment status, previous tenure and likeliness to move. The user cost of housing presents the relative cost of owning or renting. The household's tenure choice is also affected by housing attributes such as dwelling type, location, and neighbourhood quality. In addition, as the government's strong intervention in the housing market, the housing subsidy and the rationing in the admission to owner-occupied sector and the social housing sector have important influences on the household's tenure decision behaviour in Scotland as well as the rest of Britain. This thesis, therefore, emphasises the impact of the housing subsidy and rationing factors on the household's tenure choice.

To examine the impact of the determining factors on the household's tenure choice, two simulation models with different structures are developed in the thesis. The first tenure choice model contains a simple one-level choice set. The tenure choice splits into three choice alternatives: owner-occupation, social renting and private renting. A multinomial logit (MNL) model is chosen to estimate the three-choice function. The MNL model provides a simple and convenient functional form to estimate the choice probabilities. Because of its simple structure, the interpretation of the MNL model is more straightforward than other discrete choice models. As a result, the MNL model is suitable for the first model to directly interpret the influences of the determinants on tenure choice. However, the MNL model has a widely know weakness, which could easily violate the independence from irrelevant alternative (IIA) property. The rejection of the IIA property in the MNL model implies that the estimation of tenure choice could be bias. As a result, the MNL model in this thesis should be treated with caution.

The second model estimates the household's mobility decision and tenure choice. This model contains a two-level choice structure assuming that the household's tenure choice is followed by its decision to move. The hierarchical choice model of mobility and tenure choice provides an alternative approach to solve the IIA problem without breaking the tenure choice structure presented in the first model. Therefore, this two-level choice model can be seen as a substitute of the first model. A nested multinomial logit (NMNL) model is employed to estimate the probability of a household choosing to move/stay and the probability of choosing a tenure alternative under the influences of the determining variables. In the NMNL model, the inclusive value parameter is an indication of the IIA property. When the inclusive value parameter lies between 0 and 1, the NMNL model satisfies both the IIA property and the random utility function.

The 1996 Scottish House Condition Survey is the data set used in this thesis. This data set contains large samples and rich information about households' socio-economic characteristics and dwelling conditions. These are important variables to estimate the Scottish households' tenure choice behaviour. In the MNL tenure choice model, the dependent variable is the household's current tenure status including owner-occupation, social renting and private renting. The explanatory variables come

from several categories including the household's demographic characteristics, employment status, previous tenure status, location, expected mobility, dwelling type and neighbourhood quality variables. These variables are expected to have important impacts on tenure choice. This thesis also constructs household long-term income, the user cost of housing, housing (economic) subsidy and rationing variables to estimate their influences on households' tenure decisions. The use of long term income implies the household's tenure decision is based on long term and multiple periods rather than a current and single period. The housing user cost presents the relative cost of owning, social renting and private renting. The housing (economic) subsidy reduces the user cost of housing and thus, its effect can be expressed by estimating the difference between the user cost and the net user cost. The mortgage rationing and social housing rationing variables are developed by simulating households' access constraints into the owner-occupied sector and the social rented sector respectively.

In the NMNL mobility and tenure choice model, the dependent variable is the household's move-stay and tenure status including stay, move to choose owner-occupation, move to choose social renting and move to choose private renting. If a household has moved within two years, the household is defined as a recent mover and is assigned to its current tenure status. Otherwise, the household is defined as a stayer. The explanatory variables of the mobility and tenure choice model are drawn from the first tenure choice model. As a requirement of the nested logit model, the explanatory variables are interacted with four possible choices in order to estimate the interactive coefficients for these four alternative choices. One exception is the user cost variable which is treated as an attribute across tenures. Because of the requirement of the NMNL model structure, the user cost is measured not on the individual household basis but on the tenure basis. The user cost in this model is measured by the average cost across tenures and also across all 32 unitary authorities in Scotland in order to express the regional variation of the user cost.

Due to the IIA problem in the MNL model, it was found that the NMNL model provides robust results in estimating households' tenure choice and mobility decisions. The MNL model in this thesis can be treated as a pilot model to test the initial influences of the explanatory variables on tenure choice. Unlike the NMNL model requiring specific data arrangement and variable interactions, the MNL model

provides a simple approach to estimate the influences of the explanatory variables on three tenure alternatives. With respect to the model results, it was found that most explanatory variables in the MNL model are statistically significant. This indicates that these explanatory variables have substantial influences on tenure choice in Scotland, and also these explanatory variables are applied to the NMNL model.

The results of the NMNL model show that the household demographic variables have substantial influences on tenure choice. It was found that older and married households are more likely to choose owner-occupation, while younger and single households are more likely to choose private renting. Households having more dependent children have significantly positive likelihood of choosing social renting. Female household heads are more likely to choose social renting. In addition, the household head's employment variables have the most determining influences on tenure choice. Household heads having full time or part time jobs are strongly likely to choose owner-occupation, while unemployed household heads are more likely to choose social renting. These results draw a clear picture that households in better socio-economic positions are more likely to be homeowners, while households with socio-economic disadvantages are more likely to choose social renting.

Households' previous tenure has a statistically and numerically significant influence on their current tenure decision. It is more likely the see that households will choose the same tenure as their previous one when making a tenure decision. Similar results also apply to the neighbourhood quality variables. Households' tenure decisions are strongly influenced by their current neighbourhood environments. Dwelling type and location are usually associated with tenure. As Scottish Homes (1997) indicate, in Scotland, most houses are owner-occupied. Therefore, households who live in or want to live in houses could only be homeowners. In this sense, it is not surprising that households living in houses are more likely to choose owner-occupation than social renting. Moreover, Scottish Homes (1997) also indicate that there are substantial private renting dwellings located in rural areas of Scotland. As a result, the model results show that households living in rural areas are more likely to choose private renting rather than owner-occupation. However, it would be difficult to estimate the household's decision on whether social renting or owner-occupation based on the simple definition of the urban area in the 1996 SHCS. It needs more

specific location variables to present the spatial concentration of social housing and owner-occupied housing in the inner city, the periphery and the suburban areas.

The household long-term income and the user cost have statistically and numerically significant influences on the household's tenure choice. When income rises, the household is more likely to choose owner-occupation than social renting or private renting. The user cost of housing has a significantly negative impact on the household's tenure choice, indicating that when the user cost of a certain tenure increases, households are less likely to choose that tenure. The housing (economic) subsidy plays a distinct role in reducing the housing user cost and also has a substantial effect on tenure choice. Mortgage rationing and social housing rationing have numerically strong impacts on tenure choice, which play a role as gatekeeper, filtering the household's access to the owner-occupied sector and to the social rented sector respectively. As expected, households who are potentially constrained from mortgages are more likely to choose social renting or private renting. In contrast, households who are potentially constrained from the social renting sector are more likely to choose owner-occupation or private renting.

In addition to tenure decision, the household head's age, the number of dependent children and household long-term income have important influences on the household's mobility decision. Older households and households having more dependent children are more likely to stay at current status. When income rises, households are more likely to stay than to move. It is noted that these variables not only have significant impacts on mobility decision but also have remarkable influences on tenure choice.

The model results provide us with a better estimation of the household's tenure choice behaviour in Scotland. Some issues are derived from the results of the two tenure choice models. From a policy perspective, it is of interest to discuss the influences of changes in policy or schemes on the household's tenure decision. As a result, the first issue relates to an analysis of two simulations of the tenure choice models. The first simulation discusses the influences of a change in the income tax rate on the user cost of owner-occupiers and also on tenure choice. The second simulation analyses the effect of a change in the mortgage rationing criteria on tenure choice. It was found

that an increase in the marginal income tax rate (24%) reduces the user cost of owner-occupiers and thus it reduces the cost difference between tenures. Therefore, the simulation results show that the new user cost has become a less statistically and numerically influence on tenure choice. Further, a 20% reduction in the mortgage rationing ratios creates more constraints on households. Thus, it leads to the new mortgage rationing variable having a stronger influence on tenure choice.

The second issue concerns the outcomes of tenure choice and income distribution emphasising income inequality and tenure polarisation in Scotland and the four major cities — Aberdeen, Dundee, Edinburgh and Glasgow. The results show that income inequality in mortgaged owners is lower than in outright owners, while income inequality in social tenants is lower than in private tenants. However, when examining tenure distribution between and within income quintile groups, a significant tenure polarisation is shown in that mortgaged owners are concentrated in the upper income quintile groups, while social tenants are concentrated in the lower income groups. Together, these indicate that higher income households are most likely to be owner-occupiers with mortgages, while low-income households are concentrated in the social rented sector. In addition, it implies a big income gap between mortgaged owners and social tenants.

The third issue concerns the distribution of housing subsidies between income levels across tenures. At both the whole of Scotland level and the four cities level, the results indicate that housing subsidies are progressive with income rise. Households in lower income groups receive a greater proportion of housing subsidies to their incomes than households in upper income groups. Compared to 1980s, the focus of housing subsidy has been switched from owner-occupiers to tenants, particularly to social tenants. Housing Benefit is the most significant subsidy to tenants in both the social rented and the private rented sectors. The average amount of Housing Benefit received by tenants is much higher than the rent gap subsidy to tenants. In the owner-occupied sector, the difference of economic subsidies between outright owners and mortgaged owners primarily comes from the imputed rental income where part of mortgaged owners' imputed rental income is deducted by their mortgage debts. MIRAS only accounts for a very small proportion of household income for mortgaged

owners, thus the abolition of this tax relief would not have a significant impact on household income and the user costs for mortgaged owners in all income levels.

From a policy perspective, the simulation results provide us with a clear direction of the influences of changes in policy or schemes on households' tenure decisions. In particular, the government's housing proposals aim to continue to encourage sustainable homeownership in Scotland. To some extent, the simulation results imply that an increase in the income tax rate reduces the user cost of owner-occupiers, thus it gives advantages to increase the homeownership rate. An increase in the mortgage rationing ratios creates fewer mortgage constraints on homebuyers and thus, it can promote the owner-occupied sector.

Moreover, the results of the distribution of income and housing subsidies between tenures together draw a clear picture that low-income households are significantly concentrated in the social housing sector and these households heavily depend upon Housing Benefit. The rigid need-based allocation system and the small private rented sector could partly be the result of tenure and income polarisation in the social rented sector. On the other hand, some low-income homeowners, mainly elderly and outright owners, may find it difficult to remain in homeownership. These results draw attention to policy makers regarding housing policy reform for housing benefit scheme, social housing allocation system, low-income homeownership and the promotion of the private rented sector. The implications to housing policy reform may not be new but I like to address again. For housing benefit reform, the emphasises are not only to provide work incentives to working welfare recipients but also to provide more shopping incentives to benefit recipients to look for cheaper accommodation. In the social rented sector, the implication addresses the allocation system, which should provide more choices to tenants and to encourage cross boundary and cross tenure applications. In the owner-occupied sector, the focus is to assist low-income and elderly homeowners either to secure their homeownership or to offer flexible options to share ownership or to sell properties to repay their housing costs. In the private rented sector, the reform addresses on providing tax concessions to encourage new investment and conversion properties for rented residential uses.

In summary, this thesis provides a detailed analysis of the household's tenure choice behaviour in Scotland where few studies have been carried out on this topic. Moreover, the robust results of the tenure choice models and the results of income inequality and tenure polarisation and the distribution housing subsidies between tenures can be applied to many perspectives. The contributions of this thesis and some suggestions for further research are discussed below.

8.2 Contributions and Further Research

The contributions of this thesis can be classified into several categories. Theoretically, this thesis presents a clear and detailed review of the tenure choice theory and previous tenure choice studies. A detailed discussion of the theory of tenure choice assists with the understanding of the different characteristics of tenure choice (discrete choice) from other housing consumption decisions (continuous choice), and then clarifies the importance of tenure choice in a bundle of housing decisions. In a review of previous tenure choice studies, this thesis highlights the strengths and weaknesses of the study in terms of theoretical, methodological and empirical grounds. In addition, the discussion of the Scottish tenure and housing market context also helps to explain the changes in tenure patterns and the unique housing market conditions in Scotland compared to the rest of Great Britain.

Empirically, this thesis performs the leading study of the household's tenure choice behaviour on the basis of the whole of Scotland. As stated earlier, Scotland has experienced a dramatic change in tenure structure. In particular, there has been a rapidly growing owner-occupied sector but a rapidly declining social rented sector over the last two decades. Tenure pattern, to some degree, reflects the outcome of the household's tenure choice. With the change in the household's tenure preference, academic researchers and policy makers will be interested in these questions: what are the determining factors of tenure choice in Scotland, and to what extent do these factors influence the Scottish households' tenure decisions? In this thesis, the robust results of the tenure choice models provide clear answers to these questions. Moreover, this thesis emphasises two determinants—housing subsidy and rationing factors that have seldom been examined in previous tenure choice studies. The

empirical results in this thesis demonstrate that these two determinants have statistically and numerically significant influences on tenure choice.

In a comparison of the MNL model and the NMNL model, this thesis demonstrates that the hierarchical structure of the NMNL model is more suitable for tenure choice analysis. The NMNL model has robust results in the estimation of Scottish households' tenure decisions in this thesis. In contrast, MNL model is not a robust model for tenure choice analysis; especially, the model fails in estimating the simulations of the effect of changes in some determinants on tenure choice.

In addition to the model results, this thesis also performs a detailed analysis of the issues regarding income inequality and tenure polarisation and the distribution of housing subsidy between tenures in Scotland and in its four main cities. This is the leading study which sets out to examine these issues at the Scottish and city level. In particular, there have been significant changes in social housing policy and housing subsidy schemes. It is of interest to analyse these issues in the 1990s, compared to a decade ago.

Finally, there are some suggestions for further research. In this thesis, the hierarchical NMNL model contains a two-level tree with four choices. In the future, it would be of interest to develop the NMNL model with more levels and more choice and to examine the household's tenure choice associated with other housing decisions such as the dwelling type and the location. Due to data limitations, this thesis estimates Scottish households' tenure decisions by using a cross-sectional data set—the 1996 Scottish House Condition Survey. As stated in previous chapters, it has been seen that studies have increasingly used panel data in tenure choice analysis in recent years. Under this circumstance, the next step will be to connect the 1996 SHCS with the 1991 SHCS or the forthcoming 2002 SHCS to analyse Scottish households tenure choice behaviour during these periods. This thesis also suggests that the forthcoming 2002 SHCS will contain more detailed and higher quality information on location and neighbourhood data, thus it will be helpful to have better estimation results in the tenure choice or housing choice study. Moreover, some suggestions are derived from the analysis of policy issues and implications, such as a discussion of alternative approaches to measure and income inequality, an analysis of the impacts of MIRAS

abolition on house prices and the housing market, and a detailed discussion of housing policy reform related to income and housing subsidy distributions. These topics will be discussed in further research.

APPENDICES

APPENDIX I Appendix to Chapter Five

A.5.1 Variable Definitions

Variables	Definitions
Tenure	The household's tenure status: 0=owner-occupation; 1=social renting; 2=private renting
Age	Age of the head of household
Agesq	Age square of the head of household
Nedepch	Number of dependent children in the household
Marry	Dummy variable if the head of household is married =1
Male	Dummy variable if the head of household is male=1
Fullwork	Dummy variable if the head of household has full time job=1
Partwork	Dummy variable if the head of household has part time job=1
Unemploy	Dummy variable if the head of household is unemployment=1
House	Dummy variable if the head of household live in house=1
Prevown	Dummy variable if previous tenure is owner-oaation=1
Prevsoc	Dummy variable if previous tenure is social renting=1
Prevprv	Dummy variable if previous tenure is private renting=1
Likmov2	Dummy variable if the household likely to move in 2 years=1
Urban	Dummy variable if the dwelling is located in urban area=1
Affown	Dummy variable if the neighbourhood is predominant of affluent owners=1
Prvtcity	Dummy variable if the neighbourhood is predominant of private inner city tenants=1
Poorcnl	Dummy variable if the neighbourhood is predominant of the poorest council tenants=1
Lnperinc	Log of predicted long term household income
Lnucc_1	Log of user cost of capital
Lnuccn_1	Log of net user cost
Ratmort	Dummy variable if the household is rationed from mortgages=1
Ratsoc	Dummy variable if the household is rationed from social housing=1
Ethnics	Dummy variable if head of the household is white=1
Ndepchgp	Grouped number of dependent children in the household
Sick	Dummy variable if the head of household is in long term sickness=1
Selfemp	Dummy variable if the head of household is self-employed=1
Prof	Dummy variable if the head of household has professional and managerial job=1
Empman	Dummy variable if the head of household is employer or manager=1
Interjun	Dummy variable if the head of household has intermediate/junior non-manual job=1
Skill	Dummy variable if the head of household is skilled manual work=1
Semiskil	Dummy variable if the head of household is semi-skilled manual

	work=1
Unskill	Dummy variable if the head of household is unskilled manual work=1
Detach	Dummy variable if the dwelling is detach house=1
Dwage1	Dummy variable if the dwelling was built in pre-1919=1
Dwage3	Dummy variable if the dwelling was built between 1945-1964=1
Dwage5	Dummy variable if the dwelling was built in post 1982=1
Lntfa	Log of the total floor area of the dwelling
Fullheat	Dummy variable if the dwelling has full central heating=1
Prospown	Dummy variable if neighbourhood is predominant of prosperous owners=1
Graff	Dummy variable if neighbourhood has graffiti and vandalism=1
Dparking	Dummy variable if neighbourhood has adequate parking space=1
Vacsite	Dummy variable if neighbourhood has vacant sites=1
Yr94	Dummy variable if the household purchased current home in 1994=1
Yr95	Dummy variable if the household purchased current home in 1995=1

A.5.2 The User Cost, Net User Cost and Economic Subsidy between Tenures and Across 32 Unitary Authorities in Scotland

1. UA(10): Aberdeen City

Tenure, User Cost and Subsidy	No. of Observation	Average Per Annum (£)	Simulation of UC of Owners (24% of ITR)
Owner-Occupation			
User Cost	202	3482.09	2653.84
Net User cost	202	2722.57	1894.32
Economic subsidy	202	759.52	759.52
Social Renting			
User cost	164	2352.39	NA
Net user cost	164	1534.05	NA
Economic subsidy	164	818.34	NA
Private Renting			
User cost	22	4474.65	NA
Net user cost	22	4466.34	NA
Economic subsidy	22	8.31	NA

Notes: The simulation is to apply 24% of income tax rate to the user cost of owner-occupiers.
NA denotes the simulation does not apply to social tenants and private tenants.

2. UA(11): Aberdeenshire

Tenure, Cost and Subsidy	No. of Observation	Average Per Annum (£)	Simulation of UC of Owners (24% of ITR)
Owner-Occupation			
User Cost	251	3865.64	2937.25
Net User cost	251	2940.22	2011.83
Economic subsidy	251	925.42	925.42
Social Renting			
User cost	152	2501.61	NA
Net user cost	152	1627.92	NA
Economic subsidy	152	873.69	NA
Private Renting			
User cost	25	3060.24	NA
Net user cost	25	3060.24	NA
Economic subsidy	25	0.00	NA

3. UA(12): Angus

Tenure, Cost and Subsidy	No. of Observation	Average Per Annum (£)	Simulation of UC of Owners (24% of ITR)
Owner-Occupation			
User Cost	511	3701.45	2814.99
Net User cost	511	2793.75	1907.29
Economic subsidy	511	907.70	907.70
Social Renting			
User cost	272	2231.46	NA
Net user cost	272	1543.65	NA
Economic subsidy	272	687.81	NA
Private Renting			
User cost	58	2461.69	NA
Net user cost	58	2404.96	NA
Economic subsidy	58	56.73	NA

4. UA(13): Argyll and Bute

Tenure, Cost and Subsidy	No. of Observation	Average Per Annum (£)	Simulation of UC of Owners (24% of ITR)
Owner-Occupation			
User Cost	383	3731.03	2836.16
Net User cost	383	2782.13	1887.25
Economic subsidy	383	948.90	948.90
Social Renting			
User cost	231	2319.96	NA
Net user cost	231	1855.93	NA
Economic subsidy	231	464.03	NA
Private Renting			
User cost	64	2602.66	NA
Net user cost	64	2602.66	NA
Economic subsidy	64	0.00	NA

5. UA(14): the Borders

Tenure, User Cost and Subsidy	No. of Observation	Average Per Annum (£)	Simulation of UC of Owners (24% of ITR)
Owner-Occupation			
User Cost	114	3815.88	2899.26
Net User cost	114	2824.01	1907.39
Economic subsidy	114	991.87	991.87
Social Renting			
User cost	81	2262.65	NA
Net user cost	81	1584.40	NA
Economic subsidy	81	678.25	NA
Private Renting			
User cost	26	2179.96	NA
Net user cost	26	2179.96	NA
Economic subsidy	26	0.00	NA

6. UA(15): Clackmannan

Tenure, User Cost and Subsidy	No. of Observation	Average Per Annum (£)	Simulation of UC of Owners (24% of ITR)
Owner-Occupation			
User Cost	40	3595.88	2735.57
Net User cost	40	2730.63	1870.33
Economic subsidy	40	865.25	865.25
Social Renting			
User cost	47	2350.50	NA
Net user cost	47	1691.78	NA
Economic subsidy	47	658.72	NA
Private Renting			
User cost	0	NA	NA
Net user cost	0	NA	NA
Economic subsidy	0	NA	NA

7. UA(16): Dumbarton and Clydebank

Tenure, User Cost and Subsidy	No. of Observation	Average Per Annum (£)	Simulation of UC of Owners (24% of ITR)
Owner-Occupation			
User Cost	78	2937.53	2250.52
Net User cost	78	2308.77	1621.76
Economic subsidy	78	628.76	628.76
Social Renting			
User cost	120	2302.71	NA
Net user cost	120	1803.11	NA
Economic subsidy	120	499.60	NA
Private Renting			
User cost	3	3422.29	NA
Net user cost	3	33422.29	NA
Economic subsidy	3	0.00	NA

8. UA(17): Dumfries and Galloway

Tenure, User Cost and Subsidy	No. of Observation	Average Per Annum (£)	Simulation of UC of Owners (24% of ITR)
Owner-Occupation			
User Cost	166	3649.98	2776.12
Net User cost	166	2719.68	1845.83
Economic subsidy	166	930.30	930.30
Social Renting			
User cost	126	22429.21	NA
Net user cost	126	1786.29	NA
Economic subsidy	126	642.93	NA
Private Renting			
User cost	20	2266.08	NA
Net user cost	20	2266.08	NA
Economic subsidy	20	0.00	NA

9. UA(18): Dundee City

Tenure, User Cost and Subsidy	No. of Observation	Average Per Annum (£)	Simulation of UC of Owners (24% of ITR)
Owner-Occupation			
User Cost	158	3234.85	2470.50
Net User cost	158	2486.89	1722.54
Economic subsidy	158	747.96	747.96
Social Renting			
User cost	170	2349.91	NA
Net user cost	170	1964.84	NA
Economic subsidy	170	385.08	NA
Private Renting			
User cost	17	3306.13	NA
Net user cost	17	3306.13	NA
Economic subsidy	17	0.00	NA

10. UA(19): East Ayrshire

Tenure, User Cost and Subsidy	No. of Observation	Average Per Annum (£)	Simulation of UC of Owners (24% of ITR)
Owner-Occupation			
User Cost	103	3336.43	2546.12
Net User cost	103	2571.17	1780.86
Economic subsidy	103	765.26	765.26
Social Renting			
User cost	137	2406.16	NA
Net user cost	137	1513.62	NA
Economic subsidy	137	892.54	NA
Private Renting			
User cost	4	2013.44	NA
Net user cost	4	2013.44	NA
Economic subsidy	4	0.00	NA

11. UA(20): East Dumbartonshire

Tenure, User Cost and Subsidy	No. of Observation	Average Per Annum (£)	Simulation of UC of Owners (24% of ITR)
Owner-Occupation			
User Cost	146	3981.51	3022.19
Net User cost	146	3066.73	2107.40
Economic subsidy	146	914.79	914.79
Social Renting			
User cost	45	2523.39	NA
Net user cost	45	1737.37	NA
Economic subsidy	45	786.02.	NA
Private Renting			
User cost	8	3983.00	NA
Net user cost	8	3983.00	NA
Economic subsidy	8	0.00	NA

12. UA(21): East Lothian

Tenure, User Cost and Subsidy	No. of Observation	Average Per Annum (£)	Simulation of UC of Owners (24% of ITR)
Owner-Occupation			
User Cost	462	3601.76	2747.67
Net User cost	462	2793.37	1930.28
Economic subsidy	462	817.39	817.39
Social Renting			
User cost	278	2565.47	NA
Net user cost	278	1590.09	NA
Economic subsidy	278	975.38	NA
Private Renting			
User cost	30	3335.14	NA
Net user cost	30	3321.18	NA
Economic subsidy	30	13.97	NA

13. UA(22): East Renfrewshire

Tenure, User Cost and Subsidy	No. of Observation	Average Per Annum (£)	Simulation of UC of Owners (24% of ITR)
Owner-Occupation			
User Cost	76	3960.69	3006.22
Net User cost	76	3112.60	2158.13
Economic subsidy	76	848.09	848.09
Social Renting			
User cost	29	2522.42	NA
Net user cost	29	1529.36	NA
Economic subsidy	29	993.07	NA
Private Renting			
User cost	4	3807.05	NA
Net user cost	4	3807.05	NA
Economic subsidy	4	0.00	NA

14. UA(23): Edinburgh City

Tenure, User Cost and Subsidy	No. of Observation	Average Per Annum (£)	Simulation of UC of Owners (24% of ITR)
Owner-Occupation			
User Cost	569	33290.09	2509.58
Net User cost	569	2533.99	1753.49
Economic subsidy	569	756.10	756.10
Social Renting			
User cost	280	2222.61	NA
Net user cost	280	2164.72	NA
Economic subsidy	280	57.89	NA
Private Renting			
User cost	113	4403.11	NA
Net user cost	113	4363.71	NA
Economic subsidy	113	39.40	NA

15. UA(24): Falkirk

Tenure, User Cost and Subsidy	No. of Observation	Average Per Annum (£)	Simulation of UC of Owners (24% of ITR)
Owner-Occupation			
User Cost	122	3502.43	2667.20
Net User cost	122	2703.07	1867.84
Economic subsidy	122	799.36	799.36
Social Renting			
User cost	137	2433.10	NA
Net user cost	137	1550.34	NA
Economic subsidy	137	882.76	NA
Private Renting			
User cost	6	2484.30	NA
Net user cost	6	2484.30	NA
Economic subsidy	6	0.00	NA

16. UA(25): Fife

Tenure, User Cost and Subsidy	No. of Observation	Average Per Annum (£)	Simulation of UC of Owners (24% of ITR)
Owner-Occupation			
User Cost	461	3573.65	2720.26
Net User cost	461	2715.46	1862.07
Economic subsidy	461	858.19	858.19
Social Renting			
User cost	300	2482.73	NA
Net user cost	300	1631.51	NA
Economic subsidy	300	851.22	NA
Private Renting			
User cost	37	2881.80	NA
Net user cost	37	2881.80	NA
Economic subsidy	37	0.00	NA

17. UA(26): Glasgow City

Tenure, User Cost and Subsidy	No. of Observation	Average Per Annum (£)	Simulation of UC of Owners (24% of ITR)
Owner-Occupation			
User Cost	487	2965.99	2271.80
Net User cost	487	2331.82	1637.63
Economic subsidy	487	634.17	634.17
Social Renting			
User cost	890	2198.30	NA
Net user cost	890	1814.32	NA
Economic subsidy	890	383.98	NA
Private Renting			
User cost	77	3710.67	NA
Net user cost	77	3643.06	NA
Economic subsidy	77	67.62	NA

18. UA(27): Highland

Tenure, User Cost and Subsidy	No. of Observation	Average Per Annum (£)	Simulation of UC of Owners (24% of ITR)
Owner-Occupation			
User Cost	479	3751.91	2858.07
Net User cost	479	2780.37	1880.54
Economic subsidy	479	971.54	971.54
Social Renting			
User cost	323	2542.94	NA
Net user cost	323	1852.71	NA
Economic subsidy	323	690.23	NA
Private Renting			
User cost	61	2484.07	NA
Net user cost	61	2484.07	NA
Economic subsidy	61	0.00	NA

19. UA(28): Inverclyde

Tenure, User Cost and Subsidy	No. of Observation	Average Per Annum (£)	Simulation of UC of Owners (24% of ITR)
Owner-Occupation			
User Cost	62	3489.54	2659.01
Net User cost	62	2688.81	1858.28
Economic subsidy	62	800.73	800.73
Social Renting			
User cost	117	2473.96	NA
Net user cost	117	1790.54	NA
Economic subsidy	117	683.42	NA
Private Renting			
User cost	14	2346.35	NA
Net user cost	14	2138.91	NA
Economic subsidy	14	207.44	NA

20. UA(29): Midlothian

Tenure, User Cost and Subsidy	No. of Observation	Average Per Annum (£)	Simulation of UC of Owners (24% of ITR)
Owner-Occupation			
User Cost	85	3493.13	2661.93
Net User cost	85	2724.10	1892.89
Economic subsidy	85	769.03	769.03
Social Renting			
User cost	61	2417.57	NA
Net user cost	61	1685.56	NA
Economic subsidy	61	732.01	NA
Private Renting			
User cost	7	2809.71	NA
Net user cost	7	2809.71	NA
Economic subsidy	7	0.00	NA

21. UA(30): Moray

Tenure, User Cost and Subsidy	No. of Observation	Average Per Annum (£)	Simulation of UC of Owners (24% of ITR)
Owner-Occupation			
User Cost	123	3768.59	2864.82
Net User cost	123	2786.85	1883.08
Economic subsidy	123	981.74	981.74
Social Renting			
User cost	61	2489.26	NA
Net user cost	61	1583.06	NA
Economic subsidy	61	906.20	NA
Private Renting			
User cost	17	2633.43	NA
Net user cost	17	2633.43	NA
Economic subsidy	17	0.00	NA

22. UA(31): North Ayrshire

Tenure, User Cost and Subsidy	No. of Observation	Average Per Annum (£)	Simulation of UC of Owners (24% of ITR)
Owner-Occupation			
User Cost	136	3548.52	2902.06
Net User cost	136	2706.70	1860.24
Economic subsidy	136	841.82	841.82
Social Renting			
User cost	126	2672.46	NA
Net user cost	126	1657.31	NA
Economic subsidy	126	1015.15	NA
Private Renting			
User cost	15	2877.99	NA
Net user cost	15	2858.32	NA
Economic subsidy	15	19.68	NA

23. UA(32): North Lanarkshire

Tenure, User Cost and Subsidy	No. of Observation	Average Per Annum (£)	Simulation of UC of Owners (24% of ITR)
Owner-Occupation			
User Cost	389	3276.75	2502.12
Net User cost	389	2571.73	1797.09
Economic subsidy	389	705.03	705.03
Social Renting			
User cost	504	2381.40	NA
Net user cost	504	1666.16	NA
Economic subsidy	504	715.24	NA
Private Renting			
User cost	7	1828.62	NA
Net user cost	7	1779.59	NA
Economic subsidy	7	49.03	NA

24. UA(33): Orkney Islands

Tenure, User Cost and Subsidy	No. of Observation	Average Per Annum (£)	Simulation of UC of Owners (24% of ITR)
Owner-Occupation			
User Cost	34	4351.57	3294.37
Net User cost	34	3143.65	2086.45
Economic subsidy	34	1207.92	1207.92
Social Renting			
User cost	12	2209.41	NA
Net user cost	12	1841.67	NA
Economic subsidy	12	367.74	NA
Private Renting			
User cost	3	2553.37	NA
Net user cost	3	2553.37	NA
Economic subsidy	3	0.00	NA

25. UA(34): Perthshire and Kinross

Tenure, User Cost and Subsidy	No. of Observation	Average Per Annum (£)	Simulation of UC of Owners (24% of ITR)
Owner-Occupation			
User Cost	148	3627.76	2759.57
Net User cost	148	2734.55	1866.36
Economic subsidy	148	893.22	893.22
Social Renting			
User cost	75	2381.97	NA
Net user cost	75	1610.38	NA
Economic subsidy	75	771.59	NA
Private Renting			
User cost	22	2642.62	NA
Net user cost	22	2557.63	NA
Economic subsidy	22	84.99	NA

26. UA(35): Refrewshire

Tenure, User Cost and Subsidy	No. of Observation	Average Per Annum (£)	Simulation of UC of Owners (24% of ITR)
Owner-Occupation			
User Cost	182	3409.50	2599.84
Net User cost	182	2651.80	1842.15
Economic subsidy	182	757.69	757.69
Social Renting			
User cost	181	2366.56	NA
Net user cost	181	1627.89	NA
Economic subsidy	181	738.67	NA
Private Renting			
User cost	6	2268.67	NA
Net user cost	6	1984.76	NA
Economic subsidy	6	238.91	NA

27. UA(36): Shetland Islands

Tenure, User Cost and Subsidy	No. of Observation	Average Per Annum (£)	Simulation of UC of Owners (24% of ITR)
Owner-Occupation			
User Cost	27	4390.50	3322.15
Net User cost	27	3126.44	2058.08
Economic subsidy	27	1264.07	1264.07
Social Renting			
User cost	14	2758.63	NA
Net user cost	14	1730.08	NA
Economic subsidy	14	1028.55	NA
Private Renting			
User cost	2	3105.96	NA
Net user cost	2	3105.96	NA
Economic subsidy	2	0.00	NA

28. UA(37): South Ayrshire

Tenure, User Cost and Subsidy	No. of Observation	Average Per Annum (£)	Simulation of UC of Owners (24% of ITR)
Owner-Occupation			
User Cost	151	3641.27	2771.40
Net User cost	151	2790.29	1920.41
Economic subsidy	151	850.99	850.99
Social Renting			
User cost	81	2428.56	NA
Net user cost	81	1689.98	NA
Economic subsidy	81	738.57	NA
Private Renting			
User cost	7	3227.57	NA
Net user cost	7	3227.57	NA
Economic subsidy	7	0.00	NA

29. UA(38): South Lanarkshire

Tenure, User Cost and Subsidy	No. of Observation	Average Per Annum (£)	Simulation of UC of Owners (24% of ITR)
Owner-Occupation			
User Cost	373	3340.90	2547.91
Net User cost	373	2580.21	1787.22
Economic subsidy	373	760.69	760.69
Social Renting			
User cost	333	2346.09	NA
Net user cost	333	1774.45	NA
Economic subsidy	333	571.64	NA
Private Renting			
User cost	16	2512.76	NA
Net user cost	16	2466.15	NA
Economic subsidy	16	46.61	NA

30. UA(39): Stirling

Tenure, User Cost and Subsidy	No. of Observation	Average Per Annum (£)	Simulation of UC of Owners (24% of ITR)
Owner-Occupation			
User Cost	112	3966.46	3012.15
Net User cost	112	2987.69	2033.38
Economic subsidy	112	978.77	978.77
Social Renting			
User cost	61	2477.23	NA
Net user cost	61	1863.93	NA
Economic subsidy	61	613.31	NA
Private Renting			
User cost	9	5057.58	NA
Net user cost	9	5057.58	NA
Economic subsidy	9	0.00	NA

31. UA(40): West Lothian

Tenure, User Cost and Subsidy	No. of Observation	Average Per Annum (£)	Simulation of UC of Owners (24% of ITR)
Owner-Occupation			
User Cost	157	3444.65	2625.64
Net User cost	157	2704.20	1885.19
Economic subsidy	157	740.45	740.45
Social Renting			
User cost	153	2506.06	NA
Net user cost	153	1713.17	NA
Economic subsidy	153	792.89	NA
Private Renting			
User cost	4	3147.04	NA
Net user cost	4	3147.04	NA
Economic subsidy	4	0.00	NA

32. UA(41): Western Isles

Tenure, User Cost and Subsidy	No. of Observation	Average Per Annum (£)	Simulation of UC of Owners (24% of ITR)
Owner-Occupation			
User Cost	42	4139.38	3142.29
Net User cost	42	2926.18	1929.08
Economic subsidy	42	1213.21	1213.21
Social Renting			
User cost	17	2237.10	NA
Net user cost	17	1883.72	NA
Economic subsidy	17	353.38	NA
Private Renting			
User cost	3	3480.01	NA
Net user cost	3	3480.01	NA
Economic subsidy	3	0.00	NA

Notes: The simulation is to apply 24% of income tax rate to the user cost of owner-occupiers.
NA denotes the simulation does not apply to social tenants and private tenants.

A. 5.3 The Correlation Table of the Explanatory Variables in the Two Tenure Choice Models

		AGE	AGESQ	NDEPCH	MARRY	MALE	FULLWORK	PARTWORK	UNEMPLOY
AGE	Pearson Correlation	1	0.987	-0.459	-0.156	-0.140	-0.503	-0.061	-0.154
	Sig. (2-tailed)	.	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	N	18064	18064	18064	18064	18064	18064	18064	18064
AGESQ	Pearson Correlation	0.987	1	-0.458	-0.196	-0.173	-0.530	-0.066	-0.152
	Sig. (2-tailed)	0.000	.	0.000	0.000	0.000	0.000	0.000	0.000
	N	18064	18064	18064	18064	18064	18064	18064	18064
NDEPCH	Pearson Correlation	-0.459	-0.458	1	0.234	0.084	0.241	0.056	0.057
	Sig. (2-tailed)	0.000	0.000	.	0.000	0.000	0.000	0.000	0.000
	N	18064	18064	18158	18158	18158	18158	18158	18158
MARRY	Pearson Correlation	-0.156	-0.196	0.234	1	0.671	0.402	-0.099	-0.043
	Sig. (2-tailed)	0.000	0.000	0.000	.	0.000	0.000	0.000	0.000
	N	18064	18064	18158	18158	18158	18158	18158	18158
MALE	Pearson Correlation	-0.140	-0.173	0.084	0.671	1	0.358	-0.185	0.065
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	.	0.000	0.000	0.000
	N	18064	18064	18158	18158	18158	18158	18158	18158
FULLWORK	Pearson Correlation	-0.503	-0.530	0.241	0.402	0.358	1	-0.202	-0.238
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	.	0.000	0.000
	N	18064	18064	18158	18158	18158	18158	18158	18158
PARTWORK	Pearson Correlation	-0.061	-0.066	0.056	-0.099	-0.185	-0.202	1	-0.054
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	.	0.000
	N	18064	18064	18158	18158	18158	18158	18158	18158
UNEMPLOY	Pearson Correlation	-0.154	-0.152	0.057	-0.043	0.065	-0.238	-0.054	1
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	.
	N	18064	18064	18158	18158	18158	18158	18158	18158
RETIRE	Pearson Correlation	0.743	0.774	-0.356	-0.201	-0.176	-0.575	-0.132	-0.155
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	N	18064	18064	18158	18158	18158	18158	18158	18158
HOUSE	Pearson Correlation	0.056	0.019	0.113	0.300	0.201	0.190	-0.004	-0.103
	Sig. (2-tailed)	0.000	0.011	0.000	0.000	0.000	0.000	0.621	0.000
	N	17614	17614	17705	17705	17705	17705	17705	17705

A. 5.3 The Correlation Table (Continued)

		AGE	AGESQ	NDEPCH	MARRY	MALE	FULLWORK	PARTWORK	UNEMPLOY
PREVOWN	Pearson Correlation	-0.011	-0.037	0.084	0.203	0.132	0.204	-0.012	-0.096
	Sig. (2-tailed)	0.136	0.000	0.000	0.000	0.000	0.000	0.104	0.000
	N	17488	17488	17488	17488	17488	17488	17488	17488
PREVSOC	Pearson Correlation	0.150	0.141	0.007	-0.088	-0.096	-0.203	0.001	0.051
	Sig. (2-tailed)	0.000	0.000	0.315	0.000	0.000	0.000	0.869	0.000
	N	17488	17488	17488	17488	17488	17488	17488	17488
PREVPRV	Pearson Correlation	0.025	0.034	-0.072	-0.037	-0.010	-0.025	0.003	-0.001
	Sig. (2-tailed)	0.001	0.000	0.000	0.000	0.169	0.001	0.707	0.926
	N	17488	17488	17488	17488	17488	17488	17488	17488
LIKMOV2	Pearson Correlation	-0.289	-0.265	0.098	-0.043	-0.014	0.069	0.009	0.076
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.071	0.000	0.272	0.000
	N	16095	16095	16174	16174	16174	16174	16174	16174
URBAN	Pearson Correlation	-0.029	-0.023	-0.022	-0.061	-0.054	-0.054	-0.020	0.024
	Sig. (2-tailed)	0.000	0.002	0.003	0.000	0.000	0.000	0.006	0.001
	N	18064	18064	18158	18158	18158	18158	18158	18158
AFFOWN	Pearson Correlation	0.003	-0.015	0.046	0.156	0.126	0.135	-0.009	-0.051
	Sig. (2-tailed)	0.656	0.049	0.000	0.000	0.000	0.000	0.215	0.000
	N	18063	18063	18155	18155	18155	18155	18155	18155
PRVTCITY	Pearson Correlation	-0.108	-0.085	-0.083	-0.088	-0.025	0.033	0.001	-0.004
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.001	0.000	0.945	0.637
	N	18063	18063	18155	18155	18155	18155	18155	18155
POORCNL	Pearson Correlation	-0.049	-0.039	0.034	-0.152	-0.117	-0.151	0.015	0.095
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.043	0.000
	N	18063	18063	18155	18155	18155	18155	18155	18155
LNPERINC	Pearson Correlation	-0.489	-0.544	0.414	0.797	0.586	0.599	-0.037	-0.009
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.212
	N	18040	18040	18040	18040	18040	18040	18040	18040
LNUC_NOM	Pearson Correlation	-0.090	-0.120	0.160	0.289	0.214	0.250	-0.004	-0.084
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.611	0.000
	N	14979	14979	15037	15037	15037	15037	15037	15037

A. 5.3 The Correlation Table (Continued)

		AGE	AGESQ	NDEPCH	MARRY	MALE	FULLWORK	PARTWORK	UNEMPLOY
LNAUC_NM	Pearson Correlation	-0.194	-0.208	0.149	0.251	0.199	0.300	-0.017	-0.068
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.050	0.000
	N	13800	13800	13847	13847	13847	13847	13847	13847
RATSOC	Pearson Correlation	-0.417	-0.448	0.165	0.323	0.253	0.703	0.090	-0.250
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	N	18064	18064	18158	18158	18158	18158	18158	18158
RATMORT	Pearson Correlation	-0.008	0.023	-0.047	-0.404	-0.291	-0.241	0.036	0.066
	Sig. (2-tailed)	0.330	0.006	0.000	0.000	0.000	0.000	0.000	0.000
	N	14407	14407	14450	14450	14450	14450	14450	14450

		RETIRE	HOUSE	PREVOWN	PREVSOC	PREVPRV	LIKMOV2	URBAN	AFFOWN
AGE	Pearson Correlation	0.743	0.056	-0.011	0.150	0.025	-0.289	-0.029	0.003
	Sig. (2-tailed)	0.000	0.000	0.136	0.000	0.001	0.000	0.000	0.656
	N	18064	17614	17488	17488	17488	16095	18064	18063
AGESQ	Pearson Correlation	0.774	0.019	-0.037	0.141	0.034	-0.265	-0.023	-0.015
	Sig. (2-tailed)	0.000	0.011	0.000	0.000	0.000	0.000	0.002	0.049
	N	18064	17614	17488	17488	17488	16095	18064	18063
NDEPCH	Pearson Correlation	-0.356	0.113	0.084	0.007	-0.072	0.098	-0.022	0.046
	Sig. (2-tailed)	0.000	0.000	0.000	0.315	0.000	0.000	0.003	0.000
	N	18158	17705	17488	17488	17488	16174	18158	18155
MARRY	Pearson Correlation	-0.201	0.300	0.203	-0.088	-0.037	-0.043	-0.061	0.156
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	N	18158	17705	17488	17488	17488	16174	18158	18155
MALE	Pearson Correlation	-0.176	0.201	0.132	-0.096	-0.010	-0.014	-0.054	0.126
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.169	0.071	0.000	0.000
	N	18158	17705	17488	17488	17488	16174	18158	18155

A. 5.3 The Correlation Table (Continued)

		RETIRE	HOUSE	PREVOWN	PREVSOC	PREVPRV	LIKMOV2	URBAN	AFFOWN
FULLWORK	Pearson Correlation	-0.575	0.190	0.204	-0.203	-0.025	0.069	-0.054	0.135
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000
	N	18158	17705	17488	17488	17488	16174	18158	18155
PARTWORK	Pearson Correlation	-0.132	-0.004	-0.012	0.001	0.003	0.009	-0.020	-0.009
	Sig. (2-tailed)	0.000	0.621	0.104	0.869	0.707	0.272	0.006	0.215
	N	18158	17705	17488	17488	17488	16174	18158	18155
UNEMPLOY	Pearson Correlation	-0.155	-0.103	-0.096	0.051	-0.001	0.076	0.024	-0.051
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.926	0.000	0.001	0.000
	N	18158	17705	17488	17488	17488	16174	18158	18155
RETIRE	Pearson Correlation	1	-0.028	-0.047	0.092	0.034	-0.178	-0.001	-0.037
	Sig. (2-tailed)	.	0.000	0.000	0.000	0.000	0.000	0.884	0.000
	N	18158	17705	17488	17488	17488	16174	18158	18155
HOUSE	Pearson Correlation	-0.028	1	0.201	-0.070	-0.026	-0.165	-0.245	0.256
	Sig. (2-tailed)	0.000	.	0.000	0.000	0.001	0.000	0.000	0.000
	N	17705	17705	17488	17488	17488	15773	17705	17705
PREVOWN	Pearson Correlation	-0.047	0.201	1	-0.489	-0.270	-0.026	-0.029	0.261
	Sig. (2-tailed)	0.000	0.000	.	0.000	0.000	0.001	0.000	0.000
	N	18043	17596	17488	17488	17488	16077	18043	18042
PREVSOC	Pearson Correlation	0.092	-0.070	-0.489	1	-0.315	-0.076	0.119	-0.191
	Sig. (2-tailed)	0.000	0.000	0.000	.	0.000	0.000	0.000	0.000
	N	18043	17596	17488	17488	17488	16077	18043	18042
PREVPRV	Pearson Correlation	0.034	-0.026	-0.270	-0.315	1	0.046	-0.104	-0.013
	Sig. (2-tailed)	0.000	0.001	0.000	0.000	.	0.000	0.000	0.087
	N	18043	17596	17488	17488	17488	16077	18043	18042
LIKMOV2	Pearson Correlation	-0.178	-0.165	-0.026	-0.076	0.046	1	0.045	-0.039
	Sig. (2-tailed)	0.000	0.000	0.001	0.000	0.000	.	0.000	0.000
	N	16174	15773	16077	16077	16077	16174	16174	16173
URBAN	Pearson Correlation	-0.001	-0.245	-0.029	0.119	-0.104	0.045	1	-0.170
	Sig. (2-tailed)	0.884	0.000	0.000	0.000	0.000	0.000	.	0.000
	N	18158	17705	18043	18043	18043	16174	18158	18155

A. 5.3 The Correlation Table (Continued)

		RETIRE	HOUSE	PREVOWN	PREVSOC	PREVPRV	LIKMOV2	URBAN	AFFOWN
AFFOWN	Pearson Correlation	-0.037	0.256	0.261	-0.191	-0.013	-0.039	-0.170	1
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.087	0.000	0.000	.
	N	18155	17705	18042	18042	18042	16173	18155	18155
PRVTCITY	Pearson Correlation	-0.033	-0.354	0.023	-0.132	0.059	0.143	0.130	-0.130
	Sig. (2-tailed)	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000
	N	18155	17705	18042	18042	18042	16173	18155	18155
POORCNL	Pearson Correlation	-0.024	-0.350	-0.150	0.147	-0.038	0.075	0.155	-0.119
	Sig. (2-tailed)	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	N	18155	17705	17488	17488	17488	16173	18155	18155
LNPERINC	Pearson Correlation	-0.461	0.288	0.305	-0.212	-0.049	0.056	-0.054	0.215
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	N	18040	17591	17488	17488	17488	16078	18040	18039
LNUC_NOM	Pearson Correlation	-0.127	0.406	0.389	-0.251	-0.038	-0.025	-0.068	0.366
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.005	0.000	0.000
	N	15037	15011	14944	14944	14944	13419	15037	15037
LNAUC_NM	Pearson Correlation	-0.181	0.285	0.387	-0.287	-0.014	0.071	-0.071	0.337
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.113	0.000	0.000	0.000
	N	13847	13821	13761	13761	13761	12365	13847	13847
RATSOC	Pearson Correlation	-0.518	0.198	0.228	-0.234	-0.017	0.067	-0.061	0.158
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.019	0.000	0.000	0.000
	N	18158	17705	18043	18043	18043	16174	18158	18155
RATMORT	Pearson Correlation	0.028	-0.186	-0.251	0.198	0.047	0.024	0.074	-0.158
	Sig. (2-tailed)	0.001	0.000	0.000	0.000	0.000	0.006	0.000	0.000
	N	14450	14320	14359	14359	14359	12917	14450	14449

A. 5.3 The Correlation Table (Continued)

		PRVTCITY	POORCNL	LNPERINC	LNUC_NOM	LNAUC_NM	RATSOC	RATMORT
AGE	Pearson Correlation	-0.108	-0.049	-0.489	-0.090	-0.194	-0.417	-0.008
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.330
	N	18063	18063	18040	14979	13800	18064	14407
AGESQ	Pearson Correlation	-0.085	-0.039	-0.544	-0.120	-0.208	-0.448	0.023
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.006
	N	18063	18063	18040	14979	13800	18064	14407
NDEPCH	Pearson Correlation	-0.083	0.034	0.414	0.160	0.149	0.165	-0.047
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	N	18155	18155	18040	15037	13847	18158	14450
MARRY	Pearson Correlation	-0.088	-0.152	0.797	0.289	0.251	0.323	-0.404
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	N	18155	18155	18040	15037	13847	18158	14450
MALE	Pearson Correlation	-0.025	-0.117	0.586	0.214	0.199	0.253	-0.291
	Sig. (2-tailed)	0.001	0.000	0.000	0.000	0.000	0.000	0.000
	N	18155	18155	18040	15037	13847	18158	14450
FULLWORK	Pearson Correlation	0.033	-0.151	0.599	0.250	0.300	0.703	-0.241
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	N	18155	18155	18040	15037	13847	18158	14450
PARTWORK	Pearson Correlation	0.001	0.015	-0.037	-0.004	-0.017	0.090	0.036
	Sig. (2-tailed)	0.945	0.043	0.000	0.611	0.050	0.000	0.000
	N	18155	18155	18040	15037	13847	18158	14450
UNEMPLOY	Pearson Correlation	-0.004	0.095	-0.009	-0.084	-0.068	-0.250	0.066
	Sig. (2-tailed)	0.637	0.000	0.212	0.000	0.000	0.000	0.000
	N	18155	18155	18040	15037	13847	18158	14450
RETIRE	Pearson Correlation	-0.033	-0.024	-0.461	-0.127	-0.181	-0.518	0.028
	Sig. (2-tailed)	0.000	0.001	0.000	0.000	0.000	0.000	0.001
	N	18155	18155	18040	15037	13847	18158	14450
HOUSE	Pearson Correlation	-0.354	-0.350	0.288	0.406	0.285	0.198	-0.186
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	N	17705	17705	17591	15011	13821	17705	14320

A. 5.3 The Correlation Table (Continued)

		PRVTCITY	POORCNL	LNPERINC	LNUC_NOM	LNAUC_NM	RATSOC	RATMORT
PREVOWN	Pearson Correlation	0.023	-0.150	0.305	0.389	0.387	0.228	-0.251
	Sig. (2-tailed)	0.002	0.000	0.000	0.000	0.000	0.000	0.000
	N	17488	17488	17488	14944	13761	17488	14359
PREVSOC	Pearson Correlation	-0.132	0.147	-0.212	-0.251	-0.287	-0.234	0.198
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	N	17488	17488	17488	14944	13761	17488	14359
PREVPRV	Pearson Correlation	0.059	-0.038	-0.049	-0.038	-0.014	-0.017	0.047
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.113	0.019	0.000
	N	17488	17488	17488	14944	13761	17488	14359
LIKMOV2	Pearson Correlation	0.143	0.075	0.056	-0.025	0.071	0.067	0.024
	Sig. (2-tailed)	0.000	0.000	0.000	0.005	0.000	0.000	0.006
	N	16173	16173	16078	13419	12365	16174	12917
URBAN	Pearson Correlation	0.130	0.155	-0.054	-0.068	-0.071	-0.061	0.074
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	N	18155	18155	18040	15037	13847	18158	14450
AFFOWN	Pearson Correlation	-0.130	-0.119	0.215	0.366	0.337	0.158	-0.158
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	N	18155	18155	18039	15037	13847	18157	14449
PROSPOWN	Pearson Correlation	-0.166	-0.151	0.175	0.220	0.222	0.149	-0.174
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	N	18155	18155	18039	15037	13847	18157	14449
AGRI	Pearson Correlation	-0.077	-0.070	0.050	0.040	0.068	0.063	-0.024
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.003
	N	18155	18155	18039	15037	13847	18157	14449
PRVTCITY	Pearson Correlation	1	-0.116	-0.019	-0.012	0.073	0.062	-0.025
	Sig. (2-tailed)	.	0.000	0.012	0.133	0.000	0.000	0.002
	N	18155	18155	18039	15037	13847	18157	14449
BETTCNL	Pearson Correlation	-0.178	-0.162	-0.053	-0.079	-0.104	-0.049	0.022
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.009
	N	18155	18155	18039	15037	13847	18157	14449

A. 5.3 The Correlation Table (Continued)

		PRVTCITY	POORCNL	LNPERINC	LNUC_NOM	LNAUC_NM	RATSOC	RATMORT
LWCNL	Pearson Correlation	-0.151	-0.138	-0.057	-0.138	-0.210	-0.080	0.107
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	N	18155	18155	18039	15037	13847	18157	14449
OLDCNL	Pearson Correlation	-0.119	-0.108	-0.176	-0.186	-0.187	-0.138	0.122
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	N	18155	18155	18039	15037	13847	18157	14449
POORCNL	Pearson Correlation	-0.116	1	-0.155	-0.236	-0.171	-0.171	0.158
	Sig. (2-tailed)	0.000	.	0.000	0.000	0.000	0.000	0.000
	N	18155	18155	18039	15037	13847	18157	14449
LNPERINC	Pearson Correlation	-0.019	-0.155	1	0.414	0.409	0.516	-0.421
	Sig. (2-tailed)	0.012	0.000	.	0.000	0.000	0.000	0.000
	N	18039	18039	18040	14962	13784	18040	14402
LNUC_NOM	Pearson Correlation	-0.012	-0.236	0.414	1	0.806	0.304	-0.238
	Sig. (2-tailed)	0.133	0.000	0.000	.	0.000	0.000	0.000
	N	15037	15037	14962	15037	13847	15037	13586
LNAUC_NM	Pearson Correlation	0.073	-0.171	0.409	0.806	1	0.328	-0.239
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	.	0.000	0.000
	N	13847	13847	13784	13847	13847	13847	13572
RATSOC	Pearson Correlation	0.062	-0.171	0.516	0.304	0.328	1	-0.282
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	.	0.000
	N	18155	18155	18040	15037	13847	18158	14450
RATMORT	Pearson Correlation	-0.025	0.158	-0.421	-0.238	-0.239	-0.282	1
	Sig. (2-tailed)	0.002	0.000	0.000	0.000	0.000	0.000	.
	N	14449	14449	14402	13586	13572	14450	14450

APPENDIX II Appendix to Chapter Six

A.6.1—Limdep Programme Estimation Results of the MNL Tenure Choice Model

1. The Results of Model One

Multinomial Logit Model	
Maximum Likelihood Estimates	
Dependent variable	TENURE
Weighting variable	ONE
Number of observations	13114
Iterations completed	7
Log likelihood function	-6703.855
Restricted log likelihood	-11289.02
Chi-squared	9170.324
Degrees of freedom	38
Significance level	.0000000

Variable	Coefficient	Standard Error	b/St.Er.	P[|Z|>z]	Mean of X
	Characteristics in numerator of Prob[Y = 1]				
	(Social Renting: Owner-Occupation)				
Constant	50.24791211	1.6346222	30.740	.0000	
AGE	.4671342787E-01	.10361004E-01	4.509	.0000	51.277795
AGESQ	-.7582397682E-03	.99522440E-04	-7.619	.0000	2943.4899
NDEPCH	.6172550926	.36213117E-01	17.045	.0000	.57777947
MARRY	1.093230475	.11353286	9.629	.0000	.57777947
MALE	-.1029865761	.78832454E-01	-1.306	.1914	.69246607
FULLWORK	-1.007446959	.76757851E-01	-13.125	.0000	.44547811
PARTWORK	-.1364449811	.13082059	-1.043	.2970	.45981394E-01
UNEMPLOY	.9859714088	.13779831	7.155	.0000	.60012201E-01
HOUSE	-.4826040041	.65234123E-01	-7.398	.0000	.62574348
PREVOWN	-1.227903286	.86088781E-01	-14.263	.0000	.29258807
PREVSOC	.7223274604	.70734944E-01	10.212	.0000	.37303645
PREVPRV	.2887936431	.84248806E-01	3.428	.0006	.14617966
LIKMOV2	.1969805827	.88130799E-01	2.235	.0254	.12459966
URBAN	.6591858324E-01	.67700952E-01	.974	.3302	.79891719
AFFOWN	-1.711723482	.15164910	-11.287	.0000	.11499161
PRVTCITY	-1.774898297	.10123991	-17.532	.0000	.10713741
POORCNL	1.144585050	.11792420	9.706	.0000	.99893244E-01
LNPERINC	-3.201038468	.16579699	-19.307	.0000	9.1980788
LNUCC_1	-2.709613098	.11071091	-24.475	.0000	7.9451288
	Characteristics in numerator of Prob[Y = 2]				
	(Private Renting: Owner-Occupation)				
Constant	27.32364654	2.3988646	11.390	.0000	
AGE	-.9754385289E-01	.16683263E-01	-5.847	.0000	51.277795
AGESQ	.4771151423E-03	.16932619E-03	2.818	.0048	2943.4899
NDEPCH	.2695146463	.56846912E-01	4.741	.0000	.57777947
MARRY	-.3784616528	.17553966	-2.156	.0311	.57777947
MALE	.2956142576	.12239771	2.415	.0157	.69246607
FULLWORK	-.8855553865	.13153024	-6.733	.0000	.44547811
PARTWORK	-.8682822751	.25737080	-3.374	.0007	.45981394E-01
UNEMPLOY	.8085016664	.19234239	4.203	.0000	.60012201E-01
HOUSE	.1604883054	.12675101	1.266	.2055	.62574348
PREVOWN	-.4046913038	.14425203	-2.805	.0050	.29258807
PREVSOC	.4886618486	.13316360	3.670	.0002	.37303645
PREVPRV	1.124812123	.12483259	9.011	.0000	.14617966
LIKMOV2	1.309550231	.10623790	12.327	.0000	.12459966
URBAN	-.8075052738	.10808693	-7.471	.0000	.79891719
AFFOWN	.2742267606	.14759565	1.858	.0632	.11499161
PRVTCITY	.5729863719	.13495454	4.246	.0000	.10713741
POORCNL	.3075541916	.24337550	1.264	.2063	.99893244E-01

LNPERINC	-1.169294876	.25493020	-4.587	.0000	9.1980788
LNUCC_1	-1.921084851	.14332522	-13.404	.0000	7.9451288

2. The Results of Model Two—Estimating Subsidy Effect

Multinomial Logit Model	
Maximum Likelihood Estimates	
Dependent variable	TENURE
Weighting variable	ONE
Number of observations	13114
Iterations completed	7
Log likelihood function	-6366.545
Restricted log likelihood	-11289.02
Chi-squared	9844.943
Degrees of freedom	38
Significance level	.0000000

Variable	Coefficient	Standard Error	b/St.Er.	P[|Z|>z]	Mean of X
	Characteristics in numerator of Prob[Y = 1]				
	(Social Renting: Owner-Occupation)				
Constant	56.31048586	1.7096045	32.938	.0000	
AGE	.1562259544E-01	.10784384E-01	1.449	.1474	51.277795
AGESQ	-.4902808352E-03	.10294127E-03	-4.763	.0000	2943.4899
NDEPCH	.6197518824	.38532281E-01	16.084	.0000	.57777947
MARRY	1.113984115	.11804028	9.437	.0000	.57777947
MALE	-.1590040432	.81289814E-01	-1.956	.0505	.69246607
FULLWORK	-.8898400202	.79524990E-01	-11.189	.0000	.44547811
PARTWORK	-.1278275909	.13576963	-.942	.3464	.45981394E-01
UNEMPLOY	1.067399303	.14267722	7.481	.0000	.60012201E-01
HOUSE	-.6057921190	.65239202E-01	-9.286	.0000	.62574348
PREVOWN	-1.053098721	.90151716E-01	-11.681	.0000	.29258807
PREVSOC	.7932164063	.73385409E-01	10.809	.0000	.37303645
PREVPRV	.2997343197	.87639992E-01	3.420	.0006	.14617966
LIKMOV2	.1592010169	.92125467E-01	1.728	.0840	.12459966
URBAN	.1581220952E-01	.69481857E-01	.228	.8200	.79891719
AFFOWN	-1.662854215	.15910314	-10.451	.0000	.11499161
PRVTCITY	-1.763701191	.10477574	-16.833	.0000	.10713741
POORCNL	1.361449408	.11996497	11.349	.0000	.99893244E-01
LNPERINC	-3.141525272	.17252973	-18.209	.0000	9.1980788
LNUCCN_1	-3.583322618	.11062862	-32.391	.0000	7.6690047
	Characteristics in numerator of Prob[Y = 2]				
	(Private Renting: Owner-Occupation)				
Constant	14.48925560	2.2693288	6.385	.0000	
AGE	-.9790806785E-01	.16750115E-01	-5.845	.0000	51.277795
AGESQ	.5032594857E-03	.16909735E-03	2.976	.0029	2943.4899
NDEPCH	.2258412066	.55333983E-01	4.081	.0000	.57777947
MARRY	-.2533318741	.17470696	-2.450	.0218	.57777947
MALE	.2319328866	.12393671	1.871	.0613	.69246607
FULLWORK	-.6713374413	.13263082	-5.062	.0000	.44547811
PARTWORK	-.7202549701	.25687902	-2.804	.0050	.45981394E-01
UNEMPLOY	.9108055083	.19582333	4.651	.0000	.60012201E-01
HOUSE	-.2217778298	.12525185	-1.771	.0766	.62574348
PREVOWN	-.5767056780	.14462641	-3.988	.0001	.29258807
PREVSOC	.4842092531	.13378640	3.619	.0003	.37303645
PREVPRV	.9718648480	.12546803	7.746	.0000	.14617966
LIKMOV2	1.167260938	.10668854	10.941	.0000	.12459966
URBAN	-.9171255931	.10637467	-8.622	.0000	.79891719
AFFOWN	-.5208250691E-01	.14263408	-.365	.7150	.11499161
PRVTCITY	.3005099892	.13637955	2.203	.0276	.10713741
POORCNL	.4350125983	.24753993	1.757	.0789	.99893244E-01
LNPERINC	-1.401174421	.25082309	-5.586	.0000	9.1980788
LNUCCN_1	-.8313451764E-02	.12756927	-.065	.9480	7.6690047

3. The Results of Model Three—Estimating Subsidy and Rationing Effects

Multinomial Logit Model	
Maximum Likelihood Estimates	
Dependent variable	TENURE
Weighting variable	ONE
Number of observations	13114
Iterations completed	7
Log likelihood function	-5022.817
Restricted log likelihood	-11289.02
Chi-squared	12532.40
Degrees of freedom	42
Significance level	.0000000

Variable	Coefficient	Standard Error	b/St.Er.	P[|Z|>z]	Mean of X
Characteristics in numerator of Prob[Y = 1] (Social Renting: Owner-Occupation)					
Constant	43.86589843	1.9380401	22.634	.0000	
AGE	.4915204208E-01	.12548072E-01	3.917	.0001	51.277795
AGESQ	-.6133140354E-03	.12230262E-03	-5.015	.0000	2943.4899
NDEPCH	.6488399474	.42088865E-01	15.416	.0000	.57777947
MARRY	1.360804092	.14127043	9.633	.0000	.57777947
MALE	-.2291683314	.98268337E-01	-2.332	.0197	.69246607
FULLWORK	-.2796158890	.11316411	-2.471	.0135	.44547811
PARTWORK	.4302268655	.17846816	2.411	.0159	.45981394E-01
UNEMPLOY	1.178392949	.16064336	7.335	.0000	.60012201E-01
HOUSE	-.8119850990	.77161556E-01	-10.523	.0000	.62574348
PREVOWN	-1.298952171	.10699976	-12.140	.0000	.29258807
PREVSOC	.6558951872	.88011083E-01	7.452	.0000	.37303645
PREVPRV	.1171167304	.10458899	1.120	.2628	.14617966
LIKMOV2	.3390042943	.10365967	3.270	.0011	.12459966
URBAN	-.1846426242	.82662695E-01	-2.234	.0255	.79891719
AFFOWN	-1.848042006	.18529974	-9.973	.0000	.11499161
PRVTCITY	-1.913282730	.12206225	-15.675	.0000	.10713741
POORCNL	1.462330799	.13449211	10.873	.0000	.99893244E-01
LNPERINC	-1.485537977	.20121703	-7.383	.0000	9.1980788
LNUCCN_1	-4.247685508	.12878209	-32.984	.0000	7.6690047
RATMORT	3.288755588	.79970859E-01	41.124	.0000	.45020589
RATSOC	-.7130610722	.10169910	-7.011	.0000	.62223578
Characteristics in numerator of Prob[Y = 2] (Private Renting: Owner-Occupation)					
Constant	8.709303901	2.4117683	3.611	.0003	
AGE	-.6499297031E-01	.17614955E-01	-3.690	.0002	51.277795
AGESQ	.3880798460E-03	.17822831E-03	2.177	.0294	2943.4899
NDEPCH	.2631751266	.59248216E-01	4.442	.0000	.57777947
MARRY	.1278333817	.18901879	.676	.4989	.57777947
MALE	.2115929509	.13288850	1.592	.1113	.69246607
FULLWORK	-.5141394028	.16104829	-3.192	.0014	.44547811
PARTWORK	-.4096461802	.28178696	-1.454	.1460	.45981394E-01
UNEMPLOY	1.033845819	.21104936	4.899	.0000	.60012201E-01
HOUSE	-.3361272912	.13174685	-2.551	.0107	.62574348
PREVOWN	-.9786101975	.15518544	-6.306	.0000	.29258807
PREVSOC	.2792321607	.14126232	1.977	.0481	.37303645
PREVPRV	.7616582775	.13514451	5.636	.0000	.14617966
LIKMOV2	1.427788419	.11528936	12.384	.0000	.12459966
URBAN	-1.077287448	.11435923	-9.420	.0000	.79891719
AFFOWN	-.1653157236	.15623176	-1.058	.2900	.11499161
PRVTCITY	.2023277886	.14657894	1.380	.1675	.10713741
POORCNL	.5568017902	.25504231	2.183	.0290	.99893244E-01
LNPERINC	-.3520762219	.26712909	-1.318	.1875	9.1980788
LNUCCN_1	-.8014292924	.13624790	-5.882	.0000	7.6690047
RATMORT	2.919903479	.11935639	24.464	.0000	.45020589
RATSOC	-.2607573559	.15399234	-1.693	.0904	.62223578

A.6.2—Limdep Programme Estimation Results of the NMNL Mobility and Tenure Choice Model

1. The Results of Model One and the IIA Test

```
+---------------------------------------+
| FIML: Nested Multinomial Logit Model  |
| Maximum Likelihood Estimates          |
| Dependent variable            ACHOICE |
| Weighting variable                ONE |
| Number of observations          52048 |
| Iterations completed               73 |
| Log likelihood function      -4893.708|
| Restricted log likelihood    -10584.75|
| Chi-squared                   11382.09|
| Degrees of freedom                44  |
| Significance level             .0000000|
| R2=1-LogL/LogL*  Log-L fncn  R-sqrd  RsqAdj |
| No coefficients -10584.7536  .53766  .53714 |
| Constants only   -5991.4232  .18321  .18229 |
| At start values -18038.4622  .72871  .72840 |
| Response data are given as ind. choice.     |
+---------------------------------------+

+---------------------------------------+
| FIML: Nested Multinomial Logit Model  |
| The model has 2 levels.               |
| Coefs. for branch level begin with M2 |
| Number of obs.= 13012, skipped   0 bad obs. |
+---------------------------------------+

 The IIA Test Results
+---------------------------------------+
| FIML: Nested Multinomial Logit Model  |
| The model has 2 levels.               |
| Coefs. for branch level begin with M2 |
| Number of obs.= 13012, skipped 525 bad obs. |
| Hausman test for IIA. Excluded choices are |
| OWNER                                 |
| ChiSqrd[ 3] = 429.5991, Pr(C>c) =  .000000 |
+---------------------------------------+

+--------+-------------+---------------+-------+--------+----------+
|Variable | Coefficient  | Standard Error |b/St.Er.|P[|Z|>z] | Mean of X|
+--------+-------------+---------------+-------+--------+----------+
          Attributes in the Utility Functions
          (Tenure Choice Level)
 T1       -10.50520974      1.6984682      -6.185    .0000
 T2       -.4942818350      .13556765      -3.646    .0003
 T3       -.1082910691E-01  .63944974E-02  -1.694    .0904
 T4       -.5457003215E-01  .74096993E-02  -7.365    .0000
 T7        .3117453917      .94985968E-01   3.282    .0010
 T8        .1758699582      .10579398       1.662    .0964
 T9       -.8024783158      .22399644      -3.583    .0003
 T10      -.5818314818      .24638937      -2.361    .0182
 T11      -.4112369711      .23203113      -1.772    .0763
 T12       .3767932772      .24305977       1.550    .1211
 T13      -1.758564121      .22984961      -7.651    .0000
 T14      -1.583568842      .25193406      -6.286    .0000
 T15      -1.216913576      .36197218      -3.362    .0008
 T16      -2.237282128      .55932899      -4.000    .0001
 T17       .7811248654      .41013665       1.905    .0568
 T18       .6807148670      .43191551       1.576    .1150
 T19      -1.142245405      .27008193      -4.229    .0000
 T20      -.1526898324      .26270186       -.581    .5611
 T21       1.604533558      .22522474       7.124    .0000
```

T22	.3143601889	.27123897	1.159	.2465
T23	.6883681318	.25081884	2.744	.0061
T24	1.218222738	.24465756	4.979	.0000
T25	-1.480358238	.19241355	-7.694	.0000
T26	-.1024195795	.24563813	-.417	.6767
T27	-.5010708269	.21039283	-2.382	.0172
T28	-.8761920017	.22029134	-3.977	.0001
T29	-1.085610498	.41524656	-2.614	.0089
T30	.5039736510E-01	.31899323	.158	.8745
T31	-1.675734814	.27986779	-5.988	.0000
T32	1.132860307	.26353889	4.299	.0000
T33	1.483714432	.33800031	4.390	.0000
T34	-.2310384925	.53385915	-.433	.6652
T35	-.3120831616	.49644592E-01	-6.286	.0000
T36	-.8496554334	.19954907	-4.258	.0000
	Attributes of Branch Choice Equations			
	(Mobility Decision Level)			
M2	.5470349026E-01	.23335191E-02	23.442	.0000
M3	-.1561390332	.11752768	-1.329	.1840
M4	.1962085332	.37958956E-01	5.169	.0000
M5	-.1452580814	.92299924E-01	-1.574	.1155
M6	.1146975369	.14524579	.790	.4297
M7	.5341658909	.13722140	3.893	.0001
M10	-.1746947967E-01	.11423254	-.153	.8785
M11	.2715749003	.13879760	1.957	.0504
M12	-.1963938506	.93848986E-01	-2.093	.0364
	Inclusive Value Parameters			
NOMOVE	1.000000000	.....(Fixed Parameter).....		
MOVEYES	.2425680441	.42658128E-01	5.686	.0000

2. The Results of Model Two—Estimating Subsidy Effect

FIML: Nested Multinomial Logit Model	
Maximum Likelihood Estimates	
Dependent variable	ACHOICE
Weighting variable	ONE
Number of observations	52048
Iterations completed	76
Log likelihood function	-4881.280
Restricted log likelihood	-10584.75
Chi-squared	11406.95
Degrees of freedom	44
Significance level	.0000000

R2=1-LogL/LogL*	Log-L fncn	R-sqrd	RsqAdj
No coefficients	-10584.7536	.53884	.53832
Constants only	-5991.4232	.18529	.18437
At start values	-18038.4622	.72940	.72909

Response data are given as ind. choice.

FIML: Nested Multinomial Logit Model	
The model has 2 levels.	
Coefs. for branch level begin with M2	
Number of obs.= 13012, skipped	0 bad obs.

Variable	Coefficient	Standard Error	b/St.Er.	P[|Z|>z]	Mean of X
	Attributes in the Utility Functions				
	(Tenure Choice Level)				
T1	-12.96171616	1.7990265	-7.205	.0000	
T2	-.8303668099	.13528233	-6.138	.0000	

T3	-.1078332811E-01	.63572564E-02	-1.696	.0898
T4	-.5474203476E-01	.73673161E-02	-7.430	.0000
T7	.3075308284	.94483155E-01	3.255	.0011
T8	.1864257299	.10564692	1.765	.0776
T9	-.7860175954	.22234643	-3.535	.0004
T10	-.4290881630	.24870426	-1.725	.0845
T11	-.4105496090	.23083741	-1.779	.0753
T12	.3755005703	.24320038	1.544	.1226
T13	-1.761477845	.22651829	-7.776	.0000
T14	-1.519032537	.25084916	-6.056	.0000
T15	-1.195996721	.35399604	-3.379	.0007
T16	-2.212307565	.55967960	-3.953	.0001
T17	.8115136186	.40793183	1.989	.0467
T18	.7191852646	.43123773	1.668	.0954
T19	-1.133877946	.26743687	-4.240	.0000
T20	-.1140080817	.26108080	-.437	.6623
T21	1.609462169	.22221535	7.243	.0000
T22	.3052738982	.26909395	1.134	.2566
T23	.6799807746	.24720655	2.751	.0059
T24	1.197192670	.24210797	4.945	.0000
T25	-1.475725677	.18921340	-7.799	.0000
T26	-.8986971500E-01	.24353393	-.369	.7121
T27	-.4882242192	.20728233	-2.355	.0185
T28	-.8654406382	.21834322	-3.964	.0001
T29	-1.089703757	.41314209	-2.638	.0083
T30	.7464344977E-01	.31808217	.235	.8145
T31	-1.754256219	.27840493	-6.301	.0000
T32	1.054125828	.26297591	4.008	.0001
T33	1.441749417	.33794497	4.266	.0000
T34	-.3092952114	.53440810	-.579	.5627
T35	-.2951246772	.49017404E-01	-6.021	.0000
T36	-1.110758876	.20987024	-5.293	.0000
	Attributes of Branch Choice Equations			
	(Mobility Decision Level)			
M2	.5378826074E-01	.23614003E-02	22.778	.0000
M3	-.1524967920	.11673722	-1.306	.1914
M4	.1922890548	.38541840E-01	4.989	.0000
M5	-.1388096203	.94163724E-01	-1.474	.1404
M6	.1369824723	.15226157	.900	.3683
M7	.5100783222	.13662915	3.733	.0002
M10	.1848158883E-01	.11421502	.162	.8715
M11	.2424337052	.14271682	1.699	.0894
M12	-.1526113069	.95461677E-01	-1.599	.1099
	Inclusive Value Parameters			
NOMOVE	1.000000000	.....(Fixed Parameter).....		
MOVEYES	.2735460184	.43814901E-01	6.243	.0000

3. The Results of Model Three—Estimating Subsidy and Rationing Effect

FIML: Nested Multinomial Logit Model	
Maximum Likelihood Estimates	
Dependent variable	ACHOICE
Weighting variable	ONE
Number of observations	52048
Iterations completed	54
Log likelihood function	-4858.736
Restricted log likelihood	-10584.75
Chi-squared	11452.04
Degrees of freedom	47
Significance level	.0000000

R2=1-LogL/LogL*	Log-L fncn	R-sqrd	RsqAdj
No coefficients	-10584.7536	.54097	.54042
Constants only	-5991.4232	.18905	.18807
At start values	-18038.4622	.73065	.73032

Response data are given as ind. choice.

```
+----------------------------------------+

+----------------------------------------+
| FIML: Nested Multinomial Logit Model   |
| The model has 2 levels.                |
| Coefs. for branch level begin with M2  |
| Number of obs.= 13012, skipped   0 bad obs. |
+----------------------------------------+
```

Variable	Coefficient	Standard Error	b/St.Er.	P[|Z|>z]	Mean of X
	Attributes in the Utility Functions (Tenure Choice Level)				
T1	-6.181569464	1.9282427	-3.206	.0013	
T2	-.8917281267	.13874086	-6.427	.0000	
T3	-.5716129017E-02	.63759370E-02	-.897	.3700	
T4	-.4377715575E-01	.76674742E-02	-5.709	.0000	
T7	.2967973149	.92495454E-01	3.209	.0013	
T8	.1837427883	.10643077	1.726	.0843	
T9	-.2509497223	.23670791	-1.060	.2891	
T10	-.3229861554	.26605508	-1.214	.2248	
T11	-.3806758672	.23265761	-1.636	.1018	
T12	.3032005972	.24803416	1.222	.2216	
T13	-1.631241395	.22285642	-7.320	.0000	
T14	-1.938373986	.27306641	-7.099	.0000	
T15	-1.118861525	.34034141	-3.287	.0010	
T16	-2.522832268	.56004348	-4.505	.0000	
T17	.9253162639	.40672592	2.275	.0229	
T18	.9669213919	.43943446	2.200	.0278	
T19	-1.149503253	.26350984	-4.362	.0000	
T20	-.3014604211	.26317593	-1.145	.2520	
T21	1.481085498	.21654987	6.839	.0000	
T22	.2393949770	.26801364	.893	.3717	
T23	.6262853498	.24212639	2.587	.0097	
T24	1.130792309	.24177622	4.677	.0000	
T25	-1.509891353	.18645981	-8.098	.0000	
T26	-.2041385183	.24438830	-.835	.4035	
T27	-.5240649361	.20309529	-2.580	.0099	
T28	-.9236818606	.21848527	-4.228	.0000	
T29	-1.115874516	.41039724	-2.719	.0065	
T30	-.5254827294E-01	.32154379	-.163	.8702	
T31	-1.705191690	.28079089	-6.073	.0000	
T32	.9975211399	.26740476	3.730	.0002	
T33	1.348130759	.34020464	3.963	.0001	
T34	-.3351544054	.53770764	-.623	.5331	
T35	-.1850419847	.50349397E-01	-3.675	.0002	
T36	-.4962249358	.22057632	-2.250	.0245	
T37	1.036824643	.17545783	5.909	.0000	
T38	1.140670431	.20174580	5.654	.0000	
T39	.7184567404	.25526884	2.815	.0049	
	Attributes of Branch Choice Equations (Mobility Decision Level)				
M2	.5065495350E-01	.24490453E-02	20.684	.0000	
M3	.1102321302	.11787338	.935	.3497	
M4	.2245971463	.39175298E-01	5.733	.0000	
M5	-.1248819858	.98427222E-01	-1.269	.2045	
M6	.2173577943	.16599858	1.309	.1904	
M7	-.5128515789E-01	.13085181	-.392	.6951	
M10	.4417264874E-01	.11499636	.384	.7009	
M11	.2859884510	.15076375	1.897	.0578	
M12	-.1414474463	.98539858E-01	-1.435	.1512	
	Inclusive Value Parameters				
NOMOVE	1.000000000	.....(Fixed Parameter).....			
MOVEYES	.3347962275	.43631050E-01	7.673	.0000	

Variable Definition

T1 : Constant

T2 : Lntcos—Log user cost by tenures

Lnatcost—Log net user cost by tenures

T3 : Agehsoc—Age of the household head interacted with social renting

T4 : Agehprv—Age of the household head interacted with private renting

T7 : Ndepsoc—Number of dependent children interacted with social renting

T8 : Ndepprv—Number of dependent children interacted with private renting

T9 : Marrysoc—Marital status of the household head interacted with social renting

T10: Marryprv—Marital status of the household head interacted with private renting

T11: Malesoc—Male household head interacted with social renting

T12: Maleprv—Male household head interacted with private renting

T13: Fullsoc—Household head in full time work interacted with social renting

T14: Fullprv—Household head in full time work interacted with private renting

T15: Partsoc—Household head in part time work interacted with social renting

T16: Partprv—Household head in part time work interacted with

T17: Unempsoc—Household head in unemployment interacted with social renting

T18: Unempprv—Household head in unemployment interacted with private renting

T19: Pvownsoc—Previous tenure were owner-occupation interacted with social renting

T20: Pvownprv—Previous tenure is owner-occupation interacted with private renting

T21: Pvsocsoc—Previous tenure is social renting interacted with social renting

T22: Pvsocprv—Previous tenure is social renting interacted with private renting

T23: Pvprvsoc—Previous tenure is private renting interacted with social renting

T24: Pvprvprv—Previous tenure is private renting interacted with private renting

T25: Houssoc—Household living in house interacted with social renting

T26: Housprv—Household living in house interacted with private renting

T27: Urbansoc—Household living in urban area interacted with social renting

T28: Urbanprv—Household living in urban area interacted with private renting

T29: Afownsoc—Household living in neighbourhood predominated by affluent owners interacted with social renting

T30: Afownprv—Household living in neighbourhood predominated by affluent owners interacted with private renting

T31: Pvctysoc—Household living in neighbourhood predominated by inner city private tenants interacted with social renting

T32: Pvctyprv—Household living in neighbourhood predominated by inner city private tenants interacted with private renting

T33: Pocnlsoc—Household living in neighbourhood predominated by the poorest council tenants interacted with social renting

T34: Pocnlprv—Household living in neighbourhood predominated by the poorest council tenants interacted with private renting

T35: Lnincosc—Log household long term income interacted with social renting

T36: Lnincprv—Log household long term income interacted with private renting

T37: Mratsoc—Mortgage rationing interacted with social renting

T38: Mratprv—Mortgage rationing interacted with private renting

T39: Sratprv—Social housing rationing interacted with private renting

M2 : Ageheads—Age of the household head interacted with stay

M3 : Marrys—Marital status of the household head interacted with stay

M4 : Ndepchs—Number of dependent children interacted with stay

M5 : Males—Male household head interacted with stay

M6 : Unemps—Household head in unemployment interacted with stay

M7 : Lnincs—Log household long term income interacted with stay

M10: Affowns—Household in neighbourhood predominated by affluent owners interacted with stay

M11: Porcnl—Household in neighbourhood predominated by the poorest council tenants interacted with stay

M12: Pvcitys—Household in neighbourhood predominated by inner city private tenants interacted with stay

APPENDIX III Appendix to Chapter Seven

A.7.1 Limdep Programme of the Simulation Results of the NMNL Mobility and Tenure Choice Model

1. The Simulation Results of the Change in the User Cost (Change in Income Tax Rate)

```
+----------------------------------------+
| FIML: Nested Multinomial Logit Model   |
| Maximum Likelihood Estimates           |
| Dependent variable            ACHOICE  |
| Weighting variable                ONE  |
| Number of observations          52048  |
| Iterations completed               75  |
| Log likelihood function      -4899.514 |
| Restricted log likelihood    -10584.75 |
| Chi-squared                   11370.48 |
| Degrees of freedom                44  |
| Significance level             .0000000 |
| R2=1-LogL/LogL*  Log-L fncn  R-sqrd  RsqAdj |
| No coefficients -10584.7536  .53712  .53659 |
| Constants only   -5991.4232  .18225  .18132 |
| At start values -18038.4622  .72839  .72808 |
| Response data are given as ind. choice.  |
+----------------------------------------+

+----------------------------------------+
| FIML: Nested Multinomial Logit Model   |
| The model has 2 levels.                |
| Coefs. for branch level begin with M2  |
| Number of obs.= 13012, skipped   0 bad obs. |
+----------------------------------------+

+---------+-------------+----------------+-------+--------+----------+
|Variable | Coefficient | Standard Error |b/St.Er.|P[|Z|>z] | Mean of X|
+---------+-------------+----------------+-------+--------+----------+
         Attributes in the Utility Functions
         (Tenure Choice Level)
 T1      -9.180816900      1.8641276       -4.925    .0000
 T2      -.1808371070      .15482210       -2.042    .0408
 T3      -.1076580423E-01  .63590565E-02   -1.693    .0905
 T4      -.5435099530E-01  .74087827E-02   -7.336    .0000
 T7       .3074662724      .94560757E-01    3.252    .0011
 T8       .1669533915      .10563016        1.581    .1140
 T9      -.7640698791      .22334586       -3.421    .0006
 T10     -.6320416444      .25001437       -2.528    .0115
 T11     -.4111520615      .23174524       -1.774    .0760
 T12      .3710912402      .24284702        1.528    .1265
 T13     -1.760397652      .22806456       -7.719    .0000
 T14     -1.615935217      .25078060       -6.444    .0000
 T15     -1.224152681      .35915162       -3.408    .0007
 T16     -2.250021198      .55773476       -4.034    .0001
 T17      .7552406387      .40856411        1.849    .0645
 T18      .6554388472      .43068303        1.522    .1280
 T19     -1.128616004      .26838415       -4.205    .0000
 T20     -.1621707194      .26177856        -.619    .5356
 T21      1.588357507      .22293323        7.125    .0000
 T22      .3195990551      .26988904        1.184    .2363
 T23      .6953434978      .24913584        2.791    .0053
 T24      1.223685592      .24333753        5.029    .0000
 T25     -1.502874046      .19119978       -7.860    .0000
 T26     -.1135648127      .24488904        -.464    .6428
 T27     -.4574963825      .20885354       -2.191    .0285
 T28     -.8595830494      .21928977       -3.920    .0001
 T29     -1.091536567      .41524092       -2.629    .0086
 T30      .4193246937E-01  .31791677         .132    .8951
```

T31	-1.602446848	.27929457	-5.737	.0000
T32	1.125618627	.26311503	4.278	.0000
T33	1.487371374	.33651167	4.420	.0000
T34	-.2383465084	.53270158	-.447	.6546
T35	-.2959666855	.49143291E-01	-6.023	.0000
T36	-.7190538067	.21823064	-3.295	.0010
	Attributes of Branch Choice Equations			
	(Mobility Decision Level)			
M2	.5560003564E-01	.23371793E-02	23.789	.0000
M3	-.1851614225	.11707819	-1.582	.1138
M4	.1908977910	.38170306E-01	5.001	.0000
M5	-.1474959542	.93047884E-01	-1.585	.1129
M6	.9789495456E-01	.14782342	.662	.5078
M7	.6197683186	.13535880	4.579	.0000
M10	.1224119057E-01	.11391884	.107	.9144
M11	.3183133761	.14133228	2.252	.0243
M12	-.1784462199	.94286308E-01	-1.893	.0584
	Inclusive Value Parameters			
NOMOVE	1.000000000	.....(Fixed Parameter).....		
MOVEYES	.2566781032	.43318332E-01	5.925	.0000

2. Simulation Results of the Change in the Net User Cost (Change in Income Tax Rate)

FIML: Nested Multinomial Logit Model	
Maximum Likelihood Estimates	
Dependent variable	ACHOICE
Weighting variable	ONE
Number of observations	52048
Iterations completed	76
Log likelihood function	-4897.270
Restricted log likelihood	-10584.75
Chi-squared	11374.97
Degrees of freedom	44
Significance level	.0000000

R2=1-LogL/LogL*	Log-L fncn	R-sqrd	RsqAdj
No coefficients	-10584.7536	.53733	.53681
Constants only	-5991.4232	.18262	.18170
At start values	-18038.4622	.72851	.72820

Response data are given as ind. choice.

FIML: Nested Multinomial Logit Model	
The model has 2 levels.	
Coefs. for branch level begin with M2	
Number of obs.= 13012, skipped	0 bad obs.

Variable	Coefficient	Standard Error	b/St.Er.	P[|Z|>z]	Mean of X
	Attributes in the Utility Functions				
	(Tenure Choice Level)				
T1	-10.42669010	1.8837176	-5.535	.0000	
T2	-.2895485592	.12040969	-2.405	.0162	
T3	-.1068102626E-01	.63254247E-02	-1.689	.0913	
T4	-.5463466065E-01	.73886014E-02	-7.394	.0000	
T7	.3083383559	.94244770E-01	3.272	.0011	
T8	.1752781708	.10570318	1.658	.0973	
T9	-.7446898570	.22242433	-3.348	.0008	
T10	-.5532769891	.25130873	-2.202	.0277	
T11	-.4104114237	.23098136	-1.777	.0756	
T12	.3730337945	.24304870	1.535	.1248	
T13	-1.763761884	.22523811	-7.831	.0000	

T14	-1.592014259	.24902154	-6.393	.0000
T15	-1.209780748	.35429434	-3.415	.0006
T16	-2.227954657	.55678952	-4.001	.0001
T17	.7597925053	.40735382	1.865	.0622
T18	.6700571257	.43027753	1.557	.1194
T19	-1.119257072	.26628406	-4.203	.0000
T20	-.1426328252	.26065433	-.547	.5842
T21	1.577209022	.22048754	7.153	.0000
T22	.3093161955	.26838711	1.153	.2491
T23	.6948256247	.24674103	2.816	.0049
T24	1.222081816	.24179952	5.054	.0000
T25	-1.504664313	.18918338	-7.953	.0000
T26	-.1113482713	.24379862	-.457	.6479
T27	-.4462359908	.20654582	-2.160	.0307
T28	-.8503276443	.21831671	-3.895	.0001
T29	-1.090285981	.41340487	-2.637	.0084
T30	.5195165174E-01	.31796256	.163	.8702
T31	-1.618867372	.27729688	-5.838	.0000
T32	1.100719827	.26275091	4.189	.0000
T33	1.461221685	.33632988	4.345	.0000
T34	-.2796075648	.53370073	-.524	.6003
T35	-.2827821517	.49049775E-01	-5.765	.0000
T36	-.8604563284	.22033077	-3.905	.0001
	Attributes of Branch Choice Equations			
	(Mobility Decision Level)			
M2	.5552164387E-01	.23584199E-02	23.542	.0000
M3	-.1919820392	.11606866	-1.654	.0981
M4	.1867219789	.38935925E-01	4.796	.0000
M5	-.1459168058	.94130488E-01	-1.550	.1211
M6	.1020732023	.15220665	.671	.5025
M7	.6408412354	.14284749	4.486	.0000
M10	.3832434934E-01	.11442875	.335	.7377
M11	.3096103490	.14317174	2.163	.0306
M12	-.1509708424	.96017968E-01	-1.572	.1159
	Inclusive Value Parameters			
NOMOVE	1.000000000	.....(Fixed Parameter).....		
MOVEYES	.2757186915	.45786067E-01	6.022	.0000

3. Simulation Results of the Change in Mortgage Rationing Criteria

FIML: Nested Multinomial Logit Model	
Maximum Likelihood Estimates	
Dependent variable	ACHOICE
Weighting variable	ONE
Number of observations	52048
Iterations completed	58
Log likelihood function	-4826.890
Restricted log likelihood	-10584.75
Chi-squared	11515.73
Degrees of freedom	47
Significance level	.0000000

R2=1-LogL/LogL*	Log-L fncn	R-sqrd	RsqAdj
No coefficients	-10584.7536	.54398	.54343
Constants only	-5991.4232	.19437	.19340
At start values	-18038.4622	.73241	.73209

Response data are given as ind. choice.

FIML: Nested Multinomial Logit Model
The model has 2 levels.
Coefs. for branch level begin with M2
Number of obs.= 13012, skipped 0 bad obs.

Variable	Coefficient	Standard Error	b/St.Er.	P[|Z|>z]	Mean of X
	Attributes in the Utility Functions (Tenure Choice Level)				
T1	-6.151051062	1.8836195	-3.266	.0011	
T2	-.8853039139	.13799907	-6.415	.0000	
T3	.2890046868E-03	.67115379E-02	.043	.9657	
T4	-.3691060049E-01	.79283337E-02	-4.656	.0000	
T7	.3370448152	.97069471E-01	3.472	.0005	
T8	.2163295699	.10918744	1.981	.0476	
T9	-.2680706920	.23573847	-1.137	.2555	
T10	-.4735688218	.25983336	-1.823	.0684	
T11	-.3579348633	.24002685	-1.491	.1359	
T12	.3382297507	.25127254	1.346	.1783	
T13	-1.742733460	.23537779	-7.404	.0000	
T14	-2.117348702	.28326004	-7.475	.0000	
T15	-1.118731301	.35900394	-3.116	.0018	
T16	-2.568702646	.56647459	-4.535	.0000	
T17	.9503230436	.42442855	2.239	.0252	
T18	1.004205345	.45350330	2.214	.0268	
T19	-1.163319982	.27369312	-4.250	.0000	
T20	-.2735696851	.26683549	-1.025	.3053	
T21	1.540199585	.22745648	6.771	.0000	
T22	.2888985084	.27580108	1.047	.2949	
T23	.6133848350	.24998839	2.454	.0141	
T24	1.101544402	.24754508	4.450	.0000	
T25	-1.585783754	.19722463	-8.040	.0000	
T26	-.2487798836	.24895702	-.999	.3177	
T27	-.6515989042	.21552772	-3.023	.0025	
T28	-1.041488998	.22596025	-4.609	.0000	
T29	-1.070070345	.42646259	-2.509	.0121	
T30	.3799604065E-01	.32817957	.116	.9078	
T31	-1.768260476	.28952005	-6.108	.0000	
T32	.9499544722	.27200999	3.492	.0005	
T33	1.395567258	.35435050	3.938	.0001	
T34	-.3036953116	.54416266	-.558	.5768	
T35	-.9093458302E-01	.53662507E-01	-1.695	.0902	
T36	-.5668497827	.21651100	-2.618	.0088	
T37	1.856364895	.21275677	8.725	.0000	
T38	1.707445432	.25572325	6.677	.0000	
T39	.7861062595	.25923930	3.032	.0024	
	Attributes of Branch Choice Equations (Mobility Decision Level)				
M2	.5138780785E-01	.24343515E-02	21.109	.0000	
M3	.1268957050	.11706368	1.084	.2784	
M4	.2270153827	.38799917E-01	5.851	.0000	
M5	-.1083284715	.96455338E-01	-1.123	.2614	
M6	.2045091755	.15961160	1.281	.2001	
M7	-.6088072760E-01	.13337963	-.456	.6481	
M10	.4814844496E-01	.11450391	.420	.6741	
M11	.2486665960	.14556239	1.708	.0876	
M12	-.1557465927	.96904874E-01	-1.607	.1080	
	Inclusive Value Parameters				
NOMOVE	1.000000000	.....(Fixed Parameter).....			
MOVEYES	.3007583196	.39393675E-01	7.635	.0000	

A.7.2 The McClements' Equivalence Scales

Married couple		1.00
Single adult (householder)		0.55
2nd adult (non-household)		0.45
3rd adult (non-householder)		0.45
4th adult (non-householder)		0.40
Child age	16-17	0.38
	13-15	0.28
	11-12	0.26
	8-10	0.23
	5-7	0.21
	2-4	0.18
	0-1	0.07

Source: Central Statistical Office (1987), p.112.

A.7.3. The Average Household Income by Tenures and by Income Quintiles

Table A.7.3.1 Household Income and Equivalent Household Income by Tenures and by Income Quintile, Scotland 1996

(Average weekly income £)

Income Quintile	Household Income					Equivalent Household Income				
	Outright Owners	Mortgaged Owners	LA Tenants	HA Tenants	Private Tenants	Outright Owners	Mortgaged Owners	LA Tenants	HA Tenants	Private Tenants
Bottom	67.50	140.48	74.15	71.21	61.93	102.49	125.50	84.19	91.34	67.60
2nd	111.72	252.16	105.52	102.94	111.42	142.54	209.56	126.00	133.82	127.87
3rd	162.95	330.58	136.21	130.06	163.87	196.70	277.95	156.36	168.01	175.38
4th	240.63	422.50	177.70	170.41	234.45	264.70	359.71	189.21	208.92	239.89
Top	491.60	646.16	287.77	283.45	416.47	483.23	566.07	286.70	342.03	421.52
Total Avg.	214.79	358.35	156.23	151.59	197.48	237.90	307.74	168.46	188.69	206.18

Source: 1996 Scottish House Condition Survey (own analysis)

Table A.7.3.2 Equivalent Household Income by Tenures and by Income Quintiles in Four Cities of Scotland, 1996 (Average Weekly income £)

Quintile	Outright Owners	Mortgaged Owners	Social Tenants	Private Tenants
Aberdeen				
Bottom	97.43	149.27	83.02	45.42
2nd	151.82	241.99	128.14	105.93
3rd	205.06	309.88	159.86	162.03
4th	287.56	389.00	188.33	282.50
Top	595.12	652.32	278.99	505.95
Total Avg.	265.67	346.86	167.15	215.40
Dundee				
Bottom	90.41	90.71	82.61	39.37
2nd	155.68	170.44	126.60	100.38
3rd	219.51	248.15	153.60	119.53
4th	321.63	315.57	189.22	234.43
Top	583.62	490.53	302.64	413.93
Total Avg.	269.99	261.39	170.13	184.61
Edinburgh				
Bottom	88.83	135.18	87.32	45.55
2nd	139.81	232.13	136.02	100.84
3rd	192.15	313.44	166.61	149.42
4th	279.24	404.20	200.37	228.21
Top	563.52	734.05	288.53	432.13
Total Avg.	251.22	362.52	175.56	189.57
Glasgow				
Bottom	76.46	103.46	77.55	46.39
2nd	126.82	196.53	118.21	111.02
3rd	173.18	267.04	148.73	164.19
4th	244.47	365.78	185.57	207.34
Top	493.96	603.48	285.46	405.47
Total Avg.	220.66	306.62	162.98	185.36

Source: 1996 Scottish House Condition Survey (own analysis)

Table A.7.3.3 Equivalent Household Income Ranges in Scotland, 1996

Income Quintile	Weekly Income Range (£)
Bottom	0-121.80
2nd	121.81-167.69
3rd	167.70-222.55
4th	222.56-322.84
Top	322.85-6833.77

Source: 1996 Scottish House Condition Survey (own analysis)

Table A.7.3.4 Equivalent Household Income Ranges in Four Cities of Scotland, 1996

Income Quintile	Weekly Income Range (£)
Aberdeen	
Bottom	0-125.77
2nd	125.78-175.80
3rd	175.81-243.08
4th	243.09-345.07
Top	345.08-1540.42
Dundee	
Bottom	0-115.25
2nd	115.26-151.54
3rd	151.55-209.10
4th	209.11-304.02
Top	304.03-1089.73
Edinburgh	
Bottom	0-123.64
2nd	123.65-177.27
3rd	177.28-243.64
4th	243.65-358.81
Top	358.82-5006.61
Glasgow	
Bottom	0-107.31
2nd	107.32-147.27
3rd	147.28-190.07
4th	190.08-279.10
Top	279.11-1904.31

Source: 1996 Scottish House Condition Survey (own analysis)

A.7.4 Annex Tables to Tenure Polarisation in Scotland and in Four Cities, 1996

Table A.7.4.1 Tenure Distributions within Income Quintiles in Scotland 1996

(Percentage of households)

Income Quintile	Outright Owners	Mortgaged Owners	LA Tenants	HA Tenants	Private Tenants	Total (%)
Bottom	24	14	44	8	10	100
2nd	17	17	50	9	7	100
3rd	15	29	41	9	6	100
4th	16	50	22	6	7	100
Top	19	66	7	2	5	100
Total	18	35	33	7	7	100

Source: 1996 Scottish House Condition Survey (own analysis)

Table A.7.4.2 Tenure Distributions within Income Quintile in Four Cities of Scotland 1996 (Percentage of households)

Income Quintile	Outright Owners	Mortgaged Owners	Social Tenants	HA Tenants	Private Tenants	Total (%)
Aberdeen						
Bottom	16	10	54	4	16	100
2nd	13	9	63	8	8	100
3rd	21	33	40	3	3	100
4th	9	59	23	3	5	100
Top	17	70	2	2	9	100
Dundee						
Bottom	10	23	41	12	14	100
2nd	10	22	43	20	5	100
3rd	9	20	54	12	5	100
4th	14	47	22	7	10	100
Top	19	55	16	4	5	100
Edinburgh						
Bottom	28	14	16	14	28	100
2nd	25	18	29	17	11	100
3rd	23	29	25	12	10	100
4th	19	55	9	6	10	100
Top	21	69	2	2	6	100
Glasgow						
Bottom	12	13	49	17	9	100
2nd	9	9	52	25	5	100
3rd	12	14	44	23	7	100
4th	9	30	32	21	7	100
Top	13	58	12	13	5	100

Source: 1996 Scottish House Condition Survey (own analysis)

A.7.5 Annex Tables to Housing Subsidies to Households in Different Tenures in Four Cities of Scotland, 1996

Table A.7.5.1 Housing Subsidies to Owners in Four Cities of Scotland, 1996
(Weekly £)

Income Quintile	Mean Income	Economic Subsidies	% of Econ. Sub. To Mean Income	Average MIRAS [1]	% of MIRAS to Mean Income	% of Total Sub. To Mean Income
Aberdeen						
Bottom	90.24	15.25	16.9%	3.61	4.0%	20.9%
(No. of obs.)	(30)	(24)		(10)		
2nd	151.90	17.41	11.5%	4.27	2.8%	14.3%
(No. of obs.)	(25)	(16)		(5)		
3rd	205.85	15.48	7.5%	3.88	1.9%	9.4%
(No. of obs.)	(62)	(39)		(25)		
4th	291.54	12.78	4.4%	4.64	1.6%	6.0%
(No. of obs.)	(79)	(55)		(54)		
Top	531.24	14.56	2.7%	5.00	0.9%	3.7%
(No. of obs.)	(101)	(66)		(67)		
Total Avg	323.08	14.56	4.5%	4.60	1.4%	5.9%
(No. of obs.)	(297)	(200)		(161)		
Dundee						
Bottom	76.75	14.21	18.5%	3.50	4.6%	23.1%
(No. of obs.)	(31)	(19)		(18)		
2nd	133.44	14.00	10.5%	3.45	2.6%	13.1%
(No. of obs.)	(30)	(25)		(18)		
3rd	183.53	13.53	7.4%	3.58	1.9%	9.3%
(No. of obs.)	(27)	(23)		(17)		
4th	253.27	14.53	5.7%	3.95	1.6%	7.3%
(No. of obs.)	(57)	(38)		(32)		
Top	444.26	14.91	3.4%	4.85	1.1%	4.4%
(No. of obs.)	(69)	(52)		(42)		
Total Avg	263.68	14.39	5.5%	4.06	1.5%	7.0%
(No. of obs.)	(214)	(157)		(127)		
Edinburgh						
Bottom	92.54	15.99	17.3%	4.55	4.9%	22.2%
(No. of obs.)	(108)	(75)		(27)		
2nd	152.24	15.45	10.1%	4.10	2.7%	12.8%
(No. of obs.)	(111)	(83)		(34)		
3rd	210.18	14.72	7.0%	4.17	2.0%	9.0%
(No. of obs.)	(136)	(101)		(54)		
4th	303.91	13.37	4.4%	4.68	1.5%	5.9%
(No. of obs.)	(192)	(138)		(111)		
Top	583.17	14.05	2.4%	5.13	0.9%	3.3%
(No. of obs.)	(231)	(171)		(146)		
Total Avg	319.46	14.47	4.5%	4.72	1.5%	6.0%
(No. of obs.)	(778)	(568)		(372)		
Glasgow						
Bottom	77.88	13.83	17.8%	3.81	4.9%	22.6%
(No. of obs.)	(97)	(69)		(37)		
2nd	125.78	14.33	11.4%	3.22	2.6%	14.0%
(No. of obs.)	(70)	(49)		(22)		
3rd	169.68	13.97	8.2%	3.75	2.2%	10.4%
(No. of obs.)	(102)	(77)		(42)		
4th	235.24	11.37	4.8%	4.19	1.8%	6.6%
(No. of obs.)	(154)	(109)		(94)		
Top	455.81	10.68	2.3%	5.01	1.1%	3.4%
(No. of obs.)	(277)	(193)		(190)		
Total Avg	280.22	12.19	4.4%	4.45	1.6%	5.9%

(No. of obs.)	(700)	(497)		(385)		

Source: 1996 Scottish House Condition Survey (own analysis)

Table A.7.5.2 Housing Subsidies to Renters in Four Cities of Scotland, 1996 (Weekly £)

Income Quintile	Mean Income	Economic Subsidies	% of Econ. Sub. To Mean Income	Average HB	% of HB to Mean Income	% of Total Sub. To Mean Income
Aberdeen						
Bottom	89.03	15.12	17.0%	31.72	35.6%	52.6%
(No. of obs.)	(86)	(71)		(34)		
2nd	152.89	15.37	10.1%	23.82	15.6%	25.6%
(No. of obs.)	(91)	(75)		(39)		
3rd	201.33	16.89	8.4%	26.62	13.2%	21.6%
(No. of obs.)	(54)	(43)		(19)		
4th	282.09	12.70	4.5%	40.88	14.5%	19.0%
(No. of obs.)	(37)	(27)		(12)		
Top	466.10	0.00	0.0%	0.00	0.0%	0.0%
(No. of obs.)	(14)	(7)		(0)		
Total Avg	175.19	14.96	8.5%	28.88	16.5%	25.0%
(No. of obs.)	(282)	(223)		(104)		
Dundee						
Bottom	81.10	7.89	9.7%	31.44	38.8%	48.5%
(No. of obs.)	(63)	(50)		(33)		
2nd	135.10	6.86	5.1%	34.56	25.6%	30.7%
(No. of obs.)	(64)	(48)		(47)		
3rd	157.84	6.81	4.3%	31.44	19.9%	24.2%
(No. of obs.)	(66)	(55)		(43)		
4th	246.94	8.59	3.5%	34.15	13.8%	17.3%
(No. of obs.)	(37)	(27)		(13)		
Top	382.06	5.79	1.5%	34.14	8.9%	10.5%
(No. of obs.)	(24)	(19)		(8)		
Total Avg	172.24	7.24	4.2%	32.85	19.1%	23.3%
(No. of obs.)	(254)	(199)		(144)		
Edinburgh						
Bottom	83.73	3.82	4.6%	34.49	41.2%	45.8%
(No. of obs.)	(150)	(123)		(52)		
2nd	151.60	5.50	3.6%	31.67	20.9%	24.5%
(No. of obs.)	(148)	(131)		(97)		
3rd	205.63	2.58	1.3%	38.79	18.9%	20.1%
(No. of obs.)	(122)	(107)		(83)		
4th	287.63	1.55	0.5%	42.70	14.8%	15.4%
(No. of obs.)	(66)	(53)		(24)		
Top	495.36	1.11	0.2%	36.00	7.3%	7.5%
(No. of obs.)	(27)	(25)		(2)		
Total Avg	180.20	3.59	2.0%	35.59	19.7%	21.7%
(No. of obs.)	(513)	(439)		(258)		
Glasgow						
Bottom	78.27	8.79	11.2%	28.93	37.0%	48.2%
(No. of obs.)	(294)	(249)		(193)		
2nd	127.87	8.64	6.8%	29.94	23.4%	30.2%
(No. of obs.)	(322)	(261)		(242)		
3rd	168.31	7.39	4.4%	30.27	18.0%	22.4%
(No. of obs.)	(288)	(241)		(224)		
4th	226.50	6.41	2.8%	33.22	14.7%	17.5%
(No. of obs.)	(238)	(202)		(144)		
Top	361.85	6.34	1.8%	36.62	10.1%	11.9%

(No. of obs.)	(113)	(96)		(59)		
Total Avg	165.30	7.75	4.7%	30.80	18.6%	23.3%
(No. of obs.)	(1255)	(1049)		(862)		

Source: 1996 Scottish House Condition Survey (own analysis)

Table A.7.5.3 Housing Subsidies to Outright Owners in Four Cities of Scotland, 1996

(Weekly £)

Income Quintile	Mean Income	Economic Subsidies	% of Econ. Sub. To Mean Income
Aberdeen			
Bottom	97.43	17.55	18.0%
(No. of obs.)	(18)	(15)	
2nd	148.22	20.48	13.8%
(No. of obs.)	(15)	(11)	
3rd	208.11	21.47	10.3%
(No. of obs.)	(24)	(16)	
4th	288.25	18.08	6.3%
(No. of obs.)	(10)	(8)	
Top	562.98	21.86	3.9%
(No. of obs.)	(20)	(17)	
Total Avg	265.67	20.12	7.6%
(No. of obs.)	(87)	(67)	
Dundee			
Bottom	81.71	24.19	29.6%
(No. of obs.)	(9)	(7)	
2nd	128.84	18.46	14.3%
(No. of obs.)	(9)	(8)	
3rd	188.81	17.65	9.4%
(No. of obs.)	(8)	(7)	
4th	241.54	25.31	10.5%
(No. of obs.)	(13)	(12)	
Top	491.33	21.91	4.5%
(No. of obs.)	(18)	(17)	
Total Avg	269.99	21.90	8.1%
(No. of obs.)	(57)	(51)	
Edinburgh			
Bottom	93.52	18.48	19.8%
(No. of obs.)	(72)	(53)	
2nd	150.22	18.83	12.5%
(No. of obs.)	(65)	(54)	
3rd	209.85	19.72	9.4%
(No. of obs.)	(60)	(55)	
4th	300.71	21.77	7.2%
(No. of obs.)	(50)	(41)	
Top	583.22	25.11	4.3%
(No. of obs.)	(54)	(44)	
Total Avg	251.22	20.56	8.2%
(No. of obs.)	(301)	(247)	
Glasgow			
Bottom	77.79	16.60	21.3%
(No. of obs.)	(45)	(37)	
2nd	124.85	16.61	13.3%
(No. of obs.)	(36)	(30)	
3rd	170.24	18.21	10.7%
(No. of obs.)	(47)	(40)	

4th	229.86	17.84	7.8%
(No. of obs.)	(36)	(32)	
Top	454.32	19.47	4.3%
(No. of obs.)	(51)	(38)	
Total Avg	220.66	17.81	8.1%
(No. of obs.)	(215)	(177)	

Source: 1996 Scottish House Condition Survey (own analysis)

Table A.7.5.4 Housing Subsidies to Mortgaged Owners in Four Cities of Scotland, 1996 (Weekly £)

Income Quintile	Mean Income	Economic Subsidies	% of Econ. Sub. To Mean Income	Average MIRAS	% of MIRAS to Mean Income	% of Total Sub. To Mean Income
Aberdeen						
Bottom	79.47	11.41	14.4%	3.61	4.5%	18.9%
(No. of obs.)	(12)	(9)		(10)		
2nd	157.42	10.65	6.8%	4.27	2.7%	9.5%
(No. of obs.)	(10)	(5)		(5)		
3rd	204.43	11.32	5.5%	3.88	1.9%	7.4%
(No. of obs.)	(38)	(23)		(25)		
4th	292.02	11.88	4.1%	4.64	1.6%	5.7%
(No. of obs.)	(69)	(47)		(54)		
Top	523.40	12.03	2.3%	5.00	1.0%	3.3%
(No. of obs.)	(81)	(49)		(67)		
Total Avg	346.86	11.76	3.4%	4.60	1.3%	4.7%
(No. of obs.)	(210)	(133)		(161)		
Dundee						
Bottom	74.73	8.39	11.2%	3.50	4.7%	15.9%
(No. of obs.)	(22)	(12)		(18)		
2nd	135.41	11.91	8.8%	3.45	2.6%	11.3%
(No. of obs.)	(21)	(17)		(18)		
3rd	181.31	11.73	6.5%	3.58	2.0%	8.4%
(No. of obs.)	(19)	(16)		(17)		
4th	256.74	9.56	3.7%	3.95	1.5%	5.3%
(No. of obs.)	(44)	(26)		(32)		
Top	427.65	11.51	2.7%	4.85	1.1%	3.8%
(No. of obs.)	(51)	(35)		(42)		
Total Avg	261.39	10.78	4.1%	4.06	1.6%	5.7%
(No. of obs.)	(157)	(106)		(127)		
Edinburgh						
Bottom	90.59	9.99	11.0%	4.55	5.0%	16.0%
(No. of obs.)	(36)	(22)		(27)		
2nd	155.11	9.16	5.9%	4.10	2.6%	8.5%
(No. of obs.)	(46)	(29)		(34)		
3rd	210.43	8.75	4.2%	4.17	2.0%	6.1%
(No. of obs.)	(76)	(46)		(54)		
4th	305.03	9.82	3.2%	4.68	1.5%	4.8%
(No. of obs.)	(142)	(97)		(111)		
Top	583.16	10.22	1.8%	5.13	0.9%	2.6%
(No. of obs.)	(177)	(127)		(146)		
Total Avg	362.52	9.78	2.7%	4.72	1.3%	4.0%
(No. of obs.)	(477)	(321)		(372)		
Glasgow						
Bottom	77.96	10.63	13.6%	3.81	4.9%	18.5%
(No. of obs.)	(52)	(32)		(37)		
2nd	126.77	12.63	10.0%	3.22	2.5%	12.5%

(No. of obs.)	(34)	(19)		(22)		
3rd	169.21	12.20	7.2%	3.75	2.2%	9.4%
(No. of obs.)	(55)	(37)		(42)		
4th	236.88	9.39	4.0%	4.19	1.8%	5.7%
(No. of obs.)	(118)	(77)		(94)		
Top	456.15	8.68	1.9%	5.01	1.1%	3.0%
(No. of obs.)	(226)	(155)		(190)		
Total Avg	306.62	8.52	2.8%	4.45	1.5%	4.2%
(No. of obs.)	(485)	(320)		(385)		

Source: 1996 Scottish House Condition Survey (own analysis)

Table A.7.5.5 Housing Subsidies to Social Tenants in Four Cities of Scotland, 1996

(Weekly £)

Income Quintile	Mean Income	Economic Subsidies	% of Econ. Sub. To Mean Income	Average HB	% of HB to Mean Income	% of Total Sub. To Mean Income
Aberdeen						
Bottom	93.78	19.18	20.5%	24.92	26.6%	47.0%
(No. of obs.)	(68)	(56)		(33)		
2nd	153.53	17.20	11.2%	21.90	14.3%	25.5%
(No. of obs.)	(82)	(67)		(38)		
3rd	199.34	18.15	9.1%	26.62	13.4%	22.5%
(No. of obs.)	(50)	(40)		(19)		
4th	281.46	14.14	5.0%	28.99	10.3%	15.3%
(No. of obs.)	(31)	(24)		(9)		
Top	405.34	0.00	0.0%	0.00	0.0%	0.0%
(No. of obs.)	(4)	(0)		(0)		
Total Avg	167.15	17.82	10.7%	24.46	14.6%	25.3%
(No. of obs.)	(235)	(187)		(99)		
Dundee						
Bottom	86.78	10.39	12.0%	31.44	36.2%	48.2%
(No. of obs.)	(50)	(38)		(33)		
2nd	135.30	6.48	4.8%	33.30	24.6%	29.4%
(No. of obs.)	(59)	(45)		(46)		
3rd	177.52	7.35	4.1%	28.67	16.2%	20.3%
(No. of obs.)	(61)	(51)		(39)		
4th	246.05	11.04	4.5%	17.72	7.2%	11.7%
(No. of obs.)	(28)	(21)		(8)		
Top	362.01	7.34	2.0%	37.31	10.3%	12.3%
(No. of obs.)	(19)	(15)		(7)		
Total Avg	170.13	8.25	4.8%	30.76	18.1%	22.9%
(No. of obs.)	(217)	(170)		(133)		
Edinburgh						
Bottom	90.64	7.04	7.8%	31.75	35.0%	42.8%
(No. of obs.)	(77)	(61)		(43)		
2nd	151.17	5.28	3.5%	31.23	20.7%	24.2%
(No. of obs.)	(119)	(106)		(88)		
3rd	204.10	2.39	1.2%	34.69	17.0%	18.2%
(No. of obs.)	(97)	(85)		(72)		
4th	285.83	2.35	0.8%	33.50	11.7%	12.5%
(No. of obs.)	(40)	(35)		(17)		
Top	401.68	3.07	0.8%	36.00	9.0%	9.7%
(No. of obs.)	(10)	(9)		(2)		
Total Avg	175.56	4.40	2.5%	32.67	18.6%	21.1%
(No. of obs.)	(343)	(296)		(222)		
Glasgow						

Bottom	80.92	9.83	12.1%	28.26	34.9%	47.1%
(No. of obs.)	(257)	(214)		(182)		
2nd	127.75	9.11	7.1%	29.71	23.3%	30.4%
(No. of obs.)	(302)	(247)		(234)		
3rd	167.83	7.85	4.7%	28.68	17.1%	21.8%
(No. of obs.)	(261)	(217)		(209)		
4th	226.70	7.19	3.2%	31.21	13.8%	16.9%
(No. of obs.)	(211)	(176)		(131)		
Top	344.06	7.69	2.2%	34.27	10.0%	12.2%
(No. of obs.)	(94)	(78)		(57)		
Total Avg	162.98	8.50	5.2%	29.68	18.2%	23.4%
(No. of obs.)	(1125)	(932)		(813)		

Source: 1996 Scottish House Condition Survey (own analysis)

Table A.7.5.6 Housing Subsidies to Private Tenants in Four Cities of Scotland, 1996 (Weekly £)

Income Quintile	Mean Income	Economic Subsidies	% of Econ. Sub. To Mean Income	Average HB	% of HB to Mean Income	% of Total Sub. To Mean Income
Aberdeen						
Bottom	71.09	0.00	0.0%	256.00	360.1%	360.1%
(No. of obs.)	(18)	(15)		(1)		
2nd	147.03	0.00	0.0%	96.69	65.8%	65.8%
(No. of obs.)	(9)	(8)		(1)		
3rd	226.29	0.00	0.0%	0.00	0.0%	0.0%
(No. of obs.)	(4)	(3)		(0)		
4th	285.33	1.17	0.4%	76.55	26.8%	27.2%
(No. of obs.)	(6)	(3)		(3)		
Top	490.41	0.00	0.0%	0.00	0.0%	0.0%
(No. of obs.)	(10)	(7)		(0)		
Total Avg	215.40	0.10	0.0%	116.64	54.2%	54.2%
(No. of obs.)	(47)	(36)		(5)		
Dundee						
Bottom	59.26	0.00	0.0%	0.00	0.0%	0.0%
(No. of obs.)	(13)	(12)		(0)		
2nd	132.74	12.52	9.4%	92.31	69.5%	79.0%
(No. of obs.)	(5)	(3)		(1)		
3rd	171.57	0.00	0.0%	58.38	34.0%	34.0%
(No. of obs.)	(5)	(4)		(4)		
4th	249.70	0.00	0.0%	60.43	24.2%	24.2%
(No. of obs.)	(9)	(6)		(5)		
Top	458.24	0.00	0.0%	12.00	2.6%	2.6%
(No. of obs.)	(5)	(4)		(1)		
Total Avg	184.61	1.30	0.7%	58.18	31.5%	32.2%
(No. of obs.)	(37)	(29)		(11)		
Edinburgh						
Bottom	76.45	0.65	0.9%	47.59	62.3%	63.1%
(No. of obs.)	(73)	(62)		(9)		
2nd	153.38	6.21	4.0%	35.99	23.5%	27.5%
(No. of obs.)	(29)	(25)		(9)		
3rd	211.58	3.31	1.6%	65.57	31.0%	32.6%
(No. of obs.)	(25)	(22)		(11)		
4th	290.39	0.00	0.0%	65.04	22.4%	22.4%
(No. of obs.)	(26)	(18)		(7)		
Top	550.47	0.00	0.0%	0.00	0.0%	0.0%
(No. of obs.)	(17)	(16)		(0)		
Total Avg	189.57	1.91	1.0%	53.58	28.3%	29.3%

(No. of obs.)	(170)	(143)		(36)		
Glasgow						
Bottom	59.80	2.47	4.1%	39.90	66.7%	70.9%
(No. of obs.)	(37)	(35)		(11)		
2nd	129.62	0.36	0.3%	36.59	28.2%	28.5%
(No. of obs.)	(20)	(14)		(8)		
3rd	172.97	3.26	1.9%	52.39	30.3%	32.2%
(No. of obs.)	(27)	(24)		(15)		
4th	224.95	1.14	0.5%	53.50	23.8%	24.3%
(No. of obs.)	(27)	(26)		(13)		
Top	449.88	0.49	0.1%	103.85	23.1%	23.2%
(No. of obs.)	(19)	(18)		(2)		
Total Avg	185.36	1.78	1.0%	49.40	26.7%	27.6%
(No. of obs.)	(130)	(117)		(49)		

Source: 1996 Scottish House Condition Survey (own analysis)

Table A.7.5.7 Housing Subsidies to Private Regulated Tenants in Four Cities of Scotland, 1996 (Weekly £)

Income Quintile	Mean Income	Economic Subsidies	% of Econ. Sub. To Mean Income	Average HB	% of HB to Mean Income	% of Total Sub. To Mean Income
Aberdeen						
Bottom	-	-	-	-	-	-
(No. of obs.)						
2nd	-	-	-	-	-	-
(No. of obs.)						
3rd	-	-	-	-	-	-
(No. of obs.)						
4th	254.55	3.52	1.4%	30.00	11.8%	13.2%
(No. of obs.)	(1)	(1)		(1)		
Top	-	-	-	-	-	-
(No. of obs.)						
Total Avg	254.55	3.52	1.4%	30.00	11.8%	13.2%
(No. of obs.)	(1)	(1)		(1)		
Dundee						
Bottom	-	-	-	-	-	-
(No. of obs.)						
2nd	137.20	37.56	27.4%	0.00	0.0%	27.4%
(No. of obs.)	(1)	(1)		(0)		
3rd	-	-	-	-	-	-
(No. of obs.)						
4th	-	-	-	-	-	-
(No. of obs.)						
Top	-	-	-	-	-	-
(No. of obs.)						
Total Avg	137.20	37.56	27.4%	0.00	0.0%	27.4%
(No. of obs.)	(1)	(1)		(0)		
Edinburgh						
Bottom	112.15	9.93	8.9%	18.89	16.8%	25.7%
(No. of obs.)	(4)	(4)		(2)		
2nd	152.39	17.78	11.7%	26.55	17.4%	29.1%
(No. of obs.)	(9)	(9)		(5)		
3rd	225.44	18.23	8.1%	9.23	4.1%	12.2%
(No. of obs.)	(4)	(4)		(1)		
4th	-	-	-	-	-	-
(No. of obs.)						
Top	-	-	-	-	-	-

(No. of obs.)						
Total Avg (No. of obs.)	160.11 (17)	16.03 (17)	10.0%	22.47 (8)	14.0%	24.0%
Glasgow						
Bottom (No. of obs.)	57.41 (5)	17.27 (5)	30.1%	26.10 (2)	45.5%	75.5%
2nd (No. of obs.)	130.42 (1)	5.06 (1)	3.9%	5.81 (1)	4.5%	8.3%
3rd (No. of obs.)	168.48 (5)	15.66 (5)	9.3%	38.08 (2)	22.6%	31.9%
4th (No. of obs.)	200.33 (2)	14.77 (2)	7.4%	12.70 (1)	6.3%	13.7%
Top (No. of obs.)	390.81 (3)	2.95 (3)	0.8%	0.00 (0)	0.0%	0.8%
Total Avg (No. of obs.)	177.10 (16)	13.00 (16)	7.3%	24.48 (6)	13.8%	21.2%

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