

CHAPTER 2

**A DISCRETE CHOICE FORMULATION OF HOUSING CHOICE AND
MOBILITY DECISIONS: THE BRITISH CASE**

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A DISCRETE CHOICE FORMULATION OF HOUSING
CHOICE AND MOBILITY DECISIONS: THE BRITISH CASE

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ABSTRACT

This paper presents a brief overview of some methodological developments in discrete choice modeling. It is suggested that successful adaptation of this methodology to modal residential location decisions will require explicit recognition of the particular decision context in which a choice is made. Some brief illustrative examples are also presented.

INTRODUCTION

It is a topic of little contention that disaggregate models of individual choice are gaining increasingly wide acceptance among a variety of social scientists, both in Britain and in the rest of Europe [16]. Although a number of research practitioners and academics continue to use this methodology primarily to provide a general behavioristic framework for short term prediction and forecasting, an increasing number of applications are concerned with choices between multiattribute alternatives which are selected within a much more specific decision context. This paper attempts to outline some methodological and contextual considerations which should be incorporated into the analysis of dwelling choice and the decision to move within the British housing market.

METHODOLOGICAL PRECEDENTS

Many geographers and regional scientists will be familiar with the standard multinomial logit model [16] form

$$P(r|X_i, \beta) = \frac{e^{x_{ri}'\beta}}{\sum_{g=1}^R e^{x_{gi}'\beta}} = \frac{e^{V_{ri}}}{\sum_{g=1}^R e^{V_{gi}}} \quad r = 1, \dots, R \quad (1)$$

In this model, vectors of individual characteristics and alternative attributes are incorporated within the systematic component of utility (V_{ri}) such that

$$V_{ri} = x_{ri}'\beta \quad (2)$$

where x_{ri}' is a vector of utility-relevant functions of the observations. This assumes that the V_{ri} component takes a linear-in-parameters additive form and also assumes that the random components of utility are independent and identically distributed in accordance with the double exponential distribution.

Set within a discrete choice modeling framework, the multinomial logit model has undoubtedly enjoyed considerable success as an applied research tool [6], and has also provided a valuable focus for a number of broader issues in urban analysis, such as the refinement of endogenously-stratified sampling procedures, the development of alternative and more flexible model functional forms, the incorporation of experimental design data with survey data and progress towards the development of a new generation of dynamic discrete choice

models [15]. Additionally, a very considerable amount of ongoing methodological reappraisal in the discrete choice modeling literature has focused upon the restrictive properties of cross-substitution embodied within the logit model form which result from the independence of irrelevant alternatives assumption. Indeed, scepticism concerning the robustness of the logit form has spurred the development of a variety of alternative model forms, forms which exhibit a general trade-off between computational tractability and fidelity towards the premises of random utility theory. Although the final model form adopted in any empirical application must be the outcome of consideration and reflection by the analyst, what is apparent is that the most advantageous package of costs and benefits in practical modeling situations at the present time is frequently provided by those parsimonious discrete choice model forms which allow the choice context to be realistically represented by a computationally tractable model. In particular, the nested logit model (a special case of the family of generalised extreme value models [11]) may be structured so as to allow more general and flexible properties of cross-substitution than can be incorporated within a standard multinomial logit structure, since comparison of choice alternatives which do not lie within the same nest is not constrained by the independence of irrelevant alternatives property. Additionally, the nested logit model may have considerable intuitive appeal where it is realistic to construe the decision process as the sequential consideration of a number of conditional choices. What should be apparent, therefore, is that selection of the most appropriate model form should be made in conjunction with a conscious evaluation of the decision context within which choices are revealed. With this in mind, the next section reviews progress towards the more comprehensive specification of the choice context and goes on to focus upon some considerations which are pertinent to fuller and more realistic specification of residential location and mobility decision contexts in the British housing market.

RESIDENTIAL LOCATION IN A COMPLEX AND CONSTRAINED DECISION CONTEXT

Consideration of recent United States perspectives on residential location decision making which have used logit and discrete choice modeling-based methods suggests a growing awareness of the mobility, tenure and dwelling choice contexts. Whilst some of the earliest applications based choices almost exclusively upon individual characteristics and physical dwelling attributes, subsequent studies have developed choice contexts which incorporate factors such as workplace location [13], qualitative aspects of previous dwellings [3], the learning process [4] and public service provision [2], [5]. In addition, interest has more recently been expressed in the development of long run models in which the spatial pattern of demand might be reconciled with supply of dwellings [2]. Within the European context, however, some recent research [12] has highlighted the fact that development of such a market equilibrium framework may be rather premature insofar as a variety of premises concerning the most appropriate decision context should first be incorporated within the model framework.

A variety of transport planning applications have already recognised the need to integrate complex trip-chaining within the over-all context of the household daily activity pattern through use of a daily time-budget framework [7]: this approach has been further developed to incorporate Markov and semi-Markov processes within trip-chaining models [9] and also to integrate spatial constraints [8] within the general activity pattern. What is apparent is that housing market analysis in the British and certain other European contexts would benefit by adopting the spirit of this approach: namely, to integrate complex choices more explicitly within the decision contexts in which they are made. In Britain there are two particularly important facets to this problem which both articulate the pervasive influence of the state upon patterns of housing consumption: first, it is important to recognise that housing in a predominantly post-shelter society assumes a variety of often tenure-specific roles, which are frequently unrelated to conventional physical attributes; and, second, it may become important to incorporate the variable and primarily tenure-specific pattern of choice set restriction into the analysis of revealed preferences. The first problem argues for a fuller and more realistic specification of the dwelling as a complex choice alternative, whilst the second suggests a need to model constraints upon the decision-making process [10].

Complex Behavior and Multiattribute Alternatives

Given that an increasing number of discrete choice modeling applications are concerned with multiattribute commodities, there is an increasing need to specify all of the relevant individual characteristics and alternative attributes which motivate behavior. Travel demand studies, for example, are becoming increasingly sensitive towards a variety of less conventional motives which may underlie observed behavior, such as habits [14], aspirations and prejudices. In the case of tenure and dwelling choice in the British housing market, one important consideration should be the variable magnitude of and opportunities for wealth accumulation within the owner-occupied sector. In Britain, inflation in house prices has generally outstripped market interest rates, and owner

occupiers are afforded very favorable tax status since mortgage interest repayments may be offset against personal taxation. As a consequence owner occupation is recognised to provide an important opportunity for wealth accumulation (particularly in times of rapid inflation) since (i) buyers gain immediate access to a large loan sum which appreciates rapidly in value; (ii) the cost of this loan is well below the rate of house price inflation (particularly when measured over very long loan periods); and (iii) interest rates on slowly accumulated savings are also generally far below houseprice inflation rates and are subject to taxation. Owner occupied dwellings therefore possess investment attributes additional to their physical qualities which may be expected to influence tenure choice. Access to the owner occupied sector is also regulated by a variety of eligibility criteria which are imposed by those building societies or other finance institutions which provide the loan with which a dwelling is purchased. In general, loan allocation criteria are strongly related to household income (with the onus traditionally upon the head-of-household's salary rather than supplementary income) and socio-economic status (professional white collar workers being viewed as lower-risk long-term borrowers than their blue collar counterparts). In addition, choice of an owner-occupied dwelling may be associated with the positive externality effects generated by proximity to other owner occupied dwellings. In order to gauge the effect of these socioeconomic effects upon tenure choice (and in particular to assess the influence of wealth accumulation upon choice) an analysis was performed upon a random national (England and Wales) sample of individuals from the 1976 English House Condition Survey for whom the wealth accumulation variable could be reliably estimated. A binomial logit model was estimated on 587 observations of the form:

$$\frac{P_{O/i}}{P_{R/i}} = \beta_0 + \beta_1(\text{SOCECON})_i + \beta_2(\text{HOH-Y})_i + \beta_3(\text{WEALTH})_i + \beta_4(\text{SPACPREF})_i + \beta_6(\text{BIGDES})_i \quad (3)$$

-3.09135	1.28087	0.00071	0.00278
[-9.67654]	[2.73285]*	[7.46735]*	[6.51558]*
(0.31946)	(0.46869)	(0.00010)	(0.00043)

[t statistics]
 (standard errors)
 *significant t statistics
 Log likelihood = -380.391
 Log likelihood (0) = -214.639
 Rho-squared = 0.4357

1.00147	-0.42603
[2.18849]*	[-0.85703]
(0.45761)	(0.49710)

where $\frac{P_{O/i}}{P_{R/i}}$ = the log odds that the revealed preference of respondent i is to own rather than rent a dwelling,

SOCECON = a dummy variable taking value 1 for the uppermost stratum of professional white collar workers, 0 otherwise,

HOH-Y = income of head of household,

WEALTH = a composite wealth accumulation index, recording the surplus value created by owning rather than renting a dwelling,

SPACPREF = a dummy variable recording whether (1) or not (0) the most recent move was prompted by the deliterious effects of the previous neighbourhood,

BIGDES = a dummy variable recording whether (1) or not (0) the most recent move was partly prompted by the desire (but not need as defined by local authority allocation criteria) to acquire larger property.

Whilst the conventional socioeconomic variables all exhibit the expected signs, it is also clear that the desire to accumulate wealth is also a statistically significant factor in determining tenure choice, and should consequently be included alongside the conventional use value-related attributes of dwelling choice alternatives.

Towards the Elaboration of the Choice Context

The conventional discrete choice model formulation assumes that the unobservable utility value of a given individual is a linear function of the attributes of the choice alternative and of the socioeconomic characteristics of the individual. However, the importance and relevance of the appropriate socioeconomic characteristics depends also upon the nature of the choice context. Within the rented sector of the British housing market, for example, access to public sector housing is mediated by a variety of formal need-based eligibility criteria which are administered at the local level. Even within the private sector, limits

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