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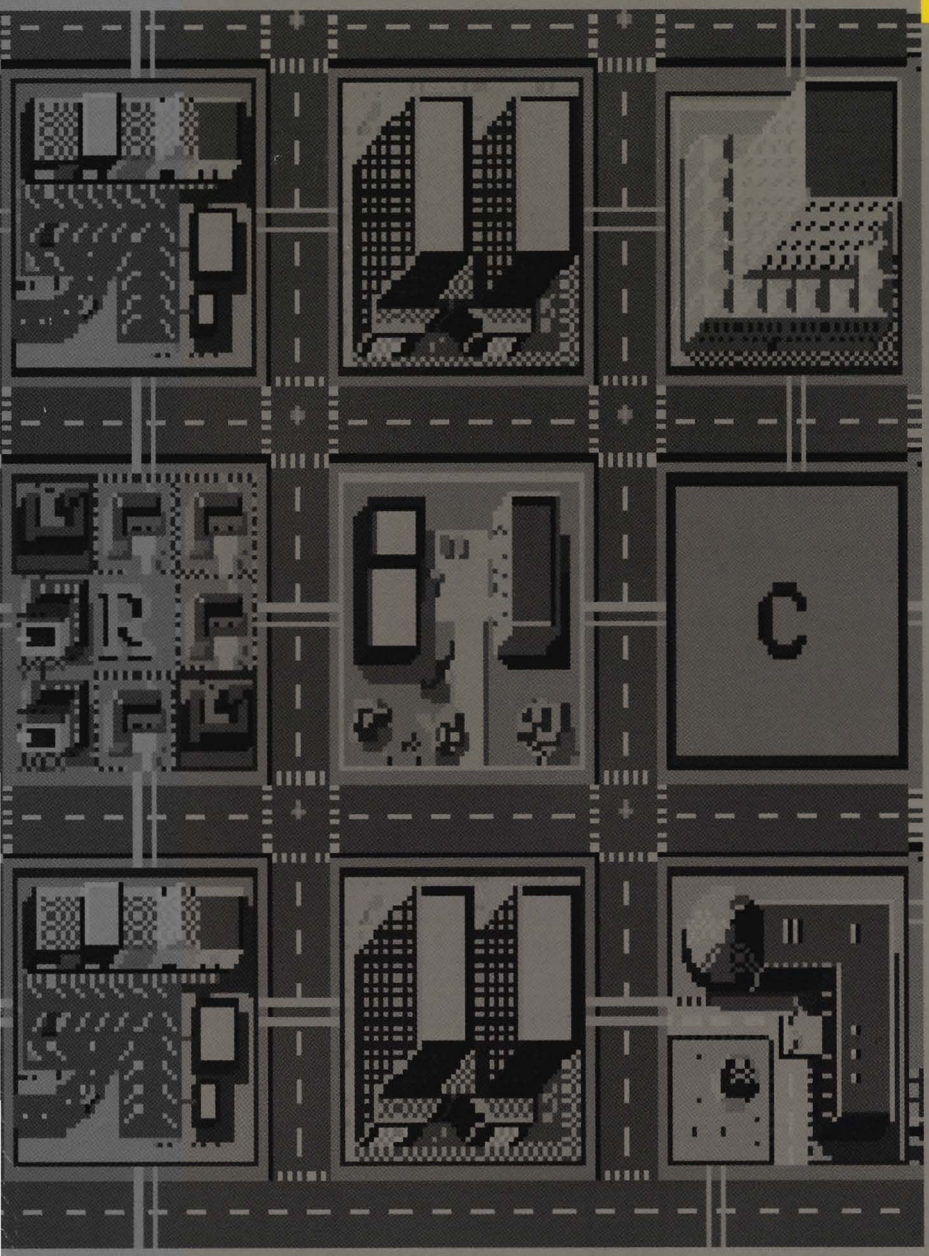
CONJOINT EXPERIMENTS AND RETAIL PLANNING

MODELLING CONSUMER CHOICE OF SHOPPING CENTRE AND RETAILER REACTIVE BEHAVIOUR

Harmen Oppewal



BOUWSTENEN

CONJOINT EXPERIMENTS AND RETAIL PLANNING

Modelling Consumer Choice of Shopping Centre and Retailer Reactive Behaviour

HARMEN OPPEWAL

CONJOINT EXPERIMENTS AND RETAIL PLANNING

Modelling Consumer Choice of Shopping Centre and Retailer Reactive Behaviour

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ter verkrijging van de graad van doctor aan de Technische Universiteit Eindhoven, op gezag van de Rector Magnificus, prof.dr. J.H. van Lint, voor een commissie aangewezen door het College van Dekanen in het openbaar te verdedigen op vrijdag 6 januari 1995 om 14.00 uur

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INTRODUCTION AND BACKGROUND

INTRODUCTION

Planners, developers, and managers of retail facilities like to have a clear understanding of the likely effects of investments or planning strategies they consider. Over the years, various theories and methods have been developed that provide insight into the factors that determine the demand for retail facilities and the viability and impact of new developments. Nevertheless, these have often been of limited use. Poor quality of available data and high cost, or impossibility of obtaining better data has resulted in untested models and in models that do not include the variables that are managerially most relevant.

Conjoint experiments (also called stated preference techniques) offer ways to overcome these limitations. Conjoint approaches allow one to experiment with various planning strategies and to disentangle effects of variables that in other approaches remain correlated. For example, conjoint approaches allow one to separate effects of shopping centre size from effects of available parking space in the centre. It is even possible to assess impacts and market shares of newly developed but locally not yet available shopping alternatives, such as teleshopping. Conventional methods require many ad hoc assumptions to allow such assessments.

Conjoint experiments involve the design and analysis of hypothetical decision tasks. Alternatives are described by their main features, called attributes. Multiple hypothetical alternatives are generated and presented to respondents, who indicate their preference by ranking, rating or choosing alternatives. For example, for several pairs of hypothetical shopping centres, they choose their most preferred shopping centres. One pair could involve one centre described as being on 15 minutes' distance, with free parking and few stores, and the other as being on 30 minutes' distance, with paid parking and many stores. From an analysis of these responses it is possible to assess the importance of the various features describing the alternatives and predict choices in new choice conditions.

This method has many advantages and, consequently, conjoint experiments have become a popular tool to model individual preferences and decision-making in a variety of research areas. In retailing, however, conjoint applications have remained somewhat limited in numbers and scope. This thesis aims to investigate whether and how conjoint experiments for retail applications can be improved, in order that public and private sector retail planners can benefit more from the

advantages of this method. The goal is in particular to develop conjoint experiments for two problem areas in retail impact assessment.

The first of these is modelling consumer choice of shopping centre. As will be argued, previous conjoint models of consumer choice of shopping destination were limited in that they typically 1) included limited numbers of attributes, 2) focussed on store choice and store attributes, ignoring features of total shopping centres, and, consequently 3) have been of only limited interest to shopping centre developers and planners. Part I of this thesis presents ideas to overcome these limitations. We propose a definition of the shopping centre marketing mix that can be operationalized in a conjoint task, and we develop a method to handle large numbers of attributes in conjoint tasks. This method is based on the theory of Hierarchical Information Integration. Part I concludes with an empirical study of consumer choice of shopping centre that was designed to test and illustrate these ideas. Research questions in this empirical study concern the relative importance of shopping centre attributes in determining consumer choice of shopping centre and the validity of the conjoint task and the resulting predictive model.

The second problem area concerns the prediction of how retailers will react to changes that they observe in their stores and retail environments. In Part II, approaches to modelling this type of entrepreneural behaviour are reviewed. It will be concluded that although conjoint approaches provide unique advantages for modelling this type of retailer behaviour, conventional conjoint approaches cannot be directly applied to this problem. New types of conjoint tasks are required such that retail entrepreneurs and managers are able, and willing, to produce responses to hypothetical decision tasks. The further study and modelling of this type of managerial decision-making also require a theoretical framework of the relevant behaviour of retail firms. In Part II we propose such a framework and we develop a conjoint task that allows us to model retailer opinions on what is likely to happen to their store if particular scenarios come to pass. We describe an empirical study in which these ideas were applied. In this empirical study, the nature of this type retailer behaviour is explored and it is tested whether and how retailer reactions depend on sales and retail environmental trends.

Parts I and II essentially comprise two independent studies, which both aim to develop new applications and types of conjoint tasks. However, both studies are also of interest to the study of another problem area in retail planning: the dynamics of urban retail systems. The two parts of this thesis focus on two driving and complementary forces in the retail market. With their decisions where to shop,

consumers determine the sales volumes at centres. Retailers observe and react to this consumer behaviour and the resulting sales volumes by changing their stores. Consumers in turn react to changes that result from these retailer actions by changing their choice behaviour. Models that capture these consumer and retailer behaviours in one integrated framework in principle would allow one to simulate dynamic aspects of the retail market. The models that are developed in this thesis are prerequisites to such an approach. However, we will only pay attention to this issue in the concluding chapter because the development and application of such an integrated framework is beyond the scope of the present research project.

The structure of this thesis is as follows[1]. Chapter 1 is a review of the background of the above problem areas. It outlines the role of impact assessment and modelling studies in retail planning and discusses why it is important to study consumer choice of shopping centre and retailer reactive behaviour. Detailed problem definitions for the studies in Parts I and II are described in the concluding sections of our review chapters (2 and 6).

Chapter 2 is the first chapter of Part I and reviews the various modelling approaches that are available to retail planners, including conjoint approaches. This chapter serves to illustrate the relative advantages of conjoint approaches over other available approaches and to introduce the major concepts of this methodology. It also reviews conjoint retail studies and concludes with a problem definition for the study reported in Part I.

Chapter 3 reviews an approach to handling large numbers of attributes in conjoint tasks, called "Hierarchical Information Integration". In this chapter we propose a modified approach and describe its advantages.

In Chapter 4 we develop a conceptual framework for the definition of shopping centre attributes. In the chapter, the shopping centre marketing mix is defined and operationalized into a set of 35 attributes. The attributes are clustered into four sets that represent dimensions of consumers' perception of shopping centres. This clustering is the basis for the implementation of the Hierarchical

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[1] *Bibliographical note:* An earlier and abridged version of Chapter 2 appeared in Dutch as Oppewal and Timmermans (1992a); Chapter 3 and an abridged version of Chapter 5 appeared as Oppewal, Louviere and Timmermans (1994). Complementary publications concerning the results of the study reported in Part I are Oppewal, Louviere and Timmermans (1993) and Oppewal and Timmermans (1992b, 1993a, 1994b). Some of the results reported in Chapter 9 were reported earlier as Oppewal, Louviere and Timmermans (1992), Oppewal and Timmermans (1994a, 1994c), and Oppewal, Timmermans and Louviere (1992).

Information Integration method in our empirical application.

Chapter 5 describes the details of this application, which involves a study among consumers in Maastricht, The Netherlands. The analyses and results presented in this chapter focus on the relative importance of the attributes and the validity of the estimated model.

Chapter 6 is the first chapter of Part II and reviews previous modelling studies of retailer spatial behaviour. It concludes with a detailed problem definition for our study of retailer reactive behaviour.

The study first involves the development of a conceptual model of retailer reactive behaviour. The development of such a model from relevant literature and pilot interviews is the focus of Chapter 7.

In Chapter 8 we develop a conjoint task that is based on this conceptual model. The chapter extentensively goes into the details of issues that arise with the development of such a task. It proposes a conjoint task that consists of "sales and environmental trend scenarios" and a "most-likely choice task".

Chapter 9 presents a study among retailers in the city of Maastricht. A sample of 183 retailers were surveyed and participated in our experiment. The chapter reports details about the experimental procedure and presents survey and experimental results concerning reactive behaviour.

Finally, Chapter 10 concludes the thesis with a review and discussion of the results that were obtained in Parts I and II. The Epilogue is an exposition of how our models could be used to develop a new tool for the simulation of spatial retail dynamics.

CHAPTER 1

TWO PROBLEM AREAS IN RETAIL PLANNING

1.1 The focus of retail planning

Planning authorities, retailers, and developers are interested in local demand-supply relations with respect to retail facilities. They are particularly concerned with the effects of changes in population, transportation, or retail structure on these relations. Local and regional planning authorities are concerned because they aim to balance interests of (particular groups of) consumers and retailers with public interests. Consumers should be provided with sufficient retail facilities within reasonable distances from their homes. Retailers, on the other hand, should be able to make a reasonable profit. In addition, retail facilities should use minimal space because space is a scarce resource in most urban areas. The spatial arrangement of retail facilities is also of interest, because it has consequences for the level of mobility in the area, and hence, for claims on resources such as as transportation infrastructure and environmental quality.

To assess whether their goals are met, urban planners require analyses of current demand-supply relationships. These analyses are relatively straightforward. It is, however, much more difficult to know whether planning goals will continue to be met in future conditions. Analyses of current demand and supply involve a description of the size, type and spatial distribution of the population and the available shopping facilities. A comparison of these two distributions reveals which choice range is available to consumers and the efforts they (minimally) have to make to purchase their goods. Vice versa, it gives insight in the total number of consumers located within a certain distance range from facilities. The analyses

usually also involve estimating the usage and performance of facilities. Typically, consumer surveys are used to estimate the numbers of consumers from particular origins who visit particular destinations. They show the efforts that consumers actually make to purchase their goods and also allow one to estimate the actual trade areas of facilities. These trade areas give a (first) indication of the current performance of facilities. Clearly, such analyses are also of interest to the private sector. For instance, retailers like to know who their customers are and where they come from, to assess their competitive position or to target their promotional activities.

Problems in the analysis of current conditions are mostly practical in nature and merely concern definition problems and problems of sampling efficiency and survey design. The delineation of trade areas, for instance, is a recurrent problem because trade areas can be defined in various ways and the shopping behaviour of only a sample of consumers is observed. However, these problems seem increasingly less pertinent, as recent years have seen rapid progress in the availability of various geographical statistical data bases, and software to explore these large data sets (geographical information systems). In The Netherlands, the DIS retail information system (D&P 1991, 1993) can quickly provide information on numbers, sizes and spatial distributions of store types and indicate whether a region has too little or too much retail space. Similarly, consumer data bases such as Geo-System or Mosaïc are commercially available and are linked to geographical locations by postal code, thus providing information for detailed spatial demand analyses.

To know whether their goals will continue to be met in future conditions, planners monitor and try to foresee population and retail structure developments. Also, they try to predict the likely impacts of new developments or adjustments to existing structures before they allow or initiate these changes. These assessments focus on the impacts on land use patterns and mobility, the viability of existing stores or shopping centres, and the availability and accessibility of services to particular groups of consumers, such as the elderly (see, e.g. Rogers 1979; Werkgroep DPO 1980; RARO 1981; Davies and Rogers 1984; Schuitema 1985; Van der Heijden et al. 1984; Van der Heijden 1986, 1987; Bolt and Kerklaan 1989; Taatgen 1991; D&P 1993).

The private sector is also interested in developments in population and retail characteristics. The private sector is particularly concerned with the impact of changes and new developments on the viability of stores and store locations.

Retailers are concerned because knowledge of local market conditions is essential to the formulation of a retail strategy. Also, developments in housing and incomes, infrastructure, or retail facilities may bring either increased competition or new retailing opportunities. Similarly, retailers who are planning to locate a new (branch) store need to assess the viability of this new store at potential locations (see, e.g. Davies and Rogers 1984; Wrigley 1988). Banking institutions who consider financing new retailing developments require similar assessments. Finally, shopping centre developers and investors want to know the viability of their shopping centre projects, e.g. after upgrading.

Thus, the assessment of the future viability of retail facilities and the impacts of retail changes and new retail developments are important issues in both retail planning and retail real estate and store management. Clearly, potential changes and new developments, and their effects, cannot readily be observed. Planners and retailers have to rely on intuitions, analogous situations or theory to analyse and predict these effects. Therefore, the assessment of the future viability and impact is much more complex than the assessment of current performance. It involves at least two problem areas: the prediction of consumer choice of shopping centre and the prediction of retailers' reactions to changing retail conditions. In the next sections, we discuss these two areas.

1.2 Predicting consumer choice of shopping centre

Several approaches have been taken in retail planning to predict spatial consumer behaviour in new conditions. These approaches range from simple rules of thumb for trade area analysis to formal and complex multivariate techniques, such as spatial interaction and individual choice models. These techniques are reviewed in Chapter 2, in which we will conclude that, whereas the more simple techniques are quick and easy to use, they are not very reliable, especially when many variables are of interest. Moreover, they do not provide insight into the relative importance of variables that managers and planners can manipulate. Retail planning and strategic retail management involves making choices about which variables to manipulate and concerns long term and large investments. Consequently, there is a need for reliable estimates of the importance of these variables and their effects on spatial consumer choice behaviour. The more advanced, formal models may provide these estimates. The potential advantages of using more advanced and

formal modelling techniques are that 1) they allow one to handle (more) complex situations in which many variables are of interest; 2) they in principle are based on established theory, therefore, they are more likely to provide correct predictions for totally new situations than simple rules of thumb; and 3) they allow one to obtain more reliable and quantitative estimates of effects of changes in retail facilities and provide indications of the reliability of these estimates.

Despite these advantages, current interest of urban planners in these methods is limited, though over the years academics have shown a continued interest in formal modelling techniques. Since the 1970s, when formal modelling was relatively popular and there were high expectations about the practical performance of models, urban planners have become disappointed about the performance of models and increasingly have returned to more simple analyses.

In Dutch retail planning, for example, retail impact research was obligatory since 1976 and it was strongly recommended that formal models be used (Werkgroep DPO 1980). However, this rule was abandoned in 1985 and formal models became less popular. Major reasons were the high costs involved in data collection and model estimation (which was particularly a burden in the economic recession of the early 1980s) and the limited practical usefulness of estimated models (see, e.g. Van der Heijden 1987; cf. RARO 1981). Moreover, the focus of retail planning shifted from new large scale developments to the refurbishing and restructuring of existing sites. Available models seemed not appropriate for assessing the impact of the more detailed planning measures that are associated with this new focus. Also, there was a shift from a strategic planning approach in which quantitative research had priority to a more incremental approach in which negotiating and consultation had priority; hence, impetus for the further development and application of quantitative models was lacking.

Similar developments took place in British retail planning, as illustrated with the implicit advice of the Department of Environment against the use of "mathematical models" in impact studies: "The models may be complicated and based on a number of arguable assumptions; they have not, so far, been of great help to Inspectors at inquiries." (in Guy 1991, p.192).

However, Guy (1991) also notes some revival of public-sector interest in retail modelling, partly through the lack of recent and comprehensive information on the retail turnover of existing sites (see also Guy 1984). This revival is stimulated by developments in computer technology and the progressive use of the mentioned large standardized data bases. The richness of these large datasets can

only be fully exploited with the use of more formal and advanced techniques for analysis (cf. Davies and Rogers 1984; Grothe and Scholten 1992).

In contrast to the public sector, commercial researchers traditionally had a limited interest in using formal models. Recently, however, an increased interest in systematic methods has been observed and the power of formal modelling is increasingly recognized in the private sector (Breheny 1988, 1989). Consultants are now advocating software programs containing consumer choice models, albeit usually of a primitive nature.

Breheny (1988, p.41) mentions the following reasons for this increased interest: 1) Markets have saturated and the more easy locations are gone, "on which the advantages of trading were so obvious that no rigorous analysis was required in making the decision to proceed"; 2) Experience has become a less reliable guide as competitiveness has increased, new forms and locations for retailing are rapidly introduced, and the nature of demand is changing; 3) As the average store size grows and competition for remaining sites increases, the costs of mistakes are more severe; 4) Competitiveness is further increased by the pressure to invest in new outlets. Additional reasons seem the concentration in retailing which has produced large firms that have specialized units with expertise for more sophisticated analyses and the aforementioned developments in computer technology and geographical information systems.

So, there is an increased interest in both the public and private sector in more systematic approaches to viability and impact assessment. Over the years, various types of formal models have been developed to assess and predict the effects of changes in retail structures on consumer choice patterns. Nevertheless, currently available methods still suffer from many of the practical limitations that made planners, retailers, and developers reluctant to use these models. These limitations are discussed in Chapter 2, which reviews current modelling approaches, including conjoint approaches. The aim of our studies in Part I is to overcome these limitations by developing improved conjoint-based models of consumer choice of shopping centre.

1.3 Predicting retailer reactive behaviour

The assessment of the profitability of retail facilities in current and potential future conditions is a focus in many applied retail studies. Clearly, profitability is of direct

interest to retailers. Profit maximization is a key goals of entrepreneurs, at least in theory. Moreover, because retailing is a commercial activity, a retail firm has to make a profit to stay in business. The public sector is also interested in whether stores are profitable, but this is merely because other public interests, such as the (continued) provision of sufficient retail facilities, depend on the attractiveness for entrepreneurs to maintain their stores at existing locations or to open stores at (e.g. planned) new locations. Indeed, it is the actual behaviour of retail firms that is crucial to the fulfilment of public sector retail planning interests. Therefore, the interest of planners is not only to assess the profitability of retail stores, but also to assess the ways in which retailers may react to (changes in) profit. Their final interest is to know the potential consequences of these retailer reactions for the performance of the urban retail system. Similarly, the commercial sector has an interest in knowing reactions of fellow retailers to, e.g. competitive actions.

In most public sector feasibility studies, profitability is assessed by comparing actual sales to some standard of retail sales volumes. Figures on actual retail sales of individual stores are often difficult to obtain because retailers are reluctant to provide this information. Therefore, alternative methods, mostly consumer surveys, are being used. Consumers are asked how much they spend at the available retail destinations or how often they visit the destinations. In the latter case, the reported trip frequencies need to be multiplied with estimated average trip expenditures to obtain sales estimates. For new conditions, consumer choice models can be used to predict these trips and expenditures, and thus to derive sales volume predictions.

Standards of retail performance are obtained from surveys among retailers. The standards are assumed to represent the total cost of operating a store of particular type and size. In the surveys, retailers of particular store types report total floorspace, sales volume and various other store characteristics. In The Netherlands, nationwide results of these surveys are reported as a percentile range of observed sales-to-floorspace ratios ("floor productivities") for the various types of stores (e.g. EIM 1991). It is assumed that some particular percentage of the observed stores has been profitable. The corresponding (lower) percentile of observed productivities is assumed to represent the sales volume that is minimally required for a store to cover its total costs ("break-even point").

The use of such standards involves that one derives the break-even point for each shopping structure (store or centre); thus, the level of sales is derived that is minimally required to balance costs. Stores or shopping centres that do not attain this threshold are considered unable to invest, and thus, unable to continue to

provide sufficient levels of service and choice range. These stores or centres are ceteris paribus regarded as likely to end business within several years time.

In contrast, stores or shopping centres that perform above this normative sales level (or "sales claim") are considered to have sufficient opportunities to make a profit. For these locations, public sector planning studies often conclude that new initiatives should be allowed to increase the availability of retail facilities to consumers. For the private sector these locations are of interest as locations for new stores or store relocations.

There has been much criticism on the use of such normative floor-productivities to assess the viability of stores (e.g. Partners 1982; Van der Heijden et al. 1984; Van der Heijden 1986; Jochems and Leijten 1991; Gantvoort 1990). First, the quality of the available data has been criticized:

* The national sample of monitored stores tends to be biased towards the better performing stores;
* The national sample does not include the larger retail chains;
* Productivities are not regionally differentiated;
* Predictions for individual sampling units by definition are less reliable than for aggregated structures; Therefore, the reliability of estimates is particularly low for single stores or small centres.

Other criticisms are of a more fundamental nature and concern the use of this data to assess the viability of stores or shopping centres:

* Total costs depend on many more factors, such as the efficient use of labour and inventory, and costs of buying and investments in promotional activities;
* Costs of floorspace vary with the quality of the (micro-)location;
* Actual floorproductivity is not a simple linear function of size of floorspace, but is related to particular store types and formats that have particular size requirements.

Despite these criticisms, the use of normative floor-productivities continues in practical assessments of the viability of new or adjusted retail structures, because other cost indicators are not publicly available for practical purposes. Another reason is that floorspace is an important planning variable. Local plans need to allocate space to particular functions, such as shopping, in accordance with the estimated demand for such functions. This requires that estimated demand, or potential sales, is translated into some spatial measure.

Impact studies are less dependent on the use of normative floor-productivities than feasibility studies. Impact studies typically define different

scenarios of potential developments. Although the ultimate effects of the scenarios on the provision of retail facilities may be difficult to derive or estimate, scenarios may be compared as to their effects on, e.g. sales levels at particular locations. This allows tentative conclusions about the favourability of scenarios for various locations.

However, planners would like to know how retailers react to changes as described in such scenarios to further the understanding and assessment of these impacts. Planners would also like to know how retailers react to effects of these changes on their store's performance. This also applies to feasibility studies. Planners like to have better estimates of the profit at particular retail locations. But they also like to know what is likely to happen to locations with particular (estimated) profits. Obviously, retailers and developers are also interested in these issues.

Current applied retail planning studies rely on assumptions from neoclassical economic theory to answer such questions. That is, they assume that the opportunity to make a profit will attract entrepreneurs, and therefore will lead to increased supply of retail facilities. Similarly, it is assumed that stores with zero profit will cease to exist, thus leading to a decrease in provision.

These assumptions, however, only partly correspond to reality. Retailers indeed may close or sell their stores in reaction to low profit levels. However, profitability is not the only motive to run a store. Stores that are not profitable may continue to exist because retailers may have other motives than to optimize their profit from this outlet. For instance, small independent retailers are known to stay in business, even if they economically no longer make a profit. And large retail firms are known to occupy (currently) nonprofitable retail sites as part of a larger and long-term strategy. Similarly, stores that observe a profit may not always remain unchanged. Retailers may choose to invest in their stores by, for example, changing the appearance, assortment or service level of their stores, by relocating their stores, by increasing the floorspace, or by opening new branch stores. In sum, there are various other ways in which retailers may react to (changes in) market conditions and performance levels.

To obtain a better understanding of the potential impact of new developments it therefore seems important to assess the ways in which retailers may react to changes in market conditions and store performance. Surprisingly, however, whereas a variety of methods exist to predict market shares and consumer choices in various conditions, few to none methods exist to predict the actual

responses of retailers to (changing) performance or market conditions. Indeed, few attempts have been made at all to investigate this behaviour, which we will call *retailer reactive behaviour* (cf. Van der Heijden 1986). Moreover, due to a variety of problems these attempts have had only limited practical results.

Many of the limitations of previous attempts may be overcome by using conjoint experiments. Conjoint experiments allow one to collect data on decisions of retailers that cannot be obtained with other methods. Nevertheless, the application of conjoint experiments to the study of retailer behaviour involves many conceptual and operational or design problems. It is therefore relevant to explore whether and how one can use such experiments to study retailer reactions to changing retail circumstances, and to answer questions regarding this type of retailer behaviour, in particular whether and how retailers' decisions are affected by changes in retail conditions. These issues are the focus of Part II of this thesis.

PART I

MODELLING CONSUMER CHOICE OF SHOPPING CENTRE

CHAPTER 2

APPROACHES TO MODELLING CONSUMER SPATIAL SHOPPING BEHAVIOUR

2.1 Introduction

Several approaches are available to predict sales volumes and market shares of retail destinations in new locations or new market conditions. One of these approaches involves the use of conjoint experiments to obtain models of consumer choice of shopping destination. Conjoint experiments have particular advantages over other available approaches.

A first goal of this chapter is to discuss and demonstrate these advantages. This goal is accomplished by reviewing the conjoint as well as the other available approaches. A second goal is to examine current barriers and limitations to the application of conjoint experiments to modelling consumer spatial shopping behaviour. This goal is accomplished by reviewing retail applications of conjoint experiments. A final goal is to provide the necessary methodological background on conjoint choice experiments, which is the particular type of conjoint experiment that we will focus on.

This chapter is structured as follows. The chapter first reviews various approaches to predicting sales volumes of retail destinations that are not explicitly based on assumptions about consumer behaviour (section 2.2). This review focusses on the limitations of these non-behavioural approaches and discusses one of these approaches, the spatial interaction model, in more detail. The chapter then presents the conceptual model that underlies individual choice modelling approaches (section 2.3), and discusses the two dominant approaches to modelling individual choice behaviour. We outline discrete choice theory (section 2.4), with a particular

focus on the Multinomial Logit model. Next, in section 2.5, we review applications in which such models were estimated from consumer choices that were observed in real markets ("revealed preference" data). This review of approaches and application problems provides the necessary background for understanding the advantages of conjoint or stated preference approaches to modeling individual preference and choice. Section 2.6 provides a general introduction and review of conjoint models, first of conjoint analysis and next of the more recently developed integration of conjoint analysis and discrete choice theory, the conjoint choice approach. This latter section is concluded with a summary of the advantages and disadvantages of conjoint choice experiments. Section 2.7 reviews conjoint applications in retailing and discusses the limitations that are barriers to the further application of conjoint approaches in retailing. It suggests ways to overcome these barriers, as summarized in section 2.8, which presents the problem definition for the further chapters of Part I of this thesis.

2.2 Non-behavioural and aggregate approaches.

Various approaches have been used to predict sales volumes and market shares of retail destinations in new locations or new market conditions (for reviews and introductions see e.g. Davies and Rogers 1984; Wrigley 1988; McGoldrick 1990, p.160; Timmermans 1981, 1993). Among these, the non-behavioural and aggregate approaches seem most popular in applied and commercial settings. However, these approaches suffer from many limitations. These are reviewed in this section.

2.2.1 Non-behavioural approaches

A first approach to assess the viability of new store locations is to use subjective *checklists* of factors that determine the viability of outlets (e.g. Rogers 1979; COB/IMK 1991). Although relatively simple and easy to apply, this method provides very crude estimates only. More detailed estimates may be obtained with *analogue models*, which involve the estimation of sales potentials of new stores by extrapolation from existing similar stores. However, the selection of these similar stores is rather ad hoc. *Multiple regression* approaches are better able to take differences among stores into account. Sales volumes are regressed against a range of store and retail situation characteristics (e.g. competitors, demographic and

socio-economic characteristics of the trade area) for stores within the class of interest. Problems of this approach are that data for a large number of stores are required to obtain reliable estimates, and that market share predictions are not logically consistent.

A further problem of the above approaches is that they do not account for the variation in competitive structures and corresponding variations in market areas. A first possible way to account for competition is to assume that consumers will purchase their goods at the nearest available destination; hence, that market areas do not overlap and have strict bounderies. It should be noted that this is one the assumptions underlying *Central Place Theory* (Christaller 1933/1966; Lösch 1940/1954). Empirical studies, however, have shown that this deterministic assumption of distance minimization is unrealistic (see e.g. Timmermans 1981, 1993 for reviews).

2.2.2 The gravity model and spatial interaction models

A less rigid approach is provided by the Gravity model. In analogy to Newton's physical law of gravity, Reilly's Law of Gravity (Reilly 1931) assumed that towns or shopping centres of particular size represent "masses". These centres attract consumers from smaller settlements or neighbourhoods in direct proportion to their mass or size but inversely proportional to some function of the distances to these centres (e.g. the squared distances). Reilly derived an equation to describe the "breaking-point" between two centres. Some of the limitations of this early gravity model were that no graduated estimates above or below this breaking-point were provided, that the model included only two centres, and that there was no differentiation to different types of shopping trips.

To counter the limitations of the early gravity model, Huff (1964) developed a model that derives the probability that consumers patronize particular stores or shopping centres. This probability depends on the attractiveness of destinations (measured by size, i.e., floor space) and the distance or travel time to these destinations, as follows:

$$p_{ij} = \frac{F_j \,/\, d_{ij}^{\beta}}{\Sigma_{j'} F_{j'} \, d_{ij'}^{\beta}}$$

where

p_{ij} is the probability of a consumer at i visiting shopping destination j;
F_j is a measure of the attractiveness of shopping destination j (e.g. floorspace);
d_{ij} is the distance between i and j;
β is a distance decay parameter, taking different values for different classes of goods.

Thus, this model focusses on the probabilities of interaction between origins i and destinations j; hence, it not only identifies market areas but also predicts market shares within market area segments.

Although Huff founded his model on behavioural assumptions, in particular Luce's utility model. The focus in the further development of the gravity or spatial interaction models has been on explaining the flows of trips or expenditures directly. These aggregate model forms have been widely used in retailing studies and spatial interaction models are even regaining in popularity as tools for analysis and prediction, as was indicated in Chapter 1.

The basic arguments of the spatial interaction model are that the flow of shopping visits or expenditures between a residential zone and a shopping centre is related directly to 1) the number of trips, or amount of expenditure generated by the population of the zone, 2) the attraction to shoppers of the shopping centre, and 3) inversely to the distance from the zone to the centre (see e.g. Wilson 1988 for a review). As demonstrated above for the early spatial interaction model by Huff (1964), the model takes into account the competition for retail trade between the shopping centre in question and all other centres accessible to the shoppers concerned. The Huff model belongs to the class of production constrained spatial interaction models. These models assume that the "production" (trips or expenditure) from each origin zone is a fixed quantity, and estimate the distribution of this demand among destination zones. The production constrained model was first used in an applied context by Lakshmanan and Hansen (1965).

More formally, the production (or singly) constrained spatial interaction model can be described as follows (cf. the Huff model):

$$T_{ij} = O_i A_i W_j^{\alpha} f(c_{ij})$$

and

$$A_i = (\Sigma_j W_j^{\alpha} f(c_{ij}))^{-1} ,$$

where

T_{ij} is the interaction (either shopping travel or shopping expenditure) between a residential zone i and a shopping zone or centre j;

O_i is some measure of generation of shopping travel or expenditure from i (e.g. the population of zone i);

W_j is some measure of attraction of shopping travel to j (e.g. total floorspace in centre j);

c_{ij} is some measure of the cost of travel from i to j (e.g. minutes travel time);

α is a parameter to be estimated (but sometimes set to unity), and

$f(c_{ij})$ is such that cost increases lead to declining interaction, ceteris paribus.

A common assumption is that $f(c_{ij}) = c_{ij}^{\beta}$, where β is to be estimated and assumed negative. The production constraint A_i ensures that the total volume of shopping travel or expenditure known to emanate from residential area i equals the sum of predicted flows from i.

Spatial interaction models were especially popular when there were debates in several European countries on the impact on existing (city-)centres of potential large-scale retail developments at locations outside these centres. However,

> *... it became clear that abstruse disagreements on matters such as zone size, choice of travel cost measure, and methods of calibration could lead to radically different conclusions about the extent of the trading impact of new developments. Public inquire inspectors and participant became increasingly tired of such discussions.* (Guy 1991, p.192)

The above lines already point at some of the major problems that were encountered with spatial interaction model applications (cf. Pankhurst and Roe 1978, Turner and Cole 1980; Timmermans 1981, 1993):

1. Various zoning systems may lead to largely different model results for one area or population (e.g. Baxter and Ewing 1981; Fotheringham and Wong 1991). A related problem is that parameters partly depend on the spatial structure of the area. Thus, parameters cannot be interpreted unequivocally.
2. Spatial interaction models typically include only a limited number of attractiveness and travel cost variables. For example, attractiveness of shopping destinations is often defined in terms of floorspace or number of store employees only. The total set, however, of potential planner and retailer instruments typically is much larger (e.g. Weisbrod et al. 1984).
3. Spatial interaction models cannot easily account for sample heterogeneity. That is, models cannot include parameters that subsume variations among zones in, for example, socio-economic backgrounds.
4. Spatial interaction models have a very limited theoretical basis, as the approach essentially is based on an analogy from physics--as such, these models "do not constitute substantive urban theory" (Oppenheim 1986a, p.42).

5. As a consequence of these limitations, the transferability of calibrated spatial interaction models to new spatial market conditions is limited and predictions are not very reliable. New applications necessarily involve complete re-estimation of models, which increases research costs and often lack any methodological basis.

Over the years, spatial interaction theory has been further developed in various ways to accommodate these criticisms. Two important developments were, first, the formulation of alternative theoretical bases, most importantly entropy maximization (Wilson 1981). This provided a statistically more sound basis and practically meant that an exponential instead of a power distance decay function was employed. Second, the set of attraction measures was extended to include multiple variables of managerial interest such as shopping destination image variables (Stanley and Sewall 1976; Jain and Mahajan 1979; Nevin and Houston 1980; Gautschi 1981). In some cases a more general version of the spatial interaction model was used for this purpose, the Multiplicative Competitive Interaction model (Nakanishi and Cooper 1974). This model was initially developed in marketing to study brand shares and the effectiveness of promotions (for a review of empirical applications of MCI, see e.g. Van Goor 1984, p.29). In contrast to the earlier (Huff and other) spatial interaction models, the models with multiple attraction variables were typically applied to assess and predict market shares of individual stores.

These developments and extensions have to some extent solved the above mentioned limitations. Nevertheless, although spatial interaction models continue to interest both academics and applied researchers, alternative approaches based on the theory of individual choice behaviour have become increasingly more popular since the 1970s.

2.3 A conceptual model of individual choice behaviour

Planning studies in the 70's and 80's increasingly replaced the aggregate spatial interaction models with modelling approaches that focus on decision-making processes at the level of the individual consumer or household. Obviously, the decisions of consumers where to shop and spend money are major determinants of retail sales volumes; hence, individual decision-making is of crucial interest to retail planning. Indeed, choice behaviour of individuals mediates the impact of changes

in retail structures on sales volumes and market shares. If impacts on choice behaviour can be predicted, then impacts on sales volumes and market shares can easily be derived by aggregating across individuals.

Individual choice behaviour is assumed to depend on preferences as well as choice opportunities. Whereas the latter directly depends on the (spatial) structure of the retail market, the former may be assumed to be more or less stable across market conditions. If one can measure or model these preferences, if follows by implication that in principle one can more reliably predict choice behaviour in new market conditions than with models, such as spatial interaction models, that cannot separate invariants in spatial behaviour from the ideosyncracies of the current spatial structure.

In addition, if preferences vary with individual or socio-economic background characteristics, one can try to account for this heterogeneity by modelling preferences at the individual or segment level. Similarly, one can account for heterogeneity in the perception of choice alternatives by measuring and modelling these variations in perception. Hence, in contrast to the above aggregate models, the individual choice modelling approach in principle can account for heterogeneity in the market. A related advantage of the individual choice modelling approach is its flexibility in handling various zonal definitions.

The conceptual model of individual decision-making that underlies most of the currently used methods to predict choice behaviour is a set of ideas that has developed from various sources. Among them is Brunswick's Lens-model (Brunswick 1952) and Anderson's Information Integration Theory (Anderson 1974, 1981, 1982). The model can be summarized as follows and is shown in Figure 2.1 (cf. Holbrook 1981; Timmermans 1982, 1993; Louviere 1988a).

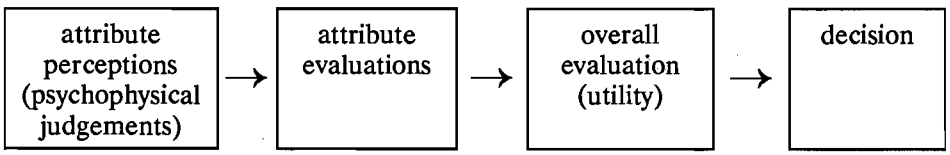

Figure 2.1. Conceptual model of individual choice behaviour.

Alternatives are perceived as bundles of features, usually called attributes. Attributes are like variables; hence, can take different values. Individuals choose alternatives from sets that may contain all the relevant alternatives or, if there are many potential alternatives, some comprehensive subset that is derived from pre-

processing or screening of alternatives. The choice process next involves a subjective trade-off among the perceived attribute values, resulting in a utility value for each alternative. Attribute values contribute to the utility of alternatives; these contributions are called part-worth utilities. Finally, given the utilities of the alternatives available in the choice set, the alternative with the highest utility is chosen.

There are various ways to measure the influence of attributes in the above decision-making process. Broadly, two types of approaches can be distinguished. The first is the *compositional* or *self-explicated* approach. This mostly involves that subjects are asked to directly state the attractiveness of attribute values and to indicate the importance of each of the attributes on some rating scale (see e.g. Green and Srinivasan 1990). Multiplication of attractiveness and importance scores results in part-worth utility estimates that are used to obtain estimates of total utilities, and to predict choices.

Although self-explicated methods have many practical advantages, they are not very reliable and suffer from potential problems and biases, of which the following are mentioned by Green and Srinivasan (1990): 1) Respondents may not hold all else equal when evaluating a particular attribute value; 2) Social desirability effects may occur; 3) The importance attached to some attribute may depend on the own range of experience over existing products; 4) The additive model is assumed as the literal truth; 5) "Double counting" may occur due to attributes that express some same underlying dimension; 6) There is little chance to detect non-linearities; 7) No evaluations of likelihood of choice or purchase are obtained. Further problems are that people cannot easily separate attractiveness from importance and that the importance of relatively unimportant attributes tends to be over-estimated (Slovic and Lichtenstein 1971). Also, dominant attributes may bias responses on other attributes of the same alternative (the "halo effect", e.g. Wu and Petroshius 1987). A major reason for the occurrence of these biases is that self-explicated tasks do not explicitly incorporate a trade-off among attributes.

In contrast, *decompositional* approaches derive importance weights of attributes from responses to total choice alternatives; hence, they explicitly allow for trade-offs among attributes. Responses are decomposed according to an assumed underlying preference function, for example using regression analysis. In this approach the importance of an attribute is indicated by the range of part-worth utilities estimated for the scores of this attribute. Although decompositional methods avoid the problems and biases of the self-explicated approach, the

compositional approaches remain popular in applied studies because of their many practical advantages. We will, nevertheless, confine our further discussion to two prominent decompositional approaches, discrete choice theory and conjoint analysis. In the sections to follow, we will discuss each of these approaches in turn, and discuss the integration of these approaches, which is the approach used in this thesis.

2.4 Discrete choice theory

Discrete choice theory has emerged from conceptual developments in both micro-economy and psychology. The current section outlines these developments and presents the most widely used discrete choice model, the Multinomial Logit model.

In micro-economics, neoclassical theories appeared unfit to study individual choice among products such as brands or stores. These theories assume that people derive utility from total products and substitute amounts of goods for other goods, depending on their preferences, their budgets, and the prices of these goods. Individual choice, however, typically involves a single choice from among mutually exclusive alternatives; hence, neo-classical marginal analysis does not apply. Furthermore, demand functions could practically only be derived for product groups, or at most limited numbers of product types (see e.g. Wierenga and Van Raaij 1988).

To solve these problems within the framework of utility theory, Lancaster (1966, 1971) proposed that utility is not directly derived from products but from the properties or characteristics of these products, or alternatives. Each alternative is described as a bundle of objective features and consumers derive utility from these features. Hence, the total utility of a product depends on only a limited set of features and substitution takes place at the feature level. Thus, Lancaster's theory allows one to describe individual choice among multiple products within the utility framework. Lancaster's theory is deterministic, however, and predicts choices rather than choice probabilities. In contrast, in applied contexts a multitude of unobserved factors influence choice behaviour. Moreover, perceptions and preferences may have some inherent randomness and typically are measured in imperfect ways. Consequently, it is better to use theories that allow for such randomness and error; hence, one should use theories that are probabilistic in nature.

Two types of utility theory can be used to derive choice probabilities: Strict utility theory and random utility theory. *Strict utility theory* originates with Luce (1959), who proposed that the probability of choosing an alternative is directly proportional to its utility and inversely proportional to the total utility of all alternatives in the choice set:

$$p(r|A) = \frac{U_r}{\Sigma_{r'} U_{r'}}, \quad \forall\, r,r' \in A$$

where:
$p(r|A)$ is the probability that alternative r is chosen from set A;
$U_r, U_{r'}$ are utilities associated with alternatives r and r'.

A corollary of this choice rule is that the odds of choosing an alternative over some other alternative is independent from the nature and presence of other alternatives in the set. This feature is called the Luce axiom, or the "Independence of Irrelevant Alternatives" characteristic (IIA). This feature is easily demonstrated by taking the odds of any two alternatives in the set, say $p(r_1|A) \,/\, p(r_2|A)$. Denominators $\Sigma_{r'} U_{r'}$ of both probabilities are equal; hence, cancel. So, the odds ratio only depends on, and is proportional to, the utilities of these two alternatives:

$$p(r_1|A) \,/\, p(r_2|A) = U_{r1} \,/\, U_{r2}\,.$$

Furthermore, if the utilities are defined as an exponential function of some underlying scale value, say U', $U = exp(U')$, then the log of this odds-ratio is equal to a difference in scale values:

$$ln\,(\,U_{r1} \,/\, U_{r2}\,) = U'_{r1} - U'_{r2}\,.$$

Strict utility theory is probabilistic and can handle choice situations with multiple alternatives. However, it assumes that utilities can be expressed and measured perfectly, moreover, that they are fixed entities. These are not feasible assumptions in practical situations, where there is always measurement error and where people cannot be expected to exactly know and remember utility values of alternatives. *Random utility theory* accounts for these various sources of variation by assuming that utilities can be decomposed into a systematic or deterministic component (V_r) and a random or error component (e_r):

$$U_r = V_r + e_r\,.$$

Consider again choice set A with alternatives r ($\forall\, r,r' \in A$), where alternative r has utility U_r as defined above. It is assumed that the alternative with the highest utility, $U_{r'}$ is chosen. Hence,

$$\begin{aligned} p(r|A) &= p(U_r > U_{r'}) \\ &= p(V_r + e_r > V_{r'} + e_{r'}) \\ &= p(V_r - V_{r'} > e_{r'} - e_r)\,,\ \forall\, r \neq r'\,. \end{aligned}$$

Random utility theory dates back to 1929 when Thurstone developed this theory to scale alternatives from choices among pairs of alternatives (see Torgerson 1958). Thurstone assumed that the random component e_r is normal distributed and developed cases for various possible further restrictions on this distribution. One of these (Case V) assumes that the error terms are independently and indentically distributed (IID). The assumption that utilities U_r are independently and identically distributed leads to the strict utility choice model defined above, which exhibits the "Independence of Irrelevant Alternatives" (IIA) property. The assumption of normally distributed error terms, however, precluded the practical estimation of this model for situations where more than two or three alternatives are of interest (e.g. Currim 1982).

2.4.1 The Multinomial Logit (MNL) model

The Multinomial Logit model is a convenient substitute for models as above that assume normally distributed error terms, and has become the most widely known type of discrete choice model. Because most applied studies assume the MNL to be valid we will confine our further discussion of discrete choice theory to this model. After outlining the assumptions of the MNL we will review discrete choice modelling studies that focused on consumer choice of retail destination.

The Multinomial Logit model is a particular type of discrete choice model. It assumes that the error terms e_r are independently and identically double exponential (or Gumbel, or "type I extreme value") distributed. The double exponential distribution is convenient because, in contrast to the normal distribution, it leads to a closed, hence tractable, model form (Hensher and Johnson 1981; Ben-Akiva 1985):

$$p(r|A) = \frac{\exp(\mu V_r)}{\Sigma_{r'} \exp(\mu V_{r'})}, \quad \forall\, r,r' \in A$$

where μ is a scaling factor that is arbitrarily set to unity in single applications (see Ben-Akiva and Lerman 1985, p. 104); other terms are defined as above.
The double exponential distribution is the only distribution that allows the integration of a Thurstone type of random utility model with Luce's (deterministic) choice axiom (Yellot 1977).

In accordance with Lancaster's charactistics theory it is assumed that the systematic utility V_r depends on the characteristics or attributes X_{ri} (i = 1,...,N) of alternative r. Utility V_r is typically assumed a linear-in-the-parameters function of attribute values: $V_r = \boldsymbol{\beta}\, \boldsymbol{X}_r'$, where $\boldsymbol{\beta}$ is an unknown parameter vector and $\boldsymbol{X}_r'$ is a vector of known attribute values of alternative r. An additive utility function is typically assumed, however this form is not restrictive as nonlinearities and nonadditivities can easily be accommodated by extending $\boldsymbol{\beta}$ and $\boldsymbol{X}_r'$ to incorporate quadratic terms or higher polynomials, or interactions among attributes.

Moreover, the IIA property of this model implies that the systematic utility V_r depends on the attributes of choice alternative r only. It is nevertheless easy to extend this function to include "cross-effects" of attributes of alternatives r' ($r \neq r'$, $r,r' \in A$) on the utility of alternative r. Because MNL by definition assumes that all such cross-effects are zero, one way to test MNL models for violations of IIA is to estimate such cross-effects (Louviere 1986; see also Oppewal and Timmermans 1991). MNL models that are extended with cross-effects are called "mother logit" or "universal logit" models (McFadden, Train and Tye 1977). These models are statistically equivalent with logit regression as a general approach to categorical data analysis (e.g. Wrigley 1985).

Estimates of MNL model parameters are typically obtained with either generalized least squares or with maximum likelihood procedures (see e.g. Louviere and Woodworth 1983; Ben-Akiva and Lerman 1985; Wrigley 1985; Louviere and Timmermans 1990c). Recently, it has been shown that in many cases maximum likelihood methods provide more reliable estimates; hence, this approach is recommended (Bunch and Batsell 1989).

Although consistent, parameter estimates of the MNL are only asymptotically efficient and normal distributed. As a consequence, many

observations are required to obtain reliable parameter estimates. In practical applications this precludes the estimation of model parameters at the level of the individual respondent, and estimation typically takes place at the aggregate, or at best the segment level. Hence, although in theory the model allows total disaggregation, in practice preferences are mostly estimated at the group level. In this case, the error component e_r not only represents measurement errors and instabilities within individuals, but also represents taste variation among respondents (see Ben-Akiva and Lerman (1985, p.55) for an outline of the aggregate or econometric version of random utility theory as developed by Manski). In addition, the error component captures specification errors, i.e., errors due to ignored attributes of alternatives. It should also be noted, however, that for predictive purposes such aggregate discrete choice models can be easily applied at a complete disaggregated level by allowing individuals to vary in the composition of their choice sets and perception of alternatives. Indeed, this approach is recommended in forecasting in order to avoid the so-called aggregation error (Ben-Akiva and Lerman 1985).

Summarizing, the MNL model is a theoretically well-founded model that is easily empirically estimated and that allows the prediction of individual choice behaviour in current and new market conditions. Although the model has some very restrictive assumptions, in particular the IIA characteristic (cf. Rumelhart and Greeno 1971; Tversky 1972), the model appears to be quite robuust in practical applications (e.g. Borgers and Timmermans 1987).

2.5 Review of revealed preference retail models

In the 70s and early 80s the MNL and other discrete choice models were typically estimated from choice data that was observed in real markets ("revealed preference studies"). This type of data, however, poses particular problems that do not appear if data are obtained in experimentally controlled choice situations, such as employed in conjoint approaches. This section discusses shopping destination choice studies that were based on survey choice data. We will focus in particular on the problems that were typically encountered in these studies and that are major reasons for applying conjoint approaches.

Following Barnard (1987), we compiled a selective review of two types of empirical studies in which MNL models of shopping destination choice were

estimated from survey data, i.e., choice data observed in real markets. Studies of the first type are listed in Table 2.1. Studies of this type apply zonal or aggregate concepts of shopping destination and employ non-behavioural measures of destination attractiveness, such as retail employment or selling space. Studies of the second type are shown in Table 2.2. In these studies questionnaire approaches were used to measure the perceptions and evaluations of features that define the attractiveness of destinations. Besides location or travel time, typical attributes are perceptions of choice range, merchandise quality, parking, service level, prices, and store or centre atmosphere or design.

Table 2.1 *Selective review of shopping destination choice models that used aggregate (zonal) destinations and non-perceptual measures of attractiveness.*

Study reference	Study area (sample size)	Purpose category	Choice alternatives	Attributes of destinations (excl. location and travel time)
Richards and Ben-Akiva 1974	Eindhoven, The Netherlands 1970 (430)	All shopping	Zones	Retail employment, CBD dummy
Adler and Ben-Akiva 1976	Washington, USA, 1968 (403)	All shopping	Zones	Retail employment, CBD dummy
Domencich and McFadden 1975	Pittsburgh, USA, 1967 (63)	All shopping	Zones	Retail employment
Van der Hoorn and Vogelaar 1978	Amsterdam, The Netherlands 1976 (795)	All shopping	Zones	Employment (tertiary)
Landau et al. 1982	Tel Aviv, Israel (467)	All shopping	Zones	Retail employment
Kitamura and Kermanshah 1984	Baltimore, USA, 1977 (130)	Non-home based shopping	Zones	Zonal population, composite retail employment, store hours variable
Southworth 1981	West Yorkshire, England, 1970 (517)	All shopping (+work +recreation)	Zones	Number of zonal trip destinations
Swait et al. 1987	Maceio, Brazil, 1977 (234)	All shopping	Zones	Employment (service and professional), CBD dummy, market place dummy

Source: Compiled from Wrigley and Longley (1984) and Barnard (1987).

Table 2.2. Selective review of shopping destination choice models that used perceptual measures of retail destination attributes.

Study reference	Study area (sample size)	Purpose category	Choice alternatives	Attributes of destinations (excl. location and travel time)
Koppelman and Hauser 1978	Chicago, USA, 1974 (500)	Non-grocery shopping	Shopping centres	Variety, quality and satisfaction, value, parking
Recker and Kostynuik 1978	Buffalo, USA (300)	Major (groceries?) shopping	Stores/ shopping centres?	Quality, store convenience, service, store type
Recker and Golob 1979	Buffalo, USA (300)	Major (groceries?) shopping	Stores/ shopping centres?	Quality, store convenience, service, store type
Verster et al. 1976	Amsterdam, The Netherlands, 1974/75 (200)	Various shopping purposes	Shopping centres	Retail floorspace by category, consumer perceived prices, researcher perceived prices
McCarthy 1980	San Francisco (566, from two areas)	All shopping?	Shopping centre	Convenience, comfort, and safety of trip, shopping area attraction and mobility (5 factors from 19 items)
Gautschi 1981	San Fransisco, USA, 1973/74 (350)	Major non-grocery shopping	Shopping centres	Assortment, centre design, low prices, hours, dress, lack of crowds
Louviere and Meyer 1981	Tallahassee, Florida (200) + Laramie, Wyoming (500)	Grocery shopping	Stores	Price, variety of goods (?)
Arnold et al. 1983	Various data sets	Food shopping	Stores	Prices, variety, service, quality, weekly specials, value, fastest checkout counters, pleasant shopping environment (all 0-1 variables)
Timmer-mans 1982	13 settlements in Kempenland, The Netherlands (771)	Clothing	Shopping area	Distance, price of goods, choice range, service, quality of goods, parking facilities
Ghosh 1984	Unspecified (300)	Major grocery shopping	Stores	Store size
Weisbrod et al. 1984	Boston, USA, 1977 (170)	Major shopping	Shopping centres	Number of stores, proportion of clothing and general merchandise stores, proportion of other stores, variety store, planned centre dummy

Source: Compiled from Wrigley and Longley (1984) and Barnard (1987).

Clearly, models that include such perceptionally or behaviourally defined alternatives more closely correspond to the theory which underlies the disaggregate approaches. Studies that employ zonal, non-perceptional definitions of alternatives require one to assume that zones are perceived as choice alternatives and that measures like floorspace approximately represent the physical and subjective attributes that are assumed to determine choice behaviour.

Nevertheless, when using zonal and non-perceptual definitions, independent variables in these models are directly related to the instruments and variables that are of interest to planners and retailers. This is an important practical advantage. In contrast, the practical usefulness of models with perceptually defined attributes is often limited because there is a lack of studies and methods to relate physical measures of managerial interest to the subjective measures that are predictors in these behaviourally defined models. Hence, additional and ad hoc operational assumptions are required in order to apply these models in practical settings. Similarly, although arbitrarily defined, zonal definitions are often more convenient in planning studies, as in many cases it is burdensome to develop and apply (other) criteria for defining shopping destination choice alternatives. Especially non-planned shopping areas may be difficult to delimit and have been defined in various arbitrary ways (cf. Downs 1970; Verster et al. 1976).

Further problems that appear with choices observed in real markets apply to both zonal/non-perceptional and perceptually based studies. A first and major problem is that many of the relevant features, whether defined physically or subjectively, display high correlations in real markets. For example, prices and quality are typically correlated, as are size of centre and parking convenience. Such covariations decrease estimation efficiency, and thus, lead to less reliable parameter estimates. They also impede the interpretation of parameters because estimates depend on the particular set of predictor variables that was used. To solve these problems typically the set of predictors is reduced by deleting variables or by applying data reduction techniques, such as principal components analysis. This, however, results in a loss of potentially relevant information and/or increased complexity of analysis and interpretation, as the managerial implications of the resulting components or dimensions are not clear.

Secondly, in these surveys respondents typically produce responses for only one choice situation, i.e., the current market situation. Thus, as many respondents as responses are required. This leads to relatively high costs of data collection. This

problem is intensified by the large number of observations that is required to obtain reliable estimates of discrete choice model parameters.

Furthermore, the specification of choice sets may pose a problem in survey-type choice studies. In particular in spatial choice studies, such as shopping studies, it is often unclear which alternatives are known or considered by an individual consumer and which are not. This poses a problem in estimation because, first, incorrect specification of choice sets may introduce large biases in parameter estimates (Louviere 1988c). Secondly, if choice sets are not correctly specified, parameter estimates are confounded with potential violations of IIA and there is no "correct" model that may serve as a base model to test for IIA.

Fourth, the application domain of such models is limited because models are based on current attribute ranges only. Utilities of new alternatives that go beyond the current domain of attribute ranges can only be inferred by ad hoc extrapolation.

Finally, the validity of choice models based on revealed data is limited in several respects. Following Cook and Campbell (1979), we distinguish four types of validity. The first, statistical conclusion validity, concerns whether the application of statistical tests is justified. Revealed preference models allow well defined tests of statistical significance; so, if tests are correctly applied, models generally have statistical conclusion validity.

The second type is internal validity. It concerns whether it can be concluded that observed (statistically significant) effects have resulted from particular independent variables. Like in any survey, the internal validity of revealed preference models may be low because independent variables may have been correlated with other, unobserved variables in the estimation area and sample. One cannot know whether the independent variables that were included in the model were causing the variation observed in the dependent variable, or whether some "third variable" was the cause of these variations. Parameter estimates may (partly) reflect these characteristics and, thus, cannot be interpreted without much caution. Note that this problem also appeared in spatial interaction modelling.

Third, construct validity concerns whether the variable as measured corresponds to the intended theoretical construct. We regard the construct validity of revealed preference studies as limited, in particular when zonal non-perceptually defined alternatives are used as discussed above. One typically does not know in these applications whether these zones act as alternatives in the assumed decision-making process. Similarly, construct validity may be limited when retail floorspace is used as a measure of attractiveness of shopping destinations.

Finally, external validity concerns whether conclusions can be generalized to new populations and circumstances. One cannot positively conclude for the external validity of some result if the internal and construct validity is not clear. Hence, considering the model parameter estimates to be the major result of a revealed preference study, the above validity problems also affect the external validity of models estimated from revealed data. Because estimated model parameters may be confounded with characteristics of the market area, estimated model parameters are not very likely to transfer to other market areas or conditions. Therefore, each new application should involve the collection of new data and re-estimation of models. Impact studies, however, typically focus on the effects of new, not yet observable conditions on choice behaviour, for example potential new alternatives that lie beyond the current domain of experience. By definition choice data for such alternatives and conditions cannot be observed. Consequently, models can not be re-estimated and one has to rely on the external validity of models estimated for currently existing real market conditions.

Thus, although choice models estimated from revealed preference data may very well be able to reproduce or predict choices in the range of currently observable market conditions, insight in the operating causal factors and theoretical framework, and the predictive validity for new choice situations is expected to be only limited for many revealed preference models.

2.6 Introduction to conjoint approaches.

Many of the above limitations of survey-based choice models potentially can be avoided by collecting data from conjoint experiments. This involves the use of experimentally controlled hypothetical choice situations to obtain responses that reflect individual preferences. Conjoint approaches have been used in several studies of consumer choice of retail outlet, as indicated in Table 2.3. These studies have shown promising results, which is in line with the success of numerous applications of this modelling approach in many other fields of applied behavioural research (cf. Wittink and Cattin 1989). In the next section we discuss these retail applications of conjoint modelling.

The present section outlines the origins, basic assumptions and typical procedures of conjoint preference and choice modelling. The purpose of this section is to provide readers who are unfamiliar with these methods some

background for understanding the literature review in the next chapter and empirical studies reported in this thesis. A first subsection (2.6.1) will outline typical procedures of conventional conjoint analysis. The next subsection (2.6.2) discusses the integration of conjoint analysis with discrete choice theory, which resulted in the conjoint choice approach, which is used in our experiments. Note that these topics have been discussed more extensively elsewhere (e.g. Louviere and Woodworth 1983; Timmermans 1984; Louviere 1988a,b; Timmermans and Golledge 1990; Batsell and Louviere 1991; Louviere 1991).

2.6.1 Conjoint analysis

The conjoint approach has its origins in two paradigms in experimental psychology: axiomatic conjoint measurement (Luce and Tukey 1964; Krantz and Tversky 1971) and functional measurement (Anderson 1970, 1981, 1982). However, in applied research these approaches have merged over the years into a single approach that is known in marketing as conjoint analysis (Green and Srinivasan 1978, 1990; Louviere 1988a). This approach has been broadly defined as "any decompositional method that estimates the structure of a consumer's preferences, given his or her overall evaluations of a set of alternatives that are pre-specified in terms of levels of different attributes" (Green and Srinivasan 1990, p.4). In other areas of research, in particular transportation research, the method is often called the "stated preference technique". We will adhere to the term conjoint analysis, mostly because the label "stated preference" ignores the essentially decompositional nature of the approach. This section will outline the conventional approach to conjoint analysis by describing the procedure that is typically followed in the design and analysis of conjoint experiments.

Conjoint analysis focusses on the measurement of the part-worth utilities that individual decision-makers associate with attribute scores of choice alternatives. Traditionally, in axiomatic conjoint measurement, the focus was also on testing the structure of preference functions, i.e, whether preference functions are additive, multiplicative or combined additive-multiplicative. However, in most applied studies the additive function is a priori assumed and other types of preference functions remain unexplored.

Conjoint experiments involve that individuals are asked to express their preference for various experimentally designed, hypothetical alternatives. These hypothetical alternatives are descriptions of potential real-world alternatives in

terms of their most relevant features, or attributes; hence, they are multi-attribute alternatives. Lists of attributes describing single alternatives are called profiles. Typically, the set of relevant attributes is generated by reviewing the research literature and performing pilot research with techniques such as focus groups, factor listing, or repertory grids. Two or more fixed values, or "levels" are defined for each attribute and these are combined to create different profiles. For example, hypothetical shopping centres have been described in terms of number of stores, distance from the home, and parking convenience, as shown in Figure 2.2 (Timmermans et al. 1984).

Number of shops:	small	[medium; large]
Travel time:	15 minutes	[30; 45]
Parking search time:	4 minutes	[12; 20]

Figure 2.2. Example description (or "profile") of a hypothetical shopping centre, as used by Timmermans et al. (1984). The right-hand column displays levels to define alternative profiles.

The experimental procedure involves that profiles are presented to respondents who are invited to express their preference by rating or ranking these profiles. For example, in the study by Timmermans et al., respondents had to rank nine profiles. Preference functions are estimated from this data, using O.L.S. regression in case of ratings data, and ordinal techniques when rankings were obtained. These functions assume preference, or utility, to be a linear-in-the-parameters function of the attributes that are included in the profiles.

Obviously, the number of possible combinations increases immensely with increasing numbers of attributes or levels. For example, seven attributes with two levels each produce 2^7, or 128 different combinations. Fortunately, only a small subset of all possible combinations is required in order to estimate an additive utility function. In analysis-of-variance terms, this means that only main effects are estimated. To allow optimally efficient estimation this subset of profiles should be balanced on the pairwise occurrence of the levels of all attributes across these profiles. This is accomplished by using fractional factorial design techniques (e.g. Montgomery 1984). In the current example with seven two-level attributes, this smallest balanced subset consists of eight profiles.

However, this reduction in the number of combinations is obtained at the cost of a priori assuming an additive utility function, i.e., that most or all interactions are negligible. In applied research, this assumption is often accepted to reduce research costs and because often interest focusses more on prediction than on testing particular hypotheses about attributes. Additive models often predict reasonably well and it has been observed that typically main effects account for most of the variance in the data (Louviere 1988a, p.40). Higher-order interactions in particular do not substantially increase the predictive ability of the models. Nevertheless, one should realize the type of assumptions that are made. Predictions for particular conditions may be wrong due to ignored interactions. Moreover, parameter estimates essentially do not represent the (main) effect of interest, but their combined effect with particular interactions that were assumed negligible and that therefore were purposefully confounded, or "aliased" with the effects of interest. To reduce the risk of large misinterpretations and biases it is advisable that estimated main effects are at least independent from first-order interactions. This usually can be accomplished by taking designs that are moderately larger than the smallest possible main effects fraction or "resolution III" designs (e.g. Montgomery 1984; cf. Hahn and Shapiro 1966; Louviere 1988a).

Thus, fractional factorial designs allow one to obtain feasible sets of treatments that permit statistically efficient estimation of all relevant effects. A further data efficiency of conjoint analysis is that multiple responses can be obtained from one respondent. In conjoint analysis, it is typically assumed that these multiple responses are mutually independent and that potential biases will cancel out if the order of presentation of profiles is randomized across respondents.

In many applications, respondents received a complete replication of the fractional factorial design, which allows the estimation of the parameters of the utility function for each individual separately. This approach, however, has been criticized for the typically limited number of residual degrees of freedom in the individual analyses (Green and Srinavasan 1990). Nevertheless, such individual estimates are commonly used in at least three different ways. First, individual attribute importances are aggregated to obtain an estimate of the importance of the attributes in the segment or market of interest. Secondly, individual part-worth utilities or attribute importances are used to cluster individuals on similarities in preferences ("benefit segmentation"). A third important use of individually estimated preference functions involves the construction of choice simulators. A computer file contains the individual preference functions from a sample of

individuals that is representative for the market of interest. This sample of preference functions is used to simulate individual choices in various potential new market situations. Choices are derived by first calculating each individual's utility for each of the simulated alternatives. Next some choice rule is applied to decide which alternatives will chosen. Commonly used choice rules are the "highest utility equals choice" rule and the rule that choice probabilities are equal to the proportion utility in the total utility across all alternatives in the set. Finally, predicted choices are aggregated to obtain estimates of market shares in the various conditions.

In conclusion, conjoint analysis is an attractive approach to measure part-worth utilities that has some particular advantages over discrete choice models estimated from real market choice data. It allows one to predict preferences for alternatives that are currently not available in the market and to obtain individual level preference functions, which allows benefit segmentation and the use of choice simulators. Nevertheless, conjoint analysis also has some particular disadvantages. First, the task structure (rating or ranking of profiles) has little resemblance with the task structure in the real market, where people make choices. Secondly, ad hoc defined decision rules are required to predict choice. Thirdly, although model parameters are estimated at the individual level, these estimates are not very reliable, due to limited residual degrees of freedom. Moreover, in many applied studies interest focusses on attribute importances at the segment or market level and on market shares only, and a completely disaggregate approach seems not required.

These limitations, and the advantages of discrete choice models as outlined in previous sections, were the major reasons for the development of a modeling approach which integrated conjoint analysis and discrete choice theory. The next subsection outlines the major features of the resulting new approach, called conjoint choice experiments.

2.6.2 Conjoint choice experiments

The integration of conjoint analysis and discete choice theory has resulted in a new approach, often called conjoint choice analysis. Various other names have been used, however, such as "decompositional choice experiments", "stated choice experiments", "experimental choice analysis", "multiple choice experiments" or "discrete choice experiments".

Conjoint analysis involved the use of the principles of the design of statistically controlled experiments to develop hypothetical multi-attribute alternatives. In contrast, conjoint choice experiments involve the use of such experimental design techniques to develop not only hypothetical multi-attribute alternatives, but to also develop multiple choice sets. These choice sets may either contain profile descriptions of hypothetical alternatives, names of currently existing alternatives (transportation modes, brand names, etc.), or combinations of both. Respondents are asked to choose the most preferred alternative from each choice set, or to allocate some fixed budget among the alternatives in each set. Hence, one observes choice frequencies or proportions and from this data one can directly estimate discrete choice models as outlined in section 2.4.

Three considerations underly the choice for a particular experimental design to construct choice sets: 1) the minimum and maximum possible size of choice sets, i.e., how many alternatives a choice set may or should contain; 2) whether the IIA assumption is assumed and accepted, or whether one wants to test for this assumption by estimating cross-effects; and 3) whether particular types of cross-effects are relevant.

If a priori the IIA property is assumed valid, and one has no intention to test this assumption, then, by definition (see section 2.4), utility is independent from choice set composition; hence, one can randomly allocate alternatives to positions in conveniently sized choice sets.

If the IIA property cannot be assumed in advance, one should design the experiment such that IIA violations can be estimated as cross-effects, or at least, that parameters of interest are independent from these violations. There are two common strategies to design choice sets that allow the estimation of cross-effects. One produces choice sets of varying size and allows one to estimate so-called availability cross-effects; the other produces choice sets of fixed size and allows one to estimated so-called attribute-based cross-effects.

Choice sets of varying size are obtained by using a 2^N designs to construct choice sets. First N alternatives are defined; again, these alternatives may either be conventionally designed conjoint profiles or names of alternatives that currently exist in the real market. Next, each of these N alternatives is treated as a factor with levels "present in the set" and "absent in the set". Treatments from this design represent choice sets which vary in size and composition. Because only a fraction of the full-factorial 2^N is required to estimate the effects of interest the number of choice sets is manageable with even larger numbers of alternatives. For example,

whereas seven alternatives could be placed in 2^7 (i.e., 128) sets of varying size and composition, only eight choice sets would be required to estimate the "main effects", or constants in the utility function. In discrete choice modelling these constants are called "alternative specific constants". However, constants estimated from this example design are not independent from cross-effects. To obtain this independence, in this example minimally twice as many choice sets are required (see Anderson and Wiley 1992). Even larger fractions are required to be able to estimate (first-order) interaction terms. These interaction terms represent systematic variations in utility due to the joint occurrence of alternatives, and have been called availability cross-effects (Oppewal and Timmermans 1991; Anderson and Wiley 1992). The MNL model assumes that all cross-effects are zero (see section 2.4), so these terms represent tests of IIA. Hence, 2^N designs permit one to obtain utility estimates for both profiles and alternatives that currently exist in the real market and easily allow one to include tests of model assumptions. Moreover, cross-effects have an interpretation as indicators of particular competitive relationshiops between alternatives. Finally, the use of 2^N designs to construct choice sets has been shown to be more efficient than other methods for the construction of choice sets, such as paired comparisons designs (Louviere and Woodworth 1983).

The other strategy simultaneously designs profiles and choice sets of some fixed size. All attributes of alternatives are treated as factors in one fractional factorial design. For example, if choice sets will contain four alternatives, and each alternative has five three-level attributes, then a fraction of the 3^{4*5} factorial design should be used. Treatments from this design represent sets of profiles. Across choice sets, attributes of these profiles are mutually independent both within and between profiles. This allows one to estimate a logit model in which utility functions not only include effects of "own" attributes, but also cross-effects of attributes of other alternatives. Again, if one assumes IIA, then all these cross-effects should be zero. Hence, these cross-effects represent tests of IIA, as well as providing information on particular (attribute-based) competitive relationships.

In sum, various approaches can be taken in conjoint choice experiments to place alternatives in choice sets. Some of these approaches allow one to estimate cross-effects, which are convenient tests of IIA. However, designs that allow independent estimation of cross-effects typically are much larger, and thus require many more different sets to be constructed.

A further typical feature of conjoint choice experiments is that a constant or base alternative is added to each designed choice set. This is to set the origin of the utility scale and to preserve the orthogonality of the design. Often this base is defined as a non-choice or "other" category. The advantage of the inclusion of such a type of base alternative is that it allows one to observe shifts in choice to and from the product category of interest under various conditions. Hence, one obtains estimates of (changes in) absolute, or primary, demand in addition to (changes in) market shares.

The advantages of conjoint choice experiments can be summarized as follows:

* Choice tasks are natural and relatively easy tasks, and closer resemble the choice situation of interest than methods that require one to rate or rank alternatives (cf. Louviere and Gaeth 1988);
* They allow one to collect multiple observations per subject;
* They allow tests of the assumed model structure;
* They allow one to control the composition of choice sets;
* They enable one to specify and study context effects (cf. Oppewal and Timmermans 1991; Fischer et al. 1992; Van der Waerden et al. 1993);
* They allow experimental control, i.e., random allocation of subjects to conditions (treatments) of independent variables and systematic control of variables that are not manipulated but that may affect responses;
* This allows one to study causal effects;
* They allow the direct estimation of probabilistic discrete choice models;
* Such models allow one to predict choice probabilities without requiring ad hoc decision rules;
* The tasks can easily be accommodated to include currently available alternatives (brand names, transportation modes, shopping alternatives) in the same framework as hypothetical alternatives.

Major *disadvantages* of conjoint choice experiments are, first, that they do not allow one to reliably estimate models at the individual level. However, as interest in retail applications usually focusses on predictions at the market share level, this should not be a real problem in the present context. Moreover, one still can apply estimated models at the individual level, provided one has individual choice set and attribute level specifications. Second, the design and analysis of the study is typically more complex with choice experiments than with other techniques, including conjoint analysis.

A potential further problem is that conjoint approaches is that the *external validity* of models is more critical than in revealed choice modelling. This is because, in contrast to revealed choice models, choice tasks that produce data to estimate conjoint models are only paramorphic, not identical to the real market choice situations to which the models are applied. On the other hand, it seems that conjoint models generally have a higher internal validity because they are based on experimentally controlled conditions. Also the construct validity of conjoint models seems defendable because conjoint studies often allow a more direct operationalization of the underlying theory of choice behaviour than revealed preference studies. Hence, we expect that conjoint-based models are at least as reliable as revealed preference choice models in predicting choice situations where new types of alternatives occur or where (unobserved) local characteristics are largely different (spatial transferability).

However, the predictive validity of choice models estimated from conjoint choice experiments has not yet sufficiently been demonstrated. Nevertheless, one may expect that the external validity of conjoint choice experiments will not be much lower than the external validity of conjoint analysis, provided that sample heterogeneity is accounted for. The external validity of conjoint analysis has been demonstrated both within laboratory settings and in real-world situations (Levin et al. 1983, Timmermans 1984; Louviere 1988b; Van der Heijden and Timmermans 1988).

In sum, we conclude that conjoint approaches, in particular the conjoint choice approach, are promising ways to obtain models that, for example, can be used to investigate the effects of changes in retail facilities. However, much further research into the potential advantages of such conjoint applications is required, as only few conjoint retail applications have been developed, yet. The next section reviews these applications and discusses ways in which the limitations of these studies may be circumvented.

2.7 A review of conjoint studies in retailing

Conjoint approaches to modelling consumer choice behaviour have many advantages, as reviewed in the previous sections. This is confirmed by the multitude of conjoint applications in a variety of research areas. Considering these advantages, there have been only few conjoint applications in retailing. Table 2.3

presents a selective review of conjoint studies of consumer choice of retail destination, including both conventional conjoint analysis studies and conjoint choice experiments. The present section focusses on limitations of these studies and on potential ways to overcome barriers to the further application of conjoint methods in retail management and retail planning. A first subsection discusses how attributes included in conjoint retail studies relate to results from retail image studies. A second subsection discusses two recently developed ways to overcome limitations of conjoint approaches. Subsection 3 discusses implications of the fact that most previous studies were limited to modelling store choice.

2.7.1 Conjoint attributes and retail image

There exists an extensive literature on the attributes that define *store* image. An important early review (Lindquist 1974) derived 35 aspects from 21 studies and categorized these aspects into nine sets. A follow-up study (Mazursky and Jacoby 1986; see also McGoldrick 1990, pp. 123-138) reviewed 26 store image studies and found that the following seven image aspects were most frequently examined in these studies: merchandise quality, merchandise pricing, merchandise assortment, general service quality, salesclerk service, locational convenience, and atmosphere or pleasantness of shopping at the store. Mazursky and Jacoby conclude that these aspects are among the most important components of store image.

These aspects are also the attributes that are typically used in conjoint retail studies. Table 2.3 shows that of seven conjoint studies of store choice, all studies included distance or convenience as an attribute, three also included parking convenience; all studies also included prices; five included variety, selection, or assortment of goods; five included quality of merchandise; and three studies included service. None included store layout or friendliness of personnel.

Fewer studies have been devoted to the study of the image of total *shopping centres*. In one of the earliest studies (Downs 1970), it was hypothesized that the image on an urban downtown shopping centre is based upon nine cognitive components: price, structure and design, ease on internal movement and parking, visual appearance, reputation, range of goods, service, shopping hours, and atmosphere. In this study, 202 women evaluated a postwar "designed" shopping centre in Bristol on 36 seven-point scales, four for each category. Downs found support for eight components using principal components analysis. However, these results may have been specific for this particular centre. Nevin and Houston (1980)

Table 2.3. Selective review of attributes and levels in conjoint studies of choice of retail destination.

Study reference	Type of destination	Distance	Parking facilities	Assortment / choice range	Prices/ value for money	Quality of products	Store service
Schuler 1979	supermarket	1; 3; 5; 7 miles	100; 200; 300 feet		−10%; −5%; av.; +5%; +10%	−30%; −15%; av; +15%; +30%	speed 5; 10; 15 min.
Louviere and Meyer 1981	store	convenience: 10; 20; 30 min. drive and park		above av; average; below av.	above av; av.; below av.		
Verhallen and De Nooij 1982	food store	5; 15; 25 min.		food;+household goods;+cosmetics & periodicals	100;110;120 gld. weekly purchases	1 spoiled product a week, month, 6 months	
Timmermans 1982	shopping centre (clothes)	15; 30; 45 min.	3; 6; 9 min search	10; 40; 70 stores			
Timmermans et al. 1984	shopping centre (clothes)	15; 30; 45 min.	4; 12; 20 min. search	small; medium; large number of shops			
Louviere and Gaeth 1987	supermarket	convenience: positions 2, 5, 8 on scale in subdesign		pos. 2, 5, 8 on sub-des. scale	pos. 2, 5, 8 on sub-des. scale	pos. 2, 5, 8 on sub-des. scale	
Ahn and Ghosh 1989	shopping centre/ anchor store (clothes)	15; 30 min.		50; 100 stores/ 1; 2 anchors/ (anchor st. ratings)	(anchor store ratings)	(anchor store ratings)	(anchor st. ratings)
Moore 1990	grocery store	(3 lev)	(3 levels)	(3 levels)	(3 levels)	(3 levels)	
Louviere and Johnson 1991	supermarket	convenience: (nms. of 5 competitors)		(names of 5 competitors)	(names of 5 competitors)	(names of 5 competitors)	(names of 5 compet.)
Louviere and Johnson 1990	department store (apparel)	convenience: (names of 5 competitors)		(5 competitors)	(5 competitors)	(5 competitors)	(5 comp.) +return policy: (5comp.)

also used principal components analysis to find the most important cognitive dimensions of shopping centres. They generated 16 attribute items to represent the domain of shopping centre image. From 827 households they obtained semantic differential evaluations on these attributes for five centres in Madison. They performed principal component analyses for each of these centres separately and found three components which they interprete as "assortment," "facilities," and "market posture." Items loading high (>.40) on the "assortment" dimension are quality of stores, variety of stores, merchandise quality, product selection, special sales/promotions, special events/exhibits, great place to spend a few hours; items loading on the "facilities" dimension are layout of area, parking facilities, availability of lunch/refreshments, comfort areas; items loading on "market posture" are general price level, store personnel, a conservative centre. The market posture dimension, however, had relatively low factor loadings and was not very reliable. Nevin and Houston found their image structure to be congruent across the five centres.

This problem can be avoided by asking consumers to indicate the degree of similarity or dissimilarity among shopping alternatives. Such data can be analyzed by multidimensional scaling and related techniques to uncover the major dimensions of consumers' perceptual space (e.g. Burnett 1973; Singson 1975; Spencer 1980). To bypass this subjectivity, other scholars have advocated the use of the repertory grid technique (Kelley 1955; Hallsworth 1988) to elicit perceptual dimensions. It involves presenting triads of alternatives and then asking consumers to mention in what way two alternatives are alike and thereby different from the third. This procedure is continued until no new constructs are mentioned. Once the constructs are obtained, alternatives may be positioned on each construct using rating scales. Standard multivariate statistical techniques are used to analyze the data and identify underlying perceptual dimensions.

In a repertory grid study by Timmermans, Van der Heijden, and Westerveld (1982) among twenty subjects and thirteen shopping centres in Eindhoven, The Netherlands, it appeared that the dimensions "size", "accessibility", "atmosphere", and "physical layout" are most frequently used by these consumers to distinguish among shopping centres. The study by Van Raaij (1983, see also Hackett et al. 1993) confirms the relevance of these four dimensions. A sample of 579 respondents evaluated shopping centres in Rotterdam on various attributes and provided ratings of the importance of these attributes. In a principal components analysis of the importance ratings, Van Raaij obtained five components. These

were labeled general evaluation, physical environment, efficiency, accessibility, and social environment. Considering the list of factor loadings, general evaluation largely corresponds to the size dimension in the Timmermans et al. study. Similarly, physical environment corresponds to physical layout, and efficiency seems related to both physical layout and location, which was the third dimension in the study by Timmermans et al. Finally, social environment seems most related to atmosphere. Hence, although minor differences exist, the four dimensions seem also valid for other Dutch cities.

Of these four dimensions, only the size and accessibility dimensions were represented by attributes in the conjoint studies that directly focused on choice of shopping centre. The studies by Timmermans c.s. (Timmermans 1982; Timmermans et al. 1984) included distance, number of stores, and parking facilities. The study by Ahn and Ghosh (1989) included number of stores, number of anchors, and distance.

Thus, attributes in retail conjoint studies were limited in at least two ways. First, studies included only small numbers of attributes, typically three to six. Larger numbers of attributes result in task-loads that have been considered as too high. The attributes in these studies mostly had a direct correspondence to the most important dimensions in consumers' cognition of shopping destinations. Although studies efficiently determined the relative importance of these dimensions, these attributes typically represented only a limited subset of the total set of attributes that consumers may use to discriminate among shopping destinations, and that may influence the attractiveness of destinations (e.g. Zimmer and Golden 1988, cf. Timmermans et al. 1982).

A second and related limitation of attributes in previous studies concerns the managerial relevance of study outcomes: It is not always clear how impacts of more detailed marketing mix instruments or planning measures should be inferred from the experimental results. That is, it is unclear how managerial actions translate into the metric of the attributes in the experiment. Retail managers and planners are often more interested in the (perhaps only limited) influence of detailed and actionable attributes than in attributes related to broadly defined cognitive dimensions. Previous retail studies have largely neglected this aspect (cf. Weisbrod et al. 1984; Barnard 1987; Corstjens and Doyle 1989).

2.7.2 Ways to include more relevant attributes

Recently, two new approaches have been developed to overcome the two limitations mentioned above, i.e., ways have been developed to include more attributes in conjoint studies, and to more directly include marketing-mix variables.

First, Louviere and Gaeth (1987) applied an extension of the conjoint methodology, called *Hierarchical Information Integration* (Louviere 1984a), to include much larger sets of attributes in a conjoint study of choice of supermarkets. In this procedure, each of the main cognitive dimensions, or higher-order constructs, is defined in terms of a number of attributes. Separate sub-experiments are designed to study the relations of these attributes with the corresponding construct. Louviere and Gaeth (1987) defined four higher-order constructs (prices, selection, quality of products, and convenience) and used twenty-two more detailed attributes to define these four constructs. For example, the attributes "prices of meats", "prices of produce", "prices of dairy products", and "prices of packaged goods" were included to define the total price image of a hypothetical supermarket. This suggests that there are viable ways to 1) study larger numbers of attributes and 2) link higher-order constructs to more detailed attributes in conjoint tasks.

A second innovation involves the use of choice tasks which directly include the attributes that are of managerial interest (cf. Louviere 1984b). A retailing application of choice tasks that directly include actionable attributes is a study by Timmermans, Borgers and Van der Waerden (1991). They presented subjects with various choice sets that (1) always contained (names of) four currently existing shopping centres that were assumed available to respondents, and (2) that contained various (maximum nine) proposed planning actions for each of the four shopping centres. Planning actions were, for instance, "10% increase in parking spaces in ... (currently existing shopping centre A)" or "15% increase in parking costs in ... (currently existing shopping centre B)". Respondents were asked how they would allocate their shopping trips among these shopping centres, given the shopping centres were available as described. The model that was estimated performed satisfactory.

The study by Timmermans et al. (1991) illustrates several of the advantages of choice experiments, especially how marketing mix or planning proposals can be studied directly.However, because the model focused on specific planning scenarios, their model cannot be generalized to other urban areas. To a lesser extent, the same criticism applies to the study by Ahn and Ghosh (1989). They included image

ratings of anchor stores as additional predictors in their conjoint-based choice model. Unless one assumes that images of store names and formats are uniform and stable across regions and conditions their model cannot be generalized. To obtain models and modelling methods (conjoint designs) that potentially can be generalized to new situations, experiments should be developed that include generic attributes only.

2.7.3 Store versus shopping centre destinations

One further limitation of previous conjoint studies of consumer choice of retail destination is that, as noted, most studies modelled store choice (mostly choice of supermarket or grocery store) and not choice of shopping centre. Yet, store choice models are only of limited use for retailers and planners who are interested in the influence of features of larger retailing structures like shopping centres and in the impact of changes in these larger structures on sales volumes.

One reason for the limited usefulness of store choice models is that it (currently) seems not practically feasible to derive reliable predictions of sales volumes of total shopping centres from store choice models. To obtain such predictions one would require a separate model for each store type. In addition, one would have to account for multi-purpose shopping, as visits to different stores are typically combined into single trips. Indeed, a second reason for directly studying shopping centre choice is that the attractiveness of a store as a destination is not only determined by its own characteristics, but also by the features of its immediate environment, i.e., by the features of the shopping centre in which it is located. Some of these features are related to particular stores or groups of stores, for example, the total selection of merchandise or the presence of a particular anchor store (cf. Ahn and Ghosh 1989). Other features, however, only emerge at the shopping centre level and are not just aggregated characteristics of the individual stores. How, for example, should store choice models account for the immediate store environment, the presence of anchor stores, whether competition is from within the own or from other shopping centres, or for the atmosphere and physical aspects like routing and layout?

Thus, it is of interest to directly study choice of shopping centre, and to include characteristics of shopping centres related to individual store characteristics, as well as those that go beyond individual store characteristics. The total set of shopping centre characteristics in the study should accommodate the major

dimensions of consumer cognition of shopping centres as indicated above, i.e., size, accessibility, atmosphere and physical layout. However, as argued above, the shopping centre attributes in the experiment should also have a direct relationship with the variables (marketing mix instruments) that are of interest to centre managers, developers, and planners.

2.8 Conclusions and summary: Problem definition for Part I

This chapter reviewed the various available approaches to modelling consumer choice of shopping destination. We discussed their various advantages and disadvantages and concluded that conjoint choice approaches in particular offer advantages over other approaches. After presenting a general introduction to individual choice models and conjoint approaches, we reviewed conjoint applications in retailing contexts.

It appeared that conjoint retail studies have been limited in at least three ways. First, studies included only limited numbers of attributes. Secondly, studies included attributes of limited managerial relevance. Third, relevance was particularly limited for shopping centre developers, designers, and urban planners, because most conjoint studies have focused on consumer choice of store, not shopping centre.

The first of these limitations result from the problem that numbers and sizes of profiles (attribute combinations) in conjoint studies increase with increasing numbers of attributes. Most researchers believe that respondents are not able to produce valid responses when larger numbers, or larger sizes of profiles are used (cf. Louviere et al. 1993). However, we identified the method of Hierarchical Information Integration (HII) as a promising way to overcome this limitation. HII potentially allows one to increase the number of attributes that can be studied in conjoint tasks. It also allows one to link general cognitive dimensions to attributes that are of interest to policy makers. Hence, it may allow us to avoid the first and second of the above three limitations. However, HII is a relatively new approach and its properties and limitations are not well understood. Therefore, a *first goal* of our studies is to further explore this method. In particular, we want to know 1) what are the limitations of the method of HII; 2) can the HII approach be improved and if so, how; and 3) can we demonstrate the advantages of HII in an application to model consumer choice of shopping centre. To achieve this goal,

Chapter 3 investigates the method of Hierarchical Information Integration and proposes a modification to the existing approach. Chapter 5 describes an empirical study that implements and demonstrates the new HII conjoint approach in an application to model consumer choice of shopping centre.

One reason for the second and third of the above limitations is that most conjoint studies used relatively ad hoc attribute definitions. Attributes were defined to represent the major dimensions of consumer cognition of shopping destinations, or to represent highly specific variables of managerial interest. However, how the "objective" shopping centre attributes, that are related to managerial actions, relate to the cognitive constructs that operate in the assumed decision-making process is not well understood. In product and retail marketing, the marketing mix concept more or less serves as a framework to theoretically integrate the various attributes and cognitive constructs into a single framework. Little work has been done, however, to develop and operationalize such a framework for shopping centres. Therefore, a *second goal* of our studies is to define the shopping centre marketing mix in terms of attributes and cognitive constructs that can be studied in conjoint tasks. In particular, we want to know whether and how constructs such as assortment, accessibility, and appearance can be defined in terms of more detailed but still generic shopping centre attributes, such that they all can be manipulated in a conjoint task. To attain this goal, Chapter 4 defines the shopping centre marketing mix in terms of constructs and attributes that can be studied in the framework of a HII choice task. We also discuss particular issues related to the definition of such attributes. The empirical study in Chapter 5 serves to test this operationalization of the shopping centre marketing mix.

A *final goal* of the studies in Part I is to answer questions pertaining to the various shopping centre attributes that are defined in Chapter 4. That is, we want to know what is the relative importance of these attributes in determining consumer choice of shopping centre, and how well can models that include these attributes predict consumer choice behaviour in real shopping markets. The empirical study in Chapter 5 was designed to answer these questions.

CHAPTER 3

INTEGRATED CONJOINT EXPERIMENTS TO MODEL HIERARCHICAL INFORMATION INTEGRATION

3.1 Introduction

Task sizes in conventional conjoint-like experiments rapidly increase with increasing numbers of attributes and/or levels. Though design techniques such as minimal fractional factorial designs, blocking techniques or hybrid approaches have been suggested to limit the numbers of profiles or choice sets in conjoint tasks, traditional (full-profile) approaches proliferate profile sizes as the number of attributes increases (e.g. Green and Srinivasan 1990; Louviere 1988).

Several approaches have been proposed to handle the problem of large numbers of attributes (Green and Srinivasan 1990), but each has drawbacks: Self-explication of attribute importances requires one to assume that individuals can provide valid and accurate evaluations of attribute weights independent of a specific context. In pairwise trade-off analysis (Johnson 1974), respondents could forget where they are in the trade-off table or adopt patterned responses (Green and Srinivasan 1990), and be forced to make assumptions or inferences about omitted attribute levels (Johnson 1987). This latter problem also may apply to BRIDGER (Albaum 1989; Bretton-Clark 1988), which uses subsets of attributes to construct separate experiments. Separate designs are "bridged" by at least one common attribute, and data from subexperiments are rescaled to a common scale by using OLS regression to calibrate the scale of the bridging attribute(s). This method is rather ad hoc, and its statistical properties are not well understood. These criticisms also apply to Adaptive Conjoint Analysis (Carmone 1987), which

asks respondents whether any attribute levels would lead to rejection of an alternative (Green, Krieger, and Bansal 1988) and selects attributes for further presentation through a self-explication task (Green and Srinavasan 1990).

An alternative approach to handling large conjoint problems is Hierarchical Information Integration (HII), proposed by Louviere (1984) and illustrated by Louviere and Gaeth (1987). Louviere's (1984) HII approach (1) categorizes attributes into several non-overlapping sets based on theory, logic, empirical evidence or applications demands, such that the sets represent particular constructs such as "quality", "atmosphere", "value for money" or the like, (2) designs and administers separate subexperiments to define each construct in terms of the attributes that categorize it; and (3) develops an "overall" or bridging design based on the constructs which permits one to concatenate the results of the separate designs and the overall design into one fully specified utility model.

Louviere's (1984) HII approach avoids the need to use the self-explicated weights and scale values and should be less affected by missing information than pairwise trade-offs. Moreover, bridging of designs is based on behavioral and statistical theory rather than an ad hoc calibration. Despite these advantages, Louviere's HII approach also has problems and limitations, which we review in the next section.

The purpose of this chapter is to propose and describe an extension of Louviere's (1984) HII approach that overcomes these problems and limitations and also avoids many of the problems associated with the preceding approaches. We first review HII theory, and several problems and limitations of the original approach. Next we present the basic idea of our proposed extension and describe procedures for designing integrated experiments consistent with the new theory. Then we discuss the analysis of these experiments and describe ways to test for the hierarchical structure that underlies the estimation of a single choice model from these separate experiments.

3.2 Hierarchical information integration

HII is an extension of Information Integration Theory (Anderson 1981, 1982) to complex decision problems in which one can assume that individuals are likely to group or categorize decision attributes into separate (high-order) decision constructs. HII assumes that individuals categorize attributes with respect to

particular constructs and integrate information about attributes to form impressions of alternatives with respect to those constructs and then integrate their separate construct impressions to evaluate alternatives holistically. Arrows in Figure 3.1 illustrate this sequence. Therefore, HII explicitly assumes that individuals simplify the evaluation of alternatives into separate partial and holistic evaluations. Recent research supports the idea that people can use high-order decision constructs when evaluating multi-attribute alternatives and choosing among brands or products (Corfman 1991). The idea behind the HII Method is to structure decision tasks to study and analyze integration processes separately and jointly.

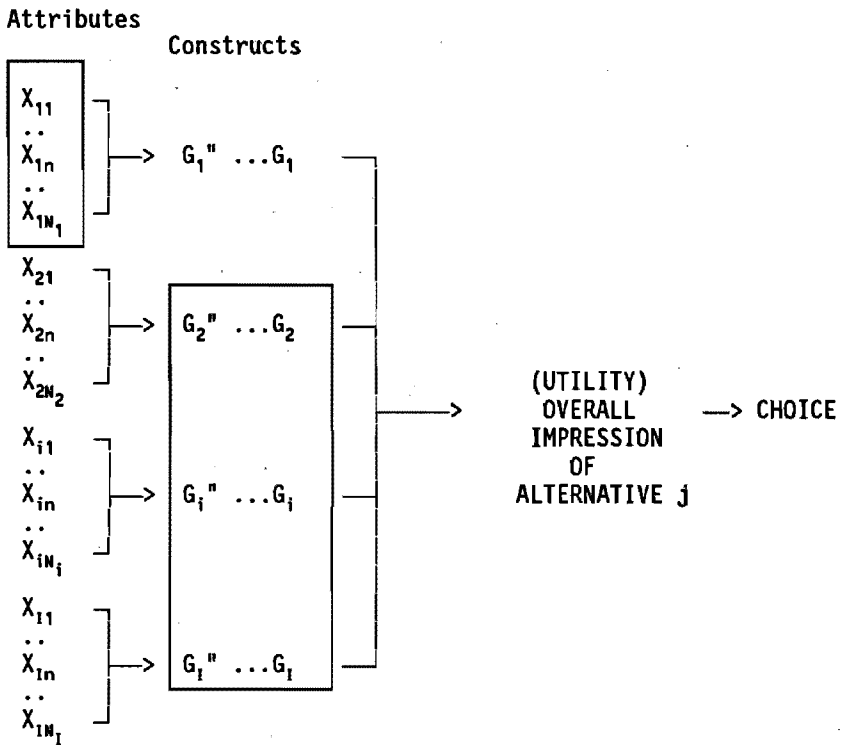

Figure 3.1 *Overview of the process of hierarchical information integration. (Boxed areas indicate attributes and constructs that are included in subexperiment 1 in the new approach; total number of subexperiments is I. The conventional approach to modeling HII would require I+1 experiments of which subexperiment 1 would include only attributes in the upper shaded area.)*

The basic idea of HII was illustrated by Louviere and Gaeth (1987), who applied it to model supermarket shopping behaviour. They first identified four high-order supermarket decision constructs using previous research (prices, selection, quality, and shopping convenience). These are indicated in Figure 3.1 as G_1 to G_I. Non-overlapping sets of attributes described each construct G_i, and different experimental designs were used to create combinations of attribute levels to define each construct. For example, attributes "prices of meats", "prices of produce", "prices of dairy products", and "prices of packaged goods" were varied in a subexperiment to create profiles of price-related attributes. Subjects evaluated the profiles on an 11-category rating scale (0 – 10) with respect to the construct "prices". In the other three subexperiments, subjects evaluated attribute profiles that described the other constructs. In Figure 3.1, construct evaluations in subexperiment i are denoted as G_i''. In a fifth experiment, each of the four decision constructs was treated as a factor, the levels of which were category values 2, 5 and 8 on the scale that subjects had used to rate the profiles in each separate construct evaluation task. Thus, the profiles were described by combinations of hypothetical ratings of decision constructs G_i. Subjects responded to this final task by rating their preference for the construct rating profiles on a 150-mm line-mark response scale. The five experiments were concatenated to obtain one overall utility function by substitution and replacement of terms.

HII also has been applied to other substantive problems, such as telecommunications (Louviere 1984a), outdoor recreation (Louviere and Timmermans 1990a), joint decision making (Timmermans et al. 1992), and residential choice (Louviere and Timmermans 1990b). In the latter two studies, the ratings-based bridging task was replaced by a choice experiment, which allowed estimation of Multinomial Logit (MNL) choice models. Despite encouraging empirical results, these studies also suggested a variety of problems and limitations with the original method.

3.3 Limitations of previous approaches to modelling HII

Among the problems identified previously, the following are germane here:

1. Louviere's (1984a) original HII approach does not test the assumed hierarchical decision structure; hence, one must assume the hierarchical structure is correct to concatenate the separate experiments logically.

2. The original HII approach produces several models rather than a single one for which overall measures of goodness- or badness-of-fit and tests of validity can be derived. A concatenated overall model cannot be estimated directly; rather, model parameters are calculated by substitution and replacement of terms in different models that are estimated separately. Hence, the attributes varied in each experiment are not related directly to the final response of interest, whether preference or choice.
3. The values of remaining constructs are not specified in each separate subexperiment because one assumes that they have no systematic effects on evaluations of a particular construct. Consequently, subjects may have to assume or infer values for other constructs (e.g., Johnson 1987). Therefore, attribute effects are tested only over a limited range of values of other decision constructs, and there is no control over respondents' inferences about the values of other decision constructs.
4. The validity of the bridging experiment poses problems because respondents have to evaluate or choose among profiles described in terms of their (hypothetical) profile ratings in the subexperiments. The difficulties of this task are unclear, nor is it clear whether resulting attribute evaluations reflect respondents' real decisions. For example, profiles in bridging tasks typically contain only numerical scores, which may encourage respondents to average construct scores.
5. Though the bridging experiment can be designed as a choice experiment, Louviere's original approach does not allow subexperiments to be framed as choice experiments. Because there may be situations in which one wants to model choice behavior, one might wish to design subexperiments as choice experiments.
6. Finally, interactions between variables that define different constructs cannot be estimated, nor can interactions between attributes and decision constructs.

In the next section we propose and describe an approach to the design and analysis of HII tasks that avoids most of these limitations and incorporates a more realistic and rich task structure.

3.4 Integrated HII conjoint experiments

3.4.1 Design considerations

Let us first consider the logic behind the design of integrated HII conjoint experiments: Suppose a particular choice is influenced by a set X consisting of N total attributes. HII requires one to categorize the N attributes into subsets that define or map into various decision constructs. Categorization of attributes into constructs can be based on logic, theory, or empirical evidence from literature or pre-experimental research. The number of constructs defined should be considered in the light of 1) how respondents categorize product attributes and 2) design requirements imposed by various categorization schemes. Suppose there are I constructs, denoted by G_i ($i=1,..I$), and assume that each construct is associated with a subset X_i that contains N_i attributes X_{in} ($n = 1,..N_i$). HII applications typically assume that each attribute maps into only one construct; hence, $\sum_i N_i = N$. In the conventional HII approach one would design $I + 1$ separate experiments: One subexperiment for each attribute set X_i that defines a decision construct G_i, and one bridging experiment. In subexperiment i, subjects would evaluate profiles of attributes from set X_i on a scale that defines the particular decision construct G_i and ignore all remaining decision constructs G_j ($j \neq i$) and corresponding attribute sets X_j ($j \neq i$). In the bridging design, they would evaluate profiles of hypothetical evaluations of all I constructs.

We extend the conventional method by explicitly including summary measures of the other decision constructs G_j ($j \neq i$) as additional design variables in each subexperiment i, as indicated in Figure 3.1. Hence, experimental profiles describe alternatives as combinations of attribute levels and construct levels. Because each profile potentially describes all I aspects of an alternative that one assumes to be relevant to the respondents, their overall evaluations (whether preference or choice) should provide information about their utilities and preferences regardless of which construct experiment they experience. This extension increases the size of each subexperiment, but eliminates the need for a bridging experiment because theoretically equivalent preference or choice models can be estimated from responses to each subexperiment. Moreover, the separate tasks can be concatenated to estimate all attribute parameters simultaneously. If the task is designed as a choice experiment, one can preserve the orthogonality of the design and fix the origin of the utility scale across the different construct

experiments by using a common, constant base alternative in all choice sets as recommended by Louviere and Woodworth (1983) and Louviere (1988a). One obvious constant alternative might be "other" or "none".

3.4.2 Analysis of integrated HII preference and choice experiments

Each subexperiment can be analysed independently with standard estimation techniques, such as OLS regression for preference ratings, or logit regression analysis for discrete choice responses. The data for each subexperiment allow one to estimate a model that contains terms for the utilities of included attributes and decision constructs.

More formally, if one assumes additive linear utility functions (e.g., within a MNL type of discrete choice model), the utility function for alternatives r in subexperiment i can be described as follows:

$$V_i = X_{(i)} \beta_i + G_{(i)} \gamma_i \quad ,$$

where V_i is the vector of systematic utilities of alternatives r ($r = 1,..,R_i$) in subexperiment i and $X_{(i)}$ is a matrix whose R_i rows consist of the N_i appropriately coded attributes X_{in} of alternatives r in subexperiment i. $G_{(i)}$ is a matrix whose R_i rows consist of the $(I - 1)$ coded constructs G_j $(j \neq i)$ that describe the remaining dimensions of alternatives r in subexperiment i; and β_i and γ_i are unknown parameter vectors for subexperiment i.

Each separate subexperiment supplies estimates of particular attributes and constructs. However, one can estimate a single overall preference or choice model by concatenating all subexperiments and estimating a common vector of parameters across designs. The utility function for such an overall model assumes that the same decision process operates in the separate experiments. Moreover, it assumes that any biases induced by separate experiments cancel out across all experiments and that error variances are equivalent across tasks. The full design matrix M is a block diagonal matrix that is constructed from the $X_{(i)}$ and $G_{(i)}$ matrices, as follows:

$$M = \begin{bmatrix} X_{(1)} & 0 & 0 & \dots & 0 & G_{(1)} & 0 & \dots & 0 \\ 0 & X_{(2)} & 0 & \dots & 0 & 0 & G_{(2)} & \dots & 0 \\ \dots & & & & & & & & \\ 0 & 0 & 0 & \dots & X_{(I)} & 0 & 0 & \dots & G_{(I)} \end{bmatrix}$$

and the full model can be stated as:

$$V = M\,[\beta,\ \gamma]' \ ,$$

where V, β, and γ are concatenated vectors: $V = (V_1, .. V_i .. V_I)', \beta = (\beta_1, .., \beta_i, .., \beta_I)$, and $\gamma = (\gamma_1, .., \gamma_i, .., \gamma_I)$.

One can, however, also constrain the matrices $G_{(i)}$ to be "generic" across subexperiments. This requires that zero-valued column vectors of length R_i are inserted in the matrices $G_{(i)}$ to represent the missing construct i; call these extended matrices $G_{(i)}{}^{+0}$. One then can construct a design matrix M_g as follows:

$$M_g = \begin{bmatrix} X_{(1)} & 0 & 0 & \dots & 0 & G_{(1)}^{+0} \\ 0 & X_{(2)} & 0 & \dots & 0 & G_{(2)}^{+0} \\ \dots & & & & & \\ 0 & 0 & 0 & \dots & X_{(I)} & G_{(I)}^{+0} \end{bmatrix}$$

and the full model is stated as

$$V = M_g\,[\beta,\ \gamma_g]' \ ,$$

where V and β are vectors as defined previously and γ_g is a single vector of parameters for the I constructs. So, in each subexperiment, attributes or constructs that do not appear in that experiment are coded zero in the design matrix. If all attribute and construct effects are centered around a zero mean and attributes in each subexperiment are orthogonal, the structural zeroes will not affect the parameter estimates. The estimated utility function, therefore, will contain separate utility parameters for each attribute and construct. Attribute parameter vectors β_i and "specific" construct parameter vectors γ_i are estimated only from subexperiment i. If construct parameters are constrained to be "generic" (γ_g), then construct estimates are derived from I minus 1 subexperiments. Only the constant, if included, is based on all I subexperiments.

The overall model estimated from the concatenated experiments can be used to predict the utility of new or existing alternatives. This requires that values of either a particular construct or its corresponding attributes are set to zero in the design matrix. In this way, utilities for new alternatives can be predicted for cases

in which attribute values are known but decision construct evaluations are not or, conceivably, construct evaluations are known but attribute values are not.

3.4.3 Assessing the validity of the HII model structure

An important advantage of our extended HII approach over Louviere's (1984a) approach is that we can test the validity of the assumed hierarchical model structure. We outline four tests and illustrate them in our example application. The first three involve the use of OLS regression and require that respondents evaluate (judge) the constructs described by the attribute profiles. To ensure measurement compatibility, respondents must evaluate constructs on the same rating scales used by the experimenter to define the levels of these constructs in the other subexperiments. The first test of the assumed hierarchical model structure is to check whether all attributes are statistically significant in a regression of these construct evaluations G_i'' on attributes from set X_i and other constructs G_j $(j \neq i)$. If a construct is well defined by its attributes, all its attributes should have significant effects. Moreover, if the ratings of a particular construct are independent of the levels of other constructs, none of the effects of the other construct measures (main effects or interactions with attributes) should be significant. More formally, this involves the estimation of the following equation for each subexperiment i:

$$G_i'' = X_{(i)} \beta_i'' + G_{(i)} \gamma_i'' \quad ,$$

where matrices $X_{(i)}$ and $G_{(i)}$ are as defined previously, and G_i'', β_i'' and γ_i'' have similar dimensions as the previously defined vectors V_i, β_i and γ_i, respectively. Hypotheses are that 1) $\beta_i'' <> 0$ and 2) $\gamma_i'' = 0$.

Second, one can compare the OLS construct regression parameters of attributes with the overall choice (or preference) model results. All attributes that have significant effects on the utilities V_i in the overall preference or choice models should also have significant effects on the construct evaluations G_i''. If an attribute is significant in the overall model, but not significant in construct-regression models, it is not well represented in the specific construct. Hence, the regressions indicate whether hierarchical processes within subexperiments are independent and include all relevant attributes.

A third application of OLS construct regression results involves a test of process equality across subexperiments. The separate construct regression equations based on observed values G_i'' can be used to predict construct values G_i associated

with attribute profiles (or sets) X_i in subexperiment i. One can substitute vectors of these predicted values for the zero-valued column vectors in matrices $G_{(i)}{}^{+0}$ to obtain matrices that we denote by $G_{(i)}{}^{+p}$, and estimate a generic "constructs-only" model across subexperiments. A modified Chow test (e.g., Kmenta 1986, p.421) can be used to test whether the effect of a construct defined as a profile of attributes in a particular subexperiment is equal to the effect of the corresponding hypothetically defined construct evaluation in the other subexperiments. Dummies are used to create sets of parameters that represent potential construct parameter deviations across particular subexperiments as follows:

$$M_c = \begin{bmatrix} G_{(1)}^{+p} & G_{(1)}^{+p} & 0 & \dots & 0 \\ G_{(2)}^{+p} & 0 & G_{(2)}^{+p} & \dots & 0 \\ \dots & & & & \\ G_{(I-1)}^{+p} & 0 & 0 & \dots & G_{(I-1)}^{+p} \\ G_{(I)}^{+p} & -G_{(I)}^{+p} & -G_{(I)}^{+p} & \dots & -G_{(I)}^{+p} \end{bmatrix}$$

and the full model is stated as

$$V = M_c\,[\gamma_g, \gamma_g^1, \gamma_g^2, \dots, \gamma_g^{I-1}]' \ ,$$

with the γ_g^i being vectors of Chow test parameters, and other terms as defined previously. Some of these Chow test parameters represent tests of whether effects of profiles of attributes are equal to effects of corresponding hypothetical construct evaluations. None of these should be significant. The remaining Chow test parameters represent another test of the equivalence of construct effects across subexperiments.

This fourth test can be performed even if no separate construct evaluations (ratings) were obtained. It involves testing whether parameter estimates for the same hypothetically defined constructs differ between different subexperiments. In theory, if each subexperiment represents the same choice process, the parameters of the decision constructs should be the same except for sampling error and differences in error variability across the different experiments. Therefore, one expects no significant construct effect differences between subexperiments that both included the construct as a hypothetical rating. Significant Chow test parameters represent context effects that induce construct parameter differences between

subexperiments. In the case of choice tasks, these tests assume that the "Independence of Irrelevant Alternatives" assumption holds and utility functions estimated from different subexperiments have equivalent scale units or can be rescaled to common units (cf. Swait and Louviere 1993).

If the data fail these two Chow tests, the models are context dependent, that is, choice processes are not equal across subexperiments. Though this requires caution when interpreting the results, indices of relative importances of attributes and constructs within separate subexperiments are as valid as any other (non-HII) single conjoint experiment. Moreover, the concatenated model could still be useful for predictive purposes because one can set construct effects to zero and use only attribute effects for prediction. There is insufficient experience to know whether context-dependent models transfer well to other (e.g., real-world) choice situations; however, context dependence could average out across different subexperiments, posing little problem for prediction. Which outcome is more likely in a real decision context is an empirical question.

3.5 Conclusion

In this chapter, we reviewed limitations of approaches to handling conjoint problems involving many attributes, including previous approaches to modelling HII. To avoid these limitations we proposed an extension to the method of Hierarchical Information Integration. Our approach involves the design of separate conjoint preference or choice experiments which include both attributes that pertain to a particular decision construct and summary evaluative measures of all other constructs not defined by attributes particular to the experiment. Data from the subexperiments can be analyzed separately, but they can also easily be concatenated to permit the estimation of one overall preference or choice model that includes all attributes and constructs. We also developed tests to assess the validity of the assumed hierarchical decision process. The new HII approach will be illustrated in Chapter 5.

CHAPTER 4

A CONCEPTUAL FRAMEWORK FOR THE DEFINITION OF SHOPPING CENTRE ATTRIBUTES

4.1 Introduction

It was argued in Chapter 2 that the development of more policy relevant models of consumer choice of shopping centre requires a (better) definition of the shopping centre marketing mix. This definition should accommodate characteristics of individual stores as well as characteristics that typically emerge at the shopping centre level and that can be manipulated by urban planners, retailers and retail centre managers and developers. This chapter is an attempt in this direction.

The chapter first reviews the concept of the retail store marketing mix and its relation to retail image (section 4.2), and next extends this idea to the level of a total shopping centre (section 4.3). We develop a definition that is logically related to the major dimensions of consumer perception of retail destination and to the attributes that are of interest to retailers and planners.

The definition allows us to develop integrated hierarchical conjoint tasks as discussed in the previous chapter, to accommodate a large number of attributes. We define three major dimensions, or higher-order constructs: "Selection of stores," "Location convenience and accessibility," and "Appearance, layout and furnishings of the shopping centre." In section 4.4, each of these constructs is defined in terms of five to ten detailed actionable attributes.

4.2 The retail marketing mix

The concept of the retailing mix has developed alongside that of the marketing mix in product marketing. It represents the variables that link particular areas of managerial activity to the dimensions through which the total offering (either a store or a single product) is communicated to the (potential) customer. In product marketing, typical examples of such activity areas are the selection of an outlet or distribution channel, the selection of the type of product to offer, and decisions about advertisements, promotions and prices. Similarly, typical activity areas in retail marketing are the selection of a store location, choosing and managing assortments, and, again, making decisions about advertisements, promotions and prices. These managerial activities all may affect the way in which a total offering is perceived by consumers, regardless of whether this is a single packaged good or a total store. More in particular, the retailing mix has been defined as

> ... *the total package of goods and services that a store offers for sale to the public. The retail mix, then, is the composite of all effort which was programmed by management and which embodies the adjustment of the retail store to its market environment.* (Lazer and Kelley 1961, in McGoldrick 1990, p.7)

Lazer and Kelley distinguish three subclasses within the total retail mix: the goods and services mix, the physical distribution mix, and the communications mix. The goods and services mix includes "merchandise, variety and assortment, guarantees and exchanges, customer services, credit, price lines, alterations and adjustments, delivery, parking, store image." Physical distribution mix involves "packing, warehousing, transportation, handling goods, distribution centres, and store location." Finally, the communications mix involves "advertising, catalogues, store layout, public relations, internal displays, personal selling, window displays, telephone sales" (Van Goor 1984, p.52).

More recently, retailing textbooks presented other, but broadly similar definitions and classifications of retailing mix elements. For example, Arnold et al. (1983) define the following retail mix elements: 1) store location; 2) selection of merchandise; 3) pricing; and 4) communications, where communications include promotions, advertisements, store atmosphere, store layout, and customer service. Other textbook authors have arrived at largely similar types of classifications (e.g. Van der Ster and Van Wissen 1987; McGoldrick 1990).

Not surprisingly, these lists of retail mix elements are very similar in content to the major consumer cognitive dimensions of shopping destination, as discussed

earlier. The advantage of the marketing mix idea, however, is that it provides an explicit link between managerially relevant variables and instruments, and the communication of the retailer's position on these variables towards (particular groups of) consumers. Previous retail patronage and image studies have been criticized for not sufficiently focusing on this positioning process (e.g. Weisbrod et al. 1984; Barnard 1987; Corstjens and Doyle 1989). To our knowledge no one has ever defined the shopping centre marketing mix in operational terms. Therefore, in the next section we will focus on this issue and accommodate definitions of the retail mix to the level of a total shopping centre. In a following section the developed idea will be defined in more operational terms, that is, in terms of attributes that can be employed in a conjoint task.

4.3 The shopping centre marketing mix

There are strong parallels between the marketing mix as defined for manufacturers, in particular of fast-moving packaged consumer goods, and the retail marketing mix as defined for stores. Indeed, definitions at the product category level and store level are essentially complementary. Some features are relevant for product (brand) marketing, but are more typically associated with the environment (e.g. the store) which offers this product. Vice versa, the set of products that are offered in a store is an important determinant of store image. Table 4.1 exemplifies this complementary relationship, using the four elements from Arnold et al. (1983) as row entries. Similar complementary relationships exist between individual stores and total shopping centres. Before further discussing these relationships and defining the four elements for shopping centres as a whole, we first define some basic terms.

We define a *product category* as a set of generically similar products that may fulfill a single consumer want or need; hence, products are potential substitutes. We define a *store* as an outlet that permanently displays products from one or more product categories for sale to the public. Stores add value to products by providing particular benefits: choice ranges and (before and after sales) services. Moreover, stores add recreational value to the act of purchasing. We define a *shopping centre* as a spatially clustered set of stores, in which any single store is within a convenient walking distance from at least one other store in the centre. Finally, a *shopping area* is a set of stores that are all located within some zone that consumers can identify

and recognize, though the zone may be researcher specified. Stores within shopping areas are not necessarily clustered or on walking distance.

We now turn to the definition of each element of the shopping centre marketing mix, extending the retail marketing mix elements (location, selection, prices, and communications) to the level of a total shopping centre.

4.3.1 Location

The decision where to locate a retail outlet is generally considered as crucial to the success of a store (e.g, McGoldrick 1990, p. 157). The location of a store determines its position relative to (potential) customers and competitors. It determines particular operational costs, such as location rent and distribution costs. It also allows particular benefits, such as agglomeration advantages. At a larger scale, the same features apply to total shopping centres. Shopping centres have locations relative to populations and other shopping centres as well as to other potential destinations.

Consumers perceive location advantages as variations in the convenience or accessibility of destinations. Thus, in terms of attributes that are relevant to consumer choice of retail destination, location involves aspects like travel-time (from the home to centre entry-points and within centres from entry-points to the various stores), parking nearness and costs, and public transport accessibility. However, convenience perceptions may also depend on the availability or nearness of various types of facilities, whether retail or non-retail facilities. Indeed, the attractiveness of, for example, department stores particularly depends on the convenience they offer by allowing consumers to combine different shopping purposes. The size of retail facilities, however, is logically most related to one of our other dimensions or constructs, retail selection, which is discussed in the next subsection. In contrast, by definition, non-retailing services and facilities are not part of the retailing offer. We therefore include the availability of non-retailing services within, or near, the shopping centre as an attribute that defines location convenience.

4.3.2 Selection

Although there is agreement among (textbook) authors about the general nature of the "retail offer", the terminology they use to describe the various aspects of the

Table 4.1. Illustration of potential operational definitions of marketing mix elements, at three scale levels: the scale of product categories, stores, and shopping centres.

		Product category	Individual store	Shopping centre
1. Location and convenience		*(location within store)* shelfing; store layout	*(location within centre)* nearness of parking; parking costs; opening hours; micro-location (e.g., relative to anchors)	travel-time from home; public transport accessibility; nearness of parking; parking costs; location relative to other facilities and centres
2. Selection / product range/ assortment	- depth	number of brands and package sizes	*(across categories)* average number of items within product categories	*(across categories and stores)* average number of items within product categories *(OR: across store types)* average number of stores per store type
	- width	-	number of product categories	*(across stores)* number of prod. categories; number of store types
3. Prices		retail prices of individual items, price range within category	*(across categories)* average price and price range; retail promotions; store or store format price image	*(across categories and stores)* price range *(across stores)* average store price image; presence of particular low or high price-imege stores
4. Communi-cations	-advertising and promotions	actions by manufacturer or retailer	actions by retailer	actions by centre management or local retailer unions
	-atmo sphere	displays, packaging	in store design	presence of particular stores; design of public environment
	-layout	shelf display	store routing	centre routing
	-personal service	skills of store personnel related to part. products	friendliness of store personnel	*(across stores)* friendliness of, e.g., centre security guards
	-financial and other services	manufacturer guarantees	credit facilities, delivery service, free parking, etc.	public services and facilities (e.g., banks, post-office, library)

Table 4.2. Example store types that correspond to various width and depth of assortments combinations.

		depth	
		small	large
width	small	small greengrocer; store selling only one product type; "bargain" street stand	greengrocer specialty store; specialized fashion retailer
	large	convenience store; variety store	(large) supermarket; department store

retail offer is not very consistent, especially with respect to selection of merchandise. Terms like assortment, product range, product line, choice range, selection, width, variety, breadth, and depth have been used in various ways to define aspects of the total set of products that a retailer offers (e.g. Arnold, Capella and Smith 1983; Van der Ster and Van Wissen 1987; Duncan, Hollander and Savitt 1983; Van Goor 1984; McGoldrick 1990). In this section we will use the terms *width* and *depth* to describe two logically distinct aspects of the total set of products that a store offers. We first define these terms and next discuss how one can apply them at the level of a total shopping centre to describe the total set of products and/or stores in a centre.

Retailers collect and assemble various manufacturers' product lines into the total set of products that they want to offer for sale. We define the *width* of a store's selection as the range of product categories that the store offers. A straightforward way to measure width at the store level would be to count the total number of product categories. We define the *depth* of a store's selection as the store's choice range within offered product categories, i.e. the number of different types of brands, package sizes, qualities that the store offers within its product categories. Obviously, a store may display a large depth for one category and a small depth for other categories. Therefore, depth is most naturally measured at the product category level, and a measure at the store level should be derived by pooling depths measures of separate product categories, i.e., as the average depth across all product categories. Both width and depth of selection of merchandise within stores can be small or large. The various combinations represent typical

store types as illustrated in Table 4.2 for food products and clothing.

Having defined width and depth for stores, we now turn to the definition of selections offered by total shopping centres. There are at least two possible ways to define the selection that is offered by a shopping centre. First, one could consider a shopping centre as just some big (e.g. department) store. The currently popular "shop-in-the-shop" concept illustrates this view. Now one could define width and depth as above, and measure the selection of merchandise in a shopping centre at the level of product categories: The total number of available product categories measures width, and the average number of items within categories is a measure of depth of selection. Such definitions focus on the total range of products and product categories that is available, and disregard aspects like price and quality.

However, the above definition of total selection ignores the bundled appearance of merchandise in shopping centres. Particular products (or brands) appear only in particular stores or store types. Moreover, store brands and store types are increasingly recognized as important for attracting consumers and creating loyal customers, and are used as such. In this context, there seems a process of mutually reinforcing factors. Consumers often first choose which stores or store formats to visit (cf. Ahn and Ghosh 1989; Corstjens and Doyle 1989). Consumers base these decisions on their expectations to find the products they want. These expectations are either confirmed or denied when they visit the store. Thus, retailers largely depend on the image of their store to attract customers. Retailers increasingly capitalize on this process, and try to offer "unique propositions". For example, they offer special services and retailer own-brand products. This has the additional advantage for retailers that own-brand products allow them to gain power in the distribution channel (e.g. Burt 1989; McGoldrick 1990). These processes reinforce the increasing consumer awareness of the differences among store formats. In addition, consumers become increasingly demanding and differentiated with respect to life-styles. Consequently, the market allows more different retail store formats. In sum, the variety and importance of store images and store formats are increasing.

Because of this importance of store formats and store types we should define shopping centres' selections not only in terms of the available set of product categories, but also in terms of the width and depth of the selection of stores. This is easily accomplished by substituting store type for product category in our earlier definitions. That is, width is the number of store types that a centre offers; depth is either the number of stores in a centre, or it is the number of product categories

that the centre offers across all store types.

To accommodate these two perspectives on "selection", retail choice models have included both total floorspace and the total number of stores or store types as predictors (e.g. Verster et al. 1976; Partners 1982; Weisbrod et al. 1984; Van der Heijden 1986). A difficulty, however, with traditional store type definitions is that retailers increasingly change the numbers and types of product groups in their assortments. Moreover, new store types emerge that do not fit in the traditional categories. This results in standard store type classifications becoming blurred and outdated (cf. Davies and Rogers 1984).

To accommodate both the above perspectives on selection of merchandise offered in a shopping centre, we defined attributes from both perspectives and included these in our conjoint study as follows:

1. The available range of product categories is defined as "the percentage of all retail product groups that are available with at least one item". Retail product groups were defined as follows: groceries, bread and pastries, vegetables and fruit, meats and meat products, wines and liquors, tobacco products, fresh flowers, and drugs and personal care. An advantage of this definition of total selection is that it avoids store type definition problems.
2. The available selection of store types is defined by a series of attributes that describe how many stores in the centre display particular features, such as "competitive prices". All these attributes are hypothesized to influence the total attractiveness of a shopping centre's "selection of stores." The next section describes in more detail the definition of these attributes and their independent manipulation in our conjoint task.

4.3.3 Pricing

Pricing is considered as the most crucial but also most difficult aspect of retail marketing (McGoldrick 1990, p.211). Pricing essentially takes place at the product level. Retailers decide for each product they offer which price they want to charge (unless, of course, there is a resale price maintenance and manufacturers make these decisions). Similarly, consumers decide for each product whether they are willing to pay this price. At the store level, however, pricing takes the form of managing store price images (cf. McGoldrick 1990, p.219). Stores offer many products, each with particular qualities and prices. Some products apparently are of more influence on the price (and quality) image of the store than other products.

Indeed, the retailer's strategy problem first consists of the decision which range of products and product qualities to offer within a chosen product class. It next consists of the decision on which subset of products to compete on price and on which subset to try to make a (higher) profit. Special offers and branded products are typical examples of products selected for price competition.

Although there are various guidelines and rules of thumb that retailers may use in making pricing decisions (cf. McGoldrick 1990, p.219) and there have been many empirical studies on pricing and price image (e.g. Dickson 1990), at the present time it is unclear from the literature how consumers perceive the prices of various products and how they integrate this information into an opinion on the price level of the total store. One complicating factor in price image studies is that prices may signal information on the quality of products. Nevertheless, stores clearly do have a price-image. Many stores are purposefully positioned, either as offering higher priced, high quality products and services, or as offering lower or lowest priced lower quality products and services.

At the shopping centre level the definition of price and price image is an even more complex problem. To the larger extent, the price image of a shopping centre will depend on the distribution of price images of the individual stores. As noted, this in turn depends in intangible ways on the positioning activities of these individual stores. This two-stage structure of the perception process resembles the problem that was encountered above in defining selection of merchandise: One can define and measure the variable at the product or product category level and pool these measurements (average price level within product categories), or one can define and measure the variable directly on the store level and pool across stores (average store price image). We chose for the latter option in our empirical study and described price aspects as aggregated store characteristics in one framework with other store characteristics.

4.3.4 Communications

The final retail marketing mix variable captures a variety of aspects related to the communication of the retail offer to potential customers. Communication is important, basically, because in most cases customers first have to be aware that an offer (product or store) exists, before they can consider and choose the offer. Communications include aspects such as advertisements, promotions, atmosphere, layout and customer service. Some of these aspects, such as friendliness of

personnel, are typically associated with the store level only. Other aspects, such as advertisements and promotions, may refer to the product or product category level (e.g. manufacturer-based brand promotions and advertisements), but may also refer to the level of a total store (retailer promotional activities). Similarly, one can apply some of these directly at the level of a total shopping centre (e.g. joint promotional activities of local retailers). Finally, there are aspects, such as atmosphere, layout, and services and facilities. These are relevant at both the store level (store atmosphere, store layout and in-store services and facilities) and at the shopping centre level (centre atmosphere; centre appearance, layout, and furnishings).

Definition problems for variables that are typically associated with the product category or store level are identical to the problems discussed above for selection of merchandise and pricing. One can skip the store level and define an attribute, such as advertisements, to represent the position of the total shopping centre directly. An example would be "the centre has many [few] good advertisements". Alternatively, one defines an attribute explicitly as an aggregation across individual stores. An example would be "one-third [two-third] *of the stores* has good advertisements". In this study, such attributes were explicitly described as aggregated store attributes. Other aspects, however, directly relate to the store environment and typically only emerge at the level of a shopping centre. Therefore, in this study, attributes to describe these aspects were defined for total shopping centres. Finally, some aspects are relevant and can be defined at both the store level and the shopping centre level. For example, layout may refer to centre layout and routing as well as to in-store layout and routing. Such aspects were included as separate attributes at the corresponding levels in our study.

4.4 Definition of determinant attributes

The previous section discussed issues that arise if one wishes to describe the shopping centre marketing mix. It appeared that three general categories of attributes can be distinguished. These categories were defined as "Location convenience and accessibility," "Selection of stores," and "Appearance, layout and furnishings." This section describes in more detail how one can define attributes in these categories. To broaden the range of possible applications, the attributes are defined for shopping areas instead of shopping centres.

4.4.1 Attributes to define "Location convenience and accessibility"

As discussed in Chapter 2, conjoint studies typically included only one or two attributes related to accessibility and location. First, and most important is travel time or distance from the home, either by car or another transport mode. Second is parking facilities, described as ease of parking and/or as parking costs. Consumers who are travelling by car will consider travel time and parking facilities as most important. However, statistics show that on average only 39% of Dutch shoppers travel by car, whereas 56% travels by bike or on foot and 4% travels by public transport (CROW 1988). Travel time is likely to account for most of the disutility of these modes. However, the utility effect of public transport may also depend on other attributes, such as connections, location of terminal points, reliability, and convenience during the trip (cf. Ettema 1991; Anderson et al. 1992).

A final aspect of "location convenience and accessibility" is the availability of non-retail facilities and services. As described above, non-retail facilities (post-office, banks, libraries, travel agents, etc.) may provide agglomeration economies and opportunities for shoppers to combine trip purposes. Therefore, they may influence convenience of shopping. This argument is similar to the use of CBD dummies in choice models based on survey data from real markets. However, to this author's knowledge, no conjoint studies have included such an attribute.

In sum, we use five attributes to define "location convenience and accessibility" of shopping areas. Table 4.3 lists these attributes and describes their levels. Level definitions are based on design considerations, logic and pretests.

4.4.2 Attributes to define "Selection of stores"

The following procedure was used to include and independently manipulate attributes to describe sizes of shopping areas and (distributions of) positionings of individual stores within areas. We assume that for each store its position on the marketing mix variables can be identified, either from consumer perception measurements, deductive reasoning, checklist store judgements, or retailer questionnaires. In particular, we dichotomized all retail marketing mix variables (except location) to obtain a set of store features, such that for each store it can be decided whether a feature applies to this store. For example, for a particular store the variable prices could take the values "has competitive prices" or "does not have competitive prices".

Table 4.3. Attributes and levels that describe ***Location convenience and accessibility*** *of shopping areas.*

p-costs	PARKING COSTS	*1* = free *2* = 1 NGL/hr *3* = 2 NGL/hr *4* = 3 NGL/hr
travel-t	Single trip TRAVEL TIME (minutes from your home, with the most appropriate means of transport for you, waiting times included)	*1* = 5 min *2* = 20 min *3* = 35 min *4* = 50 min
p-conven	PARKING CONVENIENCE	*1* = easy *2* = difficult
public-t	PUBLIC TRANSPORT ACCESSIBILITY	*1* = good *2* = bad
services	NUMBER OF OTHER SERVICES, FACILITIES OR OFFICES (bank, postoffice, library, travel agent, etc.)	*1* = many *2* = few

This procedure allows one to measure the position of a total shopping area on some feature, for instance price, by simply counting the stores that qualify for this feature. To obtain attributes that are independent from the size of shopping areas, attributes were defined as the percentage of stores in the area that qualify on the feature. For example, the price level of a shopping area was defined as "the percentage of stores that have competitive prices". As demonstrated below, this allowed us to vary size of area independently from other attributes in the experiment, which is a major advantage.

Pilot tests were performed to find the best way to present such kinds of attributes to respondents. Subjects had no problems to consider and imagine shopping areas in terms of such attributes when attributes were presented one at a time. However, profiles of attributes appeared difficult to appraise when we presented levels in numerical and/or verbal formats. The arrays of percentages or verbal descriptions tended to confuse subjects. We therefore turned to displaying the percentage levels in a graphical format. For each retail mix variable separately, individual stores in the hypothetical shopping area were represented by small graphical boxes. Open boxes represented stores for which the corresponding feature did not apply and solid boxes represented stores for which the feature did apply, as shown in Figure 4.1. In this way, subjects could see at a single glance both the

		AREA #1	AREA #2
	Basic range of FOOD PRODUCT CATEGORIES	50 % available	90 % available
	NUMBER OF SUPERMARKETS	0 SUPER MARKETS	4 SUPER MARKETS
	NUMBER OF SMALLER STORES offering foods and packaged goods	10 smaller stores	15 smaller stores
	WHICH MEANS THERE ARE:	5 units	35 units
FOODS AND PACKAGED GOODS UNITS	- LARGE CHOICE RANGE per product category	■□□□□	■■■■■■■■■■ ■■■■□□□□□□ □□□□□□□□□□ □□□□□
QUALIFIED BY: ■ = yes □ = no	- COMPETITIVE PRICES	■■■□□	■■■■■■■□□□ □□□□□□□□□□ □□□□□□□□□□ □□□□□
	- HIGH QUALITY PRODUCTS	■■□□□	■■■■■■■■■■ ■■■■■■■■■■ ■□□□□□□□□□ □□□□□
	- MANY ADDITIONAL SERVICES	■■■■□	■■■■■■■■■■ ■■■■■■■■■■ ■□□□□□□□□□ □□□□□
	- FRIENDLY, COURTEOUS SERVICE	■■□□□	■■■■■■■□□□ □□□□□□□□□□ □□□□□□□□□□ □□□□□
	- ATTRACTIVE AND COMFORTABLE STORE INTERIOR	■■■■□	■■■■■■■■■■ ■■■■□□□□□□ □□□□□□□□□□ □□□□□
(extremely bad) *- - - - = a* *- - - = b* *- - = c* *- = d* *0 = e* *+ = f* *+ + = g* *+ + + = h* *+ + + + = i* *(extremely good)*	**SELECTION FOOD AND PACKAGED GOODS STORES** *Your impression: =>*	. = ..	. = ..

Figure 4.1. Two profiles describing the "selection of stores for food and packaged goods" of shopping areas. (Part of choice set from "food stores" subexperiment, see Chapter 5 for more details).

Table 4.4. Attributes and levels to describe the Selection of stores for foods and packaged goods of shopping areas.

units	NUMBER OF FOOD STORE UNITS (or departments) (*Size was presented both in arabic numbers and graphically, as a set of boxes*)	*1* = 5 units *2* = 15 units *3* = 25 units *4* = 35 units
basic range	Proportion of all FOOD AND PACKAGED GOOD PRODUCT CATEGORIES that are available with at least some basic supply *General definition of levels: 1 = very small, .. , 4 = very large; Actual definitions, however, depended on size of shopping area as follows:*	
	If size was 5 or 15 units: *1* = 40% *2* = 50% *3* = 60% *4* = 70%	*If size was 25 or 35 units:* *1* = 70% *2* = 80% *3* = 90% *4* = 100%
supermarkets	Number of SUPERMARKETS vs Number of SMALLER FOOD STORES *General definition of levels: 1 = relatively small, 2 = relatively large; Actual definitions, however, depended on size of the area as follows:*	

If size was 5 units:	*If size was 15 units:*	*If size was 25 units:*	*If size was 35 units:*
1= 0 sup, 5 sml	*1*= 1 sup, 10 sml	*1*= 1 sup, 20 sml	*1*= 2 sup, 25 sml
2= 1 sup, 0 sml	*2*= 2 sup, 5 sml	*2*= 3 sup, 10 sml	*2*= 4 sup, 15 sml

PROPORTION OF FOOD STORE UNITS THAT HAS:
(Each of the following proportions was graphically displayed as a set of boxes. Each solid box represented one store unit that did qualify, and each open box represented one unit that did not qualify as having the particular characteristic. So, a value of 20% indicates that one in each five units did qualify)

choice ranges	LARGE CHOICE RANGES within product categories	*For each of these attributes:* *1* = 20% *2* = 40% *3* = 60% *4* = 80%
prices	COMPETITIVE PRICES	
quality	HIGH QUALITY PRODUCTS	
supplies	MANY ADDITIONAL SERVICES	
service	FRIENDLY, COURTEOUS SERVICE	
furnishings	ATTRACTIVE AND COMFORTABLE STORE INTERIOR	

number and percentage of stores that qualify for the feature, and the size or total number of stores in the shopping area.

Potential disadvantages of this approach are that distributions of features within areas may not correctly represent the attributes of interest. Having said that, further pilot tests confirmed that a conjoint task with graphically displayed distributions of store features was comprehensible and has face validity.

Advantages of the above procedure are that the resulting shopping area attributes have quantitatively defined values and that one can derive these values directly from the positionings of individual stores. Also, attributes can be independently manipulated. Moreover, one can choose experimental designs that allow the independent estimation of interaction effects of marketing mix variables with the total number of stores. This means that size-specific marketing mix effects may be estimated. For example, the design in our application in principle allows us to estimate models for large and small shopping areas separately. Table 4.4 displays the list of attributes that resulted from our procedure and pilot tests.

4.4.3 Attributes of "Appearance, layout and furnishings"

Previous conjoint studies of choice of retail destination did not include typical characteristics of shopping centres, like atmosphere and physical layout. Models estimated from real market survey choice data also seldomly included these characteristics. One notable exception is the study by Nevin and Houston (1980), who added three image factors to the traditional gravity model. As mentioned in Chapter 2, one of these factors was derived from four items, among which are "layout", "availability of lunch/refreshments", and "comfort areas". Another study (Gautschi 1981) included "centre design" and "crowds" as attributes in a shopping centre choice model, and Arnold et al. (1983) included an indicator variable for whether a shopping centre had "a pleasant shopping environment". In addition, various other models have included either a CBD dummy (e.g. Richards and Ben-Akiva 1975) or a "planned centre" dummy (Weisbrod et al. 1984). However, data requirements and the limited increase in goodness-of-fit that was obtained by adding such variables seem to have inhibited the further development of models that include such characteristics as variables (cf. Fotheringham 1988b).

The neglect of including such variables is in strong contrast with the relevance of such "urban design" variables for retail centre managers, developers, urban planners, and local authorities. Moreover, results from studies on consumer

Table 4.5. Attributes and levels to describe the Appearance, layout and furnishings of shopping areas.

pattern	PATTERN OF STORE LOCATIONS (walking routes, interruption of store fronts, surveyability)	*1* = dispersed *2* = compact
indoors	Proportion of shopping area INDOORS	*1* = 0% *2* = 30% *3* = 60% *4* = 90%
pedestrn	Proportion of shopping area that is reserved for PEDESTRIANS	*1* = 10% *2* = 40% *3* = 70% *4* = 100%
crowded	CROWDING in shopping area	*1* = very uncrowded *2* = moderately uncrowded *3* = moderately crowded *4* = very crowded
decorat	FURNISHINGS AND DECORATIONS in the shopping area (signs and displays, stalls, benches, flags, etc.)	*1* = few *2* = many
green	GREENERY	*1* = little *2* = much
mainten	MAINTENANCE of streets, hallways and buildings	*1* = very bad *2* = moderately bad *3* = moderately well *4* = very well
window-d	Proportion of store fronts with ATTRACTIVE WINDOW-DISPLAYS	*1* = 0% *2* = 30% *3* = 60% *4* = 90%
activits	Number of STREET-ACTIVITIES (markets, musicians, parades, etc.)	*1* = few *2* = many
coffee-s	Number of COFFEESHOPS, CAFÉS AND RESTAURANTS	*1* = few *2* = many

cognition of shopping centre suggest that such variables may influence consumer choice of retail destination. Timmermans et al. (1982) identified "atmosphere" and "physical layout" as respectively the third and fourth most frequently used dimensions to distinguish among shopping centres; the most frequently used dimensions were "size" and "distance". Noteworthy is also that the further dimensions that this study revealed were labeled "cognitive accessibility" and "character of centre". These dimensions seem logically related to atmosphere and physical layout. They also presented the original list of personal constructs that were produced in their interviews. This list (their table 1) clearly illustrates the kinds of detailed attributes that are related to atmosphere and layout issues: cosiness, care for maintenance, quietness, well-organized, dark or light, safety, sheltered or windy, information sufficiency, coveredness, compactness, pedestrianization, quality of window displays, special activities, intimacy, cleanliness. Clearly, many of the aspects represented by these personal constructs can be manipulated by managers and policy-makers. Thus, it seems feasible and worthwhile to include as many as possible of these attributes in the choice experiment.

Based on these considerations, a list was generated of attributes to include in the conjoint experiment. Tests of the feasibility of profiles and pilot tests to check the comprehensibility of the task resulted in some minor modifications of this list. The final list of attributes and their levels is presented in Table 4.5.

4.4.4 Shopping purpose category

A final decision in the design of our study was how to define the context of our hypothetical shopping task, i.e., for which shopping purpose categories data will be collected. Conforming to urban planning practice, we collected choice data for two general product categories: 1) convenience goods (described as "daily or weekly purchases for foods and packaged goods), and 2) clothing and shoes (representing shopping goods or semi-durables). A set of "selection of stores" attributes was defined separately for each of these product categories.

Essentially, two separate (sets of) experiments were designed. One set of experiments studies the effects of "selection of food stores", "convenience" and "appearance" attributes on shopping for foods and packaged goods. An analogous set of experiments examines the effects of "selection of clothing and shoe stores", "convenience" and "appearance" attributes on shopping for clothing and shoes.

However, because an area's attractiveness as a place to shop for convenience goods may depend on the available selection of clothing and shoe stores, we included "selection of clothing and shoe stores" as a design factor in all experiments. Similarly, "selection of stores for foods and packaged goods" was included because an area's attractiveness as a place to shop for clothing and shoes may depend on the available selection of food stores (cf. Brown 1987).

The inclusion of these factors provides a more complete description of the hypothetical alternatives. It also allows us to test hypotheses about multipurpose effects. If the available selection of stores for foods and packaged goods significantly affects the expenditures on clothing and shoes in a shopping area, then this suggests a tendency for multipurpose shopping. Similarly, a significant effect of "clothing and shoe stores" on expenditures on foods and packaged goods in a shopping area suggests a tendency for multipurpose shopping.

4.5 Conclusion

This chapter developed a definition of the shopping centre marketing mix, both in general and operational terms. The definition consists of three general categories of attributes, that correspond to both consumers' perceptual dimensions on shopping centres and to the major elements from the marketing mix. The operational model defines attributes of shopping areas; these attributes can be implemented in conjoint experiments.

The grouping of attributes in categories in correspondence to dimensions or higher-order constructs allows us to structure experiments according to the extended Hierarchical Information Integration method that was developed in Chapter 3. The next chapter reports the design and results of the conjoint study that was performed to test and illustrate these ideas.

CHAPTER 5

AN EMPIRICAL MODEL OF CONSUMER CHOICE OF SHOPPING CENTRE

5.1 Introduction

In a previous chapter, we argued that only a limited number of conjoint studies have focussed on consumer choice of retail destination. Predictor variables in these studies typically were limited to small sets of broadly defined constructs, such as "selection", "prices", "atmosphere" and/or "distance". Hence, models quantify the relative influence of such constructs on choice and allow one to predict changes in consumer choices, if one knows how subjective values of these constructs are changed by managerial actions. Though useful for positioning and broad strategy inferences, the applicability of such construct-based choice models is probably limited. The set of physically manipulable (actionable) variables that influences the choice of a store or shopping centre could be much larger than the small set of constructs typically included in previously published models. In addition, in many practical situations the values of constructs are neither known, nor forecastable; rather, values are known only for physically measurable attributes that (at the present time) are related to subjective constructs in ill-understood ways. Indeed, managers are usually interested in this larger set of potentially manipulable physical attributes, but the latter set is often too large or ill-defined to study in conventional conjoint tasks or revealed preference choice models.

This chapter presents a conjoint choice experiment in which our proposed extension of HII was used to accommodate the large number of attributes that operationalizes the shopping centre marketing mix. Attributes were defined for shopping areas, which include shopping centres, to broaden the scope of the

potential applications. Interest focusses on assessing the impact of changes in attributes on consumer choice of shopping area, and testing the validity of the HII choice model. Choice data were collected for two different contexts: shopping for foods and packaged goods and shopping for clothing and shoes. However, we use only the food and packaged goods choice data to limit the length of the discussion.

This chapter is structured as follows. Section 5.2 summarizes our definition of attributes of shopping areas. Section 5.3 describes the experimental design that was used to generate the hypothetical choice sets in our tasks. Section 5.4 briefly describes the sample and section 5.5 describes the further procedures and design of our survey. Analysis and results are discussed in sections 5.6 and 5.7. Section 5.8 completes this chapter with a brief conclusion section. A summary and discussion of results will be provided in Chapter 10.

5.2 Definition of constructs and attributes

In the previous chapter a large number of attributes were generated to describe the shopping centre marketing mix. Attributes are based on a literature review, pilot interviews with consumers and considerations about managerial relevance. Each attribute belongs to one of four groups. We assume that each group represents one dimension of consumer perception of shopping area and can be summarized into a higher-order decision construct. This assumption allows us to use the HII approach that we proposed in Chapter 3.

Figure 5.1 shows the hierarchical structure of decision constructs and integrated subexperiments that is assumed in this study. The constructs were defined as follows:

1. *Location convenience and accessibility.* In the corresponding subexperiment ("convenience" subexperiment), this construct was defined by five attributes, as shown in Figure 5.1 and listed earlier in Table 4.3. The supply of (non-retail) services was included as an attribute because it could affect convenience of destinations. In the remaining subexperiments "location convenience and accessibility" was one factor with four levels ("– – – very inconvenient", "– moderately inconvenient", "+ moderately convenient" and "+ + + very convenient").

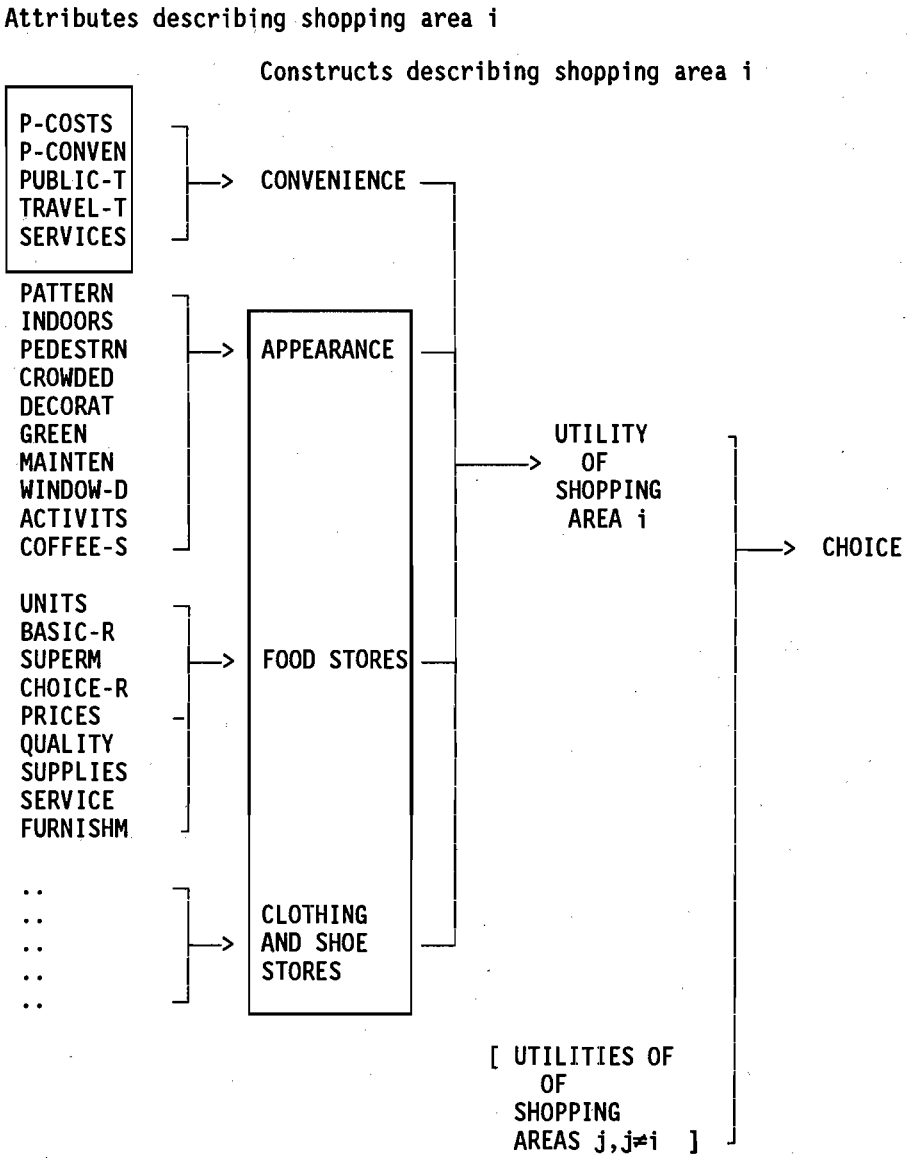

Figure 5.1. *Overview of the assumed hierarchical structure. Boxed areas indicate attributes and constructs that were included in the "convenience" subexperiment; attribute names correspond to labels in Tables 4.3 to 4.5.*

2. *Appearance, layout and furnishings.* In the corresponding subexperiment ("appearance"), this construct was defined by ten attributes, as shown in Figure 5.1 and listed in Table 4.5. The construct was deliberately disassociated with the label "atmosphere", to avoid confoundment with characteristics of stores. In the remaining subexperiments the construct was defined as "– – – very unpleasant", "– moderately unpleasant", "+ moderately pleasant", or "+ + + very pleasant".
3. *Selection of stores for foods and packaged goods.* In the subexperiment "food stores" this construct was defined by nine attributes that described the range, quality, and variety of stores that offer these goods, as shown in Figure 5.1 and listed in Table 4.4 (see also Figure 4.1). In the remaining subexperiments the it was defined as "– – – very bad", "– moderately bad", "+ moderately good", or "+ + + very good".
4. *Selection of stores for clothing and shoes.* Attributes and constructs were similar to those in the "food stores" subexperiment, but explicitly referred to stores for clothing and shoes ("clothing and shoe stores").

5.3 Experimental design

For the "convenience" subexperiment 128 profiles (including attributes and constructs) were generated from an orthogonal fraction of a $4^5 \times 2^3$ factorial design. In the "appearance" subdesign, 128 profiles were generated from an orthogonal fraction of a $4^8 \times 2^5$ factorial design. Each of the "selection of stores" subexperiments contained 256 profiles from an orthogonal fraction of a $4^{11} \times 2$ factorial design. The designs allow one to estimate various interactions and all main effects independently. Some interactions were used to split the profiles within each subexperiment into independent groups of "smaller" and "larger" shopping areas. This allowed us to nest attributes under the smaller/larger factor and adjust some attribute ranges (e.g. number of store units) to better reflect the range that is typical for an area's size. Both store selection experiments were implemented, but for reasons outlined below we only report the results for selection of stores for food and packaged goods experiment in this chapter.

Profiles in each subexperiment were combined into sets of either two or three profiles according to a separate choice set generating design. This design generated 96 sets for either selection of stores subexperiment, and 48 sets for the other two subexperiments. We designed each set to contain two or three profiles.

The "smaller" and "larger" areas were placed into choice sets such that one third of the sets contained one "smaller" and one "larger" profile, one third contained two "smaller" and one "larger" profile, and a final third contained two "larger" and one "smaller" profile. Subject to this restriction, profiles were randomly assigned to sets without replacement. The purpose of this choice set generating design was to allow tests for IIA violations that may result from the inclusion or exclusion of "smaller" and "larger" areas. To simplify our exposition, the latter manipulation is not tested here; results were presented elsewhere (Oppewal and Timmermans 1994b).

The procedure outlined above produced 96 sets for each "selection of stores" subexperiment and 48 sets for each of the "convenience" and "appearance" subexperiments. A constant "not in stores" base alternative was added to each set to accommodate catalog and other nonstore shopping options. Each respondent evaluated three choice sets from either the "convenience" or "appearance" subexperiment, plus an additional six sets from either the "food stores" or the "clothing and shoe stores" subexperiment. The order of presentation of these blocks was varied systematically, such that all blocks occurred equally often together and all blocks were equally often either the first block presented or the second.

The order of presentation of choice sets within blocks, and the joint occurrence of choice sets within blocks was randomized to create three different presentation orders. A constraint on this randomization was that one third of each block contained choice sets that consisted of pairs and two thirds consisted of triples of profiles. 288 choice sets, blocked into 32 different subsets of nine choice sets, constituted one complete replication of all subexperiments.

5.4 Sample and sample descriptives

Data were collected in Maastricht, The Netherlands, between November 1990 and February 1991. Streets were selected randomly in each of the 18 postal zones within Maastricht. (see Appendix A for a map of the locations of these zones). Locally hired and trained interviewers randomly selected households residing on these streets, and interviewed the person in the household who did most of the shopping.

Of 428 persons who agreed to be interviewed, 405 completed all parts of the survey including the HII experiment. Of these respondents, 69% were females. On average, respondents were 43 years old and had been living 15 years in their current zone of residence (s.d. 15). The average size of respondents' households is

2.8 persons (s.d. 1.6). When asked "how many out of ten times are you the person who does the food shopping for this household?", 71% answered they did more than five out of ten shopping trips (mean 7.6, s.d. 3.0). Regarding the availability of a car when shopping trips need to be made, 36.8% said they never have a car available for shopping, 20.2% said to have a car for one, two, three or four days a week, and 43.1% had a car available at least five days a week. Respondents on average estimated their household to spend 168 dutch guilders a week on food and packaged goods (s.d. 84), which is 60 guilders per week per person, if expenditures are adjusted for household size.

5.5 Survey design and dependent variables

The first part of the survey asked questions about shopping habits and perceptions of frequented shopping areas. Respondents were asked to check the shopping areas they patronize on a precoded list of potential destinations. A simple map as shown in Appendix B was used to show the locations of the various areas. Next, for both "food and packaged goods" and "clothing and shoes" we asked how frequently respondents patronized each shopping area and how often they purchased these types of products from a number of nonstore alternatives (e.g. door-to-door, at a market, by mail or telephone, or at wholesalers). The nonstore alternative is the base choice in the experimental tasks; hence, we wanted to ensure that respondents noted these alternatives and the shopping context. In addition, respondents allocated twice 20 points among all shopping areas and nonstore alternatives, once for foods and packaged goods and once for clothing and shoes. The points represented the household budgets monthtly spent on these two product categories. To compare task results and make the context of the experiments as relevant as possible, we used this same allocation task in the choice experiment. Next, frequented shopping areas were evaluated on all experimental constructs and attributes to familiarize responents with the complete attribute space and provide a specific context for the experimental task.

Respondents then reviewed a summary list of all attributes and example choice sets. A first example contained two hypothetical shopping areas defined only in terms of decision constructs. The interviewer explained the hypothetical nature of this choice situation, which involved "a residential environment decribed in terms of its shopping possibilities"; he or she then explained that each construct level

SHOPPING ENVIRONMENT IN RESIDENTIAL SITUATION	SH. AREA #1	SH. AREA #2
COSTS OF PARKING	1 NGL/hr	free
CONVENIENCE OF PARKING	difficult to park	easy to park
PUBLIC TRANSPORT ACCESSIBILITY	p.t.access. is bad	p.t.access. is good
SINGLE TRIP TRAVEL TIME (from your home, waiting times included)	5 minutes	20 minutes
OTHER SERVICES, FACILITIES OR OFFICES (bank, post-office, library, travel agent)	few other facilities	many other facilities
(extremely unfavourable) ---- = *a*	**LOCATION CONVENIENCE AND ACCESSIBILITY (FROM YOUR HOME) IS**	
--- = *b*		
-- = *c*		
- = *d*		
0 = *e*		
+ = *f*		
++ = *g*		
+++ = *h*	*INDICATE YOUR IMPRESSION: =>*	
++++ = *i* *(extremely favourable)*	. . . .	. . . .
APPEARANCE, LAYOUT AND FURNISHINGS OF AREA IS	very pleasant +++	very pleasant +++
SELECTION OF STORES FOR FOOD AND PACKAGED GOODS IS	very bad ---	moderately bad -
SELECTION OF STORES FOR CLOTHING AND SHOES IS	moderately bad -	moderately good +

ALLOCATE 20 BUDGET-POINTS:	NOT IN STORES	AREA #1	AREA #2
for foods and packaged goods	*. . . points*	*. . . points*	*. . . points*
for clothing and shoes	*. . . points*	*. . . points*	*. . . points*

Figure 5.2. Example choice set from "convenience" subexperiment; columns each describe one shopping area.

could serve as a summary measure of an associated profile of underlying attributes.

Following this introduction, task warm-up and practice phase, respondents evaluated the nine experimental choice situations, six from the selection of stores subexperiments and three from either the "convenience" or "appearance" subexperiment. Figure 5.2 shows an example choice set from the "convenience" subexperiment and illustrates the general structure of the choice task in this application of HII (see Figure 4.1 for an example of a choice set from the "food stores" subexperiment). In each choice situation, respondents first evaluated each profile on a 9-category ratings scale, which ranged from "- - - -" (extremely inconvenient, unpleasant, or bad) to "+ + + +" (extremely convenient, pleasant, or good). Next, respondents twice allocated 20 budget-points among the profile alternatives and the "not in stores" alternative. The first allocation was for food and packaged goods, the second for clothing and shoes. However, in the "food stores" subexperiment only the first allocation was collected, and in the "clothing and shoe stores" subexperiment we only obtained the second allocation. We therefore cannot include this latter subexperiment in our analyses of food and packaged goods allocations.

The survey concluded with questions on some socio-economic characteristics, such as length of residence, sex, age, budget weekly spent on foods and packaged goods, car availability, composition of household, income, and education. We also asked respondents to indicate their opinion about the easiness and pleasantness of the task.

5.6 Analysis of HII data

Our impression from the pretest of the experimental materials was that the tasks were difficult but not too hard to complete, provided that all instructions were carefully followed and the pre-experimental tasks were used as a warming up. This impression is confirmed by the fact that almost all respondents completed their questionnaires. Moreover, when asked in the post-experimental questionnaire to express on an eight-category rating scale how easy (extremely easy = 1) or difficult (extremely difficult = 8) the hypothetical choice tasks were, the average rating was 4.91 (s.d. 1.48). We also asked how much they liked or disliked participating in this research. The average score that was obtained on a six-category rating scale (1= very interesting, 6= very dull) was 2.48 (s.d. 1.09). Though these ratings could be

biased by self-justification processes, they do not falsify our a priori expectation that the HII decision tasks were feasible.

The further analysis of the HII data focusses on the assessment of the effects of attribute variations on consumer budget allocations and on the HII validity tests that we described earlier. First, separate MNL choice models are estimated for each subexperiment, assuming that the monthly budget allocations are summed counts and reports of the long run frequency distribution of choices. Treating allocations as proportions is consistent with MNL and has been used as such by several others (e.g. Batsell 1980; Hauser and Shugan 1980; Louviere and Woodworth 1983). Next, the construct ratings are regressed on the attribute-plus-construct design matrices and compared with the choice model results. Finally, we perform the Chow tests. We limit the scope of the discussion by presenting main effects only models despite the fact that our design strategy permits one to estimate particular interactions among attributes and constructs. Similarly, one can estimate particular cross-effects to test for IIA, but this also is not illustrated here. We will also limit our analyses to the monthly allocations of foods and packaged goods budgets. Note, however, that all choice model analyses can also be performed for the clothing and shoes budget allocations (see Oppewal, Louviere and Timmermans 1993; Oppewal and Timmermans 1992a, 1994b).

All attributes and constructs were coded for analysis using orthogonal polynomials. That is, attributes with two levels (1,2) were coded $(-1,+1)$ and attributes with four levels (1,2,3,4) were coded $(-3,-1,+1,+3;\ +1,-1,-1,+1$ and $-1,+3,-3,+1)$ to produce independent linear, quadratic, and cubic components (e.g. Louviere 1988a, pp.44,62).

5.6.1 Choice models for separate subexperiments

The logit estimated utility components for the "convenience" subexperiment are displayed in the left-hand columns of Table 5.1. The MNL choice model fits the (aggregated) choice data well (ρ^2 = .82) and all parameter estimates have the expected signs. Partworth utilities derived from these parameters are displayed in Table 5.2. They reveal that for the current range of factor levels, selection of stores for food and packaged goods and traveltime were the most important factors in determining monthly budget allocations for food and packaged goods. Other attributes related to location convenience and accessibility had somewhat less effect. The constructs appearance, layout and furnishings, and selection of stores

Table 5.1. Logit models estimated from separate and concatenated subexperiments and from "revealed" validation data.

Labels[a]		Convenience Param. estim.	Convenience Asympt. t-Stat	Appearance Param. estim.	Appearance Asympt. t-Stat	Food stores Param. estim.	Food stores Asympt. t-Stat	Concaten. exps. Param. estim.	Concaten. exps. Asympt. t-Stat	Revealed choice Param. estim.	Revealed choice Asympt. t-Stat
CONSTANT		1.0442	36.02	1.1778	39.14	1.1350	50.54	1.1238	73.77	-.4762	-13.63
(Constructs:)											
CONVEN	L	-		.1266	21.76	.1709	42.53	.1572	47.92	-	
	Q	-		.0645	4.15	.0190	2.16	.0327	4.18	-	
	C	-		-.0090	-1.43	-.0072	-1.77	-.0066	-1.97	-	
APPEAR	L	.0437	6.68	-		.0585	14.76	.0547	16.35	-	
	Q	-.0019	-.14	-		.0232	2.53	.0121	1.63	-	
	C	-.0192	-3.18	-		-.0149	-3.51	-.0164	-4.83	-	
FOOD&P	L	.2685	44.42	.2789	40.41	-		.2740	60.99	-	
	Q	.0393	2.75	.0006	.05	-		.0189	2.03	-	
	C	-.0003	-.04	-.0007	-.11	-		-.0031	-.74	-	
CLOTH&S	L	.0408	7.56	.0183	3.73	.0466	11.16	.0373	13.68	-	
	Q	.0301	2.34	.0084	.61	-.0065	-.73	.0050	.79	-	
	C	-.0046	-.72	.0076	1.25	.0079	2.05	.0051	1.79	-	
(Attributes:)											
P-COSTS	L	-.0854	-13.41	-		-		-.0850	-13.46	1.1439	8.08
	Q	-.0020	-.15	-		-		-.0014	-.11	.2850	1.99
P-CONVEN	L	-.1785	-14.16	-		-		-.1746	-14.12	.8648	14.65
PUBLIC-T	L	-.1406	-10.15	-		-		-.1474	-10.92	-3.5217	-16.91
TRAVEL-T	L	-.1881	-31.40	-		-		-.1887	-32.30	-1.2642	-15.03
	Q	.0104	.81	-		-		.0192	1.51	.4207	3.72
	C	-.0268	-4.69	-		-		-.0251	-4.48	-	
SERVICES	L	-.1020	-8.26	-		-		-.1008	-8.23	-.2493	-3.34
PATTERN	L	-		.0378	2.81	-		.0361	2.69	.6699	9.90
INDOORS	L	-		.0611	10.54	-		.0622	10.71	1.5960	27.93
	Q	-		-.0317	-2.40	-		-.0330	-2.52	.1975	3.23
PEDESTRN	L	-		.0211	3.65	-		.0237	4.14	.8028	13.90
	Q	-		-.0004	-.03	-		.0045	.37	.1639	2.21
CROWDED	L	-		-.0150	-2.60	-		-.0198	-3.44	-.1391	-.98
	Q	-		-.0335	-2.38	-		-.0369	-2.66	.7139	9.39
DECORAT	L	-		-.0040	-.31	-		-.0030	-.24	.4683	5.47
GREEN	L	-		.0324	2.50	-		.0417	3.26	-1.0587	-15.61
MAINTEN	L	-		.0596	8.54	-		.0531	8.63	.3916	5.15
	Q	-		-.0316	-2.23	-		-.0222	-1.59	1.0190	16.30
WINDOW-D	L	-		.0550	9.40	-		.0550	9.43	.5048	8.28
	Q	-		-.0485	-3.64	-		-.0426	-3.21	-1.0861	-13.99
ACTIVITS	L	-		.1011	7.69	-		.0963	7.44	-.9790	-12.06
COFFEE-S	L	-		.0677	5.30	-		.0709	5.58	-.6970	-8.03
UNITS	L	-		-		.2357	48.45	.2334	49.02	-.0442	-.62
	Q	-		-		-.0985	-9.27	-.0975	-9.25	.4811	6.39
	C	-		-		-.0118	-2.12	-.0125	-2.27	-	
BASIC R.	L	-		-		.0326	8.32	.0331	8.50	.0319	.60
	Q	-		-		-.0225	-2.41	-.0222	-2.39	.3830	6.82
SUPERM	L	-		-		-.0122	-1.40	-.0079	-.92	-.8272	-11.41
CHOICE R.	L	-		-		.0354	8.27	.0346	8.14	.8722	10.57
	Q	-		-		-.0192	-2.11	-.0167	-1.85	-.2025	-3.06
PRICES	L	-		-		.0553	13.47	.0545	13.40	.8019	10.79
	Q	-		-		.0016	.19	.0019	.22	.0970	1.70
QUALITY	L	-		-		.0496	12.12	.0510	12.56	.0197	.27
	Q	-		-		-.0575	-6.24	-.0591	-6.45	.5185	9.05
SUPPLIES	L	-		-		.0287	7.14	.0286	7.21	-.5624	-5.77
	Q	-		-		.0142	1.60	.0139	1.57	-.4918	-6.07
SERVICE	L	-		-		.0355	8.21	.0341	7.97	.2325	2.88
	Q	-		-		-.0049	-.54	-.0082	-.92	.1196	1.73
FURNISHM	L	-		-		.0246	6.20	.0248	6.28	.5434	7.39
	Q	-		-		.0244	2.78	.0209	2.40	-1.0414	-11.28
No. of Choice sets		48		48		96		192		18	
No. of Cases		176		176		352		704		191	
LL(0)		-3745.92		-3287.74		-7128.71		-14162.37		-5951.04	
LL(B)		-687.54		-667.87		-1299.93		-2700.63		-2540.75	
RhoSq		.816		.797		.818		.809		.573	
-2[LL(0)-LL(B)]		6116.76		5239.75		11657.54		22923.47		6820.59	
Chi-Sq d.f.		18		25		28		54		40	

[a] *Attribute names correspond to labels in Tables 4.2 to 4.4. "L", "Q" and "C" are appropriately coded linear, quadratic and cubic components of attributes.*

Table 5.2. Partworth utilities of constructs and attributes (calculated from parameter estimates obtained for the concatenated subexperiments).

Labels	Level1	Level2	Level3	Level4	Max.range	Rank	Rescaled	Rank
CONSTANT	1.12				1.124	4	1.124	4
(Constructs):								
CONVEN	-0.43	-0.21	0.14	0.50	0.930	5	0.930	5
APPEAR	-0.14	-0.12	0.09	0.16	0.295	13	0.295	13
CLOTH&S	-0.11	-0.03	0.02	0.12	0.234	15	0.234	15
FOOD&P	-0.80	-0.30	0.26	0.84	1.638	1	1.638	1
("Convenience" attributes):								
P-COSTS	0.25	0.09	-0.08	-0.26	0.511	6	0.511	6
P-CONVEN	0.17	-0.17			0.349	8	0.349	10
PUBLIC-T	0.15	-0.15			0.295	14	0.295	14
TRAVEL-T	0.61	0.09	-0.13	-0.57	1.183	3	1.183	3
SERVICES	0.10	-0.10			0.202	18	0.202	19
("Appearance" attributes):								
PATTERN	-0.04	0.04			0.072	27	0.075	27
INDOORS	-0.22	-0.03	0.10	0.15	0.374	7	0.389	7
PEDESTRN	-0.07	-0.03	0.02	0.08	0.143	24	0.149	24
CROWDED	0.02	0.06	0.02	-0.10	0.153	22	0.160	23
DECORAT	0.00	-0.00			0.006	29	0.006	29
GREEN	-0.04	0.04			0.084	26	0.087	26
MAINTEN	-0.18	-0.03	0.08	0.14	0.319	12	0.332	12
WINDOW-D	-0.21	-0.01	0.10	0.12	0.330	9	0.344	11
ACTIVITS	-0.10	0.10			0.193	20	0.201	20
COFFEE-S	-0.07	0.07			0.142	25	0.148	25
("Selection of food stores" attributes")								
UNITS	-0.79	-0.17	0.37	0.59	1.376	2	1.512	2
BASIC R.	-0.12	-0.01	0.06	0.08	0.199	19	0.219	18
SUPERM	0.01	-0.01			0.016	28	0.018	28
CHOICE R.	-0.12.	-0.02.	0.05.	0.09.	0.208	16	0.229	16
PRICES	-0.16	-0.06	0.05	0.17.	0.327	10	0.360	8
QUALITY	-0.21	0.01	0.11	0.09	0.322	11	0.354	9
SUPPLIES	-0.07	-0.04	0.01	0.10	0.172	21	0.189	21
SERVICE	-0.11	-0.03	0.04	0.09	0.205	17	0.225	17
FURNISHM	-0.05	-0.05	0.00	0.10	0.149	23	0.164	22

for clothing and shoes were less important, though significant.

The logit estimates for the "appearance" subexperiment are displayed in the second pair of columns in Table 5.1. This model also fits the aggregate choice data well (ρ^2 = .80). The partworth utilities are displayed in Table 5.2. It appears that the summary constructs "selection of stores that offer food and packaged goods" and "locational convenience and accessibility" had large effects on the allocation of purchases of these goods, while "selection of stores for clothing and shoes" had a

much smaller effect. The attributes in this subexperiment were less influential than the attributes in the "convenience" subexperiment, but all except "street decorations" contribute significantly to the explanatory power of the model. Attribute effects in decreasing order of size are, respectively, "extent to which the shopping area is indoors"; "attractiveness of window-displays", "maintenance of streets, hallways and buildings"; and "street-activities".

The logit choice model estimated from the aggregate choice data for the "food stores" subexperiment is shown in the middle columns in Table 5.1 and also fits well (ρ^2 = .82). The partworth utilities shown in Table 5.2 indicate that "the number of store units (stores or store departments) that carry foods and packaged goods" had the largest influence on budget allocations among shopping areas for these kinds of products. Next most important was "location convenience and accessibility". The other two decision constructs also were significant. Other significant effects include "proportion of store units that has competitive prices" and "proportion that has high quality products". Other attributes had less dramatic but significant effects, except for whether most of the store units are supermarket departments or small stores. With respect to this latter attribute, it may be that all features that characterized differences between supermarkets and small (specialty) stores effectively were captured by the other attributes.

5.6.2 Analysis of construct ratings and comparison with choice models

The left-hand columns in Table 5.3 display the results of a regression of the "location convenience and accessibility" construct evaluations on the attributes and constructs that were used in the "convenience" subexperiment. The model fits the data fairly well (R^2 = .31), considering the disaggregate (individual) level of this analysis. All attributes in this model are significant, and, except for one quadratic component, no constructs are significant. All attributes were also significant in the logit analysis. As discussed previously, this result supports the assumption that in this subexperiment the attributes represent or define the construct and are independent from other constructs in the hierarchical structure.

The middle columns of Table 5.3 contain the regression results for the "appearance, layout and furnishings" construct evaluations. The estimated model fits the data less well than the model fitted for the "convenience" subexperiment (R^2 = .18), but is still significant. All the attribute effects, but no construct effects, are significant (except for one quadratic construct component); all attributes significant

Table 5.3. Multiple regressions of construct evaluations in "Convenience", "Appearance" and "Food stores" subexperiments.

Labels[a]		Convenience Parameter Estimates	Convenience t-Stat	Appearance Parameter Estimates	Appearance t-Stat	Food stores Parameter Estimates	Food stores t-Stat
CONSTANT		5.3908	123.29	5.9815	160.11	6.0920	239.51
(Constructs:)							
CONVEN	L			-.0090	-.53	.0204	1.80
	Q			.0855	2.03	.0083	.33
	C			.0013	.08	-.0133	-1.16
APPEAR	L	-.0203	-1.03			.0003	.03
	Q	.0030	.07			.0087	.34
	C	-.0281	-1.45			.0158	1.40
FOOD&P	L	-.0227	-1.16	.0039	.24		
	Q	.1297	2.97	.0218	.58		
	C	.0096	.49	.0134	.80		
CLOTH&S	L	.0169	.86	.0101	.60	-.0032	-.28
	Q	.0391	.90	.0273	.73	-.0055	-.22
	C	-.0321	-1.64	-.0055	-.33	-.0053	-.47
(Attributes:)							
P-COSTS	L	-.1441	-7.37				
	Q	.0845	1.93				
P-CONVEN	L	-.2919	-6.68				
PUBLIC-T	L	-.3860	-8.83				
TRAVEL-T	L	-.4304	-22.09				
	Q	-.0032	-.07				
	C	-.0376	-1.91				
SERVICES	L	-.3441	-7.87				
PATTERN	L			.0777	2.08		
INDOORS	L			.0761	4.57		
	Q			.0084	.23		
PEDESTRN	L			.1148	6.87		
	Q			-.0302	-.81		
CROWDED	L			-.0475	-2.84		
	Q			-.0316	-.84		
DECORAT	L			.0880	2.36		
GREEN	L			.1622	4.34		
MAINTEN	L			.1786	9.57		
	Q			-.0395	-1.06		
WINDOW-D	L			.1759	10.57		
	Q			-.0686	-1.84		
ACTIVITS	L			.1940	5.19		
COFFEE-S	L			.1373	3.68		
UNITS	L					.3718	32.64
	Q					-.0807	-3.17
	C					-.0492	-4.33
BASIC R	L					.0681	6.01
	Q					-.0141	-.56
SUPERM	L					.0010	.04
CHOICE R	L					.0773	6.56
	Q					-.0185	-.73
PRICES	L					.0993	8.57
	Q					-.0129	-.51
QUALITY	L					.0941	8.09
	Q					-.0364	-1.43
SUPPLIES	L					.0685	6.02
	Q					-.0047	-.19
SERVICE	L					.0639	5.44
	Q					-.0223	-.88
FURNISHM	L					.0436	3.70
	Q					-.0290	-1.14
Multiple R			.557		.421		.547
R Square			.310		.177		.299
Adjusted R Square			.303		.165		.294
Standard Error			1.802		1.535		1.498

[a] *Attribute names correspond to labels in Tables 1a and 1b. "L", "Q" and "C" are appropriately coded linear, quadratic and cubic components of attributes.*

in the choice model results are also significant in this regression. This latter result again supports the assumed hierarchical structure.

The right-hand columns in Table 5.3 show the regression model that was fitted on the "food stores" construct evaluations. The model fits the data fairly well (R^2 = .30). Similar to the choice model results, the only attribute that is not significant is the proportion of store units that belong to supermarkets. No other constructs are significant in this subexperiment. Hence, this construct also seems to be independent from other constructs, and, as assumed, is well represented by its attributes.

In sum, the regression and choice model results support the conclusion that within each subexperiment each construct well represents its particular attributes independent of the other constructs. Therefore, within subexperiments our data seem to satisfy the hierarchical structure assumption.

5.6.3 Equivalence of construct parameters across subexperiments

To perform the two Chow tests, the construct regression equations reported previously were used to predict evaluations of the one missing construct in each subexperiment. Next, data from the three subexperiments were concatenated, and dummy codes were used to create parameters that represent variations between subexperiments. Positive dummies were used for the "appearance" and "food stores" subexperiments; dummies were coded negative for the "convenience" subexperiment. Hence, the "convenience" subexperiment was used as a constrast. The original design matrix was multiplied with these dummies to obtain two sets of parameters that represent differences between subexperiments, in addition to generic or pooled construct effects.

An MNL model was estimated from the concatenated data. The results, presented in Table 5.4, indicate that the effects of constructs defined as profiles of attributes were generally larger than effects of corresponding constructs defined as hypothetical evaluations. For example, the effect of predicted "location convencience and accessibility" evaluations in the "convenience" subexperiment was significantly larger than the effect of the corresponding hypothetical construct evaluation in both other subexperiments. Similarly, the effect of predicted "appearance, furnishings and layout" evaluations in the "appearance" subexperiment was larger than the effect of the corresponding hypothetical construct evaluation in both other subexperiments; and the effect of predicted "selection of stores for

Table 5.4. Constructs-only logit model for three concatenated subexperiments, including Chow test terms for equivalence across subexperiments.

Label		Parameter Estimates	Asymptotic t-Stat	Construct-definition in subexperiment[a]	
CONSTANT		1.0100	21.38		
CONVEN	L	.2406	46.29		
	Q	.0435	3.31		
APPEAR	L	.1079	7.42		
	Q	.1074	3.64		
CLOTH&S	L	.0312	11.37		
	Q	.0000	.01		
FOOD&P	L	.3305	40.64		
	Q	.0030	.21		
"Appearance" vs "Convenience" subexperiments:				Appearance	Convenience
CONSTANT		.2525	2.98		
CONVEN	L	-.1035	-16.91	Hypo	Pred
	Q	-.0029	-.19		
APPEAR	L	.0982	3.42	Pred	Hypo
	Q	.2003	3.44		
CLOTH&S	L	-.0172	-4.42	Hypo	Hypo
	Q	.0056	.54		
FOOD&P	L	-.0449	-4.97	Hypo	Hypo
	Q	-.0191	-1.21		
"Food stores" vs "Convenience" subexperiments:				Food stores	Convenience
CONSTANT		-.1888	-3.30		
CONVEN	L	-.0785	-13.90	Hypo	Pred
	Q	-.0278	-1.97		
APPEAR	L	-.0483	-3.29	Hypo	Hypo
	Q	-.0918	-3.06		
CLOTH&S	L	.0134	3.72	Hypo	Hypo
	Q	-.0099	-1.19		
FOOD&P	L	.0987	6.41	Pred	Hypo
	Q	.0442	1.69		

Number of choice sets	192
Number of cases	704
LL(0)	-14162.37
LL(B)	-2783.20
RhoSq	.803
-2[LL(0)-LL(B)]	22758.34
Chi-Sq d.f.	27

[a] *The two columns on the right indicate whether a construct score was an hypothetical evaluation or a predicted attribute profile evaluation.*

foods and packaged goods" evaluations was larger than the effect of hypothetical evaluations of the same construct.

Other terms in Table 5.4 represent tests of the equivalence of construct effects across both experiments in which a construct was presented as a hypothetical construct evaluation. These results suggest that "selection of stores" constructs had larger effects in the "convenience" subexperiment than in the "appearance" subexperiment. Furthermore, the "appearance" construct had a larger effect in the "convenience" subexperiment than in the "food stores" subexperiment. In contrast, the "selection of stores for clothing and shoes" construct had a larger effect in the "food stores" subexperiment than in the "convenience" subexperiment.

These results suggest that construct effects were not equal across subexperiments; however, we did not account for potential scale differences among the various subexperiments, so caution should be used in interpreting these results. Though the scale parameter in the utility function of the MNL model is arbitrarily set to one for one sample of data (e.g. Ben-Akiva and Lerman 1985), if different samples are compared or concatenated, scale parameter ratios should reflect differences in variances among the samples (see Swait and Louviere 1993). To investigate this alternative explanation (construct effect differences among subexperiments resulting from variance differences), we analyzed pairs of subexperiments to obtain optimal rescaling factors (i.e., the ratio of the scale parameters from both experiments). Design matrices for the constructs-plus-attributes MNL models were rescaled to equate variances and the models were re-estimated. The optimal scale parameter ratio for the "convenience" versus "food stores" subexperiment was .91; for "convenience" versus "appearance" the optimal ratio was .96. In further tests, it appeared that when variation in variances of choices is accounted for, construct effect differences between subexperiments are smaller but nevertheless still significant.

5.7 The Concatenated Choice Model

5.7.1 Importance of constructs and attributes across subexperiments

The three subexperiments were concatenated to estimate a choice model that includes all construct and attribute main effects components. Parameter estimates and goodness-of-fit measures were displayed in Table 5.1 and are only slightly different from the estimates obtained from the separate subexperiments. This was to be expected because essentially the attribute parameters are still estimated only from responses to the "own" subexperiment. Corresponding partworth utilities and utility ranges were shown in Table 5.2 and are plotted in Figure 5.3. The utility ranges are relevant because in conjoint studies relative importances of attributes are often assessed from these ranges: The relative importance of an attribute is derived from the maximum utility difference between the levels of the attribute. Table 5.2 displays the importance ranks of attributes and constructs in the concatenated model. The table also presents the attribute ranges and importance ranks after rescaling. Note that, in accordance with the relatively small scale

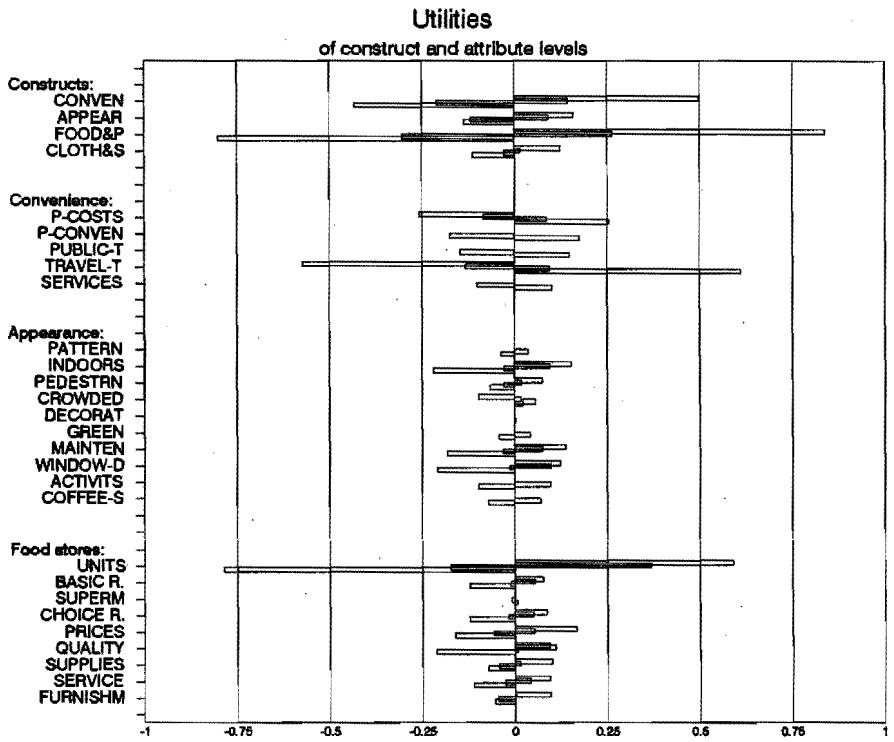

Figure 5.3. Partworth utilies of construct and attribute levels.

differences, there are only few changes in the ranking of attributes.

It appears that across subexperiments the most important constructs are the "selection of stores for foods and packages goods" and the "location convenience and accessibility". "Appearance, layout and furnishings" is less important and "selection of stores for clothing and shoes" had the least influence on budget allocations, but was still significant. This latter result could indicate a general preference to combine trip purposes, for example, buying foods and (window-)shopping for clothing and shoes. Note that the importance of the appearance factor could be much larger for other product categories, such as clothing and shoes (see Oppewal, Louviere and Timmermans 1993).

Conclusions regarding attribute importances in conjoint applications are always conditional on the used range of level definitions. These ranges were similar for all our constructs; hence, the construct importances are relatively independent

from the potential arbitrary selection of attribute levels. For our attribute level definitions, however, this equivalence cannot be assumed. Therefore, in the following discussion of attribute importances, with each attribute the highest and lowest (in that order) partworth levels of the attribute are given in brackets.

Across subexperiments, the most important attributes are the number of store units (35 units, 5 units) and travel-time (5 min, 50 min). Next most important are parking costs (free, 3 NGL/hr), followed by the extent to which the shopping area is indoors (90%, 0% of the area indoors), parking convenience (easy, difficult), attractiveness of window-displays (90%, 0%), price (80%, 20% of the store units have competitive prices), product quality (60%, 20% of the store units have high quality products), and maintenance of streets, hallways and buildings (very well, very bad).

Other attributes are less important but still significant: public transport accessibility (good, bad), large choice ranges within product categories (80%, 20% of the store units have large choice ranges), friendly and courteous service in the stores (80%, 20% of the store units offer friendly and courteous service), number of consumer services located in the area (many, few), the percentage of all possible food product categories that is available in the area (70%, 40% for small areas; 100%, 70% for large areas), number of street activities (many, few), additional services offered in the stores (80%, 20% of the store units offer many additional services), and crowdedness of the area (moderately uncrowded, very crowded). Results for this latter attribute show that people tend to dislike very uncrowded areas, which confirms intuitive ideas about what people like about their social environments. Almost equally important are the proportion of the shopping area that is reserved for pedestrians (100%, 10% of the area), whether stores have attractive and comfortable store interiors (80%, 20% of the store units), and the number of coffeeshops, cafés and restaurants (many, few).

Least important are furnishings and street decorations (many, few), how many store units are part of supermarkets instead of comprising independent small stores (relatively few, relatively many), the pattern of store locations (compact, dispersed), and the amount of greenery (much, little). Furnishings and street decorations and the availability of supermarkets are the only attributes that are statistically not significant.

5.7.2 Predictive validity of the concatenated choice model

Recall that in the survey, before respondents received any information on the experiment, real market budget allocations were collected, and shopping destinations were evaluated on all constructs and all attributes that were used in the experiment to describe the hypothetical shopping destinations. Hence, data are available with which to compare budget allocations predicted with the experimental model. To handle missing data problems, except for travel time, attribute ratings of destinations were aggregated to obtain average ratings for the 30 shopping areas within Maastricht. Average attribute ratings of shopping areas are reported in Appendix C (see also Groenhof 1993). Scores were recoded in accordance with the linear and quadratic components of the experimental attributes to obtain predictor values. Allocations were aggregated across respondents in each postal zone to avoid idiosyncracies in choice set composition. Each zonal choice set consisted of the alternatives that had been mentioned by one or more respondents residing in that zone. Consumer orientations are presented in Appendix D.

The estimated choice model was used to predict distributions within zonal choice sets; hence, we applied a hybrid of sample enumeration and aggregation by classification (Ben Akiva and Lerman 1985, p.151). The Pearson product moment correlation between predicted and observed market shares within zones was .424. This correlation is substantially higher than those obtained when various restricted models were used to obtain predictions: The correlation with predictions from a null model that included the constant representing purchases "in stores" versus "not in stores" was only .270; a model including this constant and the parameters for size of area (from the "selection of stores" subexperiment) and travel time (from the "convenience" subexperiment) resulted in a correlation of only .386; and a model including all attributes and remaining constructs from the "convenience" and "appearance" subexperiments resulted in a correlation of .406. Use of the mean absolute error as a measure of predictive validity showed a similar pattern of results (with values 38.13, 41.00, 39.56, and 38.16, respectively). These results show that inclusion of more attributes may increase the predictive ability of experimentally based models.

The previous results also suggest, though, that the predictive ability of our models is not very high. However, there are various limitations to the use of revealed choice data as benchmarks of external validity. For example, there is a limit to the predictive ability of any aggregate model specification, regardless from

which type of data the model is estimated. Moreover, experimental models are likely to predict less well if the validation data has high covariances among independent variables.

This is illustrated for our data in the model that we estimated from the validition data, as shown in the most righ-hand columns of Table 5.1. First, the correlation between predicted (fitted) and observed budget allocations for this model is .819, with a mean absolute error of 23.54. This represents the upper limit of predictive fit for our main-effects model specification. Secondly, the model has various counterintuitive signs and/or sizes of parameters, probably because the estimates are confounded with the characteristics of our application area. For example, according to this model lower parking costs and more easy parking result in an increased dislike for an area. High parking costs and difficult parking, however, are typical for the city centre, which has many food stores and is a popular place to shop. Similarly, the model seems to indicate that smaller areas are preferred. It is more likely, however, that the negative size parameter is an artifact of the preference for small distances and the fact that small areas are typically located at smaller distances from respondents' homes.

5.8 Conclusion

This chapter presented an empirical study of consumer choice of shopping area. The study implemented the extended HII method, proposed in Chapter 3, to incorporate the large number of shopping area attributes that constitute the shopping centre marketing mix, as defined in Chapter 4. We derived the importance of these twenty-four attributes and four decision constructs and tested the validity of the HII approach in this application. To avoid redundancy, we refer to Chapter 10 for a summary and discussion of the results reported in this chapter.

PART II

MODELLING RETAILER REACTIVE BEHAVIOUR

CHAPTER 6

APPROACHES TO MODELLING RETAILER BEHAVIOUR

6.1 Introduction

Insight in retailer reactive behaviour is required for a better understanding of the potential impact of changes in retail structures or new retail developments on existing retail structures. If consumers respond as predicted, and sales volumes change, then retailers may react to exploit or counteract the observed changes in sales volumes; hence, current retail structures will change. This in turn may lead to changes in consumer choice patterns, and thus invalidate the original predictions. To obtain a more complete assessment of the impact of some (initial) change in retail facilities one should investigate these potential retailer reactions and their consequences for initially predicted consumer choice patterns. This requires a model of retailer reactions to (initially predicted) sales effects of the development under investigation (cf. Van der Linde 1980; Currim and Wittink 1980).

Therefore, the goals of the studies in Part II of this thesis are to explore and model the relation between changes in the urban retail environment and retailer reactions to these changes. We focus in particular on environmental changes that are reflected in changes in sales volumes of stores. Another restriction is that we only study retailer actions that involve changes in store location, store size or store type and appearance. These actions affect the provision of retail facilities; hence, they affect consumer spatial behaviour and retailer demand for retail space.

Surprisingly little is known about this type of retailer behaviour; even descriptive studies (e.g. Nozeman and Schaafsma 1991) are rare or difficult to trace. If data is available, it is typically of an aggregate nature, and often concerns

firms instead of individual outlets. With the recent advent of large computerized databases the availability of data has improved. For example, in the Netherlands the databases of the Chambers of Commerce have recently become available for research. These databases yield data on, for example, the annual number of newly opened stores (between 1986 and 1991 6.0 %, annually, of the total number of stores) and the annual number of store closures (about 5.5% over the same period, Kemper 1992). In principle, these databases can easily be localized. However, the databases concern all types of retailer action, not only reactive behaviour. Moreover, they typically do not include data on actions other than store openings, store closures, and perhaps store size changes. Other actions may also have spatial consequences, for instance, a retailer's decision to change the assortment or prices in the store in response to actions of competitors.

This limited availability of data is one of the key problems in existing approaches to modelling retailer behaviour. As argued, conjoint approaches may provide ways to overcome this limitation. Our studies therefore focus on the development of conjoint experiments to model retailer reactive behaviour.

The present chapter reviews approaches to modelling retailer behaviour that were developed within the three modelling traditions that we discussed in Chapter 2. We will start in section 6.2 with the models of retailer behaviour that researchers in the spatial interaction tradition developed as components of dynamic urban models. We will argue that, although these models are quite advanced, they have only limited value for applied research and urban planning practice. Next, section 6.3 reviews the potentials and limitations of choice models based on revealed choice data to produce models of retailer reactive behaviour, and discusses a revealed choice study on retailer behaviour. Section 6.4 discusses previous conjoint applications to modelling retailer preferences and behaviour. It focuses in particular on an exploratory study in which hypothetical scenarios or contexts were used to study probabilities of retailer reactions. A final section presents conclusions and a detailed problem definition for the study in Part II.

6.2 Dynamic spatial interaction models

Retailer reactive behaviour and its potential effects on urban retail structures have received considerable attention in regional science literature on the modelling of urban dynamics (e.g. Harris and Wilson 1978; Beaumont, Clarke and Wilson 1981;

Clarke and Wilson 1983, 1986; Oppenheim 1986b; Lombardo 1986). We will not attempt to review all these developments, as this is beyond the scope of this thesis and presently several reviews are available (e.g. for historical reviews, see Harris 1985; Bertuglia et al. 1987; see also contributions to the volume edited by Hauer, Timmermans and Wrigley 1989).

Instead, we will present an example study and illustrate typical problems and limitations of this approach. Our example study is Clarke and Wilson (1986, see also Wilson 1988). They developed a dynamic model as follows. To the basic spatial interaction "flow" model (see Chapter 2) they added a set of hypotheses about retailer behaviour. The flow model predicts the retail revenues at each centre and the added hypotheses represent the effects of retail profits on retail sales spaces. It is assumed that the market is in equilibrium if at each location retail costs are equal to retail revenues. The resulting model is a set of nonlinear simultaneous equations that may be solved to derive parameter values that correspond to possible equilibrium states.

Stated more formally: First, it is assumed that the cost of supplying retail space at store j, say C_j, is a (linear) function of floorspace W_j, which represents retail operating costs, like rents and wages: $C_j = C_j(W_j) = k_j W_j$. Next, revenue of store j, say D_j, is derived from the flow model as: $D_j = \Sigma_i S_{ij}$, where S_{ij} is the flow of expenditure from residential zone i to shopping destinations in zone j:

$$S_{ij} = A_i e_i P_i W_j^{\alpha} e^{-\beta c_{ij}} ,$$

where

$$A_i = \frac{1}{\Sigma_k W_k e^{-\beta c_{ik}}} ;$$

e_i is the per capita expenditure of residents of i; P_i is the population of i; W_j is a measure of the attractiveness of j (e.g. measured via floorspace as a proxy); c_{ij} is a measure of travel distance or cost between i and j; α and β are parameters. Profit made at store j, π_j, is defined as: $\pi_j = D_j - C_j$, hence, is total revenues minus total costs. The (assumed perfect) market "will ensure that the π_j's are competed to zero and so the following equilibrium condition must hold": $D_j = k_j W_j$. Substitution of terms from the original flow model results in a set of nonlinear simultaneous equations in the W_j's as follows:

$$\sum_i \frac{e_i P_i W_j^{\alpha} e^{-\beta c_{ij}}}{\Sigma_k W_k^{\alpha} e^{-\beta c_{ik}}} = k_j W_j$$

all terms as defined previously.

In other, but similar studies (Beaumont, Clarke and Wilson 1981; Lombardo and Rabino 1985; Lombardo 1986) additional assumptions are made, for example, that a fixed share of total sales is profit, and that a fixed share of this profit is used to increase sales floorspace. In this way, these models attempt to model the dynamics of urban retail structures, that is, the growth and decline of shopping centres.

A distinct feature of the Clarke and Wilson (1986) paper over these other studies is that it reports the findings of an empirical application. The aim of the application was twofold: "to reproduce the size and structure of major retail centres in Leeds and to analyse certain types of structural change over time, such as the introduction of new forms of grocery retailing." Clarke and Wilson accomplished to reproduce the current retail structure in Leeds with contemporary data, and they conclude that "it is possible to calibrate and fine-tune the equilibrium model to reproduce existing structures in a plausible way". With respect to their second objective they arrive at a similar conclusion: ".. actual trajectories can be broadly reproduced and there is evidence that key parameters achieve critical values beyond which the nature of the structure of provisions change". Essentially, however, these results only represent a calibration of the model. Apparantly, data for tests of the calibrated model were not available.

This illustrates the problems associated with these aggregate dynamic model structures (for critical reviews, see Harris 1985; Oppenheim 1986a; Beaumont 1988; Pumain 1989). First and most important among these problems is that the models resort to very rigorous and simplifying assumptions about retailer behaviour, which weakens their link to the empirical domain. Variety in retailer behaviour is reduced to only one parameter. Although modellers argue that "the complexities of the real world can be added again when the basis principles which lead to the new insights have been explained" (Wilson 1988, p.169), apart from the above mentioned study no further empirical applications seem to exist.

Secondly, the models suffer from the limitations that apply to spatial interaction models in general (see Chapter 2): a limited theoretical basis; parameter estimates are highly dependent on the zoning system and other spatial

characteristics of the study area; and it is difficult to account for sample heterogeneity.

Third, a more practical limitation is that data requirements make it very difficult to calibrate and empirically test such models. "Data requirements for empirical studies would be daunting" (Beaumont 1988, p.102). Localized temporal statistical series are in general very scarce and difficult to collect. Data requirements are further increased by the modellers' special interest in specific combinations of parameters values that mark the start of major structural changes in the system, so-called bifurcations.

Fourth, as a result, researchers have to rely on numerical simulation experiments to explore the stability of structures over a range of parameter values. However, because there are so few empirical applications and tests, it is not clear what the relevant ranges of parameter values are (Pumain, 1989), and in general, it is difficult to interpret the simulation results.

One could add that these approaches do not permit statistical tests and have too narrowly focussed on conditions under which equilibria may exist, without considering appropriate time scales for these conditions and equilibria.

Finally, there is a general complaint of applied researchers and retailing consultants that these models are difficult to apply and interprete, and that they include few variables that are relevant to a planner or manager. This is illustrated with Breheny's (1988) conclusion about the practical relevance of these and related types of models:

> *Generally speaking, as it stands, much of the literature is of little help. Many of the models reported have been developed for the academic purpose of testing mathematical formulations. Often the application to, say, retailing is a trivial extension of the formulation; the concern is with the mathematics, not with retailing. This is shown in the unrealistic manner in which the retail system is characterised. It is usually too simplistic, or occasionallly too complex, for the purpose at hand. Abstract models attempting to maximise retailers' profits, maximise consumer welfare, minimise travel times and maximise developers' profits all in one go are unlikely to be of much practical help.* (p.59).

In summary, although dynamic spatial interaction models in principle allow one to simultaneously model demand and supply, there are many disadvantages to this approach. One way to avoid these limitations is to employ an individual choice modelling approach, as argued in Chapter 2. If appropriate retailer choice models could be developed and empirically estimated, one then could proceed and apply these models in combination with models of consumer choice of shopping

destination in order to investigate and simulate dynamic aspects of the urban retail sector. Such a "bottom-up" or inductive approach might lead to practical empirical insights that complement insights derived from models of urban dynamics. Part I extensively discussed demand models. The remaining sections of this chapter discuss studies that used individual choice modelling approaches to model retailer reactive behaviour.

6.3 Revealed preference models of retailer behaviour

Individual choice models assume decision makers to choose alternatives with the highest utility from among available alternatives. The advantages of this modelling approach include flexibility with regard to heterogeneity and zoning issues, potential inclusion of managerially more relevant variables, and behaviorally more realistic assumptions than those underlying aggregate models such as spatial interaction models. In this and the following sections we will consider to which extent the individual choice modelling approach can produce models of retailer behaviour that are relevant in the present context, starting in this section with models based on choices observed in real markets ("revealed preference data").

Advantages and disadvantages of the revealed preference approach to modelling retailer behaviour are demonstrated in the only relevant study that we are aware of. This study, by Miller and Lerman (1981), was an empirical investigation into a theoretical econometric model of retailer choice of "location, scale and intensity", which had been presented in an earlier paper (Miller and Lerman 1979). This model assumes the individual store owner to be the decision-making unit. Retailers' decisions on the types and qualities of their stores are considered exogenous and prior to the location and scale decisions that are modelled as a choice of "location bundle". It is argued that decisions of retailers concerning location, size of store, and number of employees to serve customers are interdependent and should be considered as a single choice from the total set of possible location bundles. A retailer will choose the location bundle with the highest expected profitability. This expected profitability is broadly defined and conceptualized as an unobserved random variable, and is equivalent to the use of the utility concept in random utility models. It is furthermore assumed that "each store is [...] sufficiently small that it views its location and scale decisions as not affecting the market for retail floor space." Thus, supply of retail floor space is

assumed to be fixed and exogenous. An error distribution is imposed on the expected profit variable, to capture all the different factors affecting expected profitability, such as "revenues, costs, market areas, neighbourhood qualities, etc [..], that are in general poorly defined, inaccurately perceived, and, in some cases, simply ignored by the retailer in his decision making."

Miller and Lerman (1979) formulate a complex revenue function to obtain a complete expected profitability model. However, it appeared impossible to collect the individual store data that were required to estimate this model. Therefore, in their 1981 study (see also Wrigley 1985, p.337) they estimated a simplified model, which only concerns combinations of store location and store size category choices. Employment intensity is included as an attribute of the location by size alternatives. In Boston, they observed the locational pattern of 161 clothing stores in Boston, their sizes and their numbers of employees. Miller and Lerman estimated various logit and probit models to explain the pattern of location bundle choices that they observed in Boston. Independent variables (attributes of alternatives) in their models were, among others, store size, average wage rate at a particular location, number of employees, and rent. In addition, they included dummies for particular locations (i.e., retail centres) in their model. It should be noted that sales and profits were latent variables. These were specificied as additive functions of store and location attributes.

Miller and Lerman's studies (1979, 1981) demonstrate the major problems in applying the revealed choice modelling approach to model retailer behaviour. It is much more difficult than in consumer contexts to obtain relevant choice data. Choices are made infrequently and it is unclear how choice sets should be specified. Moreover, data on actual store performance in terms of sales levels, profits or costs are difficult to obtain. Most retailers are not willing to provide such data, as they are anxious for potential abuse by competitors or local policy makers. Response rates of surveys among retailers may also be low retailers have limited time available, typically have a limited interest in research, and get many requests to fill out questionnaires. For example, in a study of Robinson et al. (1986) on planning practices in small retailing firms a response of only 15 % was obtained and only about half of these respondents had provided the requested information on actual store performance.

Nevertheless, the studies by Miller and Lerman also illustrates three major advantages of the use of the revealed preference choice modelling approach in the present context. It allows one to empirically estimate models that directly predict

the probability that a particular retailer chooses a particular "location bundle" or combination of actions. This choice is conceived as the total outcome of the decision-making and implementation process of the particular retail firm. The model ignores the processes within the organization and directly predicts the probability of interest.

6.4 Conjoint applications to the study of retailer behaviour

Considering the problems involved in developing dynamic spatial interaction models and choice models based on revealed choices, the properties of conjoint approaches are of particular interest in the study of retailer reactive behaviour. These include efficient model estimation (because the hypothetical choice situations are orthogonal by design and because one can collect multiple observations per respondent), opportunities to study causal relationships, and the ability to observe responses for alternatives and contexts that are beyond the current domain of experience. We nevertheless know of only one study (Timmermans 1986) in which conjoint based methods were used to study retailer behaviour. In this study retailers ranked profile descriptions of potential store locations and each retailer's utility function was estimated. Hence, this study involved a straightforward application of conjoint analysis as described in Chapter 2 and aimed at measuring retailers' locational preferences.

In contrast, the application of conjoint-based methods to examine retailer reactive behaviour poses new problems, some of which were discovered in an exploratory study by Van der Heijden (1986, 1988), which very much inspired the present study of retailer reactive behaviour. His study was not a typical conjoint study, although it may be regarded as an application of "stated" or "scenario based" methods. In this study retailers were presented with various scenarios of hypothetical sales trends and were asked to produce estimates of the probability that particular actions would be taken in their stores. A review of the retail management literature produced a list of 22 potential actions of retailers, including actions such as "increase prices", "decrease prices", "increase service level", "relocate", and "increase advertising".

This list was presented to 141 retailers from different types of businesses and merchandise in the Eindhoven region. Respondents were invited to imagine that they currently were confronted with a decrease (respectively, increase) in their sales

level of 5, 10 or 15% over one year. For each of the listed actions, they were invited to state on a numerical probability scale their subjective probability that this action would be taken. Subjective probability judgments were collected for each of the six hypothetical sales levels. For food-stores (n=38) and for durables (n=103) polynomial functions were fitted on the averaged probability scores of sales level changes for each separate action. It was tentatively concluded that respondents had been highly consistent in their probability estimates, as these polynomial functions explained very high proportions of variance. Moreover, pairs of shopping centers showed high correlations in the per action and per sales level average probability judgments. Hence, this study seems to suggest that retailers are able to respond to this type of questioning and suggests that, indeed, sales level information is an important determinant of the probability that a retailer will perform particular actions pertaining to his or her store. It also suggests that probability functions are fairly consistent across locations.

However, the validity of the data collected in this exploratory study may have been limited. First, it is unclear whether the response format that was used by Van der Heijden produced valid representations of retailers' beliefs that particular actions occur. Direct numerical (ratio-)scales are not very reliable measures of subjective probability and tend to produce biased results (Wallsten and Budescu 1983). Moreover, the list-wise measuring of reponses for several types of actions may have induced halo effects. A relevant question is therefore whether there are other ways to define and measure the relevant retailer responses?

A second limitation is that the study did not take into account that actions are likely to be chosen in bundles (cf. Miller and Lerman 1979, 1981). Van der Heijden collected information on single actions only, not on combinations of actions. Moreover, the listed actions vary widely in terms of their implications and importance, for the retail firm as well as for its spatial environment. For example, the decision to relocate has potentially much more impact on the local availability of retail facilities than the decision to increase prices. Indeed, a decision to relocate is typically taken only once in several years, whereas other actions, such as changing price levels, may be performed much more frequently. Studies of retailer reactive behaviour should take these differences in scale and joint appearance of actions into account.

Thirdly, it is unclear whether retailers reacted to sales trends or to the (hypothetical) retailing circumstances that are implied by these trends. The experiment did not control for the possibility that retailers do not respond to sales

trends per se, but to imputed causes of these sales trends. Variation in retailers' perception of these causes not only may lead to increased error variation in the responses to sales trends, but also may invalidate results as different causes may lead to similar sales trends but different reactions. Therefore, models based on scenarios that include sales trend information only have limited construct validity (Cook and Campbell 1979), hence, are expected to have limited predictive ability.

We hypothesize that, to obtain models with satisfactory predictive ability, scenarios at a minimum should control for retailers' inferences on potential causes. To resolve the issue how this should be accomplished, we first need more insight into the nature of retailer decision-making. Indeed, to construct better conjoint tasks for studying retailer behaviour we require an explicit and plausible conceptual model of retailer reactive behaviour. A particularly important question is which is the role of sales information in this decision-making process.

6.5 Conclusions and summary: Problem definition for Part II

This chapter reviewed the extent to which various modelling approaches allow one to investigate and model retailer reactive behaviour. Retailer reactive behaviour was defined as the spatially relevant actions that retailers may take in response to changes that they observe in their environment. Aggregate approaches, such as Spatial Interaction models, have the advantage that they provide formal models that allow one to investigate dynamic processes and to derive equilibrium conditions. However, empirical estimation of these models require data that are almost impossible to obtain. Moreover, the model parameters and outcomes are difficult to interpret. Individual choice models based on choices observed in real markets (revealed preference models) also suffer from data demands that are difficult to meet. We concluded that conjoint approaches may provide a way to overcome these limitations. We discussed one study that explored the application of such an approach.

This exploratory study on retailer reactive behaviour (Van der Heijden 1986, 1988) confirmed that conjoint-like methods can provide data which are practically unavailable from other sources. Moreover, the exploratory study suggested that sales trend scenarios do provide information that is relevant to retailers and that retailers are able and willing to give their expectations that particular actions will happen to their stores, given the scenario information. However, we also concluded

that sales trend scenarios and probability measures, such as used in the exploratory study by Van der Heijden may produce responses with limited validity. The goal of the research in Part II of this thesis is therefore to develop improved conjoint tasks for modelling retailer reactive behaviour.

The development of such tasks and models requires an answer to various questions and issues that arise from our review. These will be addressed in the following chapters. A first set of questions involves the nature of the retailer decision-making process:

* What is the role of sales information in the process of retailer decision-making?
* Which types of additional information does a retailer require and consider when choosing from among various potential reactions?
* Which are these possible reactions, and which of these are relevant in the context of urban retail planning?

To answer these questions, Chapter 7 reviews the relevant literature on retailer behaviour. Our focus will be on the development of a conceptual model of retailer reactive behaviour that can guide the further development of a conjoint task, such as used by Van der Heijden (1986, 1988).

A second type of question involves the implementation of this conceptual model in a conjoint task:

* How should sales trends and potential causes of trends be presented?
* How can we measure subjective probabilities of the occurrence of actions and bundles of actions?
* How can we take heterogeneity among retailers into account.

These questions are answered in Chapter 8, which describes how we designed our conjoint experiment.

A final set of questions concerns the behaviour of retailers in our study area:

* How often do particular actions occur in this area?
* How do retailers perceive the environmental and sales trends?
* How do observed changes in the retail environment and sales trends affect reactive behaviour?
* Do causes that lead to similar sales trends lead to different retailer reactions?
* How often do particular action bundles occur and what do actions look like, if implemented?
* How are these aspects associated with particular retailer characteristics?

These questions are answered in Chapter 9, in which we analyze the data from a a survey which included the proposed new conjoint task.

CHAPTER 7

A CONCEPTUAL MODEL OF RETAILER REACTIVE BEHAVIOUR

7.1 Introduction

The purpose of this chapter is to review literature on retailer behaviour and to infer a conceptual model of retailer reactive behaviour that may guide the development of a conjoint task for the study of retailer reactive behaviour. Two types of literature can be distinguished. The first is prescriptive literature on retail management, which includes the field of retail marketing. This literature is abundantly available and is relevant in the present context because (implicitly) provides elements for a theory of retailer behaviour. Sections 7.2 and 7.3 focus on this literature.

The other type of describes how retailers actually run their stores and make their decisions. Such empirical studies are fragmented and only scarcely available. Section 7.4. reviews the tenability of our model in light of this existing empirical evidence. Section 7.5 presents some pilot interview results on the tenability of the conceptual model. Finally, section 7.6 presents some concluding remarks.

7.2 Prescriptive literature: the strategic retail management process

Rather than suggesting a set of totally new management activities, the strategic approach to retailing management is a conceptual framework through which various traditional management activities are integrated and coordinated (at least conceptually). Traditionally, the marketing literature has contained a number of

"rules of thumb" and normative approaches with little empirical analysis to support the use of specific marketing strategies in specific situations (Fiorito and LaForge 1986). Because retailers learn and know these rules of thumb of retailing, it is plausible to assume that retailers behave more or less according to the elements in the strategic framework. Thus, the approach may provide a set of empirically based, hence plausible, assumptions on retailer behaviour.

We will not attempt to review the prescriptive literature on retail management and retail marketing, as this would be far beyond the scope of the present study and several textbooks have covered this topic (e.g. Arnold, Capella and Smith 1983; Duncan, Hollander and Savitt 1983; Van der Ster and Van Wissen 1987; Ghosh 1989; McGoldrick 1990). Instead, we will focus on the general conceptual framework of strategic management and marketing as it has appeared in the last decade in many of these textbooks and reviews on retail management (e.g. Omura 1986; Burt 1989).

The development of a retail management and marketing strategy is typically described as a process which starts with formulating the general purpose of the organization and analysing the environment and own resources. These internal and external analyses reveal the opportunities and potential new directions for attracting the customers that the organization wants to serve. The formulated purpose or mission guides the selection (or non-selection) of actions to exploit these opportunities. Once a strategy has been formulated and implemented, the organization's operations in the target market and the developments occurring in the environment are monitored systematically for indications that the strategy should be reconsidered. Thus, the formulation and implementation of retail strategy in principle is a continuous and iterative process.

The process can be illustrated in more detail by looking, for example, at the flow chart in Figure 7.1, which was adjusted from Arnold et al. (1983, p.2). This chart first shows that the strategic management process starts with defining the business the organization is in (or wants to be in). Retailers should know which consumer needs they want to serve. Next, the chart shows that strategic management coordinates particular business activities, like financial management and human resources management, into an integrated approach to the target market. The communication of this integrated retail effort to the consumer is the core of retail marketing. Arnold c.s. describe the basic retailing philosophy or retailing concept as consisting of three elements: the idenfication of consumer needs, the satisfaction of customers' needs through an integrated retailing effort,

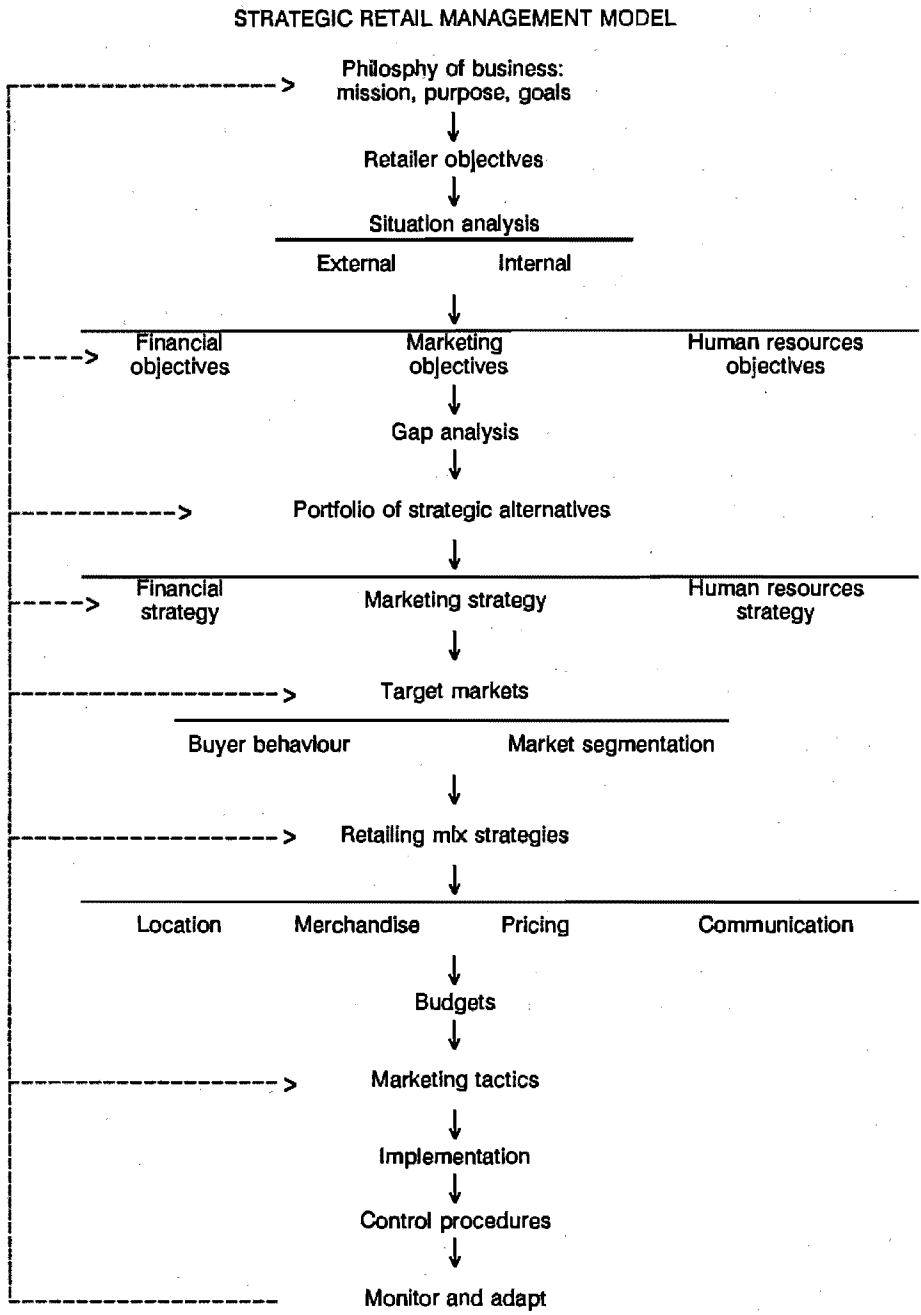

Figure 7.1. The strategic retail management process (adjusted from Arnold et al. 1983).

and the satisfaction of customers' needs at a profit (Arnold et al. 1983, p.33; cf. Van der Ster and Van Wissen 1987, p.96, who present a more simplified, but similar flow chart of retail marketing procedures and principles).

A thorough analysis of the environment is required to identify consumer needs and the ways in which a profit can be made by satisfying these needs. In the environment or external situation typically three components are distinguished: consumers, competitors and the marketing intermediaries. Consumers should be analysed in terms of how they perceive the store, how they come to buy at the store, and how the store could satisfy the needs of specific groups of consumers, or segments. Competitors should be analysed in terms of their competitiveness, market shares, and the various retail strategies they employ. Strategic actions of competitors are preferably forecasted, and contingent responses developed. The analysis of marketing intermediaries concerns the range of possible channel arrangements and available facilitating organizations, such as financial institutions or physical distribution organizations.

This micro-, or task-environment, is embedded in a macro-environment that is determined by the present demographic, economic, cultural, political and technological structure. At regular intervals retailers should inspect (monitor) the relevant developments in this macro-environment. Furthermore, the retailing organization should analyse its internal situation to know its strengths and weaknesses. This total set of analyses indicates the opportunities and threats to the own retail firm (or store), and allows the definition of the firms' marketing objectives. Marketing objectives are statements about the kind of store one wants to operate, the kind of customers one wants to serve, and the competitive position one wants to achieve. A marketing strategy involves a detailed plan of how to attain these objectives (Arnold et al. 1983).

The marketing strategy specifies how the marketing instruments will be used. In accordance with the well-known "marketing mix", in retailing this is usually called the "retailing mix". Its elements are the instrumental variables that a retailer can manipulate and that communicate the retail offer to the consumer. Although the the elements of this mix have been defined differently by different authors, there is agreement on the general aspects of the retailing mix: store location, merchandise selection, pricing, and communications (which includes promotions, advertising, atmosphere and store layout, and customer service). Van der Ster and Van Wissen (1987) characterise the retailing mix as a set of "seven P's": place, physical distribution, product, presentation, personnel, price, and promotion. In fact,

this retailing-mix is a classification of the major activity areas or instruments that retailers can use to influence store image. Not surprisingly, the main attributes that are found to constitute the store image (e.g. Zimmer and Golden 1988) correspond to this retailing mix.

A final and essential component in the process of strategic retail management process is the inclusion of strategic control. At regular intervals, the environment and performance of the store should be monitored and evaluated and it should be decided whether and how to adjust the retail mix in order to adjust stores to the new circumstances. Strategic control requires that quantified, measurable goals are set for each objective, that actual performance and desired performance are compared, and that corrective actions are taken. Ideally, at regular intervals ("at least every two or three years" Arnold et al. 1983, p.605) the total strategic retail management process should be systematically examined ("a total retailing audit"). Sales measures and market share or penetration measures can be used to evaluate growth and profitability.

7.3 A conceptual model of retailer behaviour

The above outlined strategic retail management process provides a useful framework to describe the behaviour of retailing organizations in retail markets. It suggests that on entering a market, retailers face the decision how to position their stores on the elements of the retailing mix, that is, which assortment to carry, which services to offer, how to price their goods, etc. When in operation, at more or less regular intervals, retailers (have to) reconsider their positions and decisions in these areas.

Obviously, some of the retail mix elements are more easy to adjust than other instruments. Prices, for example, are typically more easy to change, and therefore less inert, than store location. This variation in decision inertia is reflected in Lilien and Kotler's (1983, Ch.13) treatment on "distribution location" as a constituent of the total marketing effort. They describe the distribution location problem of a company "that has adopted a particular market-exposure policy and presently operates a network of sales outlets" as a sequence of four decisions that have to be faced. These decisions concern 1) the selection of a trade area that has sufficient potential (market-selection), 2) the choice of the

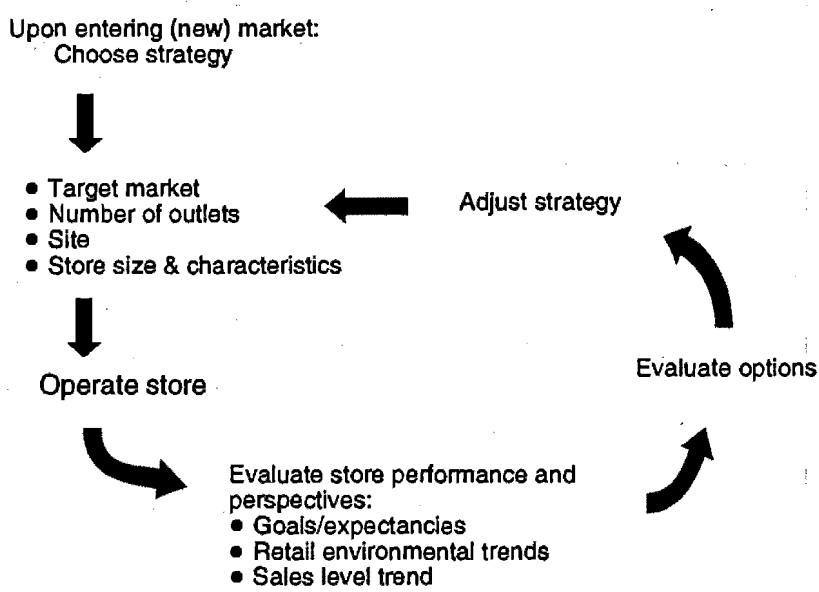

Figure 7.2 Tentative model of the operation of retail firms in urban markets.

number of outlets to operate (number-of-outlets), 3) the selection of a site for each outlet (site-selection), and 4) the choice of size and further characteristics of the store(s) (store-size and -characteristics). Note that these four decision areas cover all marketing mix elements because marketing mix elements, such as prices, assortment, services, and promotions can be defined as store characteristics.

Thus, Lilien and Kotler's decision sequence provides an attractive conceptual framework for our present purposes (cf. Van Goor 1984, p.41). It captures all the elements of the retail mix but also reflects inertia differences between these elements. Moreover, it emphasizes the variables which are most relevant for planners, that is it focuses on store location, store size and store type. Our prelimenary conceptual model of how a retail organization operates in a market is summarized in Figure 7.2.

7.4 Empirical evidence from the research literature

Our conceptual model of retailer behaviour is based on strategic management

prescriptions of how retailers should make their decisions. To what extent is this approach used in practice? Do retailers plan at all? How do retailers decide how to position their stores? To what extent may we assume that retailers run their store in accordance with the principles advocated in the strategic management literature? When and how, using which information, do they evaluate the performance of their stores? And how do they decide how to adjust their retailing mix?

This section will review empirical literature pertaining to these questions, in order to check whether our model should be adjusted in the light of empirical results. Because there is very little literature available on the actual decision-making process of retailers (as noted by, e.g., Zwart 1983; Van Goor 1984; Specht 1987; Perkins and Rao 1990), our discussion will focus on two topics that have appeared in the literature: Planning activities of small businesses, and retailer evaluation of store performance.

7.4.1 Planning activities of small businesses

Research pertaining to the planning activities of small businesses may answer our question to what extent and how retailers plan their actions. Studies by Robinson and his co-workers (Robinson, Logan and Salem 1986; Robinson, Logan, Salem and Pearce 1986) suggest that small retailers do not put much effort in long range planning practices. They surveyed 81 independent grocers in the U.S. with a list of fourty-seven planning activities and asked for each activity to what extent the firm put emphasis on this activity. Only 15% of the respondents reported to practice strategic planning activities (such as formulating the firm's mission, its principal strategies, and the key goals these elements are intended to accomplish), and only 28 % considered strategic planning to be important. On the other hand, 63% considered operational (short range) planning to be important. Out of the ten activities in which firms were engaged to the greater extent, five were marketing activities, as illustrated in Table 7.1.

The relative neglect of long range planning and the relative importance of sales level developments in small retail management is confirmed by a study of Gable and Topol (1987). In a survey among 179 small retailers in the U.S. they asked the frequency of use of certain goals and objectives and of types of forecasts. The goal reported as being set most often is the sales level. Sales is also reported as being forecasted most often. General economic trends and population trends are

Table 7.1. Percentage of sample of grocers that put emphasis (to a "great" or "very great" extent) on the activity (Robinson et al. 1986).

64%	Monitoring and readjusting pricing policy based on an analysis of demand, competition, and cost consideration.
61%	Reviewing and planning to improve business image on a regular basis.
60%	Determining at which sales volume your store will break even.
54%	Comparing sales results on a regular basis to sales quotas and expectations.
48%	Estimating what sales volume and dollar sales your firm expects to reach in a period of 6-12 months.

forecasted seldom to periodically.

From these studies we tentatively conclude that long range planning is not regular practice in small business management. Emphasis is on the short term goals and opportunities. This corresponds to the conclusions which Burt (1989) cites for the US that "retail management appears to be more reactive and dedicated to crisis firefighting than long-term analysis and planning". Burt (1989) also refers to studies which report an average time period of 5.7 years for long term views and 1.6 years for short term views in the US and suggests that in Europe this period is even shorter.

7.4.2 Retailer evaluation of store performance

A second topic that appears in the research literature focuses on our question how retailers evaluate the performance of their stores and which information they use for this purpose. These studies reviewed above suggest that (trends in) sales volumes are an important source of information for the evaluation of own store performance. Robinson et al. (1986) report that small firms are most engaged in activities like the analysis of demand, competition and costs, and the determination and comparison of sales volumes. Gable and Topol (1987) find that goals are most often set for sales levels.

Further support for our model comes from Zwart (1983). His study involved a game in which 22 Dutch druggists operated a simulated store. They had to take decisions on marketing mix variables, such as assortment, prices, etc., and could ask for the information which they required to make these decisions. It appeared that the sales level was the most important source of information for retailers when making decisions about store management.

Further indications of the importance of sales level information are that

applied and commercial studies often use sales volumes as indicators of store performance. For example, Corstjens and Doyle (1989) evaluated repositioning strategies for a major fashion retailer and used sales levels as their major performance measure for several product groups.

In sum, although the available empirical research literature is limited and does not allow strong conclusions regarding the role of sales trend information in the retailer decision-making process, it seems to support our approach. Sales levels are important indicators of store performance. This result is easy to understand: own sales figures are quantitative and easy to obtain, and are directly related to store viability.

Despite the importance of sales information, studies also seem to indicate that various *other types of information* may be relevant when retailers evaluate store performance. For example, Robinson et al. (1986) find that small businesses regularely are engaged in analyses of demand and competition. This is not surprising. Sales level trends are not simple stimuli and retailer reactions are not simple responses. Sales level trends are events which a retailer has to interpret, and reactions are decisions which require deliberate thought. Retailers cannot evaluate sales level trends in a vacuum, they can only interpret the obtained sales volumes against the context in which the sales volume was generated. Hence, they require information on this context before they can make their decisions.

Literature on how such information is obtained is very limited, though. Young and Welsch (1983) studied the relation between the types of problems that are encountered most by small businesses, and the source of information used. Their survey included 193 small firms from different types of businesses in the U.S. They concluded that personal sources of information are preferred over other possible types, such as institutional or professional types. Young and Welsch do not distinguish types of information content, so, their study does not allow us to draw further conclusions for the present purposes.

However, our practical experience and pre-experimental fieldwork, and the prescriptive literature on retailing management point at various sources of information that are easily accessible and potentially relevant for a retailer. First, changes which occur in the immediate environment of the store can be directly observed by a retailer. Retailers are also likely to be well informed about changes which occur in environmental factors such as competition, the size of the own shopping centre, and the number of anchor stores in the own centre. Retailers can also easily observe changes in the appearance of the own shopping street or mall,

and local demographic developments. Other developments, such as sales trends for particular product categories, are typically reported at a regular (e.g. montly) basis in retailer magazines and public reports. Thus, although no empirical studies seem to have been conducted on the role of these types of information in the retailer decision making process, it is very likely that this kind of cheaply available information is used when evaluating and interpreting a store's economic performance in terms of sales.

Nevertheless, various retail scholars have the impression that information about the environment is not used systematically. Arnold et al. (1983, p.107) state that developments in the macro-environment in practice are mostly scanned irregularly and ad hoc. Moreover, they state that this scanning is typically crisis initiated and merely retrospective, with a focus on the current or near future only. Hence, it is the monitoring process itself which is merely reactive. In addition, they remark that "unfortunately, very few retailers have been willing and able to conduct retailing audits" (Arnold et al. 1983, p.604). So, due to a lack of motivation, abilities, or both, stores are not often systematically evaluated. In this context it is particularly interesting to note Breheny's (1988) impression that in retailing practice many important aspects of retail performance are largely ignored; hence, not evaluated at all:

> *Remarkably, given the massive financial commitment involved on the part of all major retailers, it is in the area of existing store evaluation that the least modelling work appears to have been done. On the face of it little effort is made to determine why particular stores in a chain perform better or worse than might be expected; indeed, it may be that there is no clear idea of what is expected. Other, more specific questions often go unasked, never mind answered. For example what are the socio-economic characteristics of the company's customers? Do these differ from those of competitors? [....] How does store size affect sales? How do refits affect performance? How will changing demographic structures affect sales?* (p.82)

7.5 Empirical support from pilot interviews

To further explore the tenability of our conceptual model, thirty open interviews were conducted with retailers from different types of stores, shopping centres and firms. These interviews confirmed that sales are monitored and are important indicators of store performance. All retailers agreed that the level of sales activity is an important indicator of their store's performance and they reported that sales

levels are inspected at regular intervals, often on a weekly base.

The interviews also confirmed our intuitions that retailers require additional information in order to be able to act upon sales trend information. Several retailers made objections to a task in which they are to respond to a hypothetical retail situations that is described in terms of sales trends only, which is the task that was used in the Van der Heijden (1986, 1988) pilot study. They asked for additional information that would explain how a presented hypothetical development in their sales levels could have occurred. For example, one fashion retailer wanted to know whether a presented hypothetical decrease in sales had been induced by the arrival of a new competitor or whether it had been a season with bad weather conditions. His choice of whether, and how, to react to sales trends would depend on his interpretation of the particular circumstances that had been responsible for the observed sales trend.

Retailers mentioned various types of information that they considered relevant when evaluating a store's performance and when assessing which action is required. These types of information largely corresponded to the environmental factors that were encountered in our earlier review of the prescriptive literature. The information concerned the following information items:

* Competitive developments.
* Developments in the immediate store environment (e.g. the street within the own shopping centre) with respect to factors such as atmosphere, anchors, or accessibility.
* Trade area developments (trends in housing occupation, neighbourhood and family life cycles, building programs, income trends, etc.).
* National figures on sales developments for various product types, for example as published in retailer magazines.
* Size and stability of own sales level trends.

A final observation from the interviews was that retailers, especially retail managers, have more insight and practical knowledge about their amount of sales than about their profits. Managers especially also indicated that there are several types of costs about which they have little knowledge. This also supports our conceptual model.

7.6 Conclusion

In this chapter we reviewed the literature on retailer behaviour. From the strategic management literature a conceptual model of retailer behaviour was inferred. No evidence against this conceptual model was found in the empirical literature, but also only little support. We found that retailers typically are more reactive than proactive and that most retailers rarely systematically evaluate their store. We also found that sales information is the most important variable when retailers evaluate their store, but that they also require information about the retail environment. Further support for the model was found in pilot interviews. We therefore accept the model as a tentative theory. In the next chapter we will use the model as a framework for the construction of a retailer conjoint task. Note that the studies in this thesis do not aim to test this conceptual model as a whole. Rather, we use it as a guidance for the construction of an improved conjoint task for the study of retailer reactive behaviour. This study will focus on behaviour of existing stores and, therefore, will only partially operationalize the model.

We also conclude that little information is available on the occurrence of individual actions. Even less is known about the joint occurrence of actions, even though the marketing philosophy considers the integrated and consistent use of the marketing mix instruments as crucial for success in retailing. Also little is known about what actions look like when they are chosen and implemented. We therefore will also pay attention to these aspects in our studies.

CHAPTER 8

DESIGNING THE RETAILER CONJOINT EXPERIMENT

8.1 Introduction

Conjoint approaches potentially can provide data that cannot easily be obtained from other sources. This chapter describes the design of the conjoint task that we developed for studying retailer reactive behaviour and discusses various issues that arise with this new conjoint application.

Conjoint studies typically focus on the utility contributions of attributes of alternatives. In contrast, in our study of retailer reactive behaviour a "background variable" is of major interest. Sales level trends represent the conditions in which retailers have to make decisions, and a retailer can not choose between sales levels. Thus, instead of designing (profiles of) choice alternatives, we should design (profiles of) hypothetical choice backgrounds, or contexts. The present study however also focuses on choice alternatives, that is, on actions that retailers may perform, and on the potential advantages of multiple choice experiments to study these choices. Thus, we will have to design and analyze both choice contexts and (sets of) alternatives simultaneously. This chapter describes the design of the task that we developed and discusses various issues that arise with this new conjoint application.

The task extends the pilot study by Van der Heijden (1986, 1988) in that it is based on a conceptual model of retailer behaviour, more fully describes the hypothetical retailing conditions, and measures retailers' opinions on the likelihood of occurrence of single and multiple actions by using multiple choice experiments. Section 8.2 describes the design of the scenarios. Section 8.3 reviews alternative

ways of collecting probability judgments and presents the logic behind the "most likely" choice task which we used in our study. Finally, section 8.4 presents the survey and sample design and the procedure that was followed to collect the data. Section 8.5 is a brief conclusion section.

8.2 Designing scenarios

8.2.1 Presenting hypothetical sales trends

There are various ways to describe sales trends in hypothetical scenarios. Our aim was to select and develop a scenario that is easy to understand, that is a valid representation of the decision tasks that retailers encounter in the real market, and which contains the variables that are of interest to the researcher. In order to (pilot) test various types of scenario lay-outs and descriptions, prototypes of scenarios were presented to thirty retailers from various types of stores and location. Various issues were investigated in these pilot tests.

A first issue that was tested was whether hypothetical sales trends should be described verbally or may be presented in more quantified ways. It appeared that quantifications are no problem, provided one uses terms and types of quantifications that are common in retailing. Quantification formats that are typically used in retailing are index-figures: the value of a particular category (year, product or store) serves as a base for the variable of interest, and the values of all categories are divided by the value of the base category, and multiplied with one hundred. Hence, a linear transformation is performed, which results in the base category having a value of 100, and other categories being expressed as deviations from this base value. Such index-figures were used in our experiment to express the hypothetical sales trends, that is, sales trends were presented as deviations from some base year.

We also tested whether the stimuli should be formulated as "case" descriptions that referred to another, but similar store, or whether scenarios should be explicitly presented as pertaining to the own store. We chose for the latter becuase this "own store" option appeared to result in more involving scenarios, hence, may produce the more reliable and valid responses. For example, in the own store version respondents appeared to be more committed to give their true expectations instead of some "easy" response (e.g. the first answer that comes to

mind). The feedback from the pilot interviews also suggested that "similar store" version scenarios might lead to biased responses because some retailers tended to interpret these scenarios as a test of skills for which "correct" answers had to be produced. Futher support for our decision comes from Zwart (1983, p.109), who designed a simulation game for druggists. He reports that, if instructed to play the game for some "other" store, respondents often answered questions as if they pertained to their own store.

Another issue is whether the hypothetical trends should be presented as to be expected, future developments or as developments that already have taken place. It appeared that in case of "future" trends retailers tend to question the credibility of the presented forecast. Some interviewed retailers even became suspicious about the purpose of our project, suspecting us to work for some large firm or local planning authority that is developing new plans. No such problems were encountered with a presentation of scenarios in terms of past developments. We therefore decided to use trends defined in the past. Further support for this decision comes from our literature review, from which we concluded that retailers are much more reactive than proactive.

It also appeared in the interviews that retailers tend to think in periods of three to five years. For example, one retailer who had only recently started his store gave himself three years time before he would draw conclusions on whether his store was successful or not. Accordingly, we decided to design our scenarios as descriptions of hypothetical sales trends that could have taken place over the last three years (cf. Gable and Topol, 1987). Inclusion of a longer time period would have increased the number of stores in our sample that had not been in business for the total presented period.

Another important issue in the construction of the scenario stimuli is how precisely to describe and design the hypothetical sales trends in the scenarios. Three possibilities were considered. First, one may describe sales trends in monetary terms, for example, "suppose your current sales level was .. guilders higher than the previous year". However, there are typically large differences among stores in the total size of their monetary sales. Because we wanted to use one single design to construct scenarios fo various types of retailers, such scenario stimuli would be highly infeasible for many of the respondent retailers. A second possible approach is to describe percentage increases and decreases relative to some fixed base year, for example, "suppose your sales result over the last year had been .. percent higher than over the previous year". Essentially, this is the method

that was employed in the Van der Heijden (1986) pilot study. This presentation format avoids infeasibilities that may result from money differences among store types and sizes. However, this approach does not control for the sales trends that retailers observed in reality. Hence, this approach confounds effects of hypothetical sales trends with effects of observed real trends.

We therefore chose a third possible approach. Respondents first had to report the sales trend which they had observed in their store over the past three years. That is, they were asked to describe their sales result over 1988 as compared to the result obtained over 1986 (= 100). Next, they were instructed to imagine this trend had been different, such that over 1988 a percentagewise higher or lower sales level had resulted than observed in reality. Thus, the stimulus described results of hypothetical trend variations in terms of deviations from currently observed real sales levels. This is illustrated in Figure 8.1, which presents a hypothetical trend deviation that resulted in a 25 percent-point higher sales volume than as reported for the own store.

SCENARIO A

Assume that since 1986 **YOUR SALES VOLUMES** had been different from what you reported:
Suppose a trend had **APPEARED IN 1986** (and was stable since) and had resulted in **25 PERCENT MORE** sales over last year (1988) than as observed in reality.
So, your 1988 sales volume compares to your 1986 sales volume as
(fill out) [. . .] + 25 = [. . .] compare to 100.

Figure 8.1. Example of hypothetical sales trend scenario (top-half of scenario stimulus, see Figure 8.2 for bottom-half)

This approach minimizes design problems. First, potential infeasibility of scenarios is minimized and balanced across respondents. No retailer encounters more than 25 percent points relative increase or decrease. We chose levels of plus or minus 25 percent because for some retailers such figures already mean a very high increase or decrease. Although real markets may show larger changes for particular product groups or sites, to not jeopardize the study we refrained from

including larger trend deviations. We included two intermediate trend size levels (5 and 15 percent points increase or decrease) to allow inspection of the linearity of sales trend effects. Secondly, the "relative trend deviation" permits a design such that each respondent receives one positive scenario (a higher sales result than observed in reality) and one negative scenario. A third design advantage is that the approach permits the manipulation of the recency and stability of sales trends, i.e., whether the scenario represents a steady trend, a recent surge, or a surge which occurred in the past and has proven stable over the past three year period, as shown in Figure 8.1. Hence, three experimental factors were involved in the description of hypothetical sales trends.

8.2.2 Inclusion of environmental trend variations

Retailers require additional scenario information before they are able to produce valid responses to hypothetical sales trends. They require information on the retail environment to derive the potential causes of the observed sales trend. It is unclear, however, how such information should be presented to retailer subjects. One could present environmental trend descriptions to subjects, ask them to estimate the resulting change in sales volumes, and next ask questions about the actions they would take. In pretests, however, such a task appeared very difficult to do for retailers. Moreover, in such a task there is no experimental control over hypothetical sales trends. Vice versa, one could present hypothetical sales trends and ask retailers which environmental trend factors are the most likely causes of the sales trend. However, the same problems arise with this approach. Another possible approach is to present hypothetical sales trends and explicitly describe (explain) these as having resulted from particular changes in the environment. Our pilot interviews, however, suggested that retailers judge such a priori explanations as uncredible.

We therefore refrained from presenting any explicit explanation of hypothetical sales trends. Instead, we only suggested potential causes of these sales trends. We concatenated the sales trend profiles with profiles of environmental trends that had co-occurred with the sales trend. In this way, there was complete experimental control over all factors that are assumed relevant when retailers evaluate their store's performance and perspectives, while retailers were still free to decide whether and how to consider information on environmental trends, such as competition, immediate store environment, or trade area.

Analogous to the definition of the hypothetical sales trends, we defined levels of environmental factors as percent point changes relative to earlier reported three-year trends observed for the own store. Prior to the scenario task, retailers reported their beliefs about changes in environmental trends by comparing the current (1988) level to the base year (1986) level (=100). Experimental scenarios contained environmental trend information as shown in Figure 8.2.

ADDITIONAL INFORMATION FOR SCENARIO A:

Suppose that over this same period (1986-1988)
SOME OF THE OTHER TRENDS HAD ALSO BEEN DIFFERENT
such that results over 1988 were

COMPETITION WITHIN **YOUR** SHOPPING AREA: as reported
COMPETITION FROM **OTHER** SHOPPING AREAS: **SMALLER** (-15%)
TOTAL SIZE OF (OTHER) STORES IN AREA: **LARGER** (+15%)
ATMOSPHERE IN YOUR SHOPPING AREA: as reported
ACCESSIBLITY OF YOUR SHOPPING AREA: **LARGER** (+15%)
SPENDING POWER IN YOUR TRADE AREA: as reported
TOTAL SALES IN YOUR **PRODUCT MARKET**: as reported

Figure 8.2. Example of environmental trends scenario (bottom-half of scenario stimulus, see Figure 8.1 for top-half).

The identification of these seven environmental trend factors was based on the considerations above and on the conceptual model and pilot interviews. The definition of levels is based on analogous considerations as in the definition of sales trends. Trend profiles had to be feasible for various types of retailers, and were preferably defined in quantitative terms.

8.2.3 Experimental design of the scenarios

Scenarios involved ten factors that are hypothesized to influence retailers' assessment of how well their store is performing at present, and their assessment of whether and how to take action to exploit or counterbalance these trends. Three factors describe the *sales trend*:

* Whether the hypothetical trend was positive or negative, thus resulting in a higher or lower sales level than as reported for the own store over this three-year period (positive vs negative);
* The size of this relative increase or decrease (5; 15; or 25%);
* The recency and stability of this trend (occurred in 1986 and stable since; steady trend over previous three years; or occurred in the past year only, i.e, in 1988).

Seven further factors describe the hypothetical deviations in *environmental trends* during the same three-year period:

* Competition from within the own immediate shopping area;
* Competition from other shopping areas;
* Size and/or number of other types of stores in immediate shopping area (i.e., size of own area, competitors and own store excluded);
* Atmosphere in immediate shopping area;
* Accessibility of immediate shopping area;
* Spending power in trade area;
* National market for products in own assortment.

These seven environmental trend factors all had three levels: the trend deviation resulted in a 15% lower factor value than as was reported for the own retail environment; no trend deviation; the trend deviation resulted in a 15% higher factor value than as reported for the real environment. Factor values were defined in physical terms. For example, the competition factors were defined in terms of "the percentage increase or decrease in competitive floorspace", and trends in shopping area atmosphere were defined as changes in "the percentage of visitors who are pleased with the atmosphere in the area."

A fraction of the 2×3^9 full factorial design produced 108 different scenarios. This design, which involves a 54 treatment main effects fraction with its foldover, allows one to estimate all main effects and all interactions of factors with the two-level factor, i.e., whether the scenario is framed as a positive or negative relative sales trend. Estimated effects are all mutually independent and also independent from all other (non-estimable) two-way interactions.

8.2.4 Scenario procedure

Because of the complexity of the scenarios, instructions were carefully pretested and scenarios were introduced in a step-by-step manner. The latter means that,

first, prior to the scenario task, retailers were asked to report the changes they had observed for the factors. Next, respondents received the top half of the scenario, which contained sales trend information only (as in Figure 8.1). In the scenario, they indicated which total trend results from the combined own observed and presented hypothetical trend. Following, separate from the sales trend information, they received the bottom part of the scenario, containing information on trends in environmental factors (as in Figure 8.2). For each factor separately, retailers evaluated how fortunate or unfortunate the factor would have been for their store. These evaluations served as manipulations, because they forced respondents to read the complete scenario, and as checks on the interpretation of the scenario factor levels. Finally, respondents were shown the total scenario. They then produced judgements of total store performance, judgments of the necessity and financial ability to invest in the store, and choices on the "most likely" choice task which is described below.

To limit the task load each retailer was exposed to only two scenarios, one positive and one negative. Half of the retailer respondents received the positive scenario first and half of the sample received the negative scenario first. Aside from this constraint, respondents were randomly allocated to scenario conditions. Hence, essentially two 3^9 scenario designs were nested under the two-level sales trend sign factor. To avoid order-of-presentation effects, within each scenario the listing order of environmental factors was randomized.

8.3 Designing a choice task

In the conceptual model, four areas of strategic retail management decisions were distinguished which are relevant in the context of retail planning. These areas involved, respectively, the type of market in which the retailer wants to compete, the number of outlets to operate, the selection of a site, and the choice of the size and further characteristics of the store. These decision areas incorporate the various elements that comprise the retailing-mix and also take into account that the retail marketing mix elements vary in terms of inertia, or ease of adjustment.

In this section, we will first operationally define retailer actions. Next, we will consider ways to collect "expert opinions" on the probability of occurrence of these actions. After reviewing task requirements and alternative ways to elicit probability judgements we will suggest to use multiple choice tasks as a way to

collect subjective probability data. However, multiple choice tasks have not been used for this purpose before and the possibilities and problems that arise with the use of multiple choice experiments to collect and scale opinions on the likelihood of events are largely unexplored.

8.3.1 Definition of retailer actions

How do the four decision areas relate to the various actions that are of interest in planning contexts? Planning interest focuses on actions which may affect the demand for retail space and the supply of retail facilities at various locations. Hence, interest largely focuses on store location, store size and store type, and in addition on actions which may affect the immediate store environment or, say, the atmosphere and appearance of a shopping centre.

We therefore define the following potential retailer actions to represent and operationalize the various decision areas for firms (or store formats) that already are in business:

* Close or sell the store;
* Relocate the present store;
* Open an (additional) branch outlet;
* Change floorspace;
* Refurbish the store (interior and/or exterior);
* Change store image (i.e., reposition on retail mix variables);
* Change store environment;
* No major change.

The definition of these eight actions is based on practical and logical considerations, and on our literature review and pilot interviews.

8.3.2 Issues and task requirements

Various issues arise with the definition of the response measure in our retailer conjoint task. A first issue is who should be respondent. We want to know when and how retail firms react to changing retail circumstances. These reactions depend on decision making processes within the retail firm. Nevertheless, our focus is on the outcomes of decisions and not on the decision process itself. We therefore treat the retail firm as a "black box" and have firm representatives as respondents. Obviously, for single outlet retail firms, the owner/manager is the best available

representative. For firms with multiple outlets we assumed that the store manager has the best knowledge about the decisions which the firm may take regarding this particular store in various hypothetical conditions.

A second issue concerns the definition of the response measure. Typically, conjoint tasks ask respondents to indicate their preference or choice. However, having a preference or making a decision is not identical to implementing this decision, in particular in the setting of business decision making. It not only takes time to prepare the implementation of particular investment decisions, there also may be particular, perhaps unforseen constraints (monetary, time, or organizational), which may delay the implementation; the decision may even be abandoned. Because our current interest is in the implementation of retailer decisions more than in the decision-making process itself, we chose to ask about the (probability of) implementation rather than the preferences and decisions underlying implemented actions. An additional reason for focusing on probabilities of implementations or, say, likelihood opinions about the occurrence of actions is that in our pilot research it appeared that retailers are reluctant to indicate which action they (or their firm) would choose in various hypothetical conditions. Managers in particular were anxious to pronounce decisions that are beyond their final responsibility. However, when the task was framed such that owners or managers were approached as "best available expert for their stores", and were asked for their "expert opinions", then the task appeared much less offensive and compromising. We therefore treated retailer-respondents as experts on the behaviour of their own stores and not as decision-makers.

A third issue is that retailer decision-making concerns decisions which are non-routine and may involve high risks. This may lead to high task involvement, which would increase the reliability and validity of responses. However, the non-routine nature of the decision task may also have negative effects on the reliability and validity because respondents have little experience. In order to counterbalance this validity threat, we took special care to make the task as comprehensible as possible and to develop and include instructions and prelimenary tasks that make respondents familiar with all aspects of the final decision task before they start with the experimental treatments. Pilot interviews were conducted to pretest the comprehensibility and validity requirements of the experimental material. Moreover, the total questionnaire was designed to familiarize subjects with the various attributes and aspects of the decision-task prior to the experimental tasks. Respondents reported their current circumstances in terms of these attributes. We

also included manipulation checks in the experimental scenarios to test whether subjects correctly interpreted the experimental material. It should be noted that this latter precaution is not common practice in applied conjoint research.

The method to elicit the expert judgements should fit the particular requirements posed by the present study context. First, the task should be interesting and with minimal load. This is important because retailers typically are not motivated to participate in survey research. Secondly, to increase the reliability of responses one would like to have multiple measures per respondent and per item. Thirdly, our goal is not only to test hypotheses regarding retailer reactive behaviour, but also to obtain a model that predicts probabilities of occurrence of reactions. Therefore, the (transformed) measures should obey the rules of probability theory.

Another issue is that potential retailer actions are likely to appear in bundles. Hence, they are not mutually exclusive nor mutually independent. To assess potential retailer reactions to new shopping developments one would like know the probabilities of these bundles, not only of single actions. Thus, we should find a way to collect responses such that the marginal probabilities as well as the joint probabilities of actions can be derived.

Furthermore, the measurement approach should minimize the halo effects that potentially occur when multiple actions are evaluated or when respondents have a limited interest in the task.

8.3.3 Conventional elicitation techniques

Reviews of subjective probability elicitation techniques distinguish between direct and indirect techniques (Spetzler and Von Holstein 1975, Wallsten and Budescu 1983, Budescu and Wallsten 1987). Direct methods ask respondents to express their likelihood opinion on a categorical or numerical rating scale, indirect methods ask comparative judgements from which scale values can be calculated that represent subjective probabilities. Direct measurement was for example applied in the exploratory study by Van der Heijden (1986). Direct methods are easy to apply but suffer from various drawbacks. First, people find it difficult to give a direct estimate of probability (Selvidge 1975). Second, people differ highly in how they interpret verbal categories (Hogarth 1980; Budescu and Wallsten 1987) and tend to be over-confident when asked to give direct numerical estimates (Wallsten and Budescu 1983). Third, halo effects and response set effects may occur when likelihood

opinions are measured for several events. Fourth, if one wishes to collect multiple responses for the same event from the same person the task easily becomes (too) long and tedious. If one wishes to measure joint probabilities of events, the task becomes even more burdensome because all combinations of events are to be presented. Finally, direct numerical data is usually analyzed with OLS regression techniques assuming a linear probability model. Because values predicted with these models not always lie within the (0,1) bound of probability values and because the functional form of the linear probability model is not very realistic, this is also problematic (cf. Ben-Akiva and Lerman 1985, Wrigley 1985).

Indirect methods for measuring subjective probability often involve the application of lottery techniques (Hampton, Moore and Thomas 1973) in which subjective probabilities are derived from decisions whether to accept or reject simple bets. Assuming some type of utility function this lottery data can be scaled to fit numerical probability axioms. Although appealing, this method may be regarded too complicated for simple survey research. Other indirect methods involve ranking or paired comparisons tasks. These methods are easier to apply in survey research but potentially result in high task loads. In addition, although scales derived in this way do represent opinions on likelihood, the scales do not necessarily satisfy probability axioms. An additional potential disadvantage of (full-)ranking methods is the inability to test for transitivities. Paired comparisons, however, do allow transitivity tests. The validity of such a task is also satisfying, as suggested by Wise (1970). Wise found that a Thurstone scale derived from paired comparisons corresponds very well with direct numerical probability estimates. Despite this advantage of paired comparison tasks, to this author's knowledge Thurstone-like models have not been further applied to scale likelihood opinion data.

Paired comparisons and Thurstonian models may be regarded as choice modelling techniques as well as scaling methods. Conjoint choice experiments combine several of the attractive features of the direct and indirect elicitation and encoding methods that were discussed above. We therefore focused on developing a multiple choice task to measure probability opinions.

8.3.4 Theory of the "most likely" choice task

The application of conjoint-like choice tasks to the study of subjective probabilities requires two modifications of the choice task. First, choice sets should contain

events of interest, instead of choice alternatives. These events may be presented as experimentally designed profiles. Obviously, in the context of the present study these events are the occurrences of the retailer reactions. Secondly, instead of selecting their most preferred alternative, subjects should be asked to select the event they think is most likely to occur from each set.

Because in this modified task subjects pick the event that they think is most likely, derived scale values will represent subjects' likelihood opinions and not subjects' utilities. Hence, parameter estimates should be interpreted differently from experiments in which subjects are requested to choose their most preferred alternative. Nevertheless, principles of design and analysis of conjoint choice experiments still apply to this modified choice task. Moreover, the assumed response model is still of the MNL form and is identical to the choice model presented in Chapter 2. The only difference is that term V_r now represents subjective probability instead of utility. The derived scale is an interval level scale.

The proposed modification of the choice task is fairly simple. Nevertheless it results in some interesting new opportunities. One is that it offers a solution to the problem that indirect methods typically do not allow one to obtain values that are interpretable as probabilities. Wise (1970) therefore applied a linear transformation of the derived Thurstone scale to be able to compare scale values with direct numerical subjective probability estimates. Our modified choice task, however, allows the following solution to this problem. Regard the probability of choosing event A from set $\{A, \textit{not } A\}$ as an approximation of the subjective probability that A occurs. If an alternative "none of these" ("not any of these") or "other" has been included in the choice experiment and if IIA holds, then the MNL model can be used to calculate this probability. The subjective probability of event A is thus derived as follows:

$$p(A \mid \{A, none\}) = \frac{\exp(V_A)}{\exp(V_A) + \exp(V_{none})} ,$$

all terms as defined previously. So, the most likely choice approach is an indirect method for obtaining subjective probability estimates, requiring minimal measurement asssumptions and task load, that nevertheless produces probability estimates.

A second attractive but not yet fully explored feature of multiple choice experiments is that they allow one to examine the subjective probabilities of the joint occurrence of events with only a small increase in task load. One can instruct subjects to indicate, after having picked the most likely alternative, any other

alternative(s) from the set that they consider likely to occur together with the alternative that was chosen first. The extent into which actions tend to occur together with other actions is an indication of the non-exclusiveness or joint occurrence of these actions.

8.3.5 Design of the "most likely" choice task

A multiple choice task was designed by treating each of above defined seven potential actions as a factor with two levels: "present" or "absent" in the set. The restriction to seven actions allowed us to limit the task to only eight sets of actions, created from a main effects fraction of the 2^7 full factorial design, as displayed in Figure 8.3. Note that, by design, each action appears in four of these sets and that each pair of actions appears in two sets; hence, the sets are completely balanced. The option "not any of these actions" was added as a constant base to each of the eight choice sets. To avoid potential order-of-presentation effects, six random listing orders of sets and actions within sets were used.

A disadvantage of this design is that estimated (main) effects are not independent from potential interaction effects. Such independence, however, can be accomplished across main effects fractional factorial designs by using main effects designs that aggregate into larger, higher resolution designs (e.g. Louviere 1988a; Anderson and Wiley 1992). In the present case, a main effects fraction and its foldover were used for this purpose. This foldover design produced seven different sets (the eighth being an empty set). Respondents received the regular main effects fraction for one scenario and its foldover in the other scenario condition. This procedure guaranteed that across each respondent's choice tasks all effects are independent from potential two-way interactions.

8.3.6 Appearance of actions

The choices defined above are the major dependent variables in our conjoint task. The task does allow one to investigate conditional choice probabilities and the joint occurrence of actions. However, it is not only of interest to know whether an action is performed, but also what the action will look like when it is performed. To explore this issue we developed additional questions for each of the above actions. For each scenario, for actions that had been chosen at least once, we asked the

For each of the following sets of actions, please indicate

* which action is most likely to happen to your store within 3 years
  (mark with 'x')

* which action(s) in the set are likely to happen in combination with the first chosen alternative
  (mark with '2', '3', etc.)

SET 1.
[ ] close / sell
[ ] relocate
[ ] open (additional) branch store
[ ] change size of sales floorspace
[ ] refurbish
[ ] adjust store profile
[ ] invest in shopping area
[ ] no major change

SET 2.
[ ] close / sell
[ ] relocate
[ ] open (additional) branch store
[ ] no major change

SET 3.
[ ] close / sell
[ ] change size of sales floorspace
[ ] refurbish
[ ] no major change

SET 4.
[ ] close / sell
[ ] adjust store profile
[ ] invest in shopping area
[ ] no major change

SET 5.
[ ] relocate
[ ] change size of sales floorspace
[ ] adjust store profile
[ ] no major change

SET 6.
[ ] relocate
[ ] and refurbish
[ ] invest in shopping area
[ ] no major change

SET 7.
[ ] open (additional) branch
[ ] change size of sales floorspace
[ ] invest in shopping area
[ ] no major change

SET 8.
[ ] open (additional) branch
[ ] refurbish
[ ] adjust store profile
[ ] no major change

Figure 8.3. Example of a "most likely" choice task.

expected appearance of the action if implemented. For example, if the retailer expected a floorspace adjustment we asked the most likely size of this adjustment.

8.4 Procedure, sample, and survey design

8.4.1 Heterogeneity problems

Another issue in the design of this conjoint study is the potential heterogeneity in retailers' reactions to changes in sales and environmental trends. Our scenario design does not allow presentation of all scenarios to each subject, as there are too many profiles. Moreover, it is infeasible to obtain reliable estimates of choice model parameters at the individual level. Therefore, our study design does not permit a posteriori clustering of respondents on similarities in preference.

To take at least some potential heterogeneity into account, we designed our study to allow estimation of separate models for various types of location and types of product category. Type of location (shopping centre) and type of product category (for instance, foods and packaged goods versus clothing and shoes) are among the variables that are typically used in planning studies to classify retailers for policy purposes or to create potentially more homogeneous groups.

Secondly, prior to the experimental part of the survey we measured retailers' current expectations. This allows us to explore whether retailer background variables, such as type of firm, actions performed previously, size of outlet ("firmagraphics"), and psychographics of respondents allow the definition of clusters or segments of retailers who have similar expectations about actions. It also allows us to include retailers' current expectations in the experimental model as a set of inertia dummies (cf. Morikawa, Ben-Akiva and McFadden, 1990).

8.4.2 Sample and sample design

Data collection took place between June to November 1989. Retailers were individually interviewed in person by trained university student interviewers. We selected a stratified random sample of 344 retail outlets from a database of all stores in the city of Maastricht. Of 203 retailers who agreed to be interviewed, 183 retailers provided complete responses for all parts of the survey (usable response rate = 53%).

Nine strata in the sampling design were defined according to a 3 x 3 factorial design. Factors were 1) The type of merchandise (foods and packaged goods; clothing, textiles, and shoes; other less frequently purchased goods), and 2) The location of the store with respect to the city centre (located in the most expensive area of the city centre; located in the city centre but in not the most expensive area; located in a suburban neighbourhood--These area types are identified in Appendix A, Figure A.2, as, respectively, neighbourhood numbers 0; 1 to 6; and 7 and higher).

Retailers were randomly sampled until each of the 108 scenario treatments had been observed at least once within each of these sampling factor levels. This was accomplished by extending the scenario design to include the two sampling factors as blocking factors. This strategy produced three to four replications for each scenario treatment and 18 to 20 retailers sampled within each stratum. Response rates within the nine strata ranged from 38% to 65%.

8.4.3 Procedure and survey design

Outlets received an introductory letter in which the board of the local union of retailers recommended the participation in this research. It was stressed that data would be confidential and that results would not be used for local policy. Interviewers next contacted the retailer and asked for a personal interview.

As a warm-up, the interview started with a ranking task that was designed to measure retailers' self-perception of store image. Seventeen store characteristics related to retail mix variables had been printed on cards. Retailers had to rank-order these cards according to the extent into which the characteristic distinguishes the store from fellow retailers in the same product category. We refer to one of our research papers (Oppewal and Timmermans 1994c) for further details of this procedure because the analysis of this data is beyond the scope of this thesis. Retailers next had to indicate whether the image of their store had changed during the previous three-year period. If so, then they had to adjust the order of the cards to reflect the 1986 store image.

We then asked about actions taken in the past and various background variables, such as size of store. Questions were also asked concerning the necessity and ability to invest in the store. Respondents filled out a most likely choice task, i.e., they chose the actions they considered most likely to happen in the years to come from designed sets of actions.

Respondents also reported their beliefs regarding trends in retail conditions that had occurred in their store's environment. They reported the sales trend they had observed since 1986. Then the first experimental scenario was introduced by the interviewer, as described earlier in this chapter. After the responses (manipulation checks, performance and investments judgements, "most likely" choices and expected appearance characteristics) had been recorded, the second scenario was administered in a similar fashion. The interview concluded with an additional set of questions on retailer background characteristics.

8.5 Conclusion

This chapter described the design of our retailer study. We first developed experimental scenarios describing hypothetical sales trends. Scenarios involve either positive or negative sales trends relative to the trends observed for the own store over the past three year period. They are accompanied by selected environmental trends, which can be negative, unchanged or positive. The trends include competition, atmosphere in the store environment, accessibility of the store, own product category national sales, and spending power in the trade area. The present design involves 54 positive and 54 negative sales trend scenarios. Each respondent receives one of each type.

Next, a multiple choice task was developed to measure retailers' expectations that particular actions will be taken for their stores. Respondents have to choose the action that is most likely to happen from designed sets of actions. In the present design, it involves either seven or eight choice sets. The task is designed to allow one to derive subjective probabilities and to explore the joint occurrence of actions. It is framed as a subjective probability task instead of a management decision task to avoid problems regarding issues such as who does and who should take the decisions in the retail organization and the success rate of implementation.

Finally, this chapter described the sample and survey design of a study in which these new methods were applied. It involves a study among retailers in Maastricht. The next chapter presents the results of this application.

CHAPTER 9

ANALYSIS AND RESULTS OF THE RETAILER SURVEY AND CONJOINT EXPERIMENT

9.1 Introduction

Retailer reactive behaviour concerns the ways in which retailers react to changes in retailing conditions. Our focus is in particular on reactions to changes that have repercussions on the sales volumes that retailers observe in their stores. The present chapter describes the results of the empirical study in which we explored the nature of retailer reactive behaviour and implemented the ideas presented in Chapters 7 and 8. The empirical study reported in this chapter concerns a sample of various types of retailers from our study area, the city of Maastricht. Retailers answered various survey questions and participated in the conjoint experiment that was developed in the previous chapter. In this chapter the data from this study are analyzed.

The following questions concerning retailer reactive behaviour guide the analysis of the survey data from our application:

* For each of the actions defined earlier, how many retailers performed this action in the past years?
* Which environmental and sales trends did the retailers observe?
* How do they evaluate their current store performance ?
* What is their perception of the current necessity and ability to invest in their stores?
* What are their expectations about actions to occur in the near future?
* How do retailers of different types of merchandise and location differ on the above aspects?

The analysis of the experimental data in our study focuses on the following questions:

* What are the effects of sales and environmental trends on retailers' evaluations of store performance?
* What are the effects of sales and environmental trends on retailers' perceived necessity and ability to invest in their store?
* What are the effects of sales and environmental trends on retailers' expectations about actions that may happen to their store?

Finally, we try to answer the following questions regarding joint occurrence and appearance of actions:

* Which of the actions that we defined tend to occur together?
* What do actions look like, if chosen and implemented?

This chapter is structured as follows. Sections 9.2 and 9.3 present sample descriptives and analyses of relationships between trend perceptions, retailer background characteristics, actions performed in the past, and actions expected to happen in the near future. In section 9.4 we analyze the experimental data. Section 9.5 presents results on the joint occurrence and the appearance of actions, if implemented. Section 9.6 is a brief conclusion section as the results of this study will be summarized and discussed in Chapter 10.

9.2 Sample descriptives

This section describes various background characteristics of the retailers in our sample, such as type of location and product category, store size and type of firm, respondents' age and position in the firm, perceived image position, and actions taken in the past.

9.2.1 Type of location and product category

The sample was stratified according to a 3 x 3 design, using as factors Location relative to city centre and Type of merchandise. Consequently, one third of our sample were retailers located in the most expensive areas of the city centre, one third were located in the less expensive areas in the city centre (centre fringe area), and one third resided in suburban neighbourhoods, as shown in Table 9.1. Note that we distinguish among two types of neighbourhood centres: larger or community

Table 9.1. Frequencies of retailer location types and subtypes in sample and total study area (totals Maastricht by december 1989).

	Frequency	Percent	Cum. Percent	Totals Maastricht	Sampled proportion
A: City centre	63	34.4	34.4	392	.16
B: City fringe	59	32.2	66.6	232	.25
C1: Community centres	27	14.8	81.4	106	.25
C2: Neighbourhood centres	34	18.6	100.0	355	.10
C: Neighbourhoods	61	33.4	100.0	362	.17
Total	183	100.0		1085	(.17)

centres and smaller or neighbourhood centres. This distinction was not part of the sampling frame. It should also be mentioned that a few neighbourhood centres were excluded from the sampling frame because retailer organizations in these centres refused participation.

Similarly, by design one third of our sample are food and packaged goods retailers, one third are clothing, textiles and shoes retailers, and one third trade other less frequently purchased goods (mostly durables). Table 9.2 describes in more detail how our sample is distributed across types of merchandise.

Table 9.2. Frequencies of retailer merchandise types and subtypes in sample and total study area (totals Maastricht by december 1989).

	Frequency	Percent	Cum. Percent	Totals Maastricht	Sampled proportion
D1: Food specialties	39	21.3	21.3	254	.15
D2: Grocers	14	7.7	29.0	70	.20
D3: Drug stores	9	4.9	33.9	38	.24
D: Foods & packaged goods	62	33.9	33.9	362	.17
E1: Clothing	38	20.8	54.6	187	.20
E2: Textiles	8	4.4	59.0	29	.28
E3: Shoes	15	8.2	67.2	55	.27
E: Clothing, textiles, shoes	61	32.4	67.2	271	.23
F1: Furniture	6	3.3	70.5	52	.12
F2: Flowers and plants	10	5.5	76.0	47	.21
F3: Other/varieties	44	24.0	100.0	353	.12
F: Other	61	32.8	100.0	452	.13
Total	183	100.0		1085	(.17)

9.2.2 Size of store, type of organization and age of respondent

A majority of the retailers in our sample are small independent retailers. It appears that 68.7% are independent and 19.8% are branch stores; the remaining 11.5% participate in a cooperation. The sales floorspace of 74.4% of the retailers is less

than 100 m^2; 47.2 % are even smaller than 50 m^2 in size. Only 4.9 % are larger than 500 m^2.

These differences in size are also revealed in the numbers of employees. It appears that 32.6 % have one or less full-time employee. Most (38.7%) have two employees, 25.4% have between three and eight, and only 3.3 % have nine or more full time employees. A minority of the retailers (36.3%) own their store, the others rent or lease their accommodations.

Only 3.8% of the respondents were not the owner or manager of the outlet. The age distribution shows that 17.0% were less than 30 years old, 61.0% were between thirty and fifty, and 40 retailers (22.0%) were over 50 years old. We asked this latter group whether they have a successor for their store; 21 had not (yet) arranged succession.

9.2.3 Present need and possibility for size adjustments

We asked the retailers to indicate on a five-category scale to which extent their present location allows extensions. It appears that 69.8% have little to no possibilities, 9.5% says they have moderate possibilities, and 20.7% have ample or abundant space for extensions at the present location. Retailers also indicated whether their present size is satisfactory: 42.5 % evaluate their present size of sales floorspace as too small or much too small, 54.1% consider the present size as good, and 3.4% consider their sales area as too large or much too large. From a cross-table of extension possibilities by satisfaction with present size (Table 9.3) we conclude that 59 (=33.1%) of our retailers consider their present size as too small but have physically no sufficient possibilities to extend at the present location; 18 (10.1%) do consider their size too small and are on locations that allow extensions.

Table 9.3. Crosstable of possibilities to extend on present location by satisfaction with present sales floorspace.

Present size:		Too small	Good	Too large	Row count	Row percentage	n = 178 (excl. 5 missing observations)
Possibilities to extend:	None	43	54	1	98	55.1	
	Few	16	10	1	27	15.2	
	Moderate	6	10	1	17	9.6	
	Ample	12	21	3	36	20.2	
	Column count	77	95	6	178		
	Col. percent	43.3	53.4	3.4		100.0	

9.2.4 Actions performed in the past

For each of the actions defined in the experimental parts of our survey, we asked the retailers, where possible, whether they had performed this action in the past. We asked them in which year their store had opened on the present location. It appears that 45.9% opened later than 1980 at the present site and under the present name (see Table 9.4). Of these, seven retailers had relocated to their present site and 62 had started a new store. 23.3% opened in 1986 or later; of these, three had relocated and twenty had started a new store. Regarding store closures, only one retailer mentioned that the firm had closed a store within this municipality. However note that stores that have closed are deleted from the municipal store data base; hence, stores that have closed were not part of our sampling frame.

When asked how recently they refurbished their stores, 35.0% say to have refurbished at least once since 1981 (including 10.4% who refurbished since 1986). Changes in floorspace had occurred since 1980 at 16.0% of the stores in our sample (8.3% since 1986). Twenty-one retailers increased their floorspace (average size increase 403 m^2, s.d. 1515 m^2) and seven retailers decreased their sales area since 1981 (average size decrease 292 m^2, s.d. 391 m^2). A change over the years since 1981 in the atmosphere of the immediate store environment is reported by 35.5% (15.9% since 1986); of the retailers 31.6% (15.1% since 1986) report a change in area size; 11.1% (4.3% since 1986) report changes in area services, and 19.4% report changes in area accessibility (7.4% since 1986). When we combine these reported changes, it appears that 42.1% report not any change since 1981, 74.3% report not any change since 1986. To support and promote any of these changes, 6.5% of the retailers invested considerably, 17.2% invested moderately, and 76.3% invested little to none in their store environment since 1981. Finally, we measured the changes in self-perceived competitive advantage (store image) by asking the retailers to also rank the set of store characteristics for the 1986 condition. Changes in store image were reported by 52 retailers (27.9%).

To test whether retailers of different type of merchandise and location differ in when actions occurred to their stores, we performed a series of Chi^2 analyses. For each action it was tested whether the occurrence since 1981 is independent from our two sampling frame factors. Only two actions were significantly dependent. Whether the store was opened before 1981 depends on merchandise type: 33.9% of the food and packaged goods stores has relocated or changed their

store name since 1981; this percentage is 55.7 for clothing and shoe stores and 48.3 for other store types ($Chi^2 = 6.13, df = 2, p < .05$). Observation of changes in area size or atmosphere since 1981 depends on location type: At city centre locations, 28.3% of the retailers perceived changes in area atmosphere since 1981 and 40% perceived changes in area size. For retailers at the city fringe locations these percentages are 47.4 and 39.3, respectively, and for retailers in neighbourhoods they are 23.7 for area atmosphere and 15.5 for size (Chi^2 values are 8.21 and 10.41, both with 2 degrees of freedom, $p < .05$).

Table 9.4. Most recent performance of actions (percentages of retailer sample).

n = 183	None or before 1981	1981 or more recent[a]		
		1981 thru 1985	1986 or more recent	missing
Opened at present site with present name	54.1	21.3	23.0	1.6
Firm closed other store in this municipality	99.5	0	0.5	0
Refurbished	65.0	23.0	10.4	1.1
Floorspace increase	84.0	4.4	5.5	1.6
floorspace decrease		1.6	2.8	
One or more changes in store environment:	42.1	32.2[b]	25.7	0
Change in area atmosphere	64.5	9.8	15.9	10.4
Change in area size	65.0	5.5	15.1	16.9
Change in area services	83.1	2.2	4.3	10.9
Change in area accessibility	77.1	5.5	7.4	10.9
Change in store image		69.9[c]	27.9	2.2

[a] Retailers were first asked whether the action had occurred since 1981. If yes, they were asked whether the action had occurred since 1986. The latter question had various missing values.

[b] Questions were asked separately for various types of change in store environment. This category therefore includes all retailers who observed at least one area change since 1981 but not any area change since 1986.

[c] Only changes in store image since 1986 were collected.

9.3 Current condition trend perceptions, evaluations and choice responses

Prior to the experimental task, we asked retailers to report the trends they perceived in their real environments for each of the experimental factors, and we asked them various questions similar to the questions posed in the experimental task. The following subsections report results for these questions regarding current condition perceptions, evaluations and expectations.

9.3.1 Reported trends

We used magnitude estimation techniques to measure retailers' perceptions of trends in their retail environment and own sales. Retailers indicated for each environmental factor whether the factor had increased, been stable, or had decreased since 1986. Next, they estimated how the current level compared to the 1986 level, where the 1986 level of each factor was defined as 100. This was allowed because the factors were defined as physical quantitaties. For example, area atmosphere was defined as the proportion of visitors that are satisfied with the area's atmosphere and competition was defined as the total size of competing floorspace. Magnitude estimation was also used to measure the own perceived sales trend. Average observed trends are displayed in Table 9.5.

To explore whether there are differences in trends perceived by retailers of different locations and store types, we performed ANOVA's on these trends. Significant differences ($\alpha < .05$) appeared only for the effect of store type on reported competition from other areas (clothing and shoe stores perceived an increase of 11.5%, the other two store type categories perceived increases of 3.6 and 3.8% only) and for the effect of location type on the perceived atmosphere

Table 9.5. Reported magnitudes of environmental and sales trends.

Var	Mean	S.d.	Min.	Max.	Variable Label	n = 183
R_Cmpw	104.29	26.24	50	400	COMPETITION FROM WITHIN OWN AREA	
R_Cmpo	106.18	16.45	40	200	COMPETITION FROM OTHER AREAS	
R_Size	104.51	13.15	50	200	SIZE OF AREA	
R_Atms	108.97	15.16	70	200	ATMOSPHERE IN OWN AREA	
R_Accs	102.12	11.90	70	175	ACCESSIBILITY OF OWN AREA	
R_Spdp	106.48	14.07	50	170	SPENDING POWER IN TRADE AREA	
R_Prdm	108.79	16.82	50	200	NATIONAL PRODUCT CATEGORY SALES TREND	
R_Sales	111.88	19.10	20	210	SALES TREND 86-88	

Table 9.6. Multiple regression of reported sales trend on perceived environmental trends.

Multiple R	.619	R Square	.384
Standard Error	15.311	Adjusted R Square	.359

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	7	25531.58854	3647.36979
Residual	175	41023.32949	234.41903

F = 15.55919 Signif F = .0000

Variable	B	SE B	Beta	T	Sig T	Variable label
(Constant)	33.889	17.815		1.902	.0588	
R_Cmpw	-.012	.044	-.017	-.286	.7754	COMPETITION FROM WITHIN OWN AREA
R_Cmpo	-.177	.073	-.153	-2.431	.0161	COMPETITION FROM OTHER AREAS
R_Size	-.084	.090	-.058	-.938	.3495	SIZE OF AREA
R_Atms	.342	.084	.270	4.049	.0001	ATMOSPHERE IN OWN AREA
R_Accs	-.094	.103	-.058	-.908	.3651	ACCESSIBILITY OF OWN AREA
R_Spdp	.252	.091	.185	2.740	.0068	SPENDING POWER IN TRADE AREA
R_Prdm	.483	.071	.425	6.797	.0000	NATIONAL PRODUCT CAT. SALES TREND

trend (neighbourhood centre retailers perceived only 4.5% increase, retailers in both city locations reported increases of 10.5 and 11.9%). It appears that retailers perceived increasing trends on all environmental factors. The largest increase is on "atmosphere in own area" and "national sales in own product category".

To explore the extent into which the reported sales trends depend on these environmental trends we also performed a multiple regression of reported sales trends on perceived environmental trends. Regression results are displayed in Table 9.6. The model fits fairly well (R^2 = .39). Inclusion of the store type and location factors from our sampling design did not significantly improve the fit of the model. The most important predictors are: product category trends, shopping environment atmosphere trends, spending power trends, and competition from other areas. Clearly, although these results indicate how environmental trends covary with sales, they do not imply that sales trends are perceived by the retailers as causally dependent on these trends.

We suggest caution in drawing conclusions about the importance of trends because the trend perceptions are correlated. To obtain insight into the major dimensions underlying retailers' trend perceptions we performed a principal components analysis. Three factors with eigenvalues larger than one were selected. These three factors explain 59.1% of the variance (see Table 9.7). We interpret the first factor as "Atmosphere, accessibility and trade area trends", the second as "Changes in sizes of areas", and we label the third factor as "Product category trends". These analyses demonstrate the limitations of "revealed" data.

Table 9.7. Varimax rotated factor matrix for principal components analysis of environmental trend perceptions.

Var	Communality	FACTOR 1	FACTOR 2	FACTOR 3	Variable Label
R_Cmpw	.27	-.29	.41	-.13	COMPETITION FROM WITHIN OWN AREA
R_Cmpo	.61	.08	.77	-.13	COMPETITION FROM OTHER AREAS
R_Size	.62	.08	.68	.38	SIZE OF AREA
R_Atms	.61	.78	-.04	.05	ATMOSPHERE IN OWN AREA
R_Accs	.64	.73	.20	-.25	ACCESSIBILITY OF OWN AREA
R_Spdp	.63	.62	-.22	.45	SPENDING POWER IN TRADE AREA
R_Prdm	.76	-.04	.01	.87	NATIONAL PRODUCT CATEGORY SALES TREND

9.3.2 Store performance evaluations

We asked the retailers how good their store performed over the past three year period. These evaluations were expressed on a 100 category rating scale, anchored by 0 ("extremely bad") and 100 ("extremely good"). The average performance evaluation as 69.1 (s.d.= 16.8). Our conceptual model assumes that this evaluation depends on sales trends and interactions of sales and environmental trends. To test this hypothesis we performed a multiple regression analysis of performance evaluations on the reported sales trend and interactions of sales trend by trend dimensions (from the principal component analysis reported previously).

Results of this analysis are displayed in Table 9.8. Inclusion of the location and store type sampling design factors did not significantly improve the model. The

Table 9.8. Multiple regression of performance evaluations on reported sales trend and environmental trend dimensions.

Multiple R	.46958	R Square	.22050
Standard Error	15.18339	Adjusted R Square	.18859

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	7	11151.47390	1593.06770
Residual	171	39421.52051	230.53521

F = 6.91030 Signif F = .0000

Variable	B	SE B	Beta	T	Sig T	Variable label
(Constant)	67.082	1.464		45.800	.0000	
TRENDIM1	2.011	1.488	.120	1.351	.1784	PC-fac1:ATMOSPHERE,ACCESS,TR.AREA
TRENDIM2	-1.456	1.351	-.087	-1.078	.2827	PC-factor 2:SIZES OF AREAS
TRENDIM3	.026	1.483	.001	.018	.9857	PC-factor 3:PRODUCT CATEGORY
R_Sal	.272	.073	.311	3.730	.0003	REPORTED SALES TREND
R_SalxTR1	-.122	.037	-.320	-3.264	.0013	SALES TREND BY FACTOR1
R_SalxTR2	-.002	.054	-.003	-.038	.9696	SALES TREND BY FACTOR2
R_SalxTR3	-.084	.037	-.207	-2.262	.0250	SALES TREND BY FACTOR3

results confirm that evaluations depend on sales. As expected, all interactions of sales by environmental trend dimensions are also significant and none of the environmental main effects are significant. However, one cannot conclude that there is a causal relationship between sales trends and performance evaluations, as this data is cross-sectional. Note that our conjoint experiment was designed to allow such tests.

9.3.3 Necessity and ability to invest

To gain insight into the capacity and propensity of our respondent firms to invest in their stores they were asked the following questions.

* How desirable is it at this moment to invest in store improvements.
* How easy is it to finance potential investments from own internal sources.
* How easy is it to finance potential investments from outside sources.

These judgments were expressed on five category rating scales, anchored by 1 ("not at all desirable" and "not at all easy", respectively), to 5 ("very desirable" and "very easy"). We assume that the two easiness-to-finance measures can be averaged to represent a general ability to finance investments, either from internal or external sources, and we will use this average score in the analysis.

Analysis will focus on the explanation of the necessity and ability to invest in the store from reported trends.

Necessity to Invest In One's Own Store. It appears that the regression model estimated from the desirability to invest ratings is not significant and fits poorly (R^2 = .043; $F_{(7,171)}=1.1$, $p<.36$). This is also true when the store and location type factors are included. The lack of fit may be due to the limited range of response variation produced by using only a five category rating scale. It should be noted that not even the sign of the hypothetical sales change was significant. This suggests that retailers may not immediately take advantage of or react to sales level changes by increasing or decreasing investments.

Ability to Finance Investments. The overall regression equation for this investment condition is marginally statistically significant, indicating some explanatory power. The goodness-of-fit of the regression model for this response was poor (R^2 = .09), even when considering the disaggregate nature of the response data and the use of 5-category rating scales. Table 9.9 shows a negative significant

interaction between sales trend and product category trends (trend dimension 3). The perceived ease of financing is higher with either a positive sales trend or a positive development in national product category sales, but not with both. Inclusion of location and store type factors did not improve the model.

Table 9.9. Multiple regression of Ability to finance judgments on reported trends.

Multiple R	.30551	R Square	.09333
Standard Error	1.04143	Adjusted R Square	.04800

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	7	15.63087	2.23298
Residual	140	151.84210	1.08459

F = 2.05883 Signif F = .0519

Variable	B	SE B	Beta	T	Sig T	Variable label
(Constant)	3.481	.117		29.601	.0000	
TRENDIM1	-.072	.121	-.070	-.599	.5503	PC-factor 1:ATMOSPHERE,ACCESS,TR.AREA
TRENDIM2	-.004	.120	-.004	-.039	.9687	PC-factor 2:SIZES OF AREAS
TRENDIM3	.167	.127	.151	1.308	.1929	PC-factor 3:PRODUCT CATEGORY
R_Sales	.008	.006	.132	1.236	.2187	REPORTED SALES TREND
R_SalxTR1	.001	.003	.065	.498	.6193	SALES TREND BY FACTOR1
R_SalxTR2	.007	.005	.162	1.356	.1774	SALES TREND BY FACTOR2
R_SalxTR3	-.005	.002	-.216	-2.063	.0410	SALES TREND BY FACTOR3

Propensity to invest. Finally, we combined the necessity and ability scores to obtain insight in the proportion of retailers that can be assumed to have some propensity to invest in their store. For both variables, we collapsed the three lower categories into one category and we collapsed the two higher categories into one new category. In this way we obtained a crosstable as displayed in Table 9.10. It appears that 35 retailers (.19%) can be expected to have a high propensity to invest in their stores. Regression and logit analyses of propensity on reported trends and store and location type factors did not show substantially different results as reported previously.

Table 9.10. Crosstable of necessity to invest by ability to finance investments (frequencies).

Ability to finance:		Low	High	Total	Perc
Necessity to invest:	Low	30	56	86	58.9%
	High	25	35	60	41.1%
	Total	55	91	146	
	Perc	37.7%	62.3%		100.0%

n = 146
(excl. 37 missing observations)

Table 9.11. Logit estimation results for "most likely" choice task in current conditions, across all 183 retailer respondents.

Number of choice sets	=	1363	
Number of cases	=	6452	
LL(0)	=	-2093.9166	
LL(B1=actions only)	=	-1723.2146	
LL(B2=actions+contrasts)	=	-1682.4547	
RhoSq(0)	=	.196503	
RhoSq(0,Akaike)	=	.183131	
-2[LL(0)-LL(B2]	=	822.92377	Chi-Sq, d.f. = 28
-2[LL(B1)-LL(B2)]	=	81.5198	Chi-Sq, d.f. = 21

Variable	Parameter Estimate	SE of Parameter	Asymptotic t-Stat	Subjective Prob Estimate[a]
CLS: CLOSE	-2.4146	.2138	-11.294	0.082
RLC: RELOCATE	-1.8350	.1518	-12.086	0.138
BRA: OPEN BRANCH	-1.8719	.1500	-12.486	0.133
FLR: FLOORSPACE	-1.0895	.1071	-10.177	0.252
RFB: REFURBISH	-.2057	.0826	-2.491	0.449
IMG: STORE IMAGE	-.8473	.0977	-8.675	0.230
ENV: ENVIRONMENT	-2.0158	.1533	-13.153	0.118
NOC: NO CHANGE	(.0000)			0.321
CLSx LOC1	0			
LOC2	-.3936	.1343	-2.929	
WTY1	-.5096	.2485	-2.050	
WTY2	-.1561	.1370	-1.139	
RLCx LOC1	0			
LOC2	-.4042	.2088	-1.936	
WTY1	.1251	.1705	.734	
WTY2	.2005	.0829	2.418	
BRAx LOC1	0			
LOC2	-.3328	.0950	-3.501	
WTY1	-.1961	.1841	-1.065	
WTY2	-.1028	.0995	-1.033	
FLRx LOC1	0			
LOC2	-.2926	.1406	-2.081	
WTY1	.1714	.1182	1.449	
WTY2	.0033	.0632	.053	
RFBx LOC1	-.2301	.1710	-1.345	
LOC2	0			
WTY1	.1311	.1766	.743	
WTY2	0			
IMGx LOC1	-.3397	.2101	-1.617	
LOC2	.2339	.1223	1.912	
WTY1	.0894	.1268	.705	
WTY2	0			
ENVx LOC1	-.0957	.1318	-.726	
LOC2	-.1742	.0704	-2.472	
WTY1	-.2468	.1284	-1.922	
WTY2	-.0324	.0728	-.446	

[a] The subjective probability of an action is derived as the probability of choosing this action over choosing "no major change". The subjective probability of "no change" is the probability of choosing "no major change" from the set that includes all actions. See Chapter 8 for details.

9.3.4 Actions expected to occur

The choice task that we developed to measure likelihood opinions consisted of seven to eight choice sets. From each set, respondents had to pick the alternative (action) which they considered most likely to occur in the own store within three years time. To derive subjective probabilities of actions we first estimated a Multinomial Logit model. For this model the totally disaggregated choice data were used. In addition a model was estimated which included for each action the contrasts between the levels of our sampling design factors (location and store type). Some of the contrast parameters were constrained to zero as indicated in Table 9.11 because otherwise the estimation procedure would not converge. The inclusion of the contrasts resulted in a significant increase in explanatory power of the model.

The model shows that, across all sampled stores, probabilities are smallest for closing or selling the store (.08) and investing in the immediate store environment (.12). Probabilities for branch store openings and relocations are slightly higher: .13 and .14, respectively. Floorspace adjustment has a probability of .25, adjust store image of .23, and the most likely actions are "no major change" (.32) and refurbish (.45). The contrast parameters indicate whether there are probability differences between location and store types for particular actions. There appear to be significant differences between city centre and neighbourhood locations: neighbourhood stores are more likely to close, open branch stores, change floorspace and invest in store environment. Secondly, clothing, textiles and shoes stores are less likely to close than stores selling other types of non-frequently bought products. Thirdly, food and packaged good retailers are more likely to relocate than other store types.

9.3.5 Associations between retailer characteristics and expected actions

To explore and summarize the ways in which various retailer characteristics are associated with choice patterns of actions, a Multiple Correspondence Analysis (MCA) was performed on a crosstable of retailer characteristics (91 rows) by actions (8 columns). The analyzed retailer characteristics were the variables that we described in the previous and current section. Some numerical variables were redefined as categorical variables.

Based on the percentages of inertia explained by the various extracted

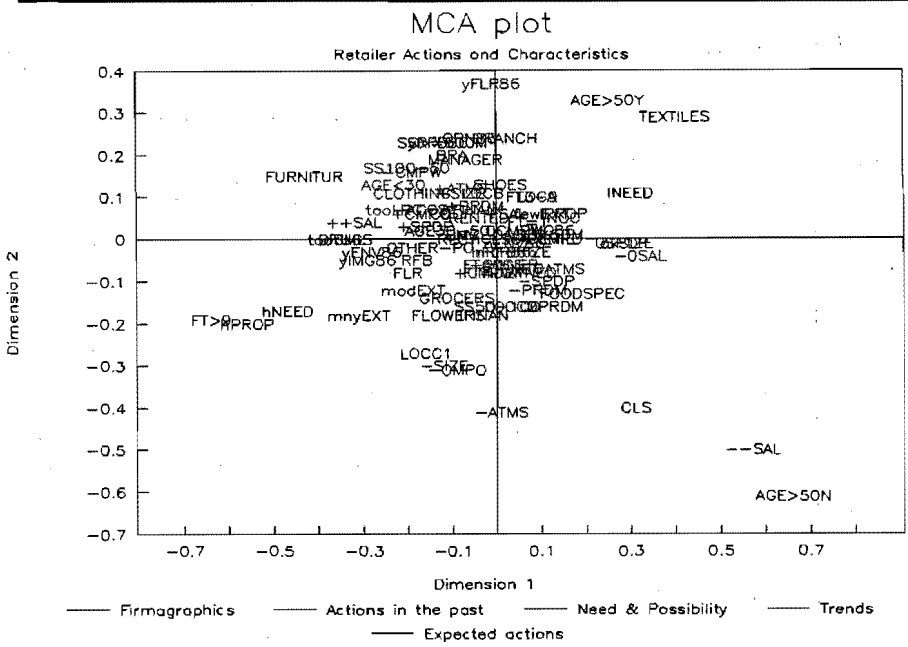

Figure 9.1. Multiple Correspondence Analysis plot of Expected Actions and Various Retailer Characteristics (see Figures 9.1a to 9.1e for plots per variable subset; see Appendix E for legend of category labels).

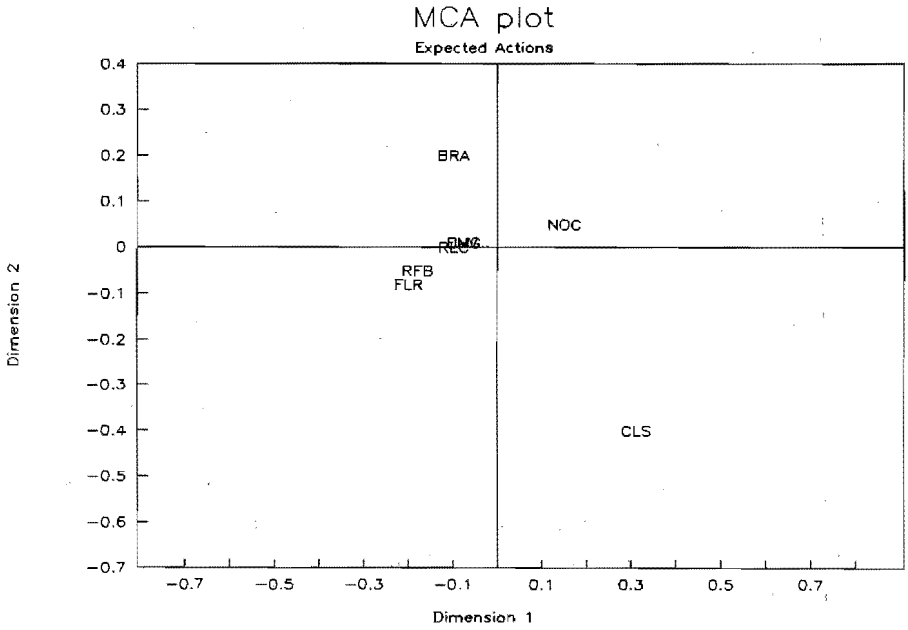

Figure 9.1a. Positions of Expected Actions in MCA space of Figure 1.

dimensions (intertia is the MCA equivalent of variance), two dimensions were selected. The first dimension explains 44.1% of the total inertia, the second dimension explains 19.2%; together these two dimensions explain 63.3%. A third dimension explained another 10.0% but is not interpreted.

The major advantage of MCA is that it allows one to graphically and simultaneously inspect the joint bivariate relations between row and column variables (e.g. Greenacre 1984). Figure 9.1 displays the positions of the various retailer variable categories and the positions of the eight possible actions. The more close together row points (retailer characteristics), the more similar they are in their profile of action frequencies. Similarly, the closer together two column points, the more these points (actions) are similar in the type of retailers that chose these actions. Finally, row and column points that are close together indicate that these categories are associated. To allow closer inspection of the dense pattern of points in Figure 9.1, Figures 9.1a to 9.1e present subsets of points from this figure.

Our interpretation of these figures is as follows. Figure 9.1a shows that dimension 1 separates actions "close or sell store" and "do nothing" from all other actions. Dimension 2 separates store closures from branch store openings, with the other actions taking a position in between. So, retailers who expect to close their store share certain characteristics, whereas retailers who expect no actions share other characteristics and retailers who expect branch store openings have still other characteristics in common. The figure also shows that retailers who expect floorspace adjustments are similar to retailers who expect refurbishments. No pattern of typical characteristics emerges for retailers who expect to relocate, invest in the store environment, or change the store image.

Figure 9.1b shows that store closures are particularly associated with decreasing sales and decreasing own area size, atmosphere, competition from other areas, and national sales levels for the own product category. So, these seem to be the stores with a deteriorating performance in a deteriorating environment. Expected branch store openings are most typical for retailers who perceived a decreasing within-centre competition, an increase in centre size, and an improvement in centre atmosphere. Finally, "no change" and "close store" are relatively most often chosen by retailers who report constant sales levels or small sales decreases.

Figure 9.1c shows that "no change" is typical for retailers who consider their size to be okay, have few extension possibilities, and/or feel no need to invest in their store. In contrast, many extension possibilities, a high need to invest, and

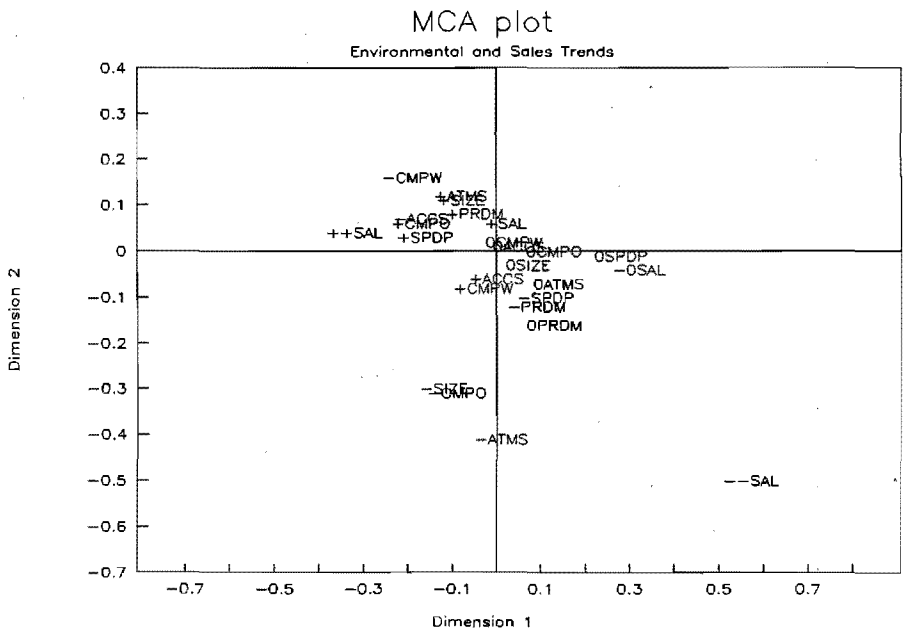

Figure 9.1b. Positions of Environmental and Sales Trends in MCA space of Figure 1.

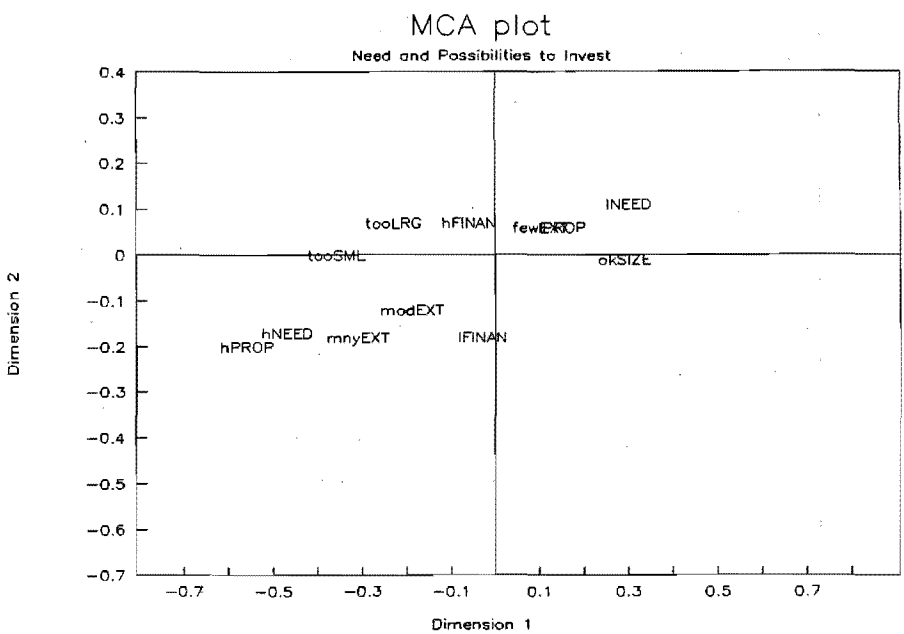

Figure 9.1c. Positions of Reported Necessity and Possibility to Invest Categories in MCA space of Figure 1.

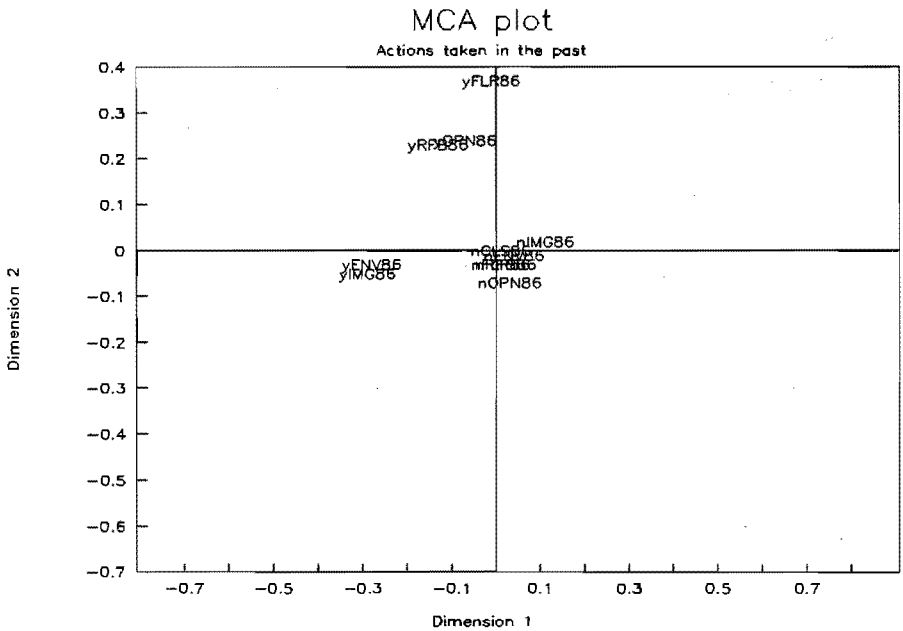

Figure 9.1d. Positions of Actions Taken in the Past in MCA space of Figure 1.

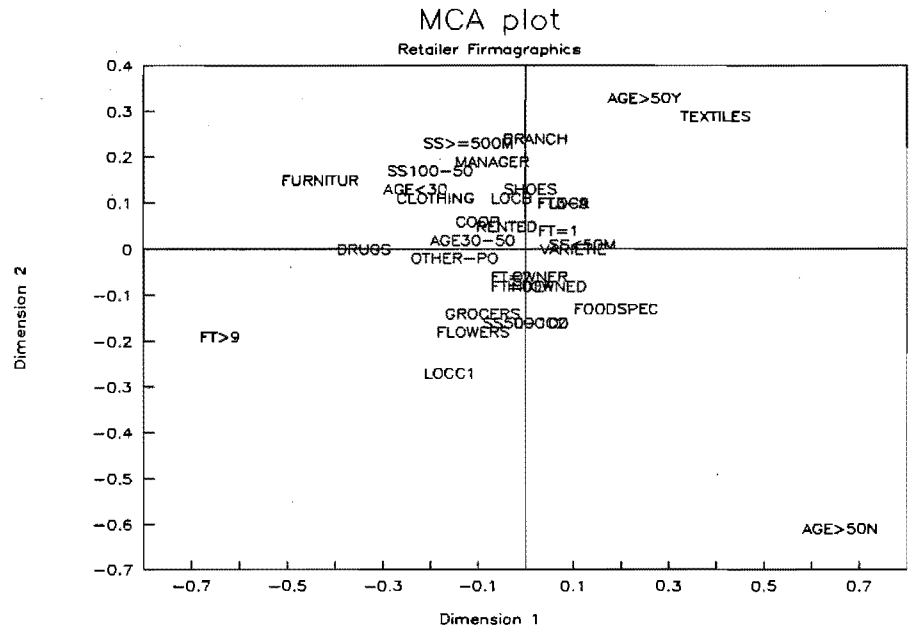

Figure 9.1e. Positions of Retailer Firmagraphics in MCA space of Figure 1.

dissatisfaction with the current size of the store is typical for retailers who expect to refurbish or adjust their floorspace.

Figure 9.1d shows that retailers who expect branch store openings typically also have more recently changed or opened their store, whereas retailers whose store image recently changed or who invested in their store's environment are more inclined to refurbish or adjust their floorspace.

Finally, Figure 9.1e indicates that retailers who consider to close or sell their store are relatively more often older than 50 years without having a successor, are located in the neighbourhood centres, and typically are food stores. Expected branch store openings are particularly associated with the larger and medium sized stores (>100 m^2 sales space), with stores selling clothing, shoes, textiles, or furniture, and with stores in which the retailer is over 50 years old but does have a successor or where the retailer is under 30 years old. Refurbishments and floorspace adjustments are most typical for retailers with more than 9 fulltime employees, retailers located in the larger neighbourhood centres (community centres), grocers, and florists.

In conclusion, this analysis suggested which types of retailers tend to expect which type of action. It should be stressed, however, that the assocations are based on survey data that may include many confounded variables. Further investigations are required to assess whether there are spurious relations. Also, no conclusions can be drawn on the causal direction of the relations. The next section reports the results of conjoint experiment, which was designed to allow a better investigation of some of the suggested relationships.

9.4 Scenario conditions

Retailers made various evaluations in response to the overall scenarios, that is, taking all the information provided by the scenario into account. Many of these evaluations are similar to the pre-experimental task. They are all analysed with either O.L.S. or logit regression. Predictors in these models are the recoded scenario factors.

Recall that the scenario design allows the independent estimation of sales trend direction effects (positive or negative direction) and interactions of these effects with each of the remaining scenario factors. Because we expected effects of scenario factors to vary with the positive or negative framing of the scenario, all remaining scenario factors were nested within the respective positive and negative sales trend. This means that we recoded all main effects and above defined interactions into main-effects-within-sales-trend-direction components. Because the sales trend size, sales trend suddenness and the various environmental trend factors are all three level factors, we created multiple components for each factor. Orthogonal coding was used to decompose factors into independent linear and quadratic components or contrasts. Consequently, we estimate four parameters to test the effect of one factor on a particular response variable: a linear and a quadratic component within positive scenarios, and a linear and quadratic component within negative scenarios. As there were nine factors and two blocking factors, we created 11 × 4, or 44 columns to represent scenario effects within a particular frame on a particular action. A 45th additional column represented sales trend direction, which had only two levels.

The following subsections discuss the results of these analyses. Table 9.12 summarizes the scenario factors and explains the factor labels used in the presentation of these results. First, however, we present results on measures that served as manipulation checks.

9.4.1 Manipulation checks

When presented with the scenarios, retailers first rated how favourable each of the environmental changes would be for their stores on seven-category rating scales. Analysis of these manipulation checks reveals that, for each environmental factor, the favorableness judgments are significantly related to the changes in that factor. Thus, most retailers attended to the changes and understood their consequences.

Table 9.12. Labels, descriptions and levels of factors manipulated in the scenarios.

	Factors describing sales trend:
Trend	Higher vs Lower Sales Trend Scenario
Tsiz	5, 15 or 25% Higher (resp. Lower) Sales Trend Size
Tsud	Sudden 86, Steady, or Sudden 88 Sales Trend
	Factors describing changes in environment; each with the following levels: 15% Lower, No Change, or 15% Higher
Cmpw	Competition From Within Immediate Shopping Area
Cmpo	Competition From Other Shopping Areas
Size	Area Size (Competitors Excluded)
Atms	Atmosphere In Immediate Shopping Area
Accs	Accessibility Of Immediate Shopping Area
Spdp	Spending Power In Trade Area
Prdm	National Product Market
	Factors used in sampling design (4 contrasts):
Loc-1	City-core vs City-fringe
Loc-2	City (pooled) vs Neighborhouds
Typ-1	Clothing & Shoes vs Other Less Frequently Purchased Goods
Typ-2	Foods vs Clothing&S and Other Less Frequently Purchased Goods (pooled)

As a further check, after they had concluded the experimental tasks we asked retailers to rate on a five-point scale how well they had felt able to imagine the hypothetical scenarios (1= poorly, 5 = very well). The average rating was 3.40 (s.d. .84). We also asked them to self-rate their experience in judging actions and choice situations such as presented in the experiment (1= very little, 5 = very much). Average experience with actions was 3.24 (s.d. 1.10) and average experience with scenarios was 2.83 (s.d. 1.06). We asked on a similar scale whether they would recommend fellow retailers to participate in this study. Average recommendation was 3.57 (s.d. .77). Finally, after completion of the interview, interviewers had to rate their impression of how well the respondent seemed to have understood the hypothetical scenarios (1= very badly, 5= very well) and how interested the respondent was (1= not at all, 5= very interested). The average understanding

score was 3.48 (s.d. .79) and the average interestedness score was 4.01 (s.d. .72). Although self-justification and demand effects may have contributed to these various results, they at least do not falsify our impression that the retailers were highly involved and understood the experimental tasks. Therefore, these results all support our assumption that respondents have read the scenarios and understood the tasks.

9.4.2 Store performance evaluations

For each scenario, retailers were first asked how good their general store performance would have been, had the presented hypothetical situation happened. Similar to the pre-experimental questionnaire, this evaluation was expressed on a 100-category rating scale, anchored by 0 ("extremely bad") and 100 ("extremely good"). The O.L.S. regression model for store performance evaluations was significant ($F_{(45,309)} = 10.66, p < .001$) and the R^2 is high (.61), considering the disaggregate level of the data; hence, the model describes the retailers' responses quite well. Of the factors that are significant, the largest effect was from was from the sign of the hypothetical sales change trend (positive vs negative). The average rating in negative conditions was 42.8, in positive conditions it was 79.8. The remaining results refer to the (interaction) effects of each factor within either the positive or negative sales change.

We expected the effects of each factor to differ significantly within the positive and negative frames. However, within the positive sales frame no effects of any factors were significant at the $\alpha = .05$ level. Hence, the retailers took none of the environmental change related factors into account if the scenario was framed as one in which sales was higher than currently observed in their own stores.

In the negative sales frames the simultaneous effect of the factors was significant ($F_{(18,306)} = 3.33, p < .001$), which can be however attributed to only a few significant factor effects. The larger the relative sales decrease, the more negative the retailers were about their store's performance. The more competition from other shopping areas, the lower retailers evaluated their store's performance. Performance evaluations also decreased as competition from within the own shopping area either increased or decreased. Similarly, as atmosphere changed in their shopping area, performance ratings decreased.

These results suggest that if a scenario described an increase in sales level compared to the three-year trend, retailers seemed to ignore the environmental

information supplied in the scenarios. Only in the negatively framed sales change conditions did retailers appear to take account of the environmental information.

To test the robustness of these conclusions vis-a-vis possible framing and adaptation level effects in the scenarios, we ran two additional regression analyses:

1. The sales and environmental changes were rescaled to be the percent change relative to the change reported by the interviewees. We then tested whether these percentage changes produced an adaptation effect due to, for example, framing a scenario as a 25% additional change to a reported 100% change, as compared with a reported 10% change. In the former case, the additional sales might be perceived as only marginally better, while in the latter case, the same change might be perceived as very much better. The results of this analysis were not substantially different from the results reported above; therefore, will not be presented.
2. The sales and environmental changes were rescaled to be the total (positive or negative) change, that is, the changes reported by the retailers plus or minus the changes posed by the scenario. We tested whether the total difference in sales and environmental changes, rather than the simple difference expressed in the scenario factor levels better described the responses. Again, the results of the analysis did not substantially differ from previous results.

From these analyses, we conclude that the possible adaptation level and framing effects have not biased our results.

9.4.3 Necessity and ability to invest

Analogous to the pre-experimental task, retailers were questioned about their propensity to invest. They were asked:

* How desirable is it to invest in store improvements over the next three years if the present scenario was as described instead of what you reported.
* How easy is it to finance potential investments from your own internal sources if the scenario presented had happened instead of what you reported.
* How easy is it to finance potential investments from outside sources given the scenario presented instead of what you reported.

These judgments were expressed on five-category rating scales, anchored by 1 ("not at all desirable" and "not at all easy", respectively), and 5 ("very desirable" and "very easy"). Similar to the previous analysis of the ease-of-financing measures, the average of the measures on internal and external sources is used in the analysis.

Necessity of Investing in One's Own Store. The regression model estimated from the desirability to invest ratings was not significant ($F_{(45,307)} = .93, p = .61$) and fit poorly ($R^2 = .12$). This may be due to the limited range of response variation produced by using only a five-category rating scale. It should be noted that not even the sign of the hypothetical sales change was significant. This suggests that retailers may not immediately react to sales level changes by increasing or decreasing investments.

Ability to Finance Investments. The regression equation for this investment decision was statistically significant ($F_{(45,290)} = 1.69, p < .01$) and the goodness-of-fit of the regression model for this response was moderate ($R^2 = .23$), considering the disaggregate nature of the response data, and the use of a 5-category rating scale. The explanatory power can all be attributed to effects of the sign and size of the sales trend: The perceived ease of internal financing significantly increased with increasing sales levels. The simultaneous effect of the factors that describe environmental changes was not significant within positive or negative sales conditions.

As we mentioned earlier, we were somewhat concerned about the narrowness of the category scale used to measure "necessity to invest" and both "ability to finance" judgments. To test whether the relative failure to detect significant effects was due to lack of scale variability, we recoded each response measure into a binary response by collapsing categories 4 and 5 into a "top box" score, and categories 1 to 3 into a lower box score. We then reanalysed these binary measures with binary logit analysis. The results that we obtained from these analyses were not substantially different from the results based on the O.L.S. regression analysis reported above; therefore, we avoid the redundant reporting of these results.

9.4.4 Actions expected to occur

Each retailer completed a "most likely choice task" as defined earlier for each of the two presented scenarios. To simultaneously investigate the effects of sales trend conditions and co-varying environmental conditions on retailer expectations about actions, we estimated one large logit model from the choice data obtained in the scenario experiment. This model assumes that the choice of a particular action from among presented actions is a function of the 'utilities' that retailers derive

from these actions in the conditions as stated in the scenario. In turn, these 'utilities' are linear functions of sales-trends and sales-trend-by-environmental-condition interactions, which are all independent by design. The model is formally described as follows:

$$p(i \mid A) = \frac{\exp(V_i)}{\Sigma_{i'} \exp(V_{i'})}, \ \forall i, i' \in A$$

where $V_i = \boldsymbol{\beta}_i \boldsymbol{X}$ and is the 'utility' of action i, $\boldsymbol{\beta}_i$ is a parameter vector that represents sales-trend and sales-trend-by-environmental effects on action i, $\boldsymbol{X}$ is a matrix representing scenario conditions (12 factors decomposed into 45 parameters). Note that all effects are 'alternative specific', hence, the total analysis involves a design matrix where each row of $\boldsymbol{X}$ occurs multiple times to separately define the (identical) scenario conditions for each action (cf. Oppewal and Timmermans 1991). Because there are 7 actions, the total number of columns in the design matrix was 7 × 45, hence there were 315 parameters to estimate.

To allow efficient estimation, within each respondent's scenarios we aggregated choice frequencies and rescaled them to sum to one hundred. Before rescaling, however, we adjusted the frequencies of the 'no change' alternative. By design each action occurred in four sets only. The alternative 'no change', however, had been added to all experimental sets. Therefore, its maximum frequency across sets was either seven or eight (depending on whether a fraction included an empty set). To adjust the imbalance that arises with aggregation, frequencies of the 'no change' alternative were multiplied by 4/7 or 4/8, depending on the design. This ensured that the maximum score of all alternatives was four.

The total number of completed experimental choice tasks was 363, as not all of the 183 respondents had completed both scenarios. We created a data file that contained 2904 records (eight records for each of the 363 scenarios). Models were estimated using iteratively reweighted least squares procedures, which produce maximum likelihood estimates. To reduce computer estimation time, the minimally restricted model was estimated in seven parts. Each partial model included all constants of actions in the specification but included for only one action all possible scenario effects, as shown in Table 9.13. For action 'close or sell the store' convergence problems occurred because positive sales trend conditions had resulted in many zero frequency cells. We therefore deleted the positive scenario factors from this model. McFadden's ρ^2 goodness-of-fit values were .26 and .27 for all the

Table 9.13. Experimental retailer choice models, including inertia factors.

	Close/sell		Relocate		Open branch		Floorspace		Refurbish		Store image		Environment	
	Param	t-stat	Param	t-stat	Param	t-stat	Param	t-stat	Param	t-stat	Param	t-stat	Param	t-stat
(Constants:)														
Cls	-3.38	-63.31	-2.50	-81.24	-2.49	-81.24	-2.50	-81.26	-2.49	-81.26	-2.50	-81.26	-2.50	-81.31
Rlc	-2.88	-79.87	-4.24	-53.48	-2.88	-79.84	-2.88	-79.91	-2.88	-79.85	-2.88	-79.81	-2.88	-79.88
Bra	-2.89	-78.75	-2.89	-78.80	-5.51	-40.09	-2.89	-78.67	-2.89	-78.71	-2.89	-78.71	-2.89	-78.75
Flr	-2.32	-80.34	-2.31	-80.34	-2.32	-80.31	-2.98	-67.70	-2.32	-80.30	-2.32	-80.36	-2.32	-80.27
Rfb	-1.34	-62.87	-1.34	-63.02	-1.35	-62.95	-1.34	-62.93	-1.48	-62.49	-1.35	-63.18	-1.34	-62.93
Img	-1.22	-63.85	-1.22	-63.84	-1.22	-63.80	-1.22	-63.72	-1.22	-63.88	-1.37	-63.71	-1.22	-63.73
Env	-2.62	-80.37	-2.62	-80.37	-2.62	-80.30	-2.62	-80.39	-2.62	-80.41	-2.62	-80.30	-3.41	-61.02
(Inertia-factors:)														
InCls	0.05	41.45	0.04	43.45	0.04	43.34	0.04	43.53	0.04	43.43	0.04	43.49	0.04	43.94
InRlc	0.06	56.96	0.08	46.39	0.06	56.84	0.06	57.26	0.06	56.93	0.06	56.87	0.06	56.94
InBra	0.05	43.03	0.05	43.27	0.07	32.26	0.05	42.71	0.05	42.99	0.05	43.17	0.05	43.08
InFlr	0.05	51.95	0.05	51.85	0.05	51.84	0.05	45.41	0.05	51.83	0.05	51.99	0.05	51.70
InRfb	0.02	39.21	0.02	39.46	0.02	39.39	0.02	39.28	0.02	34.78	0.02	39.84	0.02	39.32
InImg	0.02	35.69	0.02	35.59	0.02	35.51	0.02	35.34	0.02	35.77	0.02	31.94	0.02	35.37
InEnv	0.03	26.78	0.03	26.50	0.03	26.16	0.03	26.50	0.03	26.75	0.03	26.14	0.05	23.61
(Scenariofactors:)														
Trend	-1.17	-27.80	-0.75	-11.70	1.35	11.45	0.39	11.68	0.17	10.38	-0.35	-21.85	0.01	0.24
TsizLP	-		-0.47	-5.32	-1.13	-13.32	0.19	4.89	-0.10	-4.09	-0.22	-7.48	0.09	1.24
TsizLN	0.36	8.81	-0.42	-7.26	-0.61	-5.67	-0.24	-4.86	0.39	13.34	0.09	3.60	0.25	3.93
TsizQP	-		-0.58	-14.52	-0.83	-16.72	0.01	0.68	0.00	0.32	0.02	1.38	-0.13	-4.02
TsizQN	-0.11	-4.99	-0.12	-3.73	-0.05	-0.63	0.01	0.49	0.02	0.95	0.03	2.35	0.35	7.43
TsudLP	-		-0.29	-5.24	-0.05	-0.89	0.55	15.33	0.20	7.68	-0.14	-4.56	-0.54	-9.39
TsudLN	0.13	3.67	0.20	3.52	0.33	3.43	0.70	11.07	0.20	7.15	0.16	6.46	-0.16	-2.50
TsudQP	-		0.38	8.17	-0.03	-0.99	0.24	10.61	-0.16	-11.24	-0.00	-0.00	0.05	1.52
TsudQN	0.12	4.98	-0.05	-1.83	-0.22	-3.42	-0.29	-9.48	-0.04	-2.40	0.00	0.04	0.03	0.87
CmpwLP	-		-0.04	-0.56	-0.66	-10.47	0.27	7.10	0.01	0.32	0.10	3.35	0.73	11.45
CmpwLN	-0.05	-1.47	-0.36	-6.38	-1.40	-11.49	-0.17	-3.12	-0.02	-0.73	-0.09	-3.53	-0.35	-5.85
CmpwQP	-		-0.20	-5.37	0.03	0.85	-0.02	-0.84	-0.03	-2.29	0.02	1.20	-0.12	-3.50
CmpwQN	0.45	17.15	0.30	8.99	-0.46	-7.43	-0.16	-6.16	-0.11	-7.20	-0.12	-9.09	0.04	1.10
CmpoLP	-		-0.13	-1.66	-0.55	-7.29	0.46	11.12	-0.07	-2.74	-0.22	-7.37	-0.10	-1.44
CmpoLN	-0.23	-5.61	-0.14	-2.67	0.37	3.60	0.15	3.02	0.33	11.08	0.16	6.35	-0.06	-0.98
CmpoQP	-		-0.16	-3.80	0.64	12.54	-0.12	-5.68	-0.08	-5.89	0.01	0.48	-0.35	-10.43
CmpoQN	-0.10	-4.40	0.21	6.35	0.11	1.39	0.11	3.78	-0.05	-2.96	-0.14	-10.00	0.15	4.09
SizeLP	-		-0.24	-3.46	-0.22	-2.36	0.30	7.16	-0.03	-1.32	-0.16	-5.07	0.65	9.05
SizeLN	0.06	1.45	0.33	5.45	-1.25	-7.11	0.27	4.38	0.23	8.21	0.06	2.54	0.02	0.28
SizeQP	-		-0.06	-1.43	-0.53	-11.25	-0.19	-8.80	-0.04	-2.97	-0.11	-6.83	-0.01	-0.31
SizeQN	0.08	3.66	-0.21	-7.49	-0.87	-15.28	-0.10	-3.56	-0.01	-0.85	0.14	9.58	-0.13	-3.82
AtmsLP	-		-0.25	-3.23	-0.09	-1.31	-0.32	-8.23	-0.07	-2.70	-0.13	-4.28	-0.34	-5.26
AtmsLN	0.07	1.72	0.38	7.42	-1.63	-9.98	0.14	2.47	-0.20	-6.97	0.02	0.87	-0.02	-0.22
AtmsQP	-		-0.30	-7.19	0.21	6.20	-0.10	-4.51	0.00	0.35	0.08	4.55	0.12	3.28
AtmsQN	0.02	0.99	0.12	3.55	-0.34	-4.91	-0.22	-7.75	-0.15	-9.30	-0.04	-3.24	-0.43	-11.11
AccsLP	-		-0.19	-2.56	0.34	4.40	-0.39	-10.34	-0.12	-4.97	0.06	1.86	-0.07	-1.08
AccsLN	0.03	0.85	-0.25	-4.50	-0.89	-6.64	-0.00	-0.09	0.10	3.55	0.17	6.91	0.28	4.23
AccsQP	-		-0.28	-7.82	-0.39	-12.70	0.18	7.85	0.03	2.26	-0.01	-0.66	-0.24	-6.52
AccsQN	-0.10	-4.70	-0.03	-0.86	-0.16	-2.51	-0.07	-2.26	-0.01	-0.57	-0.13	-9.56	-0.06	-1.81
SpdpLP	-		-0.09	-1.43	-0.25	-4.25	0.04	1.16	-0.03	-1.26	0.03	0.91	-0.69	-9.90
SpdpLN	0.60	13.77	0.01	0.19	-0.20	-1.85	-0.20	-3.90	-0.09	-3.36	0.09	4.05	-0.04	-0.63
SpdpQP	-		0.35	7.45	-0.08	-2.19	0.04	1.72	0.06	3.82	-0.06	-3.40	0.17	4.91
SpdpQN	0.03	1.15	-0.01	-0.45	-0.56	-7.58	-0.14	-5.12	0.10	5.87	0.21	13.76	-0.07	-2.02
PrdmLP	-		-0.09	-1.36	0.58	7.67	-0.31	-7.53	-0.38	-14.57	0.11	3.86	0.56	8.25
PrdmLN	0.04	1.02	0.49	9.13	-0.40	-3.18	0.55	9.43	-0.09	-3.13	-0.05	-2.22	-0.32	-4.28
PrdmQP	-		0.27	5.98	-0.15	-4.01	-0.24	-11.27	-0.09	-6.06	-0.03	-1.85	-0.05	-1.41
PrdmQN	-0.15	-7.08	0.24	6.71	-0.58	-8.37	-0.08	-2.63	-0.06	-3.79	0.06	4.51	-0.37	-9.64
Loc1P	-		-1.84	-12.35	0.32	5.68	0.45	11.48	-0.04	-1.49	-0.05	-1.72	0.05	0.96
Loc1N	-0.18	-4.74	-0.60	-10.67	0.90	8.75	0.06	1.26	-0.02	-0.64	0.18	7.77	0.26	4.06
Loc2P	-		-0.58	-10.34	0.00	0.11	-0.15	-7.59	0.04	2.85	-0.17	-10.55	-0.02	-0.84
Loc2N	-0.05	-2.31	0.13	4.11	-0.78	-15.03	-0.05	-1.93	0.22	13.05	0.10	7.18	-0.22	-7.27
Typ1P	-		-0.70	-10.07	0.34	6.46	-0.27	-7.57	0.03	1.06	-0.06	-2.04	0.17	3.48
Typ1N	0.32	8.26	0.13	2.55	1.66	10.63	-0.29	-5.79	0.08	2.89	0.01	0.35	0.47	7.28
Typ2P	-		0.13	3.66	0.05	1.66	0.08	3.80	-0.02	-1.65	-0.10	-5.67	0.13	4.16
Typ2N	0.05	2.44	0.22	6.85	-0.67	-10.27	-0.05	-1.87	-0.19	-12.59	0.00	0.10	-0.13	-4.07
No. of Sets		363		363		363		363		363		363		363
No. of Cases		2904		2904		2904		2904		2904		2904		2904
LL(0)		-53038		-53038		-53038		-53038		-53038		-53038		-53038
LL(B)		-32389		-32461		-32166		-32454		-32832		-32609		-32803
RhoSq(0)		0.39		0.39		0.39		0.39		0.38		0.39		0.38
RhoSq(0,A		0.39		0.39		0.39		0.39		0.38		0.38		0.38
-2[LL(0)-LL(B)		41298		41153		41743		41168		40411		40857		40469
Chi-Sq d.f.		37		59		59		59		59		59		59

seven models and it appeared that many sales-trend and many sales-trend-by-environmental-condition effects are significant (see Table 9.13). To test the statistical significance of all scenario effects on choice probabilities simultaneously, we ran an additional model that included only the action constants. McFadden's ρ^2 for this model is .24. The model serves as a base model against which to test the models that include scenario factors. Inspection of the LogLikelihood differences between the various models and this base model reveals that for each action the model which includes all scenario factors (β_2) is significantly better than the model with constants only (β_1). The LR statistic $-2\ [LL(\beta_2) - LL(\beta_1)]$ is Chi^2 distributed with degrees of freedom equal to $df(\beta_2) - df(\beta_1)$. These statistics vary between values 1510 and 3000, with 52 degrees of freedom or less. The increase of the Akaike (or 'adjusted') ρ^2 values (from .24 for the base model to .25 or higher for the scenario models) leads to a similar conclusion, that is, that scenario factors do contribute to the explanation of observed choice behaviour.

The above increase in fit of models when scenario factors are included may seem not very high. However, one should consider that aggregate models are estimated for a sample from a very heterogeneous population. One of the sources of variability among retailers is their pre-experimental or, say, current probabilities of picking actions as most likely to occur. To take this variation into account, we estimated a model from the scenario-based frequencies that includes dummies for the choices the retailer has made when asked about the current conditions. These dummy parameters represent the 'inertia' of retailers' initial or current condition expectations (cf. Morikawa, Ben Akiva and McFadden 1990). Table 9.13 shows that these inertia components are highly significant (LR statistics for the comparison of these models to corresponding scenario models without inertia dummies vary between 12682 and 13632, with only 7 degrees of freedom). Retailers tend to pick similar actions as most likely in scenario and current conditions, regardless which scenario is presented. However, it also appears that the scenario parameters are still significant and, moreover, they are not substantially different from the models without inertia factors. This means that across all types of retailers the scenario effects are relatively robust. It also means that when models are used in impact studies to compare alternative scenarios, differences between these scenarios do not depend on whether models include retailers' current choices. However, if interest focuses on the absolute sizes of predicted probabilities of actions, then one may want to take the inertia effects into account, to obtain more precise estimates.

Application of models for such purposes requires that one knows or is able to estimate subjects' current choice expectations.

The model confirms our ideas that environmental conditions influence the effectcs of sales trends on actions chosen as most likely to occur. To interpret the models, we calculated each action's probability of occurrence in the various scenario conditions. Probabilities of occurrence are represented by the binary probabilities of a retailer choosing an action over choosing 'no change', as discussed earlier. For the 'no change' option we calculated probabilities of choosing this option over any of the other actions. Figures 9.2 to 9.12 visualize the effects of scenario factors on these choice probabilities.

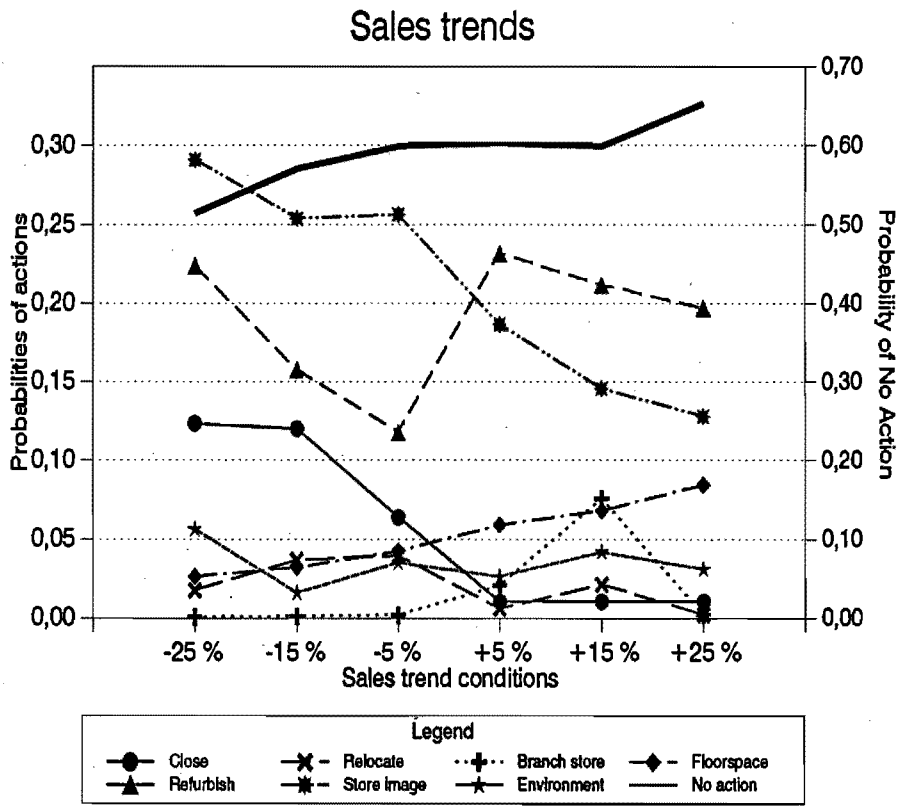

Figure 9.2. Probabilities of actions in various sales trend conditions.

Effects of *sales trend size and direction* (positive or negative), displayed in Figure 9.2, are as follows. First, with an increasing sales trend there is an increasing probability that retailers refrain from taking action. With increasing sales there is also an increasing probability that retailers will adjust their size of floorspace or open branch stores. In contrast, probabilities of store image changes and store closures decrease with increasing sales. There is a marked decrease in the probability of refurbishing the store when sales are moderately bad. Note also that the highest likelihood of bringing changes to the immediate store environment is when sales conditions are very bad.

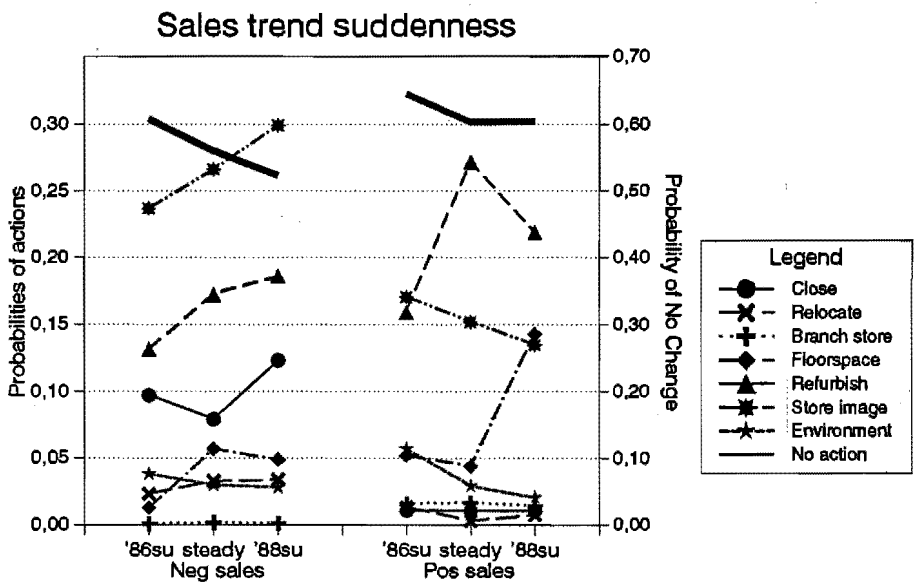

Figure 9.3. Probabilities of actions in various trend suddenness conditions.

Considering *sales trend recency and suddenness* (Figure 9.3), there is an increased inclination to take action with a more recent or steady sales trend. In negative frames (relative decrease in sales) a steady or more recent trend leads to an increased probability of changing store image, refurbishing, changing floorspace, or closing the store. This suggests that retailers want to react quickly when sales go down. In positive sales conditions, a recent and sudden sales trend seems to trigger retailers' inclination to change floorspace. Refurbishments tend to occur particularly in conditions with a steady sales increase.

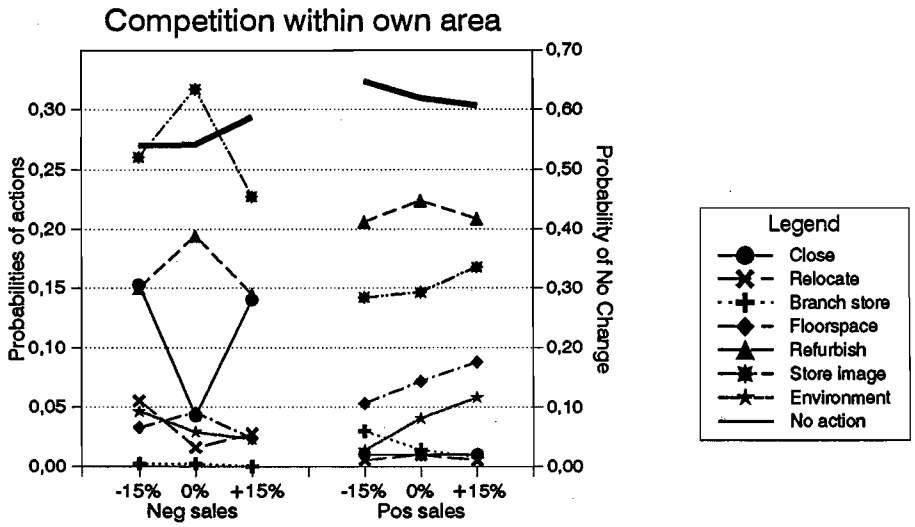

Figure 9.4. Probabilities of actions for competition from own shopping area trend conditions.

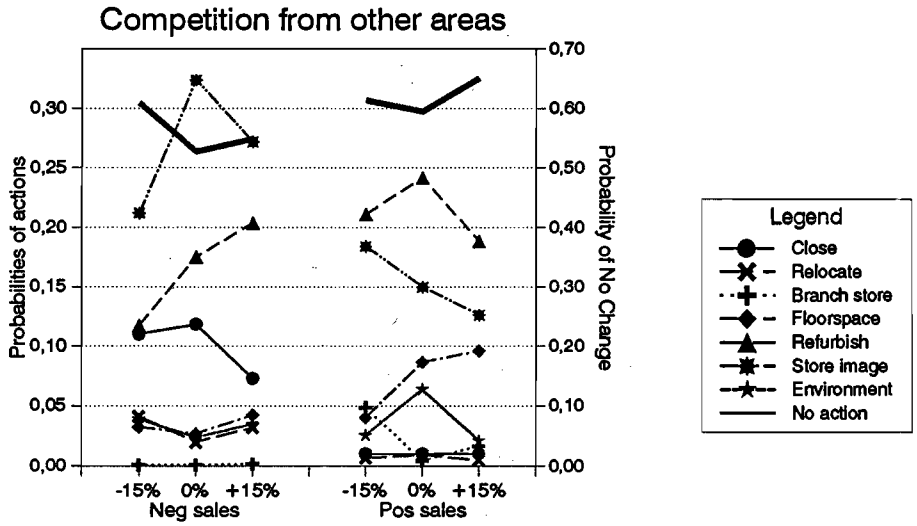

Figure 9.5. Probabilities of actions for competition from other shopping areas trend conditions.

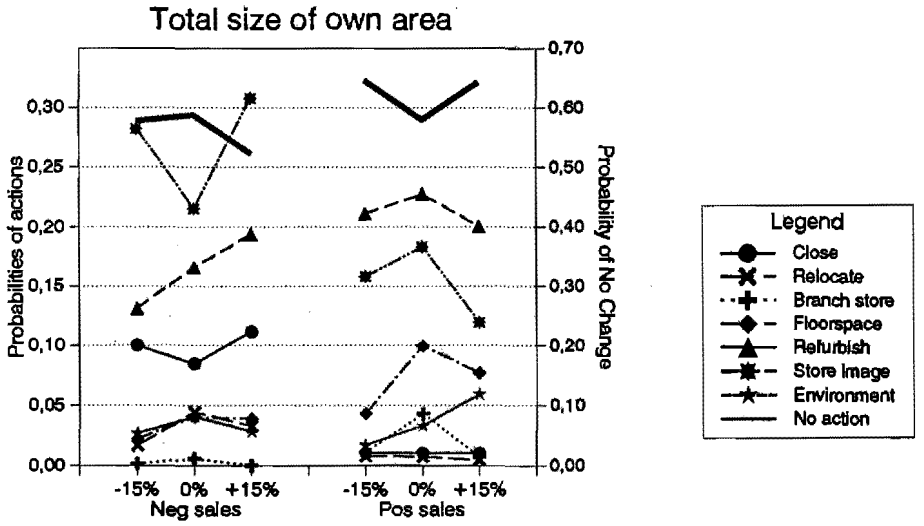

Figure 9.6. Probabilities of actions for own shopping area size trend conditions.

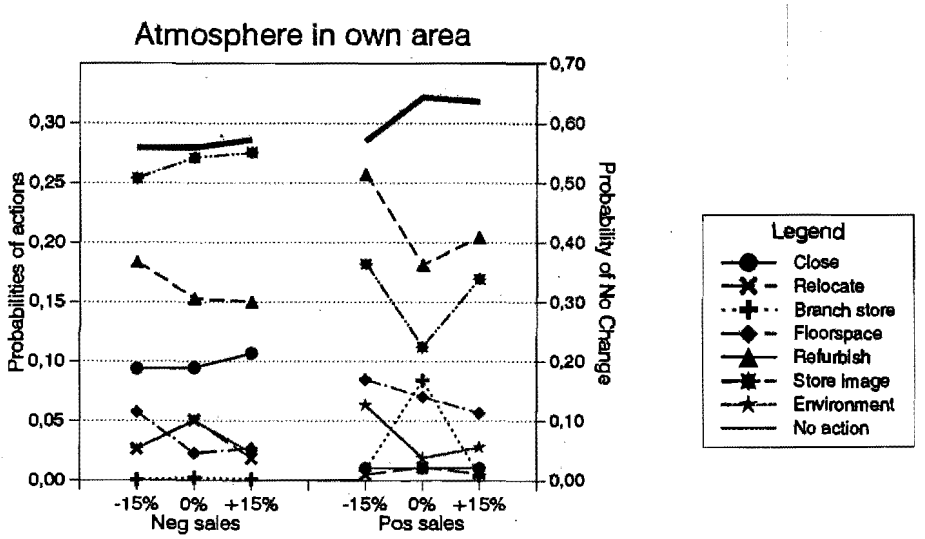

Figure 9.7. Probabilities of actions for atmosphere in own shopping area trend conditions.

The effects of the environmental trend factors and the sampling design factors on probabilities of actions are shown in Figures 9.4 to 9.12. We will discuss each of the actions in turn. The probability of *selling or closing the store* decreases with increasingly positive sales trends. Within negative sales frames, probabilities of store closure are almost as high in the minus 15% sales trend change conditions as in the minus 25% conditions. Probabilities are particularly high when the negative sales trend appeared recent and suddenly, competition within the own area has changed (either increased or decreased), competition from other areas has not increased, accessibility of the own area and national product category sales have remained unchanged, or when spending power has increased. Considering retailer types, retailers located in the city core consider it less likely to close their store when sales trends are negative than retailers at other locations. Expected probabilities of closure are relatively high for clothing and shoe stores. Within positive sales scenarios, there appear to be no effects of environmental trends as the action was too seldomly chosen to allow estimation of these effects.

With respect to the probability of *relocations*, these are smaller in positive than in negative sales trend conditions. Within negative sales frames, the less recent the sales trend change, the more retailers expect to relocate. Decreasing competition also results in higher probabilities of relocating. Total area size and area atmosphere result in higher probabilities when no changes are observed. Increased national own product category sales and decreasing accessibility of the own shopping area result in higher relocation probabilities when sales trends are negative. Retailers located in the centre fringe and clothing and shoes retailers are more inclined to relocate when sales decrease than other types of retailers.
Within positive sales conditions, probabilities are lower for steady than for sudden sales changes. Environmental trends have only limited effects in the positive sales frames. With respect to type of retailer, retailers located in the city core are the least inclined to relocate when sales conditions are positive.

The probability of *opening a branch store* in negative sales conditions is very small, whatever the type of environmental trend. Within positive sales frames, the probability of opening a branch store increases markedly with sales increases, and then drops when sales increases are at 25%. Both competition factors result in higher probabilities of opening branch stores when competition has decreased. Probabilities of branch store openings are further highest in unchanged area size, atmosphere, and accessibility conditions. Increased product category sales result in higher probabilities of branch store openings, while changes in spending power do

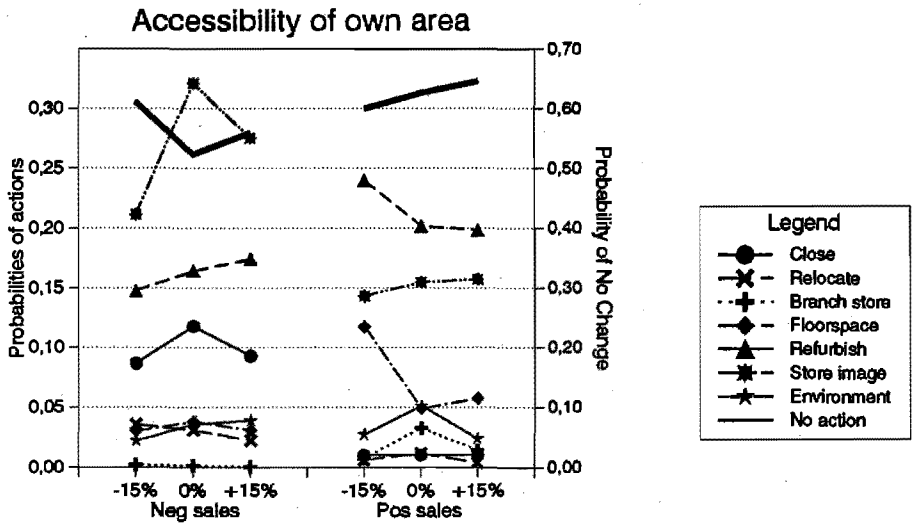

Figure 9.8. Probabilities of actions for accessibility of own shopping area trend conditions.

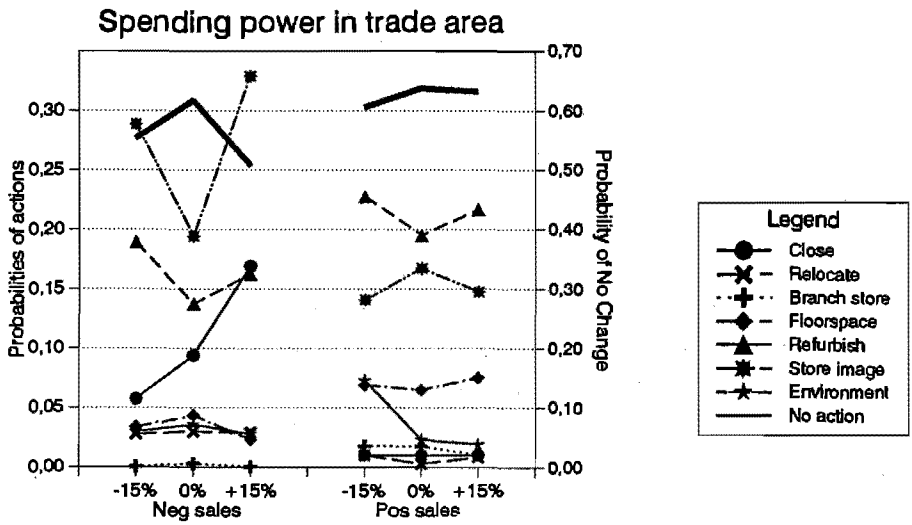

Figure 9.9. Probabilities of actions for spending power in own trade area trend conditions.

not have any effects. Suddenness of sales trend change does not have any effects. Finally, there are no large differences between retailers from different location and store types.

Probabilities of *changes in floorspace* increase with increasingly positive sales trends. Within negative sales conditions, the more sudden the sales trend, the higher the expectation to change floorspace. Relatively high or increasing probabilities are also associated with increasing competition from other areas, with unchanged competition within the own area, and with increases in own area size and accessibility. Increases in atmosphere, spending power and product category tend to lead to smaller probabilities of changing floorspace. Within positive sales conditions, probabilities of changing floorspace are particularly high if the sales increase is a recent and sudden trend. Increased competition, either from within own or from other areas leads to higher probabilities of floorspace changes. Lower probabilities are associated with decreasing area sizes, with increasing own area atmosphere, accessibility, and national product category trends. Spending power seems to have no effects. Finally, while within negative sales frames location and store type had no effects on probabilities of changing floorspace, within positive frames retailers at city core and neighbourhood locations have a relatively high probability to change floorspace. The same is true for retailers from product categories, other than foods and clothing and shoes.

Refurbishments appear to have relatively low probabilities in moderate sales decrease conditions. Probabilities are higher if sales trends appeared more recently, and are particularly high if a steady sales increase took place. Unchanged competition trends lead to relatively high probabilities, with the exception that an even higher probability occurs if a negative sales trend is observed in combination with an increase in competition from other areas. Within negative sales trend conditions, probabilities increase with increasing total area size and accessibility. They decrease with increasing atmosphere, spending power, or national product category sales. Finally, in negative sales frames, retailers located in the city centre (core or fringe) are more inclined to refurbish than retailers at neighbourhood centres. Similarly, in these conditions food retailers are more inclined to refurbish than other retailers. If sales trends are positive, refurbishments are expected in particular in conditions where area atmosphere or accessibility has deteriorated, or when national product category trends have been less positive. There are no large differences between types of retailers in the positive sales frames.

Probabilities of *store image adjustments* show a marked decrease with increasingly positive sales trends. Within negative sales trend conditions, probabilities are particularly high when the negative sales trend was more sudden and recent, when competition or area accessibility has not changed, or, in contrast, when area size, spending power or national product category sales has changed. Retailers located in the city core area are expecting more image adjustments in negative sales conditions than retailers in city fringe who, in turn expect more adjustments than retailers in neighbourhood shopping centres. There are no differences among the three store types. In positive sales conditions, fewer image adjustments are expected when competition from other areas or total area size has increased, when own area atmosphere has been stable, or when spending power has changed. When national product category sales have increased, slightly more adjustments are expected. In contrast to the negative conditions, in the positive sales conditions the neighbourhood centre consider image adjustments more likely to occur. In positive conditions, also food retailers appear to expect more image adjustments than do other types of retailers.

Expectations about investments to improve the *immediate store environment* are not affected by sales trend direction or size, except that a slightly higher probability occurs for the most negative sales condition. Sales trend suddenness has an effect in that a sudden sales increase that appeared several years ago leads to a higher probability. Within negative sales frames, competition, area size, area accessibility, and spending power have only very small effects. With respect to area atmosphere and national product category trends, unchanged conditions lead to relatively high probabilities of environmental investments. Finally, retailers located in neighbourhood centres appear more inclined to invest in their environments when sales trends are negative; retailers from product categories other than foods and clothing and shoes are less inclined to do so. Within positive sales frames, increased competition within the own area leads to increased investments to improve the own store environment. In contrast, probabilities are highest if competition from other areas has not changed. The same is true for area accessibility. If the size of the own shopping area has increased, a retailer is more likely to invest in the immediate environment. The same is true for own product category sales trends at the national level. Finally, retailers are particularly inclined to invest in their environment when area atmosphere has deteriorated and own sales have gone up. Probabilities within positive sales conditions appear no to vary among the various types of retailers.

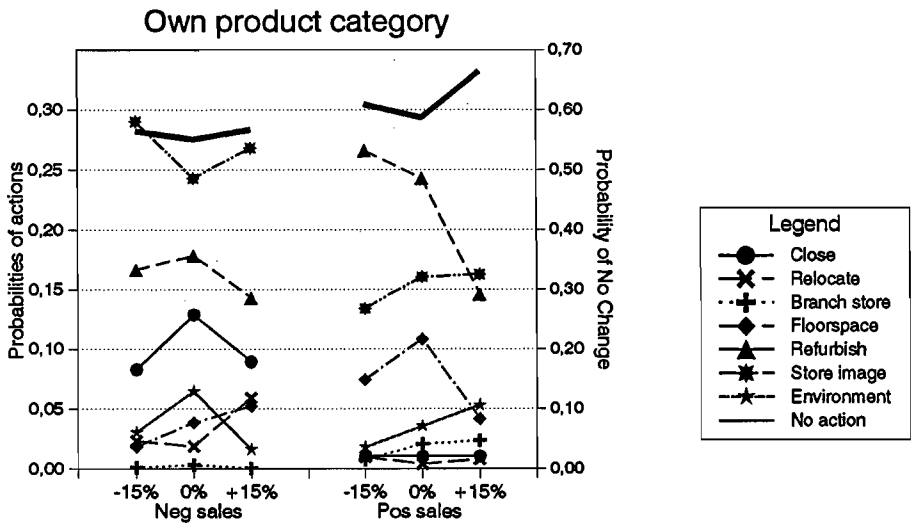

Figure 9.10. Probabilities of actions for own product category trend conditions.

Finally, increased sales trends appear to lead to higher subjective probabilities that *no major change* will occur to their store. Within negative sales frames, more recent and sudden trends lead to lower probabilities. Also, the more competition within the own area has increased, competition from other areas has decreased, accessibility has changed, or spending power has remained unchanged, the higher the expected probability. Atmosphere and national product category trends appear to have no effects. Expectations of no major change within negative sales conditions are particularly high for neighbourhood shopping centres and for store types other than foods or clothing and shoes. Within positive frames, trends that suddenly appeared a few years ago result in higher probabilities of no major change. Again, the more recent and sudden the trend, the lower the probability. Also, the more competition within the own area has increased, competition from other areas, own area atmosphere and accessibility have decreased, or size of centre have remained unchanged, the lower the expected probability. High probabilities also occur with increased national product category trends. Finally, concerning store types, the only effect is a low probability for neighbourhood centre stores.

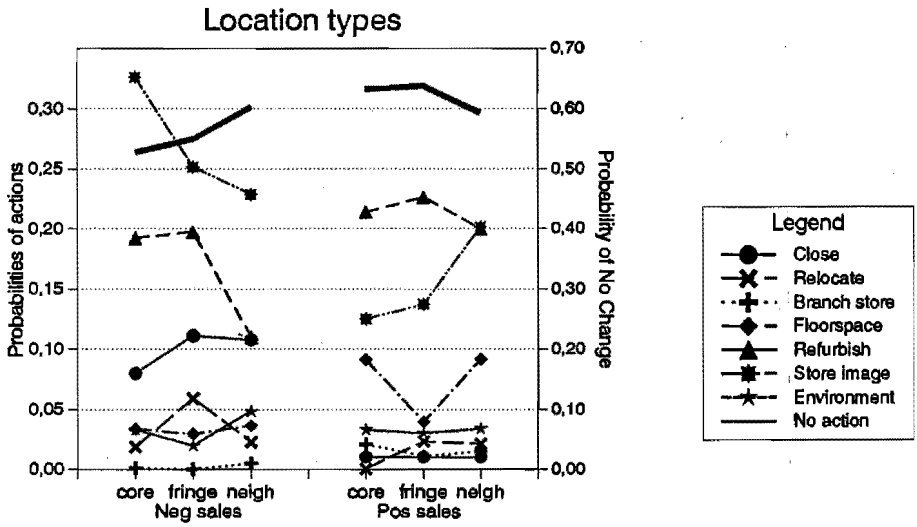

Figure 9.11. Probabilities of actions for types of location.

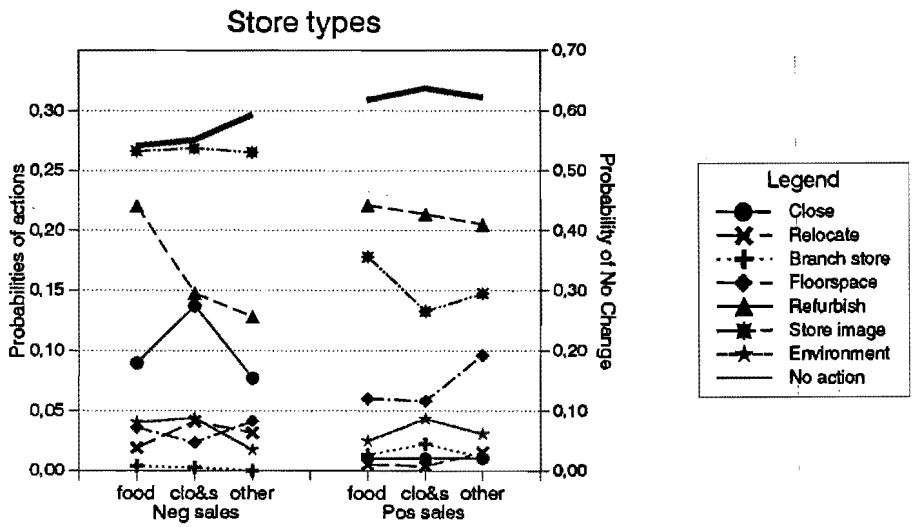

Figure 9.12. Probabilities of actions for store types.

9.5 Appearance of actions

9.5.1 Bundling of actions

In the choice task we asked retailers to mark in each choice set the actions that would occur together with the action chosen as most likely to occur. The analysis of such "pick any" tasks is not straightforward and is still an issue in the current research literature. To explore the extent into which particular actions tend to occur together, for each possible pair of actions we calculated the proportion of times this pair was chosen when it was available in the choice sets. In Table 9.14, all resulting cross-tables are put next to each other.

Table 9.14. Extent to which actions are chosen as likely to occur jointly. Entries represent relative frequencies of choosing pairs of alternatives when pairs are available, calculated across choice tasks in current and scenario conditions.

Chosen as jointly[b]: First chosen[a]:	Cls	Rlc	Bra	Flr	Rfb	Img	Env	Not Any Joint Action
Close	(0.0)	5.0	0.0	1.2	0.0	1.3	0.0	96.3
Relocate	4.0	(0.0)	2.0	25.0	29.1	27.2	9.6	70.1
Branch Store	0.0	4.1	(0.0)	11.0	29.2	19.0	1.4	77.3
Floorspace	0.0	5.1	3.2	(0.0)	43.8	42.1	7.9	63.2
Refurbish	0.9	8.8	6.4	27.6	(0.0)	37.5	14.7	62.5
Store Image	2.2	4.2	5.8	9.9	19.7	(0.0)	8.2	79.7
Environment	0.0	0.0	0.0	11.5	14.6	19.4	(0.0)	84.1
No Major Change	2.2	2.1	1.8	1.5	1.9	4.0	1.9	(0.0)
Average proportion across other actions[c]	1.2	4.5	2.9	14.4	22.7	24.4	7.0	76.2

[a] *Rows are actions chosen as most likely.*
[b] *Columns are actions chosen as likely to occur together with the row-action.*
[c] *i.e., excluding "no change" and structural zeroes on diagonal.*

The table shows that floorspace adjustments, refurbishings and image adjustments in particular tend to occur together (relative choice frequencies between .28 and .44). Hence, these actions are the least mutually exclusive. There is also a tendency to combine relocations with the previous three actions (relative

frequencies between .25 and .29). In contrast, combinations of close store and investing in the environment with other actions have very low frequencies (relative frequency of not any joint action are respectively .96 and .84), indicating high degrees of exclusiveness. In theory, one would expect the joint frequency of "close the store" and all other actions to be zero and we attribute the obtained non-zero proportions to carelessness, misunderstandings or undecidedness by some respondents. The same applies to combinations of "no major change" with other actions. Some other combinations of actions also are expected to have zero frequency. The further analysis of Table 9.14 is hampered by these structural zeroes. Further research should focus on modelling the joint occurrence of actions with loglinear models; we hope to report such analyses in subsequent research papers.

9.5.2 Specification of actions

When retailers had concluded the "most likely" choice task for a scenario, they were asked questions about the actions that they had selected as most likely or as co-occurring action in any of the choice sets. The purpose of these questions was to gain insight in what actions will look like, if they are chosen and implemented. For actions "close or sell store" and "no change", we asked no additional questions. For action "invest in environment", we asked whether this investment concerned public space appearance and atmosphere, available choice range of products and stores, available services and facilities, accessibility of the own store, or any other environmental measures.

For action "change store image" we asked retailers to specify the expected change in image by re-ordering the set of cards with store characteristics. Consistent with our previous analysis of the joint occurrence data, many retailers indicated to expect changes in image to accompany other actions. However, only few retailers went through the effort of re-ordered the cards for each type of appearance question. A likely reason is that this task was too burdensome. We therefore do not present results for the specifications of store image changes.

For the remaining actions we asked, where relevant, questions concerning the expected location, size and image of store. Retailers had to indicate their most likely new location by marking one of the categories "within current area", "within municipality but not within current area", "outside this municipality", "don't know". They also had to give their expectation about the expensiveness of the new location

by selecting one of the categories "cheaper than present location", "similar priced location", "more expensive location". Concerning size, they had to tell their minimum and maximum sales floorspace, and they had to tell the expected total floorspace. Finally, they were asked whether a different image was expected for the new location.

We will next present results for each action in turn. Because each retailer responded to one positive and one negative sales trend scenario, we can compare results for these two conditions.

Action "Invest in store environment". This action was chosen at least once by 34 retailers in negative sales scenarios; 33 retailers chose this action at least once in positive sales scenarios. Across positive and negative sales conditions, 67.2% say they will invest in the appearance and atmosphere of their shopping area; 41.8% will invest in the choice range of products and stores in the area. 34.3% say they will invest or contribute to increase the level of services and facilities in the shopping area; 40.3% will invest to increase the accessibility of the own store; and 31.3% would (also) invest in some other way in the shopping area. These percentages are not significantly different between negative and positive sales scenarios.

Action "Relocate store". This action was chosen at least once by 35 retailers in negative sales scenarios; 23 retailers chose this action at least once in positive sales scenarios. Across sales conditions, many of these retailers expect to relocate within the own area (41.4%) or to another location within the municipality (46.6%). Only few retailers (9%) expect their new location will be outside of Maastricht. There is no significant relation between hypothetical sales trend type and the expected new location.

When asked for the expensiveness of the new location, 19.6% of the retailers who are inclined to relocate expect to move to cheaper locations, 37.5% will locate at a similar priced location, and 30.4% will relocate to more expensive locations. Again, there is no significant difference between positive and negative sales scenarios. When asked whether and how their store image will change when relocating, 61.0% say they expect no change in image. This percentage did not differ between negative and positive scenarios.

Finally, when asked for the size of store at the new location, in negative sales scenarios the average minimally expected sales space size is 260 m^2 and the average maximally expected size is 357 m^2. The current size of these retailers is 183 m^2. The average minimally expected size in positive sales scenarios is 347 m^2 and

the average maximum is 394 m^2. The average current size of these retailers is 205 m^2. These differences between scenario types are not statistically significant. So, the retailers who expect to relocate expect to increase the size of their stores when relocating, even if sales conditions were bad.

Action "Open branch store". This action was chosen at least once by 11 retailers in negative sales scenarios; 30 retailers chose this action at least once in positive sales scenarios. Across sales conditions, most retailers expect to open a branch store within Maastricht but not in the own area (56.1%); 36.6% expect to open a branch store outside of Maastricht. There is no significant relation between hypothetical sales trend type and expected location of branch store.

When asked for the expensiveness of the branch location, 51.2% of the retailers who may open a branch store expect this store will be located at a site that is similarly priced. Again, there is no significant difference between positive and negative sales scenarios. When asked whether and how the image of this branch store differs from the present store, 50.0% expect no difference in image. Again, there is no substantial difference between positive and negative scenarios.

Finally, when asked for the expected minimum and maximum possible size of the branch store, in negative sales scenarios the average range is between 106 and 142 m^2, where the current average size of these retailers is 227 m^2. So, in negative conditions retailers who expect to open branch stores, expect this store to be smaller than their current store. In positive sales scenarios the average minimum and maximum expected sizes are 141 and 564 m^2, respectively. The average current size of these retailers is 298 m^2, so they expect some opportunities to open branch stores that are larger than their current store. However, these differences between scenario types may be not very reliable as they are not statistically significant.

Action "Change floor space". This action was chosen by 45 retailers in negative sales scenarios; 53 retailers chose this action at least once in positive sales scenarios. When asked whether and how the image of this branch store differs from the present store, across sales conditions 50.0% expect no difference in image. There seems to be no relation between hypothetical sales trend type and expectations about image changes. When asked for the size of floorspace after the adjustment, the expected size is 336 m^2 in negative sales scenarios, with an average current size of 206 m^2, and 551 m^2 in positive scenarios, average current size being 423 m^2. These differences between scenario types are not statistically significant. These results seem to suggest that a majority of the retailers tend to consider sales space increases when they indicate to expect floorspace adjustments, even when

sales conditions get worse.

Action "Refurbish". This action was chosen at least once by 76 retailers in negative sales scenarios; 85 retailers chose this action at least once in positive sales scenarios. When asked whether and how the image of the refurbished store differs from the present store, across sales conditions 48.4% expect no difference in image. There is no significant relation between hypothetical sales trend type and expectations about image changes.

9.6 Conclusion

This chapter presented results from our empirical study of retailer reactive behaviour. Retailers from various types of locations and product categories in the city of Maastricht responded to the experimental scenarios and choice tasks that were developed in Chapter 8, and answered various survey questions on observed trends and previous behaviour. The analyses were guided by the questions formulated in sections 6.5 and 9.1. To avoid redundant repeating of conclusions and discussions, we refer to our next and final chapter for a summary of results and a discussion of their implications.

CONCLUSION

CHAPTER 10

CONCLUSIONS AND DISCUSSION

10.1 Introduction

This thesis developed new types of conjoint experiments to model consumer choice of shopping centre and retailer reactive behaviour. In this final chapter we will summarize and discuss the results from the research presented in Parts I and II of this thesis. The discussions will focus on the validity of the results and on their implications for applications of the models and further research. The epilogue discusses ways in which models such as developed here could be used to model retail dynamics.

10.2 Conclusions from Part I

Part I focussed on the modelling of consumer choice of shopping centre. It first reviewed conjoint and other modelling approaches and argued that models are required that include attributes that are directly related to marketing mix instruments of shopping centre managers, developers, and planners. To allow the development of such models, this thesis proposed an operational definition of the shopping centre marketing mix involving 24 attributes. These attributes were all generic; hence, they can be used to describe any shopping centre. The attributes were categorized into four groups, each representing one dimension of consumers' perception of shopping centres. Because it seemed not feasible to study such a large number of attributes in one conjoint task, we chose the method of Hierarchical Information Integration (HII) as a candidate way to solve this problem. This approach, however, has several limitations, such as the impossibility

to test the validity of the assumed hierarchical structure and the need to use a 'bridging' task. We therefore developed a new and general approach to modelling HII processes that avoids these limitations. The relevance and usefulness of these two new ideas were tested and illustrated in an empirical study of consumer choice of shopping centre. The following subsections present a summary and discussion of the results from this study.

10.2.1 Shopping centre attributes

Whereas previous studies of consumer choice of retail destination typically included only three to six attributes, the present HII application resulted in a choice model that includes 24 attributes and four constructs (convenience, appearance, selection of food stores, selection of clothing and shoes stores). This model was estimated across all 405 respondents in the sample from our study area and is based on their allocations of monthly food shopping budgets. Thus, the model describes the food shopping preferences of a representative household from our study area. The model parameters indicate how shopping centre attributes and constructs compensate each other and what is their relative influence on consumers' food budget allocations.

Consistent with the research literature and traditional insights, it appeared that of the four constructs, "selection of stores for foods and packaged goods" and "location convenience and accessibility" are the most important determinants of consumer allocations. "Appearance, layout and furnishings" is less important and "selection of stores for clothing and shoes" has the least and a very small, but still positive and significant, influence on budget allocations. This latter result could indicate a general preference to combine trip purposes, for example, buying foods and (window-)shopping for clothing and shoes. Note that the importance of the appearance factor could be much larger for other product categories, such as clothing and shoes (cf. Oppewal, Louviere and Timmermans 1993).

The HII construct importances are relatively independent from the potential arbitrary selection of attribute levels. In contrast, the findings regarding attribute importances are dependent on the used range of level definitions and should be interpreted with the caution that usually applies to conjoint results. Having said that, we conclude that the most important attributes are the number of store units (35 units vs 5 units) and travel-time (5 min vs 50 min). Next most important are parking costs (free vs 3 NGL/hr), followed by the extent to which the shopping area is indoors (90% vs 0% of the area indoors), parking convenience (easy vs

difficult), attractiveness of window-displays (90% vs 0%), price (80% vs 20% of the store units have competitive prices), product quality (60% vs 20% of the store units have high quality products), and maintenance of streets, hallways and buildings (very well vs very bad). Most other attributes were less important but were still significant. Results for one of these, area crowdedness, show that people tend to dislike crowded and very uncrowded areas, as "moderately uncrowded" was most preferred and "very crowded" the least. This confirms intuitive ideas about what people like about their social environments. Not significant were furnishings and street decorations (many vs few) and how many store units are part of supermarkets instead of comprising independent small stores (relatively few vs relatively many). With respect to this latter attribute, it may be that all features that characterized differences between supermarkets and small (specialty) stores effectively were captured by the other attributes.

Hence, our results confirm that size (number of stores or store departments) and location (or convenience) are the most important determinants of food and packaged goods expenditures at retail destinations. However, our results suggest that these expenditures are also significantly determined by the further characteristics of a centre, in particular the parking facilities, the extent to which the centre is indoors, and the price/quality positions of individual retailers. Indeed, a major result of this study is that it tests and quantifies the effects of all these various managerially potentially relevant attributes.

10.2.2 HII experiments

In this thesis a new approach to modelling HII was proposed in order to be able to study the large number of attributes that were defined for shopping centres. The approach involves a new type of choice task. In the present application, these experimental choice tasks were complex but nevertheless appeared feasible, at least in a face-to-face interview setting. The feasibility and validity of the task was confirmed by the logit analyses of the separate subexperiments. All defined attributes (except the availability of supermarkets attribute) had significant effects on allocations among shopping centres of monthly household budgets for foods and packaged goods, with signs as expected.

Two types of tests were proposed and applied to assess the validity of the assumed hierarchical decision process. The first type concerns the relation between attributes and constructs within subexperiments. It involves tests of 1) whether and

how construct ratings are functionally related to the assumed attributes, independently from the context defined by other remaining constructs, and 2) whether these functional relationships differ from the direct relationships of attributes with utility or choice. In our application, the choice data passed both tests of this first type.

The second type of test involved whether the influence of constructs on choice is equivalent across subexperiments, conditions in which the construct is a priori defined as a single measure, and conditions in which the construct is defined by a profile of attributes. Data in our application did not pass these latter tests. First, for all constructs, hypothetical evaluation scores had smaller effects on choice than profiles of attributes. Second, the sizes of the effects of hypothetical construct evaluations differed across subexperiments. These differences seem to indicate that choices were context dependent in this application. This suggests caution in using the concatenated choice model for predictive purposes, because the model may be context sensitive. Though it could be that context effects "average out" across subexperiments, we could not directly test this possibility with our data.

A possible explanation for the nonequivalence of construct effects and joint attribute effects is that each additional attribute in a profile captures some share of the attention that subjects pay to profiles. Consequentely, attribute sets and constructs that are theoretically equivalent are not equivalent in their effects on utility. This resembles the effects that have been observed in conjoint ranking tasks for increasing numbers of levels of attributes (Wittink, Krishnamurti, and Reibstein 1989). An attention effect, however, would not explain the nonequivalence of effects of a priori defined hypothetical construct ratings across subexperiments. Differences in construct effects can result from specification errors due to omitted interaction terms in the utility functions, or from scales of utility functions being unequal across subexperiments. The latter of these alternative explanations was tested and rejected. Further research is needed to investigate the former and other possible alternative explanations for the construct differences between subexperiments.

10.2.3 The predictive ability of the HII-based model

Because the present focus was on HII as a way to design experiments that allow the prediction of choices, another important research objective was to test the predictive ability of choice models derived from HII experiments. Such tests can be

performed independently of tests of the assumed hierarchical structure because all construct indicators in the estimated utility function can be set to zero. We therefore used the concatenated model to predict choice, regardless of whether construct effects differed between subexperiments. Predictions from the concatenated model corresponded better to the observed "revealed" budget allocations than predictions from various more restriced model specifications

Despite this improvement in predictive ability when the experimental model includes more attributes, the predictive ability of the models was only moderate. Various factors could have reduced our ability to better predict shopping behaviour reported for real shopping environments (cf. Oppewal and Timmermans 1993b). First, there could have been substantial measurement error in the validation data. For example, the use of budget allocations may have introduced error because this is a rather difficult task. The measurement of attribute perceptions may also have introduced error because, although not difficult, this task appeared burdensome, especially for respondents who patronize many centres. Moreover, there was some ambiguity in the definition of these alternatives, as the tasks concerned the perception and choice of shopping areas. Though most shopping areas in the study area were equivalent to shopping centres and all areas were recognized as such by the respondents, not all respondents may have been aware of all the stores in an area.

A second and related issue is that we did not account for heterogeneity among respondents. Indeed, because our sample was representative for the total urban area it incorporated various kinds of heterogeneity. However, some of the heterogeneity could relatively easily be taken into account by estimating models for a priori defined segments. For instance, the model does not distinguish car-borne shoppers from those who go by bike or on foot but the model could be extended to do so. Another approach is to focus on utilities as a base for segmentation. Problems with this approach are how to find segments that are stable and interpretable. If clusters are formed on individual preference or choice data, clusters are partly based on error and may include too small numbers of individuals to assume some stability. An additional problem with the present data is that not all respondents received all profiles or choice sets. It is currently unclear how to cluster these individuals on their choice behaviour, as the clusters that are formed will partly represent the blocking structure that was used to assign subsets of treatments to individuals.

Third, we tested main-effects models only, whereas particular attributes could interact in real markets in their effects on utility and choice. For example, the disutility of alternatives with high parking costs and low parking convenience could have been underestimated. We also did not take into account the spatial structure of our validition area, though it is well known that size differences among shopping centres can lead to particular violations of IIA (e.g. Borgers and Timmermans 1987; Fotheringham 1988a; cf. Oppewal and Timmermans 1992a, 1994b). Finally, the attribute covariance structure of our validation data limited the potential of our model to predict the reported allocations. This was demonstrated in the model that we estimated from this validation data.

We conclude from this discussion that the limitations of our conjoint-based model mostly involve application issues, such as choosing a model specification (and corresponding experimental design), choice set definition, and the measurement of attribute perceptions, and not the conjoint approach per se.

10.2.4 Application of the model and issues for further research

Despite its limitations, this study has resulted in a powerful tool to support the planning and management of shopping centres. The differences in importances of attributes indicate how one should position or reposition a shopping centre in order to optimize its attractiveness to consumers. A retail planner or developer, or a shopping centre manager or designer can trade-off costs of new shopping centre designs against the effects of various shopping centre attribute changes on the attractiveness of the centre as a place to shop for foods. If data are available on how consumers perceive a currently existing shopping centre or a new shopping centre concept on these attributes, one can use the model to assess on which attributes the shopping centre can be most effectively improved. Finally, the model can be used to predict how consumers will allocate their budgets among the available shopping centres; hence, it allows planners and developers to assess the impact of changes in one shopping centre on the sales volumes at competing shopping centres.

Because all attributes were defined generically, the model is very versatile and in principle can be applied to any existing or newly designed shopping centre. In fact, the model can be applied to shopping areas in general because attribute definitions were not restricted to shopping centres only. This also means, however, that the model cannot take into account the special features and peculiarities of

particular shopping centres or areas. The models will always only give a 'best guess' based on the general characteristics of a shopping centre or area. More in particular, the model is based on an analysis of our total sample only. Clearly, attribute importance may vary with different segments of shoppers. Also, there may have been important interactions between the attributes included in the present model and there may have been violations of the model structure. These issues were already discussed in the previous subsection and will be investigated in further research.

For new applications, the model may need to be recalibrated because the parameter estimates could be dependent on the characteristics of the respondents in the estimation sample. This relates to the more general issue of the *external validity* of conjoint models, in particular if they are HII-based. We demonstrated the ability of the present HII-based model to predict choices in the real market, but we also pointed at the various problems involved in finding the proper data for validation. Indeed, it remains an open empirical issue as to what extent subjects' decision-making processes outside laboratories conform to hierarchical structures, and whether preferences and choices are unaffected if subjects are forced to process information according to such a task structure. However, these research questions are not only important for HII but for conjoint-type models in general. Our tests suggest that context dependency could be a larger problem than commonly assumed. The advantage of the HII approach over other conjoint-type methods is that it provides indicators of these effects.

The current HII application involved only one possible way to implement HII. The approach could also be applied to preference tasks, which might allow one to estimate individual level models (e.g. Bremer et al. 1994). Furthermore, numerous variations in the design of preference and choice experiments can be implemented. To mention a few: 1) one could link attributes to more than one construct, 2) tasks in which two or more constructs are substituted with profiles of attributes could be implemented (and compared to full profile implementations), 3) tasks in which respondents are not instructed about the potential hierarchical structure of attributes and constructs could be used if more critical tests of the mapping of attributes into constructs are required (even "filler" attributes that are expected to have no relation with constructs could be used), 4) the effects of missing attributes on construct evaluation and choice could be investigated with tasks in which the absence of attributes is systematically varied. This range of potential designs and research questions illustrates the flexibility of the proposed

HII approach. This and other advantages demonstrated here suggest that integrated conjoint experiments could provide a valuable tool to estimate partworth utilities and predict choice for situations that involve many attributes.

Further research on shopping centre attributes and conjoint tasks should focus on assessing the reliability and validity of the results in the present experiment, in particular with respect to the various ways and formats in which one can describe hypothetical shopping centres in conjoint tasks. A related topic that is particularly relevant to planners and retail managers concerns the attribute 'relative location'. It would be of interest to implement and independently manipulate the geographical relative location of shopping centres and of stores within shopping centres, as this is a rather neglected feature in conjoint as well as in other types of studies of retail destination.

These issues can be put in a broader perspective and concern the *construct validity* (Cook and Campbell 1979) of conjoint tasks. Conjoint studies typically assume perfect perception of presented attributes. This assumption is usually tested only in pilot tests; manipulation checks or multiple operationalizations of theoretical constructs are seldomly used. We would argue that more research is required on the conditions under which product profiles are perceived as assumed by the researcher. Our HII approach provides a useful framework for studies on this topic.

10.3 Conclusions from Part II

Part II first reviewed previous studies concerning retailer reactive behaviour. It appeared that very little empirical research on retailer behaviour has been performed, possibly due to practical and methodological difficulties. It was suggested that many of these difficulties may be avoided by developing an appropriate conjoint task. However, from a previous study (Van der Heijden 1986, 1988) and own exploratory research it was also concluded that, though feasible, such applications require the development of a new type of conjoint task that preferably is based on a theory about retailer behaviour. Because such theory was only partially available, a conceptual model of retailer reactive behaviour was developed. This model is partly based on the strategic retail management philosophy and partly based on the scarcely available empirical research literature. It proposes a continuous feed-back process of retailers, taking a position in the

market, operating their store, monitoring their results - in particular their sales - and adjusting their position by taking particular actions concerning their target market, number of outlets, sites, and store sizes and characteristics. It was hypothesized that sales trends are important indicators of store performance, but that retailers require additional information, in particular regarding trends in the retail environmental, to set the context for the interpretation of own observed sales trends.

This conceptual model of retailer reactive behaviour was a guide to the development of a retailer conjoint task. Experimental scenarios were developed which present hypothetical trends in sales and retail environmental factors, such as competition, atmosphere in the immediate store environment, accessibility of the own store and shopping area, own product category national sales, and spending power in the own trade area. Scenarios involve either positive or negative sales trends relative to the trends observed for the own store over the past three year period, and are accompanied by selected environmental trends, which can be negative, unchanged or positive. To measure retailers' expectations that particular actions will be taken for their stores, a multiple choice task was developed in which respondents have to choose the action that is most likely to happen from designed sets of actions. This task was designed to allow one to derive subjective probabilities and to explore the joint occurrence of actions. We framed the task as a subjective probability task instead of a management decision task because in this way we could avoid problems regarding issues such as who does and who should take the decisions in the retail organization, and the success rate of implementation of actions.

The retailer conjoint task was implemented in a survey among 183 retailers in Maastricht. Each retailer received one positive and one negative sales trend scenario. To take some of the heterogeneity among retailers into account, the experiment was administered to nine strata in the survey. These strata involved nine store type by location type combinations. The survey included additional questions regarding various issues such as retailer background characteristics, trends perceived in the own store and retail environment over the past few years, actions performed in the past, and expectations about future actions. The following subsections present a summary and discussion of the results from this study.

10.3.1 The retailer survey

The survey aimed to shed some light on the nature of retailer reactive behaviour, as very little is known about this type of entrepreneural behaviour. The first research question in the survey concerned the proportion of retailers in the study area who in the past years performed the actions that we defined. The survey data demonstrated the differences in the relative occurrences of actions: It appeared that over the past three years changes in store image were observed most often (27.9%), followed by changes in the immediate store environment (25.7%) and new store openings (23.0%). The latter includes openings of new independent stores, openings of new branch stores, and relocations. Refurbishings were observed less frequently (10.4%) and changes in floorspace were observed least often (8.3%). These proportions varied significantly over the location and product category types that we defined. Food and packaged goods stores had the smallest proportion of stores that had relocated; clothing and shoes had the largest. Changes in area size and atmosphere had been observed most by stores in the centre fringe and least by retailers in neighbourhoods. One retailer reported to have closed a branch store within our study area. However, this is not a valid indicator of all store closures because our sample did not include stores that went out of business in this period.

A second question concerned the environmental trends that the retailers had observed. Retailers reported average increases for all trend factors, including sales. Differences between retailers from different location and store type categories were found only for competition from other areas and for atmosphere in the own area. Retailers reported an average sales increase of twelve percent over the past three year period. We suggest the following explanations for this reported increase. 1) Over this period, the number of stores in the neighbourhoods decreased (Gemeente Maastricht 1988, p.8). This may have led to an increase in sales in the remaining stores. 2) The population of Maastricht increased (Gemeente Maastricht 1990, p.13). Consequently the total expenditures will have increased. 3) The average retail expenditures per household in The Netherlands increased (CBS 1992, p. 295). 4) The in-flow of expenditures from outside Maastricht (the wider region and from tourists) may have increased (as suggested in Gemeente Maastricht 1989). Other possible explanations are 5) that retailers who observed decreasing sales trends may have gone out of business and therefore were not included in our sampling frame, and 6) that evaluation apprehension effects have made retailers reluctant to report decreasing sales trends. Finally, 7) inflation could be considered as an explanation.

However, the national inflation in The Netherlands over the period 1985-1988 was only 0.7% (CBS 1992, p.327), so inflation is not a likely explanation. The present research does not allow further conclusions on the issue of why retailers on average reported increases on all sales and environmental trends.

To assess how sales relate to environmental trends a regression was performed of reported sales trends on perceived environmental trends. This analysis showed that a substantial proportion of variation in sales trends can be explained from environmental trends. The best predictors of sales trends were "national own product category sales trends" and "atmosphere in the own centre"; "spending power" and "competition from other centres" were next best. As this analysis was on survey data, it is unclear to which extent environmental trends were causing sales trends. The same cautionary note applies to the analysis of current condition store performance evaluations. Nevertheless, results that were obtained from the analysis of store performance evaluations supported the assumption that evaluations depend on sales trends and interactions of sales trends and environmental trends, but not on environmental main effects.

The analysis of the reported need to invest in one's own store and ability to finance investments did not reveal any relations to sales or environmental trends. This suggests that either retailers react so quickly to sales level changes (by increasing or decreasing investments) that reactions to the trends reported in the survey had already been performed, or that retailers do not (or not immediately) react to observed trends and that other factors determine investment behaviour.

We also measured retailers' subjective probabilities about actions expected for the near future. It appears that they considered refurbishings as most likely to occur in the three years to come, followed by store image changes. Least likely were store closures and investments in environmental changes. The subjective probabilities varied with the factors in the sampling design that was used. Neighbourhood stores were more likely to close, open branch stores, change floorspace, and invest in store environment. Clothing, textiles and shoes stores appeared less likely to close than stores selling other types of non-frequently bought products, and, finally, food stores appeared more likely to relocate than other store types.

Finally, we explored the associations between retailer characteristics and actions expected to occur. This exploration suggested that retailers who expect to close or sell their store appeared to have observed relatively more often decreasing sales and a deteriorating retail environment. These retailers are typically older

persons who have not yet arranged succession, relatively more often trade food products, and are located in the neighbourhood centres. Retailers who expect no major change relatively more frequently observed no change or small decreases in sales trend, are satisfied with their current size, and feel no need to invest in their store. Branch store openings were expected relatively more often by retailers who reported decreases in within-centre competition, increases in centre size, or improvements in centre atmosphere. These retailers also relatively more often have recently refurbished or adjusted their floorspace, are medium or larger sized stores, sell clothing, shoes, textiles, or furniture, and are managed by relatively young or old persons, the latter having arranged succession. The analysis suggested that refurbishments and floorspace adjustments are most typical for retailers who have many extension possibilities, a high need to invest, and dissatisfaction with the current size of their store. These retailers relatively more often recently changed their store image or invested in their immediate store environment, they are located in the larger neighbourhood centres, and have relatively more often many employees. No pattern of characteristics emerged for retailers who expect to relocate, invest in the store environment, or change the store image.

Further analysis of these associations could focus on the stability of the relations that were found, and on the selection of a subset of variables to include in a logit discriminant model to predict the actions expected by particular types of retailers. Such a model would allow us to predict for our study area the probability that particular retailers consider a particular action as likely to occur.

10.3.2 The retailer conjoint experiment

In the experimental part of the study, retailers responded to hypothetical scenarios describing sales and accompanying trends in the retail environment. Manipulation checks showed that the trends were well understood by the retailer respondents. As expected, retailers' performance evaluations in positive sales trend scenarios are much higher than in negative sales conditions. Contrary to our expectations, within the positive sales scenarios there were no significant effects of sales trend composition or environmental factors. This suggests that retailers took none of these factors into account if the scenario was framed as one in which sales was higher than currently observed in their own stores. If a scenario was framed as a relative sales decrease, however, some of the environmental factors had significant effects on store performance evaluations. This suggests that retailers take

environmental information into account only if sales changes are negative. Also significant within negative sales conditions was the size of the sales trend. This again suggests that retailers are more sensitive to details of retailing conditions when sales decrease then when they increase. In further tests we could reject the hypothesis that these conclusions depend on framing or adaptation level effects in the scenarios.

For each scenario, judgements of investment necessity and ability were also collected. Similar to the survey results, we did not find any effect of scenario factors on perceived necessity to invest. Hence, our experimental results support the idea that retailers not immediately take advantage of, or react to sales level changes by increasing or decreasing investments. Apparently, there is no simple relationship between propensity to invest and sales conditions. Nonetheless, in contrast to the survey data, the experimental results do indicate a reliable effect of sales trends on judgments of ability to finance investments: the more positive the sales, the more easy retailers can finance investments. There were no environmental effects for these variables. We were able to reject an alternative explanation, that this lack of effects was due to the narrowness of the category rating scale that was used.

To assess the effects of sales and environmental changes on retailers' expectations about actions to happen to their store in the near future, logit models were estimated on the experimental choice data. It appeared that, in contrast to the performance evaluations, many sales trend effects and sales by environmental trend interaction have significant effects on choice probabilities and that models fitted significantly better when these factors were included. This confirms the hypothesis derived from our conceptual model of retailer behaviour that choice of action depends on sales trends and on the environmental conditions in which sales trends appear.

Because the choice model is estimated from a sample that is typically heterogeneous, we included additional parameters in the model to capture the inertia or loyalty of individual retailers to their choices in current conditions. This increased the model fit considerably, which suggests that retailers tend to pick similar actions as most likely in hypothetical scenarios and current conditions, regardless which scenario is presented. However, addition of scenario factors did not substantially change the size or significance of scenario parameters. We therefore conclude that across retailers the scenario-factors are robust. This means that if one knows a retailer's initial or current condition choice probabilities (e.g. from the discriminant logit model that was suggested earlier), one can obtain more

accurate predictions of this retailer's choice probabilities in new sales and environmental conditions.

In this application, the most remarkable effects of scenarios on actions were the following:

* The higher the sales, the more inclined retailers are to do nothing; the lower the probability of changing store image or closing the store, and the higher the probability of a change in floorspace.
* Large sales decreases and all sales increases lead to a higher probability of refurbishing.
* In negative sales conditions, the more recent the sales drop, the more inclined retailers are to take action, suggesting that retailers want to react quickly when sales go down.

10.3.3 Joint occurrence and appearance of actions

A particular problem in the study of retailer reactive behaviour is that the potential actions may appear jointly and that there may be large differences in how actions are implemented once they are chosen. To explore to which extent actions are likely to occur in bundles, we had our retailers indicate which actions they expect to occur together with the actions they chose as most likely to occur. We quantified joint occurrence by calculating the relative choice frequencies for all pairs of most likely and co-occurring actions. It appeared that floorspace adjustments, refurbishings and image adjustments are least mutually exclusive and most tend to occur together. To a lesser extent, relocations tend to occur in combination with these actions. In contrast, apart from store closure, investing in the environment was the action that was least likely to be chosen in combination with other actions. Thus, we were able to explore the non-exclusiveness of the actions defined in our study. The further application of these results could involve that the predictions from our subjective probability choice models are adjusted, such that they entail the total probabilities of actions, either occurring single or in bundles.

To explore what actions will look like, if implemented, we also asked the retailers various questions about the actions that they had chosen at least once in the choice tasks. The resulting data suggest there are no differences between negative and positive scenarios in the appearance of actions. They furthermore suggest that almost all relocations would be within Maastricht, many of them within the own shopping area, and equally often to more expensive as to less expensive

sites. Of the branch store openings, roughly half would be in another area within Maastricht, the other half outside of Maastricht. Most branch stores would be located at similar priced locations. Most floorspace adjustments would involve sales space increases, even when conditions get worse. Finally, our efforts to measure image changes were not very succesful, so we could not draw conclusions about what image changes will look like.

This approach to investigate joint occurrence and appearance of actions was only a first and exploratory attempt to gain further insight in the nature of retailer reactive behaviour. As a first step, we quantified the joint occurrence or non-exclusiveness of the actions defined in our study. Further aspects of the joint occurrence and appearance of actions should be investigated in future studies on retailer behaviour. Methodological issues like the usefulness and validity of these new approaches are also left for further research.

10.3.4 Benefits, design issues, and topics for further research

This study demonstrated the various benefits of a conjoint-based approach to the investigation of retailer behaviour. In contrast to most previous studies, we were able to obtain high response rates, multiple observations per respondent, sufficient variation in independent variables, and experimental control. Moreover, retailers felt free to answer questions about their stores because they were framed as hypothetical conditions.

The study also demonstrated the issues and trade-offs that are involved in developing conjoint applications to study retailer behaviour. Indeed, several of the limitations of our application originate in design decisions that were made earlier. First, the results should be viewed cautiously inasmuch as we may have used too small a range of percent changes in sales and environmental factors to produce reliable effects. Indeed, particular stores may easily observe sales and environmental trends double the size as the largest trends in our scenarios. We used relatively restrictive ranges to ensure that the scenarios would be feasible to all types of retailers.

Second, to ensure a broad exploration of retailer behaviour and to obtain a sufficient number of retailer respondents within our study area, we wanted that all types of retailers would be included in the study. As a consequence, however, a very heterogeneous sample was obtained. This heterogeneity was particularly problematic because each retailer received only two scenario profiles from a large

design. As an alternative approach, one could use much smaller designs, such that for each respondent a complete replication can be obtained. Having said that, it should be mentioned that we included a three by three sampling design in the scenario design and did find only few effects. This suggests that the heterogeneity in retailer behaviour goes beyond simple a priori classifications. Note also however that the choice model that we extended with inertia factors avoids the need for any classification.

Third, we could have designed the scenarios to vary only one environmental change at a time. This would make the task more easy to complete. However, then a major advantage of using factorial designs would be lost. We now obtained responses for each factor across a range of other factor levels, hence, effects may be assumed to be relatively robust. Of course, this robustness is limited in that the designs that were used do not allow the assessment of interactions between different scenario factors. To allow the assessment of interactions, we should have included fewer scenario factors. However, as literature and pretests indicated all factors to be potentially important, we considered it better to explore and quantify all environmental factors.

Fourth, one could argue that we should have included a control condition for sales by having a set of scenarios that have neither a sales increase nor a decrease. Such a control group would have broadened the scope of the research. If environmental factors have effects in these conditions, this would indicate pro-active behaviour as no effects on sales were yet observed. We refrained from adding such a control group, however, because it would have further increased the size of the scenario design and because it would in a way duplicate the data that were collected for the retailer's current conditions. As a less satisfying compromise, we included the plus and minus five percent sales trends to explore the effects of environmental changes in conditions with small sales changes. Unfortunately, however, we did not nest the environmental factors under these two sales trend levels but collapsed small and larger sales trend increases into one 'positive scenario' condition and the small and larger sales decreases were collapsed into one 'negative scenario' condition under which we nested the environmental factors. Therefore, the five percent sales increase and decrease levels could not serve as a control group. Indeed, the plus and minus five percent sales trend conditions may even have diluted the effects of environmental factors that could appear with larger sales trend changes.

The choice task to measure retailers' subjective probabilities about the occurrence of actions in the near future appeared easy to complete and produced data that allowed us to derive subjective probability scores for each of the actions. In addition it allowed us to explore the extent into which the actions are non-exclusive and jointly occur. In this application only seven actions were included because we wished to have balanced choice sets and no more than eight choice sets per task. In other applications one might wish to include more actions, or to include actions that vary on particular attributes. A limitation is that the choice data cannot be analyzed for each individual separately, however, this problem is common to all conjoint choice applications. One might also wish to assess the reliability of the measures. Reliability measures could for example be obtained by including holdout choice sets in the task and measuring how well the model can predict these holdouts. Alternatively, one could collect data in different formats, for example, use direct numerical probability estimates, and compare the results to assess the reliability, hence validity, of this task. In a pilot study (not reported here), we performed such a cross-validation and the validity proved to be satisfactory (Oppewal, Louviere and Timmermans 1991).

It should be acknowledged that in the approach we took, we a priori accepted the conclusion from the limited available literature that "retailers are merely reactive". Though a majority may be reactive, it is the proactive minority that may drive the market. Moreover, we pose that though in numbers of outlets these retailers may be a minority, in terms of the sales space they occupy, they may be a majority, and an increasing majority. It are the larger chains and larger stores that are important in directing future developments in retailing, either when developing new sites, negotiating opening hours or labour contracts, or introducing new technologies such as electronic payment. Most importantly, it are they who attract customers to a shopping centre.

Also, the present study did not pay much attention to the many local political and strategical aspects and local real estate conditions that may largely determine which retail developments are possible at all. Finding a possible site to locate a new store or to which to relocate, getting the allowance from local authorities to extend a store's floorspace, rental agreements that say that competitors are not allowed to open their doors within a centre, and many more possible factors may interfere with the processes that we studied. Implicitly, however, our approach included all these factors because retailers had to express their opinions on what they think is likely to happen. Expectations of these 'local

experts' are based on all these types of factors in addition to the factors that we manipulated in the scenarios, hence they are absorbed in the results. On the negative side, this also means that the model estimates for our study area cannot readily be generalized to other cities or even to other time periods. Such generalizations will require further data collection to update the models.

Despite these limitations, this research represented a first step towards understanding how retailers respond to changes in their marketing environment. The present study demonstrated that conjoint-based methods can be fruitfully applied to study entrepreneural behaviour. We developed a conceptual model of retailer behaviour and, by using conjoint-based methods, we were able to study some of the relations posed in this model. The study has shown that the interpretation of, and reaction to sales trends is conditional on the various environmental conditions in which a trend may occur. It implies that if planners or retail managers want to assess how retailers will react to sales trend changes, they should take the environmental conditions into account under which a sales trend occurs. In further research, the model should be further developed and investigated. For example, it could be studied how new entrants choose a location and marketing strategy (cf. Timmermans 1986) and how the model can be specified for different types of retailers. Further research on these issues is important because so little is known, yet, about how and why retailers behave the way they do.

10.4 Epilogue: A tool to simulate spatial retail dynamics?

Retailer reactive behaviour concerns actions which retailers perform to exploit, counteract, or just comply with developments which they observe in the retail market. The focus in Part II of this thesis has been on retailer spatial reactions to observed sales trends because sales volumes determine the economic feasibility of stores and because it seemed likely to assume that sales trend information is actually used by retailers to evaluate store performance.

An additional reason for focussing on sales trends stems from our interest in modelling spatial retail dynamics. Traditionally, changes in retail structures are only inspected for their direct impacts on sales volumes. However, retailers may react in systematic ways to exploit or counteract these observed changes in sales volumes. These reactions involve (additional) changes in the retail structure, which lead to (additional) changes in consumer choice patterns. It has been argued that

these additional changes may invalidate the original sales forecasts (e.g. Currim and Wittink 1980; Van de Linde 1980). In order to obtain a more complete assessment of the likely impacts of new retail developments one should investige these reactive effects. One can take this argument even further and speculate that a predictive model of retailer reactive behaviour can be used in combination with a consumer model as a tool to simulate urban dynamic processes. It has been suggested (Harris 1985; Van der Heijden 1986; Oppewal and Timmermans 1988) that this would allow a new way to investigate the dynamics of spatial retail structures. Spatial retail dynamics have been studied previously using aggregate modelling approaches (e.g. Harris and Wilson 1978; Clarke and Wilson 1983; Lombardo and Rabino 1985). Disadvantages of these approaches include unrealistic assumptions regarding retailer behaviour and difficulties in relating results to the empirical domain. The advantage of a more 'bottom up' approach would be that it is based on established behavioural theory and directly linked to the empirical domain.

At present, it is unclear whether it is feasible to develop empirically based models in such an integrated framework. The work by Van der Heijden (1986) was a first attempt in this direction and recently Krider and Weinberg (1994) presented a simulation of dynamic spatial competition in retailing based on simple but realistic assumptions about reactive management behaviour. One of the goals of future research should be to explore this issue, that is, to see if models of consumer and retailer choice behaviour can be developed in an integrated framework, such that they can be used in combination as a tool to simulate the dynamics of retail environments. Though it was beyond the scope of this thesis to develop such a simulation tool, the study provided the basic ingredients for such an approach. Our models in principle allow one to use output from one model as input for the other model, and vice versa, as shown in Figure 10.1. In analogy to Van der Heijden (1986), the integrated use would involve that the consumer model is used to predict consumer expenditures at each of the shopping centres in the study area from the centres' attribute scores. The retailer model predicts retailer reactions to changes in consumer expenditures in terms of changes in the attributes scores of the shopping centres. The retailer model constitutes a link that transforms the output of the consumer model (predicted changes in sales) into new input values for this model (new attribute scores). Dynamic aspects of the retail system could be represented in a repeated integrated operation of our models.

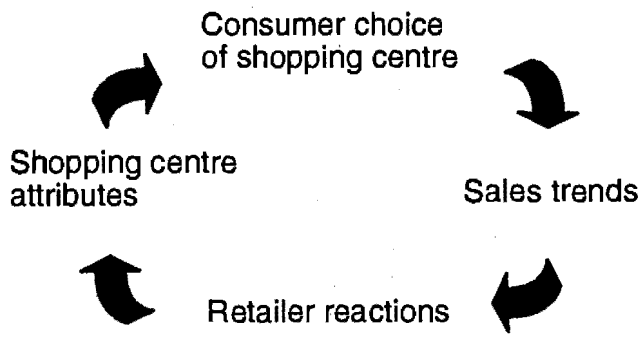

Figure 10.1 Framework for the integrated operation of the consumer and retailer models.

As a first step, where possible, we defined our models to anticipate such an integrated operation of models. This involved that the independent and dependent variables in the models were defined as follows:

* The response measure in the consumer choice experiment was an allocation of monthly household budgets among available shopping centres. Though this definition resulted in a higher task load than when only destination choices or trip frequencies had been asked, the advantage is that it allows us to more directly predict consumers' expenditures at shopping centres (by multiplying predicted allocations with average household budgets). These expenditures in turn allow us to derive the total sales volumes at each shopping centre.
* The retailer study explicitly focussed on modelling retailer reactions to observed changes in sales volumes instead of exploring more general issues regarding retailer behaviour. To some extent this was premature because so little is known yet about retailer behaviour and we had to rely on a largely untested conceptual model. The positive side, however, is that our limited focus resulted in a retailer model that can be directly applied to sales trend predictions obtained from the consumer model. Note, however, that the sales predictions from the consumer model involve total shopping centres whereas the retailer model in principle should be applied to sales trends observed for individual stores. Hence, an integrated operation of the models requires one to find ways to disaggregate shopping centres' sales trends into individual stores' sales trends.

* The most important dependent variable in the retailer experiment was retailers' subjective probability that particular actions happen to their store within three years. As argued in Chapter 8, by using this definition of the response we were able to avoid the various issues that arise if one wants to predict organizational choice behaviour from individual preferences. These issues include the nature of group and organizational decision making and the succes rate of action implementations. We were only provisionally able, however, to establish a link between subjective and objective probabilities of the occurrence of actions; hence, this is still a missing link in the integrated model. Another link that is still missing is that we do not know how actions, if implemented, translate into changes in shopping centre attributes. As a first attempt, we collected data on how retailers think actions will look, if implemented. Though the reliability of this data is questionable and they are only subjective, in simulations one could sample from these response distributions.
* We defined the shopping centre attributes in the consumer choice experiment as much as possible in physical terms and we tried to establish direct links between objective shopping centre features and conjoint attributes. For example, we defined shopping centre price image as the proportion of available stores that have competitive prices. As a result, minimal operational assumptions are required to translate objective or physical changes in retail environments into changes in values of independent variables (shopping centre conjoint attributes) in the consumer model. For example, this means that if a price competitive store is predicted to move to another centre one only has to adjust the proportions in the old and new centre to use the consumer model to predict changes in sales volumes. There are two potential other ways to model the relation between retailer actions and conjoint shopping centre attributes. First, one can rely on the insight of the retailer respondents and ask them how they think their actions will affect the shopping centre attributes. Again, however, it is questionable to which extent such an approach could produce valid responses. A second way involves the development of a separate (non-behavioural) model to describe and predict how retailer investment budgets are formed and how they are allocated to the implementation of actions (cf. Oppenheim 1986b; Van der Heijden 1986). A disadvantage of such approaches is that many ad hoc assumptions are required.
* Because our consumer and retailer models were estimated for the same study area, the city of Maastricht, we have a potentially optimal match between the

models because peculiarities of the area may have similar disturbing effects on both models. A negative consequence, however, of restricting the retailer study to one city was that we had to include retailers from various locations and product categories, which led to more heterogeneity in the data.

The previous discussion of how we accommodated our models to allow their integrated operation in a larger framework revealed some of the issues that are involved in the development of integrated models. Another important issue is which time scale to use in the operation of the models. At some given point in time, output from the one model is fed into the other model, and then for some given time the models have to operate separately again. At what point in time should the exchange between models happen? The simplest approach would be to have equal time intervals in which the consumer and retailer models are applied to all members of the relevant populations of consumers and retailers. Assuming a linear cumulative probability distribution over time for actions and attribute changes, one can also vary the forecasting periods (and take corresponding proportions of predicted values) to explore whether equilibrium situations develop. Because models are applied at the individual level it is also possible to vary the scope of model exchanges. This gives for example the opportunity to experiment with delays in when consumers perceive the shopping centre attribute changes.

There are many other unexplored and unsolved issues in the application of such models. How should one accommodate for local policies regarding allowances? How to assess the stability of model predictions when models are operated in sequence and prediction errors may multiply? How can we predict the type of location retailers choose when they relocate? How is the local real estate market affected by these decisions? These and many more questions arise with the further application of individual choice models to separate actors in a dynamic system. This clearly demonstrates that much more research is required before dynamic models can be developed that can be used for practical planning purposes. The contribution of this study to the modelling of retail dynamics is that it explores some of the issues involved and that it demonstrates how conjoint approaches can be used to build the requisite empirical models of consumer and retailer behaviour.

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APPENDICES

Appendix A Residential zones in Maastricht

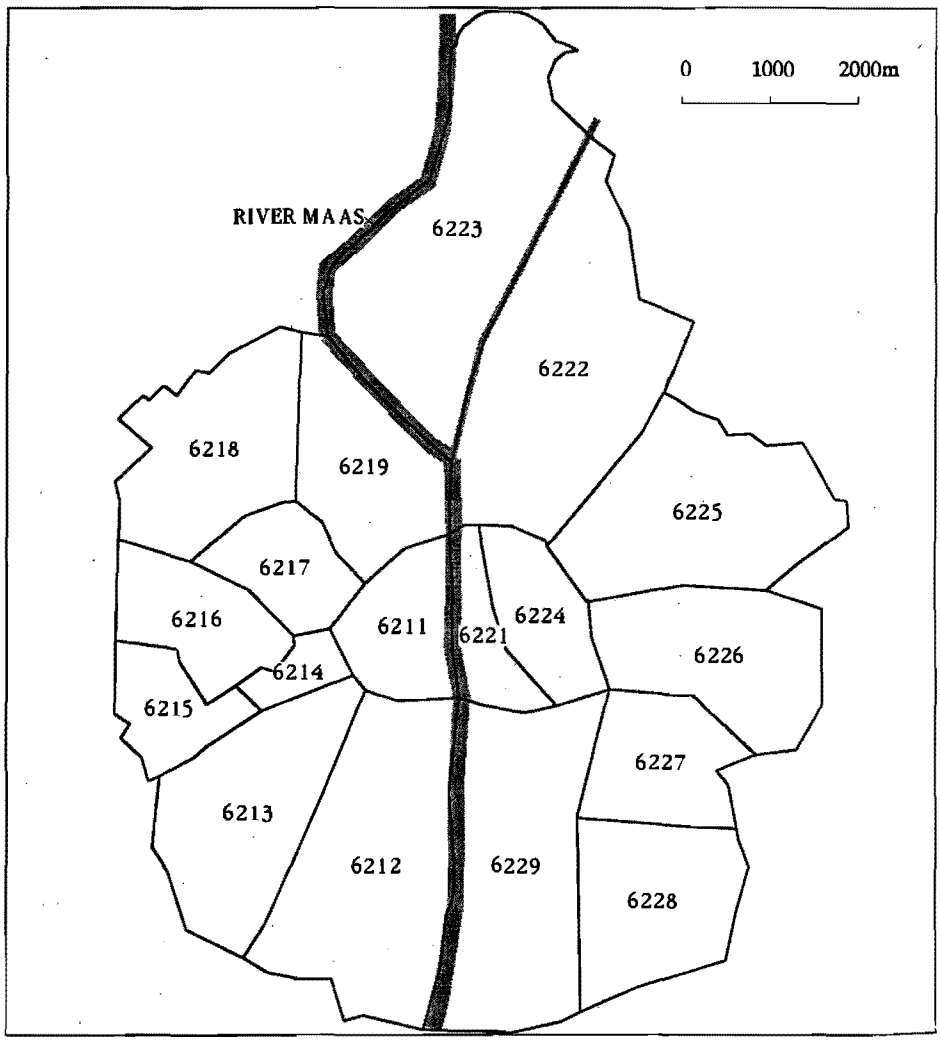

Figure A.1 Map of postal code areas in Maastricht.

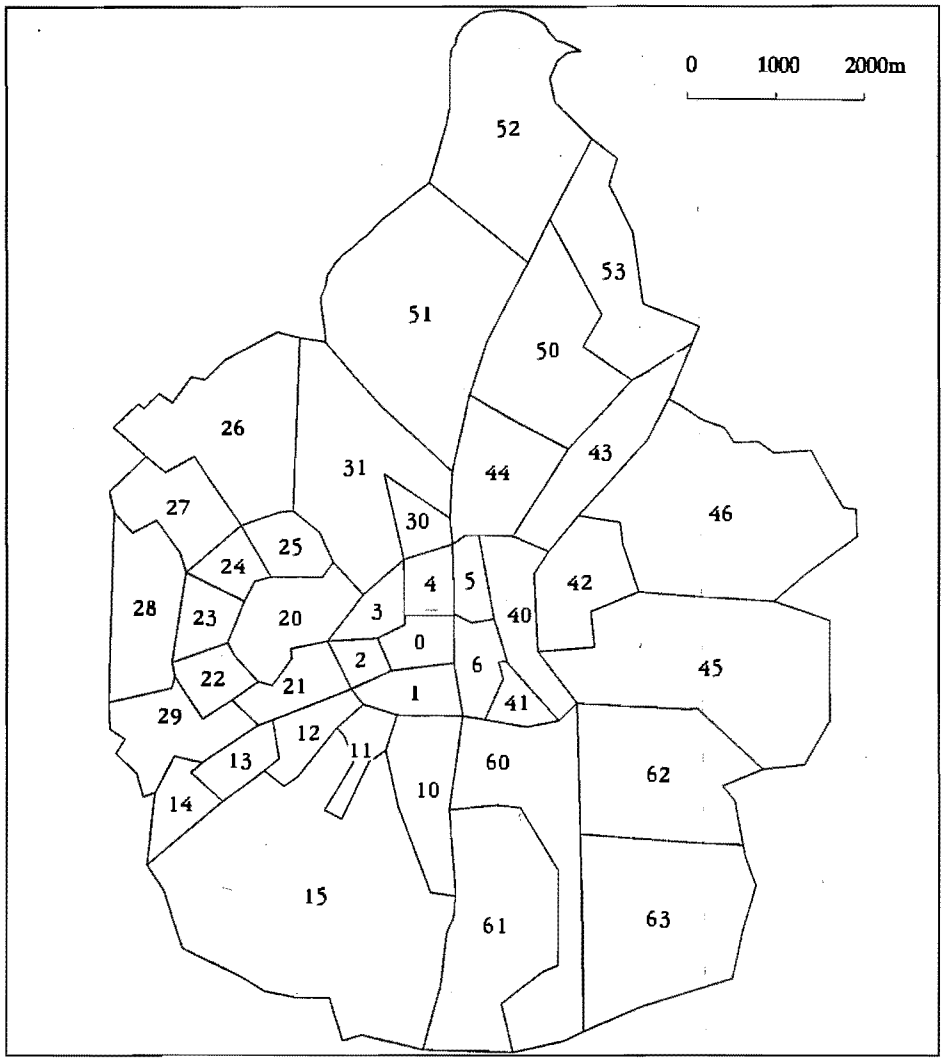

Figure A.2 Map of neighbourhoods in Maastricht (CBS codes).

Table A.1 Correspondence between neighbourhood and postal code area locations and population size per neighbourhood (Dec 1989).

Neighbourhood code (CBS)	Neighbourhood name	Corresponding postal code area(s)	Population size[a]
0	City	11	1618
1	Jekerkwatier	11	1735
2	Kommelkwartier	11	2152
3	Statenkwartier	11	2408
4	Boschstraatkwartier	11	1720
5	St. Maartenspoort	21	1599
6	Wyck	21	2688
10	Villapark	12	3168
11	Jekerdal	12	1389
12	Biesland	13	1688
13	Campagne	13	1533
14	Wolder	13,15	1788
15	St. Pieter	12,13	161
20	Brusselsepoort	16,17	4280
21	Mariaberg	14	5171
22	Belfort	16	3092
23	Pottenberg	16	3043
24	Malpertuis	17	2766
25	Caberg	17	3790
26	Oud-Caberg	18	1815
27	Malberg	18	6521
28	Dousberg/Hazendan	15,16,18	22
29	Daalhof	15	8212
30	Boschpoort	11,19	1147
31	Bosscherveld	19	358
40	Wyckerpoort	24,27	4025
41	Akerpoort	21	2892
42	Oostermaas	24,25,26	5693
43	Nazareth	22	3808
44	Limmel	22	2454
45	Scharn	26	5775
46	Amby	25	4722
50	Beatrixhaven	22	53
51	Borgharen	23	2102
52	Itteren	23	1120
53	Meerssenhoven	22	53
60	Randwyck	27,29	1554
61	Heugem	29	3330
62	Heer	27	8408
63	De Heeg/Vroendaal	28	7127
64	Vroendaal	28	46
	Total:		117026

[a]*Source: Gemeente Maastricht (1990)*

Appendix B Shopping Areas in Maastricht

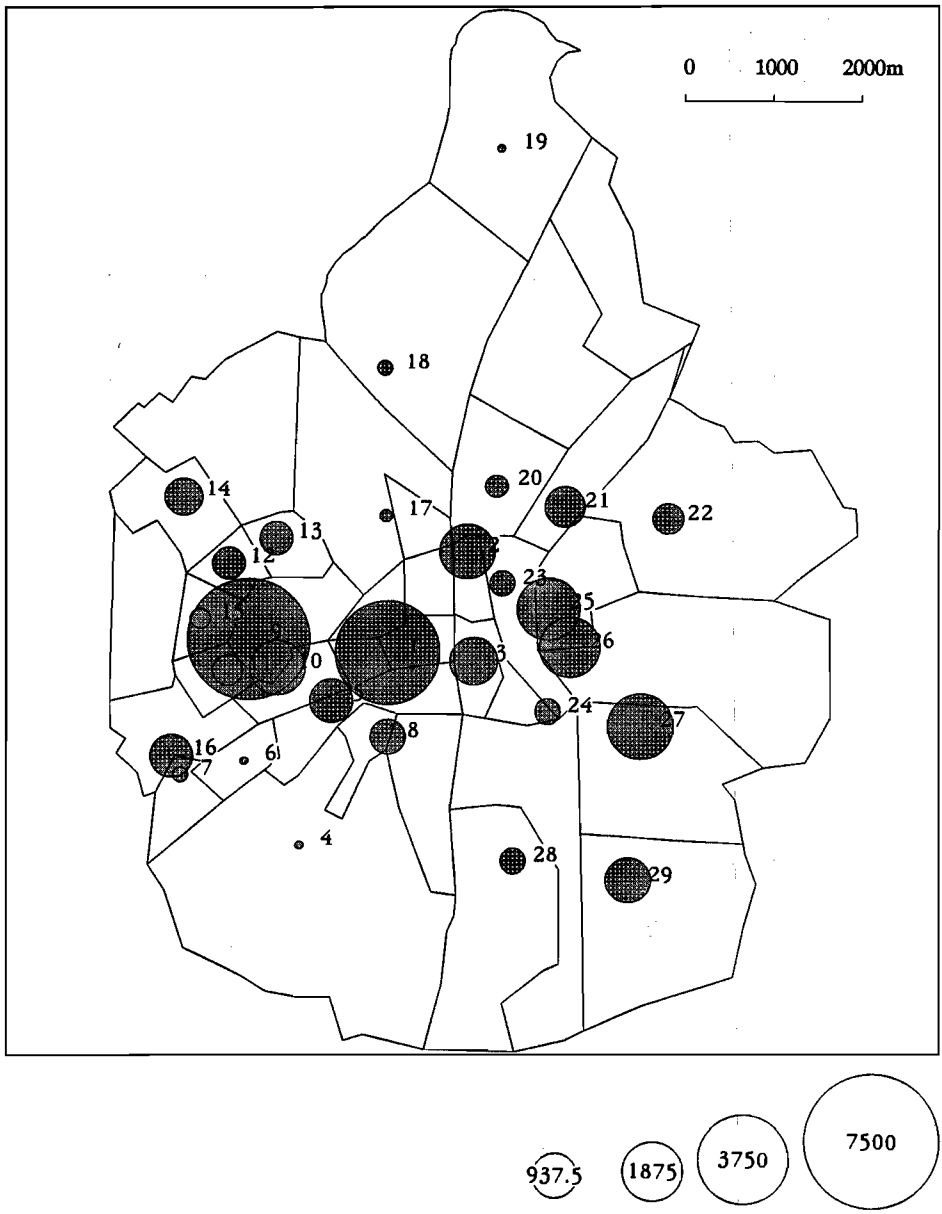

Figure B.1 *Map of Maastricht shopping areas and their sizes (sales floorspace food, in m^2). For area names, see Table B.1.*

Table B.1 Number of stores and size of total sales floorspace in the shopping areas in Maastricht (June 1987)

Nr.	and name of area	Number of stores		Total sales floorspace (m^2)	
		Food	Non-food	Food	Non-food
1	Binnenstad-West	116	408	5451	62805
2	St. Maartenspoort	4	5	1809	9972
3	Wyck	27	73	1486	5654
4	Jekerdal	4	2	86	32
5	Biesland	4	5	1171	1241
6	Campagne	2	0	105	0
7	Wolder	6	1	236	38
8	Villapark	16	3	912	98
9	Brusselsepoort	19	27	7312	4338
10	Mariaberg	35	8	1893	433
11	Belfort	4	0	677	0
12	Malpertuis	14	3	779	253
13	Caberg	13	9	745	702
14	Malberg	12	2	1004	219
15	Pottenberg	9	2	373	80
16	Daalhof	10	4	1147	367
17	Boschpoort	6	3	153	79
18	Borgharen	5	3	232	366
19	Itteren	1	1	98	160
20	Limmel	7	4	442	1667
21	Nazareth	15	6	1052	456
22	Amby	11	7	701	867
23	Wyckerpoort	13	2	516	2737
24	Akerpoort	9	2	469	225
25	Oostermaas	25	20	2355	1197
26	Scharn	21	20	2072	2791
27	Heer	34	23	2375	3078
28	Heugem	9	3	495	185
29	De Heeg	13	4	1264	170
	Total	464	650	37410	100210

Source: Gemeente Maastricht (1987).

Appendix C Average attribute perceptions of shopping areas in Maastricht

Table C.1 Average attribute perceptions of shopping areas in Maastricht, as reported in the consumer questionnaire (n = 428).*

			Total evaluation when shopping for		Construct Ratings				Convenience Attributes				
					Convenience				Parking costs				
					Appearance				Parking convenience				
			Food				Food Stores				Public transport		
Nr.	and name of area	n[a]		Clothing &shoes				Clothing Stores	& shoes			Travel-time	Services
1	Binnenstad-West	408	6.3	7.5	7.0	6.9	6.5	7.3	4.7	2.3	5.1	13.1	4.9
2	StMaartenspoort	50	6.5	4.7	7.1	5.4	6.6	4.4	1.0	5.1	4.2	10.4	1.3
3	Wyck	90	6.4	6.3	7.2	6.4	6.2	6.2	3.6	2.7	5.0	10.6	3.6
4	Jekerdal	38	6.3	3.6	6.9	5.3	6.3	3.6	1.0	4.9	3.9	6.9	2.1
5	Biesland	32	5.9	3.9	7.0	5.1	6.2	3.8	1.0	4.9	4.4	4.8	1.7
6	Campagne	1	2.0	1.0	7.0	6.0	1.0	1.0	1.0	5.0	-	5.0	1.0
7	Wolder	10	4.7	1.7	7.4	6.1	3.5	1.0	1.0	5.5	3.8	4.2	1.6
8	Villapark	23	6.1	3.3	7.6	5.1	5.2	2.3	1.0	4.7	3.0	3.9	2.8
9	Brusselsepoort	221	6.9	6.0	6.9	6.4	7.2	6.1	1.1	4.8	4.6	10.3	2.9
10	Mariaberg	37	6.0	3.5	7.0	4.8	6.3	3.5	1.1	4.7	4.1	5.4	1.6
11	Belfort	10	6.3	3.4	6.3	5.7	6.3	4.6	1.0	5.1	4.7	5.9	2.4
12	Malpertuis	12	5.7	6.3	7.7	5.0	5.5	-	1.0	4.9	4.7	4.4	2.0
13	Caberg	17	5.9	6.3	7.1	5.4	5.2	5.0	1.0	5.3	4.4	6.5	2.9
14	Malberg	31	7.2	5.6	7.8	6.5	7.0	5.3	1.0	5.0	5.3	5.2	2.9
15	Pottenberg	12	7.3	3.6	7.5	6.5	6.8	4.0	1.0	5.6	4.3	6.7	2.2
16	Daalhof	35	6.3	4.2	7.1	5.4	6.4	4.6	1.0	5.1	3.9	4.7	2.5
17	Boschpoort	13	5.9	4.9	8.2	5.6	5.9	1.0	1.0	5.2	-	2.5	1.0
18	Borgharen	17	5.7	2.3	6.8	4.9	4.5	1.7	1.0	5.6	5.2	3.7	1.9
20	Limmel	7	5.0	2.4	6.4	5.2	5.8	-	1.0	4.2	4.0	5.6	1.8
21	Nazareth	12	7.3	4.9	8.2	5.6	6.7	4.0	1.0	4.9	4.7	6.1	2.6
22	Amby	17	6.8	1.6	7.5	6.4	6.2	5.0	1.0	5.4	4.9	9.1	3.7
23	Wyckerpoort	4	6.8	5.5	6.8	6.7	7.3	4.5	1.0	5.5	3.3	9.3	2.0
24	Akerpoort	5	4.3	4.3	6.0	4.6	5.0	1.0	1.0	4.8	4.2	10.4	1.8
25	Oostermaas	64	6.7	4.4	7.2	5.4	6.9	4.3	1.1	4.6	4.1	7.7	2.4
26	Scharn	58	6.5	3.7	7.1	5.3	7.3	4.7	1.3	4.6	4.2	7.8	3.0
27	Heer	65	6.5	4.5	6.9	5.5	6.9	5.4	1.2	4.4	4.5	8.2	3.4
28	Heugem	23	6.1	2.9	7.2	5.1	5.4	2.0	1.0	4.2	4.7	3.7	1.5
29	De Heeg	16	5.3	1.6	7.8	4.1	5.1	1.0	1.2	5.3	3.2	3.6	1.6

* Attribute definitions are identical to the attributes that were used in the experiment, see Tables 4.3 to 4.5. See Table C.2 for the definition of response categories for these attributes in the survey.

[a] *n*: the number of respondents who evaluated the shopping area.

(Table C.1 - continued)

		Appearance									
		Pattern			Crowded			Mainten			Coffee-s
			Indoors			Decorat			Window-d		
				Pedestrn			Green			Activits	
1	Binnenstad-West	4.7	18.9	70.4	4.8	4.1	1.7	5.4	75.8	3.9	5.3
2	StMaartenspoort	4.5	14.3	24.0	4.3	2.4	1.4	5.4	37.0	2.1	1.4
3	Wyck	4.3	6.8	23.8	3.8	3.5	1.9	5.5	64.9	3.6	4.0
4	Jekerdal	3.8	21.4	22.4	2.8	1.9	2.3	4.5	33.6	1.8	1.5
5	Biesland	4.1	49.7	50.7	3.8	2.2	2.0	4.8	20.0	1.6	1.5
6	Campagne	1.0	0.0	0.0	1.0	1.0	2.0	6.0	0.0	1.0	2.0
7	Wolder	2.6	0.0	11.4	1.6	1.4	3.2	5.7	23.8	2.1	3.1
8	Villapark	3.6	1.8	8.7	1.9	1.7	2.9	4.9	36.2	2.3	2.0
9	Brusselsepoort	5.3	94.4	89.8	4.2	3.5	1.7	5.4	55.1	3.7	2.7
10	Mariaberg	3.4	5.1	24.2	3.5	1.7	2.4	4.6	22.3	1.5	1.8
11	Belfort	4.2	32.5	47.8	3.3	2.7	2.7	4.5	53.0	2.5	1.4
12	Malpertuis	4.5	9.1	33.3	2.5	2.7	1.8	4.9	40.0	2.0	1.3
13	Caberg	4.4	75.0	43.8	3.4	2.4	2.7	5.8	58.0	2.8	1.5
14	Malberg	4.7	78.3	52.0	3.3	2.6	2.6	5.7	71.3	2.8	1.2
15	Pottenberg	4.3	20.0	41.8	3.2	3.1	3.2	5.3	56.4	2.6	1.6
16	Daalhof	4.7	70.8	70.0	3.1	3.0	2.2	4.6	44.5	2.5	1.2
17	Boschpoort	2.5	0.0	0.0	3.0	1.6	3.7	4.8	37.5	1.3	2.0
18	Borgharen	3.4	0.0	2.4	2.5	1.4	1.8	4.8	18.8	1.4	1.7
20	Limmel	4.0	0.0	0.0	2.3	1.2	2.8	4.7	22.0	2.6	1.7
21	Nazareth	3.9	3.3	15.0	2.9	1.6	1.9	5.2	41.8	2.3	2.0
22	Amby	3.9	7.5	7.7	3.4	2.4	2.9	5.5	59.4	2.8	1.4
23	Wyckerpoort	4.3	22.5	47.5	3.0	2.3	2.5	5.8	43.3	1.3	1.0
24	Akerpoort	3.8	2.0	24.0	3.8	2.0	1.8	5.2	37.5	1.8	1.5
25	Oostermaas	3.7	13.9	19.8	4.1	2.1	2.2	5.1	37.8	2.0	1.7
26	Scharn	3.8	3.0	7.6	4.0	2.0	1.5	5.2	47.7	2.0	2.2
27	Heer	3.5	3.9	8.8	3.7	2.1	1.5	5.1	55.2	2.3	2.5
28	Heugem	3.8	2.3	5.9	2.8	1.4	1.5	5.1	24.8	1.2	1.1
29	De Heeg	5.4	65.0	86.3	3.8	1.6	1.8	3.5	15.3	2.9	1.2

(Table C1 - continued)

		Food Stores								
		Units			Choice-r			Supplies		
			Basic-r			Prices			Service	
				Superm			Quality			Furnishm
1	Binnenstad-West	34.7	87.8	2.5	70.3	48.4	63.8	52.1	54.8	60.2
2	StMaartenspoort	6.6	86.3	1.0	77.0	61.8	66.3	57.8	65.7	70.2
3	Wyck	14.0	74.4	0.6	59.4	37.8	66.3	56.2	63.8	63.8
4	Jekerdal	9.4	61.8	0.9	53.1	45.1	57.2	35.8	58.1	56.2
5	Biesland	7.1	67.5	1.0	57.9	47.5	59.3	36.9	55.3	53.0
6	Campagne	-	10.0	-	0.0	0.0	90.0	0.0	90.0	70.0
7	Wolder	3.0	27.0	0.0	31.1	31.4	72.0	49.0	71.1	64.4
8	Villapark	11.1	80.0	0.8	50.5	18.9	65.5	43.7	61.4	42.5
9	Brusselsepoort	16.1	82.5	1.9	74.3	51.8	65.7	51.6	60.1	68.7
10	Mariaberg	10.2	68.9	0.9	46.9	42.9	56.6	46.3	55.6	49.7
11	Belfort	6.7	48.9	0.8	41.0	30.0	45.0	32.5	54.0	57.0
12	Malpertuis	7.5	53.6	0.3	47.3	24.6	59.1	55.5	61.8	52.7
13	Caberg	10.6	60.8	1.1	49.2	39.1	60.0	50.0	60.0	52.3
14	Malberg	11.2	82.0	1.0	72.1	42.2	71.4	56.6	72.7	78.3
15	Pottenberg	8.0	39.0	0.6	43.3	46.0	61.8	42.0	64.2	63.3
16	Daalhof	9.3	61.2	0.8	51.5	37.2	56.2	44.8	56.4	53.9
17	Boschpoort	3.4	62.3	0.1	45.4	49.2	57.7	56.9	69.2	61.5
18	Borgharen	6.3	60.6	0.7	27.7	11.4	52.4	32.4	54.1	33.1
20	Limmel	11.3	60.0	0.0	43.3	12.5	74.0	64.0	81.7	66.7
21	Nazareth	10.1	100.	0.8	66.4	33.6	59.1	67.3	87.3	66.7
22	Amby	15.6	80.6	0.8	62.5	41.3	70.6	72.5	76.5	64.7
23	Wyckerpoort	8.0	82.5	1.0	70.0	35.0	63.3	56.7	60.0	76.7
24	Akerpoort	5.5	42.0	0.0	56.0	33.3	54.0	42.0	58.0	58.0
25	Oostermaas	17.4	78.5	0.7	70.0	49.8	67.8	53.9	58.4	61.5
26	Scharn	13.6	72.1	1.5	71.3	52.3	68.4	59.8	70.2	71.4
27	Heer	17.6	74.1	1.3	61.6	51.2	62.8	53.8	68.7	60.6
28	Heugem	7.8	57.8	1.4	41.9	30.6	49.1	44.3	72.3	46.5
29	De Heeg	8.3	68.1	0.9	42.5	23.6	50.0	37.9	56.3	50.0

Table C.2 Definition of attribute perception response categories in the consumer survey*

Total evaluations:	1 = extremely unattractive ,..., 9 = extremely attractive
Construct ratings:	1 = extremely bad (or unpleasant, or inconvenient), ..., 9 = extremely good (or pleasant, or convenient)
Parking costs:	1 = 0 cts/hr, 2 = 50cts/hr, ... , 7 = 300 cts/hr
Parking convenience:	1 = very difficult, ..., 6 = very easy
Public transport access.:	1 = very bad, ..., 6 = very well
Travel-time:	number of minutes
Services:	1 = very few, ..., 6 = very many
Pattern:	1 = very dispersed, ..., 6 = very compact
Indoors:	0, 10, 20, ... , 100% of shopping area indoors
Pedestrian:	0, 10, 20, ... , 100% of shopping area reserved
Crowdedness:	1= very quiet, ..., 7 = very crowded
Greenery:	1 = very little, ..., 6 = very much greenery
Decorations:	1 = very few, ..., 7 = very many
Maintenance:	1= very bad, ..., 7 = very well
Window-displays:	0, 10, 20, ... , 100% of all store fronts
Activities:	1 = very few, ..., 6 = very many
Coffee-shops:	1 = very few, ..., 6 = very many
Units:	*constructed score:* 5 * [the estimated number of supermarkets] + [the estimated number of (smaller) food stores]
Basic range of product categories:	0, 10, 20, ... , 100% of all food product categories
Supermarkets:	0, 10, 20, ... , 100% of all food store units
Choice ranges:	0, 10, 20, ... , 100% of all food store units
Prices:	0, 10, 20, ... , 100% of all food store units
Product quality:	0, 10, 20, ... , 100% of all food store units
Supplies:	0, 10, 20, ... , 100% of all food store units
Service:	0, 10, 20, ... , 100% of all food store units
Furnishment:	0, 10, 20, ... , 100% of all food store units

*Response categories in the questionnaire corresponded to the attribute levels used in the experiments, though in some cases intermediate and/or extremer levels were used. Note that before these attribute scores can be used as input to the experimental choice model to predict choices, they need to be recoded into the metric of the linear and quadratic attribute components that were used during model estimation.

Appendix D Consumer orientations in Maastricht

Table D.1 Percentage allocations of budgets from residential zones (columns, see Appendix A) to shopping areas (rows, see Appendices B and C). Dashes indicate that a shopping area was not considered by any respondent from the zone.

Residential zone (postal code area 66+ ..)	11	12	13	14	15	16	17	18	19	21	22	23	24	25	26	27	28	29
Number of respondents in zone: n	21	46	29	29	23	19	28	19	15	36	20	17	33	17	25	10	17	24
Shopping area:																		
1	57.4	17.6	5.8	7.1	1.7	0.6	18.0	2.1	21.3	37.0	18.3	5.6	10.3	1.5	6.2	4.0	2.6	7.4
2	0.0	-	-	0.4	-	-	-	-	-	11.0	17.2	28.1	4.1	0.0	0.6	-	-	0.4
3	0.5	1.8	-	0.0	-	4.7	-	-	9.7	20.6	0.0	4.4	8.3	7.1	-	-	0.6	0.7
4	2.1	22.6	7.6	-	-	-	-	5.8	-	-	0.3	-	1.5	-	-	-	2.9	-
5	3.6	4.6	18.0	20.2	3.3	-	-	-	-	-	-	-	-	-	-	-	-	-
6	-	-	0.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	-	-	5.9	-	0.9	-	-	-	-	-	-	-	-	-	-	-	-	-
8	-	19.5	-	-	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-
9	17.6	17.6	34.6	28.8	40.7	46.6	49.7	22.1	14.7	2.7	5.8	0.0	0.0	-	2.2	-	5.3	10.2
10	3.6	-	6.9	38.0	1.1	5.9	-	3.9	-	0.6	-	-	2.9	-	-	4.0	-	-
11	-	-	0.0	-	8.0	10.6	-	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	0.2	-	5.9	-	-	-	-	-	-	-	-	-	-	-
13	-	-	-	0.0	0.0	-	3.6	-	10.0	-	-	-	-	-	-	-	-	-
14	-	-	0.2	0.0	0.0	0.9	9.1	54.2	3.3	-	-	-	-	-	-	-	-	0.0
15	0.5	-	0.0	-	-	18.8	-	-	-	-	-	-	-	-	-	-	-	-
16	-	-	7.2	0.0	30.9	0.0	-	-	-	-	-	-	-	-	-	-	-	-
17	-	-	-	-	-	-	-	-	14.0	-	-	-	-	-	-	-	-	-
18	-	-	-	-	-	-	-	-	-	-	-	29.4	-	-	-	-	-	-
19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-	-	-	-	5.0	-	-	-	-	-	-	-
21	-	-	-	0.0	-	-	-	-	-	-	18.1	-	0.6	-	-	-	-	-
22	-	-	-	0.0	-	-	-	-	-	-	0.3	-	-	31.2	1.8	-	-	-
23	-	-	-	-	-	-	-	-	-	-	-	-	6.1	-	-	-	-	0.0
24	-	-	-	-	-	-	-	-	-	-	-	-	3.2	-	-	-	-	0.9
25	4.3	3.9	-	-	-	-	-	-	6.0	16.1	12.8	0.0	49.2	7.1	-	-	3.2	5.2
26	-	3.9	-	1.3	-	-	0.0	-	-	6.3	0.0	-	-	30.3	49.6	54.0	3.5	0.7
27	0.0	-	0.2	-	-	-	-	0.0	0.0	-	1.4	-	7.3	4.1	22.0	34.5	12.1	4.1
28	-	-	0.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	50.9
29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.2	-	63.5	5.0
30	1.2	1.7	4.6	0.2	4.3	4.7	2.5	3.4	3.3	1.4	10.0	18.8	0.6	11.5	10.6	1.0	3.8	5.7
32	9.3	6.6	7.4	4.1	8.9	7.2	11.2	8.4	17.7	4.3	10.8	13.8	5.9	7.4	6.8	2.5	2.4	8.9
	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Appendix E Legend for multiple correspondence analysis plots in Figure 9.1

EXPECTED ACTIONS

CLS = Close or sell store
RLC = Relocate store
BRA = Open branch store
FLR = Adjust floorspace
RFB = Refurbish store
IMG = Change store image
ENV = Invest in immediate store environment
NOC = No major change.

SALES AND ENVIRONMENTAL TRENDS

--SAL = Large reported sales decrease over past three years (1986 = 100, 1988 < 85)
-0SAL = Small decrease or stable over past three years (1988 between 86 and 100)
+SAL = Small to moderate sales increase (1988 between 101 and 115)
++SAL = Large sales increase (1988 higher than 115)

-CMPW = Competition from within own shopping area decreased over past three years
0CMPW = No change
+CMPW = Increased competition from within

-CMPO = Competition from other shopping areas decreased over past three years
0CMPO = No change
+CMPO = Increased competition from outside

-SIZE = Size of own shopping area decreased over past three years
0SIZE = No change
+SIZE = Increased size

-ATMS = Atmosphere of own shopping area deteriorated over past three years
0ATMS = No change
+ATMS = Improved atmosphere

-ACCS = Accessibility of own shopping area deteriorated over past three years
0ACCS = No change
+ACCS = Improved accessibility

-SPDP = Spending power in own trade area decreased over past three years
0SPDP = No change
+SPDP = Increased spending power

-PRDM = Sales level in own product category decreased over past three years
0PRDM = No change
+PRDM = Increased product category sales

NEED AND POSSIBILITY

fewEXT = Few extension possibilities on present location
modEXT = Moderate extension possibilities
mnyEXT = Many extension possibilities

tooSML = Present floorspace judged too small
okSIZE = Present size of floorspace sufficient
tooLRG = Present floorspace too large

lNEED = Low reported necessity to invest
hNEED = High need to invest

lFINAN = Low reported ability to finance investments
hFINAN = High ability to finance investments

lPROP = Low propensity to invest
hPROP = High propensity to invest

ACTIONS IN THE PAST

nOPN86 = Opened before 1986
yOPN86 = Opened in 1986 or later

nCLS86 = No store closures in M. since 1986
yCLS86 = Firm closed (branch) store(s) in M. since 1986

nFLR86 = No floorspace changes since 1986
yFLR86 = Floorspace changed since 1986

nRFB86 = No refurbishments since 1986
yRFB86 = Refurbishments took place since 1986

nENV86 = No major changes observed in immediate store environment since 1986
yENV86 = One or more major changes in immediate store environment since 1986

nIMG86 = No image changes since 1986
yIMG86 = Store changed image since 1986

RETAILER FIRMAGRAPHICS

LOCA = Centre
LOCB = Fringe
LOCC1 = Community centre
LOCC2 = Neighbourhood centre

FOODSPEC = Foodspecialists
GROCERS = Grocers
DRUGS = Drug stores
CLOTHING = Clothing stores
TEXTILES = Textiles stores
SHOES = Shoe stores
FURNITUR = Furniture stores
FLOWERS = Florists
VARIETIE = Varieties and other stores

INDEP = Independents
COOP = Cooperation members
BRANCH = Branch stores

RENTED = Rented premises
OWNED = Premises in ownership

OWNER = Respondent is owner
MANAGER = Resp. is manager
OTHER-PO = Resp. has other position

FT=0 = < 1 employee (fulltime equivalent)
FT=1 = 1 ft. employee
FT=2 = 2 ft. employees
FT3-9 = 3 to 9 ft. employees
FT>9 = More than 9 ft. employees

SS<50M = Sales space < 50 m^2
SS50-100 = Sales space 50 to 100 m^2
SS100-50 = Sales space 100 to 500 m^2
SS> = 500M = Sales space > 500 m^2

AGE<30 = Respondent's age < 30 years
AGE30-50 = Resp. between 30 and 50
AGE>50Y = Resp. over 50 and has arranged succession
AGE>50N = Resp. over 50 and has not yet arranged succession

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SAMENVATTING

(DUTCH SUMMARY)

Conjuncte meetmethoden (ook wel "stated preference" methoden genoemd) behelzen het gebruik van speciaal ontworpen denkbeeldige keuzesituaties om voorkeuren van individuen te meten en hun keuzegedrag in nieuwe situaties te voorspellen. Dit proefschrift doet verslag van een onderzoek dat ten doel had na te gaan hoe deze methoden geschikt kunnen worden gemaakt voor onderzoek naar de relaties tussen consumentengedrag, winkelcentrum-kenmerken, en winkeliersgedrag. De achterliggende gedachte was dat de voordelen die zijn verbonden aan deze methoden beschikbaar dienen te komen voor detailhandelsplanners bij de overheid en in het bedrijfsleven. Deze voordelen bestaan er in de eerste plaats uit dat gedragsvoorspellende modellen veelal efficiënter kunnen worden ontwikkeld als men de benodigde gegevens verzamelt met behulp van conjuncte experimenten. Ten tweede kan men met deze methoden preferenties en keuzekansen voor (nog) niet bestaande alternatieven onderzoeken en voorspellen, hetgeen bijvoorbeeld het doorrekenen van beleidsvarianten mogelijk maakt. Tenslotte is het mogelijk nauwkeuriger inzicht te krijgen in de waardering die mensen hebben voor kenmerken van alternatieven, met name de kenmerken die voor ontwerpers, planners of managers het meest relevant zijn.

Het onderzoek richtte zich op twee probleemvelden in de distributieplanning. Deze worden uiteengezet in *HOOFDSTUK 1*. Het eerste is het voorspellen van de invloed van wijzigingen in kenmerken van winkelcentra op het keuzegedrag van consumenten. Zowel lokale overheden als winkelbedrijven en projectontwikkelaars hebben belang bij het kunnen inschatten van de effecten van toekomstige veranderingen in winkelstructuren op consumentengedrag en koopstromen. Formele modellen maken het in principe mogelijk om tot betrouwbare schattingen te komen van de effecten en de relatieve invloed van bepaalde beleids- of "marketing-mix" instrumenten op consumentengedrag. Bestaande modelbenaderingen blijken echter onderhevig aan een aantal beperkingen, waardoor hun toepasbaarheid in de distributieplanning gering is. In *DEEL I* van dit proefschrift wordt onderzocht in hoeverre deze beperkingen kunnen

worden vermeden door gebruik te maken van conjuncte meetmethoden. Er wordt hierbij met name aandacht besteed aan de definiëring van kenmerken van winkelcentra en het opnemen van grotere aantallen kenmerken in een conjuncte meettaak. De voorgestelde benadering werd toegepast in een empirisch onderzoek in Maastricht.

Het tweede probleemveld betreft het voorspellen van reacties van winkeliers op veranderingen die zij in hun omzet en winkelomgeving waarnemen, bijvoorbeeld als gevolg van een geplande ingreep. Veranderingen of ingrepen in winkelcentra kunnen leiden tot wijzigingen in koopstromen en dus in de omzetten van winkels en winkelcentra. Inzicht in de wijze waarop winkeliers reageren op zulke veranderingen is nodig om in te kunnen schatten wat de uiteindelijke effecten zijn van een verandering of ingreep in een winkelcentrum op de omringende winkels en winkelcentra, en dus op de beschikbare winkelvoorzieningen. Over hoe winkeliers reageren is echter nog maar weinig bekend. Inschattingen van winkeliersreacties worden in de planning-praktijk veelal gebaseerd op een vergelijking tussen de behaalde of geschatte omzet per vierkante meter en normgetallen voor de vloerproductiviteit. Aangezien aan dit gebruik van normgetallen vele bezwaren kleven is nader onderzoek naar winkeliersgedrag gewenst. Echter, dit soort onderzoek wordt gehinderd door het feit dat geschikte gegevens over winkeliersgedrag moeilijk te verkrijgen zijn. Conjuncte methoden maken het in principe mogelijk deze gegevens wèl te verkrijgen. Voordat conjuncte methoden voor dit doel kunnen worden gebruikt dient echter eerst een aantal conceptuele en operationele problemen te worden opgelost. Het oplossen van deze problemen staat centraal in *DEEL II* van dit proefschrift. Dit deel presenteert een conceptueel kader voor winkeliersgedrag en een onderzoeksopzet die gebruik maakt van denkbeeldige omzet-scenario's. Tenslotte wordt in een empirische studie de aard van het reactief gedrag van winkeliers nader verkend en er wordt op basis van de ontwikkelde scenario-benadering een voorspellend model voor reacties van winkeliers ontwikkeld.

DEEL I van dit proefschrift beslaat de hoofdstukken 2 t/m 5. In *HOOFDSTUK 2* worden bestaande methoden voor het bestuderen en voorspellen van consumentenkeuzes van winkelbestemming kritisch besproken. Er wordt ingegaan op het zwaartekrachtmodel en op modellen gebaseerd op individueel keuzegedrag. Na een bespreking van discrete keuze theorie en het Multinomiale Logit model volgt een overzicht van "revealed preference" studies van winkelbestemmingkeuze en een bespreking van de voornaamste tekortkomingen van deze benadering.

Kenmerkend voor de "revealed preference" benadering is dat modellen worden geschat op basis van keuzes die zijn waargenomen in feitelijke, konkrete keuzesituaties of marktomstandigheden. Hierdoor heeft de onderzoeker weinig controle over attributen van alternatieven en kunnen geen waarnemingen worden gedaan voor alternatieven die buiten het huidige ervaringsdomein liggen. De conjuncte meetmethoden bieden deze mogelijkheden wel.

Het hoofdstuk geeft een introductie op de conjuncte methodologie en gaat daarna met name in op een variant die gebruikt maakt van keuze-experimenten. Voor- en nadelen van directe observatie van keuzes in plaats van ratings of rangordeningen worden uiteengezet, waarna een bespreking volgt van detailhandelsstudies die gebruik maakten van conjuncte meetmethoden. Deze blijken slechts in beperkte mate relevante informatie op te leveren voor het ontwerp, de planning en het beheer van winkelcentra. Ten eerste werd meestal de keuze van consumenten voor winkels in plaats van winkelcentra onderzocht. Ten tweede werden steeds geringe aantallen variabelen onderzocht. Ten derde was er niet altijd een duidelijke relatie tussen deze variabelen en de variabelen waar ontwerpers, planners en beheerders invloed op kunnen uitoefenen.

Geconcludeerd wordt dat het wenselijk is de relevante winkelcentrum-attributen te inventariseren en in een kader te plaatsen, zodanig dat tegelijkertijd een conceptueel coherent raamwerk ontstaat en praktische operationalisatie in een conjuncte meettaak mogelijk wordt. Dit doel wordt bereikt door in de resterende hoofdstukken van Deel I eerst een methode te ontwikkelen die het toestaat grotere aantallen attributen met conjuncte experimenten te onderzoeken, vervolgens een "marketing-mix" voor winkelcentra te definieren en te operationaliseren, en tenslotte deze aanpak uit te testen in een empirische toepassing.

In *HOOFDSTUK 3* staat de vraag centraal hoe men grotere aantallen attributen in conjuncte experimenten kan onderzoeken. Het hoofdstuk gaat met name in op een methode die is gebaseerd op de theorie van "Hiërarchische Informatie Integratie" (HII). Deze gaat er van uit dat in het geval van een beslissingsprobleem met veel attributen individuen de attributen groeperen in een aantal deelverzamelingen. Iedere deelverzameling wordt gerepresenteerd in één abstract attribuut, hier hogere-orde beslissingsconstruct genoemd. Voor iedere deelverzameling van attributen komen individuen tot een oordeel over het bijbehorende beslissingsconstruct volgens een bepaalde combinatie of beslissingsregel. Individuen komen tot een keuze of eindoordeel door het nut dat zij aan de hogere orde constructen toekennen te integreren volgens een bepaalde

combinatie- of beslissingsregel. De op deze theorie gebaseerde methode maakt het mogelijk een grote groep attributen in deelgroepen te splitsen en voor deze deelgroepen afzonderlijke, voor de respondent hanteerbare, deel-experimenten te ontwikkelen. Door middel van een aanvullend, overkoepelend deel-experiment kunnen de nutsfuncties die zijn geschat voor de attributen in de deelgroepen worden geïntegreerd tot één nutsfunctie of keuzemodel.

Aan de bestaande methode van HII kleven echter een aantal bezwaren. Daarom wordt in het proefschrift een nieuwe variant op deze methode voorgesteld. Deze variant maakt gebruik van geïntegreerde experimenten. In elk van de deel-experimenten worden de resterende hogere-orde beslissingsconstructen als attribuut meegenomen. In theorie zijn daarmee in elk deel-experiment de alternatieven volledig gespecificeerd op alle constructen (of hoofdaspecten); ze verschillen slechts in de mate en wijze waarop de constructen zijn uitgewerkt in attribuutwaarden. Daardoor kan in de deel-experimenten respondenten meteen naar hun eindoordeel over de alternatieven worden gevraagd, desgewenst in de vorm van een keuzetaak. De gegevens van de verschillende deel-experimenten kunnen nu in één datamatrix onder elkaar worden geplaatst en er kan één geïntegreerd (keuze-)model worden geschat. Een aanvullend overkoepelend experiment is hiermee overbodig geworden. De nutsfunctie in het model heeft parameters voor elk van de attributen en voor elk van de constructen. Zoals wordt gedemonstreerd is een belangrijk ander voordeel van de methode met geïntegreerde deel-experimenten dat deze het mogelijk maakt de veronderstelde hiërarchische structuur te toetsen.

HOOFDSTUK 4 is gericht op het definiëren van winkelcentrum-attributen. Uitgaande van bestaande ideeën over de "marketing-mix" en de "detailhandels-mix" wordt een "winkelcentrum-mix" opgesteld. Uit de literatuur over hoe consumenten winkelcentra waarnemen en waarderen wordt geconcludeerd dat hierin drie belangrijke dimensies te onderscheiden zijn. Deze worden in de huidige studie gehanteerd als hogere-orde constructen in een hiërarchische conjuncte meettaak. De eerste dimensie is "bereikbaarheid en toegankelijkheid". Deze wordt geoperationaliseerd in 5 attributen: reistijd, parkeer-kosten, parkeer-gemak, bereikbaarheid met openbaar vervoer, en hoeveelheid niet-winkel voorzieningen. De tweede dimensie is "aankleding en inrichting"; deze dimensie wordt gedefinieerd door 10 attributen: ligging van de winkels ten opzichte van elkaar, mate van overdektheid van het winkelcentrum, aandeel voetgangersgebied, drukte op straat, hoeveelheid straatmeubilair en versieringen, hoeveelheid groenvoorzieningen, staat van verzorging en onderhoud, aantrekkelijkheid van etalages en gevels, aantal

straat-activiteiten, en aantal coffee-shops, café's en restaurants.

De laatste dimensie betreft het winkel-aanbod in een winkelcentrum. Voor deze dimensie worden 9 attributen gedefinieerd: aantal winkels of winkeleenheden in het centrum, aantal branches, het aandeel van het totaalvloeroppervlak dat in beslag wordt genomen door grote winkels (bijv. supermarkten), en de mate waarin aanwezige winkeleenheden veel keus, scherpe prijzen, hoge productkwaliteit, veel service, prettige bediening, of een aantrekkelijke winkelinrichting bieden. De dimensie wordt twee maal gebruikt om een winkelcentrum te beschrijven, één maal voor winkels voor dagelijkse artikelen en één maal voor het winkelaanbod voor kleding en schoeisel. Om de praktische relevantie van de winkelaanbod-attributen maximaal te doen zijn, zijn deze zodanig gedefinieerd dat zij direct gekoppeld zijn aan positioneringskenmerken van afzonderlijke winkels.

In *HOOFDSTUK 5* wordt een empirische studie beschreven welke ten doel had de relatieve invloed te bepalen van de constructen en attributen die werden gedefinieerd in het voorgaande hoofdstuk, en de voorgestelde hiërarchische conjuncte meetmethode te demonstreren en testen. De studie werd uitgevoerd in Maastricht. In persoonlijk afgenomen vraaggesprekken beantwoordden 405 personen uit verschillende buurten eerst een aantal vragen over het koopgedrag van hun huishouden en over wat ze vinden van de door hen bezochte winkelgebieden. Vervolgens kregen zij negen maal een denkbeeldige woonsituatie voorgelegd waarin steeds twee of drie winkelcentra waren beschreven. Respondenten moesten aangeven hoe hun huishouden het maandelijkse budget voor dagelijkse boodschappen (levensmiddelen) zou verdelen over de in de woonsituatie gespecificeerde winkelcentra.

Een belangrijk resultaat van de empirische studie is dat de effecten van de verschillende winkelcentrum-attributen op het keuzegedrag van consumenten in één model zijn ondergebracht en als zodanig gekwantificeerd. De belangrijkste conclusies met betrekking tot de winkelcentrum-attributen zijn dat 1) het aantal winkels of winkeleenheden en de reistijd de grootste invloed hebben op de verdeling van bestedingen aan dagelijkse artikelen over de beschikbare winkelcentra en 2) dat deze verdeling van bestedingen ook beinvloed wordt door andere kenmerken van winkelcentra. Dit zijn dan met name de parkeerkosten en het parkeergemak, de mate van overdekt-zijn, de mate waarin gevels in beslag worden genomen door aantrekkelijke etalages, de mate waarin er winkels aanwezig zijn met scherpe prijzen of producten van hoge kwaliteit, en de mate waarin het centrum er verzorgd en goed onderhouden uitziet. Van de meeste andere attributen

was de invloed, hoewel aantoonbaar, minder groot. Niet significant waren de invloed van de hoeveelheid straatmeubilair en versieringen en de mate waarin aanwezig vloeroppervlak deel uitmaakt van een supermarkt.

De opzet van de empirische studie was gebaseerd op de veronderstelling dat respondenten de attributen volgens een aangeboden hiërarchische structuur beoordeelden. De voorgestelde methode voor hiërarchische conjuncte analyse staat toe deze veronderstelling te toetsen. Uit de toetsing blijkt dat de hiërarchische structuur niet in alle opzichten wordt ondersteund in deze toepassing. Het blijkt met name dat de effecten van eenzelfde hogere-orde construct niet even groot zijn in de verschillende deel-experimenten. Desalniettemin kan het geschatte model worden gebruikt om nieuwe voorspellingen te doen. Het blijkt dat het model waarin alle attributen zijn opgenomen de voor de eigen woon-winkel-situatie gerapporteerde bestedingspatronen beter voorspelt dan modellen met minder attributen.

DEEL II van dit proefschrift bestaat uit de Hoofdstukken 6 t/m 9. *HOOFDSTUK 6* geeft een bespreking van eerdere studies met betrekking tot reactief gedrag van winkeliers. Het blijkt dat op dit gebied slechts weinig empirisch onderzoek is verricht, naar het lijkt deels als gevolg van methodische en praktische problemen die zouden kunnen worden voorkomen door gebruik te maken van een conjuncte meettaak. Uit één van de vorige onderzoeken en uit eigen interviews met winkeliers blijkt dat toepassing van conjuncte meettaken in principe mogelijk is. Echter, het blijkt tevens dat hiervoor een nieuw type meettaak dient te worden ontworpen en dat deze gebaseerd dient te zijn op een theorie over winkeliersgedrag.

Omdat zo'n theorie slechts gedeeltelijk voorhanden is, wordt in *HOOFDSTUK 7* een conceptueel model voor reactief gedrag van winkeliers opgesteld. Dit model is gedeeltelijk gebaseerd op de denkwijze van strategische bedrijfsvoering en gedeeltelijk op de schaars beschikbare empirische onderzoeksliteratuur. Het model poneert een continue proces waarin winkeliers een positie kiezen in de markt, hun winkel drijven, hun resultaten in de gaten houden (met name hun omzet) en vervolgens zonodig hun strategische positie aanpassen door maatregelen te nemen ten aanzien van de doelgroep waar men zich op richt in de markt, het aantal vestigingen, de locaties van de vestigingen, en/of de groottes en verdere kenmerken van de winkelvestigingen. Als hypothese wordt gesteld dat omzet-trends belangrijk zijn als indicator voor de prestaties van een vestiging, maar dat winkeliers aanvullende informatie nodig hebben, in het

bijzonder ten aanzien van de winkelomgeving, om tot een oordeel over de situatie en een keuze van te treffen maatregelen te komen.

Dit conceptueel model van reactief gedrag van winkeliers is uitgangspunt bij de ontwikkeling van een conjuncte meettaak voor winkeliers, zoals beschreven in *HOOFDSTUK 8*. Er worden experimentele scenario's ontworpen waarin hypothetische trends zijn gespecificeerd met betrekking tot de eigen omzet en de omgeving waarin de winkel zich bevindt. In deze denkbeeldige scenario's is de omzet hoger of lager dan die welke in werkelijkheid werd waargenomen. Tevens wordt gevarieerd of deze omzettrend geleidelijk of vrij plotseling tot stand kwam. In de scenario's wordt de omgeving van de winkel gedefinieerd door middel van de volgende zeven factoren: de concurrentie binnen het eigen winkelgebied, de concurrentie buiten het eigen winkelgebied, de sfeer en het totale winkel-aanbod in het eigen winkelgebied, de bereikbaarheid van de winkel, de landelijke omzet in de eigen branche, en de koopkracht in het eigen verzorgingsgebied. In de hypothetische scenario's wordt voor elk van de omgevingsfactoren gespecificeerd of de factor is afgenomen, gelijk is gebleven, of is toegenomen ten opzichte van de trend die in werkelijkheid werd waargenomen over de afgelopen periode van drie jaar.

Naast de scenario's wordt in Hoofdstuk 8 tevens een keuzetaak ontwikkeld waarmee verwachtingen van winkeliers kunnen worden gemeten. Betoogd wordt dat het beter is om winkeliers te benaderen als "beste beschikbare experts" dan als "beslissers". In de taak moeten respondenten uit sets van mogelijke maatregelen steeds die maatregel kiezen die zij het meest waarschijnlijk achten voor hun vestiging. Uit deze gegevens kunnen vervolgens subjectieve kansen van maatregelen worden afgeleid. Door middel van aanvullende metingen kan met de ontwikkelde keuzetaak tevens de mate van gezamelijk voorkomen van maatregelen worden onderzocht. De mogelijke maatregelen bestaan uit het opheffen of verkopen van de vestiging, het verplaatsen van de vestiging, het oprichten van een nieuw filiaal, het aanpassen van het eigen vloeroppervlak, verbouwen en herinrichten, aanpassen van het imago van de eigen winkel, investeren in de directe winkelomgeving, of geen ingrijpende maatregel.

De nieuw ontwikkelde conjuncte meettaak werd toegepast op een gestratificeerde steekproef van 183 winkeliers uit Maastricht. De strata betroffen de negen mogelijke combinaties van drie typen winkelcentrum (binnenstad citycentrum, binnenstad cityrand, buitenwijken) en drie typen branche (voedings- en genotmiddelen en persoonlijke verzorging, kleding en schoeisel, en overige niet-

dagelijkse artikelen). Winkeliers werden persoonlijk geinterviewd en beantwoordden vragen over bedrijfskenmerken, waargenomen trends in omzet en eigen winkelomgeving, maatregelen getroffen in de afgelopen drie jaren, en maatregelen verwacht voor de komende drie jaar. Daarna ontving elke winkelier één positief en één negatief omzet-scenario en beantwoordde vragen omtrent noodzaak en mogelijkheden om te investeren en verwachte maatregelen.

In *HOOFDSTUK 9* worden deelvragen ten aanzien van winkeliersgedrag beantwoord aan de hand van de resultaten van dit winkeliersonderzoek. Eerst worden de "survey"-gegevens gebruikt om nader inzicht te verkrijgen in de aard van het reactief gedrag van winkeliers. Het blijkt onder andere dat aanpassingen van het winkel-imago het meest frequent voorkwamen en wijzigingen van vloeroppervlak het minst vaak. Ook blijkt de mate waarin maatregelen werden genomen te verschillen tussen de typen locaties en tussen branche-typen. Daarnaast wordt gevonden dat winkeliers gemiddeld een stijgende trend waarnamen voor alle omgevingsfactoren en voor hun eigen omzet. De gerapporteerde omzettrend blijkt sterk samen te hangen met de gerapporteerde trends in omgevingsfactoren. Verder wordt gevonden dat het oordeel van de winkeliers over het behaalde resultaat van hun vestiging samenhangt met de behaalde omzet en, afhankelijk van de omzettrend, van de waargenomen trends in de omgevingsfactoren. Omzet- en omgevingstrends blijken echter geen relatie te hebben met de wenselijkheid en financiële mogelijkheid om te investeren in de vestiging. Tenslotte blijkt dat de winkeliers gemiddeld genomen verbouwen en herinrichten de meest waarschijnlijke maatregel vinden voor de komende drie jaar, gevolgd door aanpassing van het winkel-imago. Winkelsluiting en investeren in de directe omgeving van de winkel worden het minst waarschijnlijk geacht. De samenhang tussen verwachte maatregelen en algemene kenmerken van winkeliers, zoals bedrijfsvorm en vestigingsgrootte, wordt eveneens onderzocht.

Vervolgens worden de experimentele gegevens gebruikt om op een meer gecontroleerde wijze na te gaan of er een oorzakelijk verband is tussen omzettrends en omgevingsfactoren enerzijds, en anderzijds het oordeel over het behaalde resultaat, de wenselijkheid en mogelijkheid om te investeren, en de verwachtingen omtrent maatregelen. Het oordeel over het verwachte resultaat blijkt in positieve omzetcondities positief, onafhankelijk van de omvang van de omzetstijging en de aard van de omgevingsfactoren. In de negatieve omzetcondities daarentegen blijkt er wel een samenhang te bestaan tussen deze variabelen. Winkeliers betrokken omgevingsinformatie dus alleen in hun oordeel indien de omzet zich negatief

ontwikkelde. De wenselijkheid om te investeren in de vestiging blijkt op geen enkele wijze samen te hangen met de omzet- of omgevingsfactoren in de scenarios. De financiële mogelijkheid om te investeren hangt alleen samen met de behaalde omzet. De verwachtingen omtrent maatregelen tenslotte blijken wel afhankelijk te zijn van de omzet- en omgevingstrends, zoals ook werd verondersteld in het ontwikkelde conceptuele model. Het blijkt met name dat naarmate de omzet meer toeneemt, winkeliers minder geneigd zijn maatregelen te nemen, uitgezonderd het doorvoeren van een wijziging van vloeroppervlak en het oprichten van een nieuw filiaal.

De samenhang tussen verwachtingen omtrent maatregelen en omzet- en omgevingsfactoren is hier uitgedrukt in de vorm van een logit keuzemodel dat wordt geschat over alle typen winkeliers. Omdat winkeliers onderling erg kunnen verschillen wat betreft hun verwachtingen is tevens een model geschat waarin een parameter is opgenomen die weergeeft in hoeverre winkeliers in de denkbeeldige scenario's dezelfde maatregel kiezen als in de keuzetaak die werd afgenomen voor hun feitelijke, huidige situatie. Hoewel deze loyaliteit aan eerdere keuzes inderdaad blijkt op te treden, blijven de overige parameters in het model nagenoeg onveranderd. Hieruit wordt geconcludeerd dat de op groepsniveau gevonden relaties robuust zijn, maar dat de nauwkeurigheid van voorspellingen van winkeliersgedrag kan worden verhoogd door in een afzonderlijke stap de aanvankelijk verwachte maatregel te voorspellen uit achtergrondkenmerken van de winkelier. Het hier ontwikkelde winkeliersmodel kan dan worden gebruikt om de effecten van een omzetverandering te voorspellen.

Tenslotte wordt ook nog onderzocht in hoeverre de hier gedefinieerde maatregelen samen voorkomen, dan wel elkaar uitsluiten, en welke vorm de maatregelen aan zullen nemen bij doorvoering. Om methodische redenen zijn deze vragen echter lastig te beantwoorden. In dit proefschrift wordt volstaan met het geven van een eerste aanzet hiertoe. Ten eerste is in de keuzetaak gevraagd per keuzeset aan te geven welke maatregelen waarschijnlijk samen met de eerstgekozen maatregel zullen worden doorgevoerd. Uit deze gegevens blijkt dat met name aanpassingen van vloeroppervlak, winkelinrichting, en winkel-imago het meest samen voorkomen. Ten tweede werd na elk scenario voor elk van de gekozen maatregelen een aantal vragen gesteld over de vorm bij doorvoering. Deze gegevens bieden een indicatie van bijvoorbeeld de gewenste lokatie bij verplaatsing of de verwachte nieuwe omvang na aanpassing van het vloeroppervlak.

HOOFDSTUK 10 is een afrondend hoofdstuk. Er wordt voor de delen *I* en *II*

een samenvatting van de belangrijkste resultaten en conclusies gegeven. Daarnaast wordt ingegaan op de geldigheid en toepasbaarheid van de resultaten en er worden aandachtspunten voor verder onderzoek geformuleerd.

Ten aanzien van *DEEL I* wordt met name gesteld dat het ontwikkelde consumentenmodel de effecten van een groot aantal voor de praktijk relevante winkelcentrum-attributen kwantificeert en toetst. Het model is breed toepasbaar, ook al werd het model hier alleen geschat voor Maastricht. Voor de ontwikkelde methode van hiërarchische conjuncte analyse geldt eveneens dat deze ruim toepasbaar is. Het hoofdstuk bespreekt mogelijke verklaringen voor de gevonden schendingen van de in het experiment veronderstelde hiërarchische structuur. Er wordt tevens ingegaan op de factoren die de predictieve validiteit van modellen zoals hier ontwikkeld beperken. Gesteld wordt dat het voorspellend vermogen bij toepassing in nieuwe marktsituaties meer wordt beperkt door de problemen omtrent de keuze van het type model, de definiëring van attributen en keuzesets, en de meting van attribuut-percepties, dan door het denkbeeldig karakter van de alternatieven in een conjuncte meettaak.

Ten aanzien van *DEEL II* wordt met name ingegaan op mogelijke verklaringen voor de door winkeliers gerapporteerde trends en de gevonden samenhangen tussen trends en prestatie-oordelen en verwachte maatregelen. Daarnaast wordt ingegaan op de achtergronden en konsekwenties van een aantal beslissingen die moeten worden genomen bij het opzetten van dit soort onderzoek. Dit betreft beslissingen ten aanzien van de definiering van de scenario's, keuzetaken en onderzoekspopulatie. Tevens wordt aandacht besteed aan de beperkingen die inherent zijn aan de gekozen onderzoeksbenadering. Ondanks zijn beperkingen kan echter op basis van dit onderzoek worden gesteld dat als planners of managers willen inschatten hoe winkeliers reageren op omzetveranderingen, zij voor het verkrijgen van een goede voorspelling de omgevingscondities waaronder de omzet tot stand kwam in ogenschouw moeten nemen. Daarnaast kan worden gesteld dat conjuncte meetmethoden met vrucht kunnen worden toegepast in onderzoek bij ondernemers.

In de *EPILOOG* bij dit proefschrift wordt ingegaan op een mogelijke toepassing van de hier ontwikkelde modellen, namelijk als onderdelen van een simulatie-model van de dynamiek in de detailhandelssector. Er wordt geschetst hoe zo'n simulatie-model er uit zou kunnen zien en in hoeverre de hier ontwikkelde modellen nu al voor deze doeleinden geschikt zijn.

ABSTRACT

Conjoint experiments (also called stated preference methods) involve the use of designed hypothetical choice situations to measure individuals' preferences and predict their choice behaviour in new conditions. The research reported in this thesis aimed to investigate how conjoint experiments can be developed so that public and private sector retail planners can benefit more from the advantages of this method. Conjoint experiments are developed for two problem areas in retail planning. The first is the prediction of effects of shopping centre changes on consumer choice behaviour. Issues addressed are how to define shopping centre attributes and how to include larger numbers of attributes in conjoint tasks. The second problem area concerns the prediction of how retailers will react to changes that they observe in their sales volumes and retail environments. Such changes may result from, for example, a planned new retail development. This thesis investigates how conjoint approaches can be used to model this type of behaviour. It develops a conceptual model of retailer behaviour and a research design that employs hypothetical sales trend scenarios. The proposed new ideas were tested in applications among consumers and retailers in Maastricht.

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STELLINGEN

behorend bij het proefschrift

Conjoint experiments and retail planning: Modelling consumer choice of shopping centre and retailer reactive behaviour

Harmen Oppewal

Eindhoven, 6 januari 1995

1 Afstand tot -, en omvang van winkelcentra zijn belangrijke, maar niet de enige determinanten van consumentenkeuze van winkelcentrum. Bestaande modellen veronachtzamen het feit dat minder invloedrijke kenmerken voor managers en planners juist van groot belang kunnen zijn, bijvoorbeeld omdat zij eenvoudiger te veranderen zijn.
(Dit proefschrift; vgl. Fotheringham 1988b).

2 De hiërarchische conjuncte methode zoals in dit proefschrift voorgesteld veronderstelt slechts dat respondenten *in staat zijn* aangeboden informatie te verwerken volgens een door de onderzoeker aangebrachte hiërarchie en dat daarmee op geldige wijze hun preferenties worden gemeten; er wordt *niet* verondersteld dat respondenten in hun dagelijkse werkelijkheid volgens dit hiërarchisch schema informatie verwerken en beslissingen nemen.
(Dit proefschrift)

3 Omzetdalingen leiden meer dan omzetstijgingen tot veranderingen in de lokatie, omvang, inrichting of overige formule-kenmerken van winkels.
(Dit proefschrift)

4 Als winkeliers als informant dienen in onderzoek naar veranderingen die bepaalde winkelvestigingen kunnen ondergaan, dan kunnen zij beter worden aangesproken als "expert" dan als "beslisser".
(Dit proefschrift)

5 Het stemt tot nadenken dat tot op heden het computerspel SIMCITY even goed tegemoet lijkt te komen aan Lee's (1973) kritiek op grootschalige stedelijke modellen als de formele modellen van stedelijke dynamiek die door wetenschappelijke onderzoekers zijn ontwikkeld.

(D.B. Lee Jr. 1973, "Requiem for Large-Scale Models", *Journal of the American Institute of Planners* 25 (May), 163-178.)

6 In veel onderzoek waarin conjuncte metingen per respondent worden geanalyseerd resteren weinig tot geen vrijheidsgraden. Bijgevolg kan in deze onderzoeken net zo goed op basis van de ruwe, d.i. niet geanalyseerde, scores worden gesegmenteerd als op basis van individueel geschatte preferenties.

(Green en Srinivasan 1990; Louviere et al. 1993)

7 Het zou de samenwerking tussen ontwerpers en onderzoekers ten goede komen wanneer beide partijen erkenden dat zowel in het ontwerp- als in het onderzoeksproces nieuwe ideeën dienen te worden ontwikkeld èn getoetst, en dat hierbij zowel een goede presentatie als een goede onderbouwing van ideeën van belang is.

(vgl. J. Zeisel 1984, *Inquiry by Design: Tools for Environment-Behavior Research*. New York: Cambridge University Press.)

8 De Groot's stelling dat "Als ik iets weet, kan ik iets voorspellen; kan ik niets voorspellen dan weet ik niets" wordt in de praktijk van het wetenschappelijk onderzoek vaak foutief geïnterpreteerd als "Kan ik iets voorspellen, dan weet ik iets".

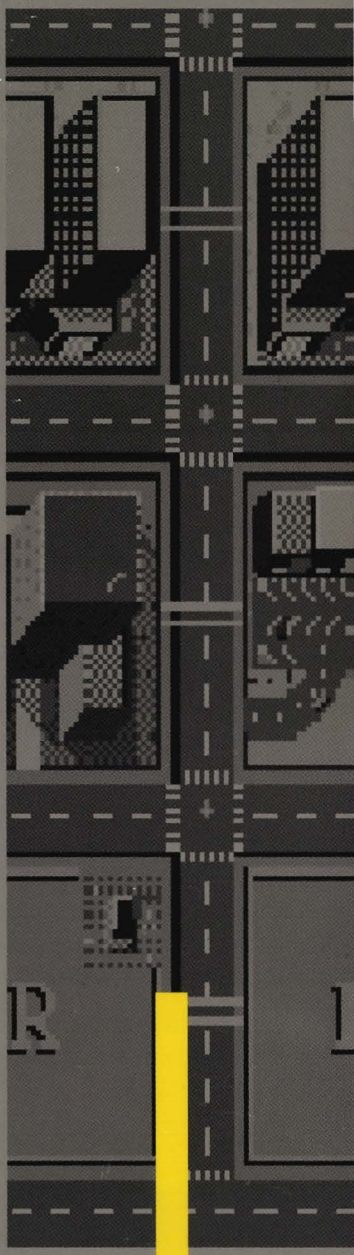
(A.D. de Groot 1961, *Methodologie*. 's-Gravenhage: Mouton & Co, 7e druk, 1975, p.20)

9 Levensmiddelenbedrijven die boodschappen thuis bezorgen helpen de automobiliteit te beperken. Deze vorm van commerciële dienstverlening dient derhalve te worden bevorderd.

10 Het gebruik dat bankinstellingen de door hen gehanteerde wisselkoersen presenteren onder de kolomtitels "aankoop" en "verkoop", daarmee respectievelijk bedoelend "wij kopen" en "wij verkopen", stemt tot nadenken over de mate waarin deze instellingen met hun klanten meedenken.

11 Teneinde het gebruik van het openbaar vervoer te stimuleren moet het uitgevers van wegenkaarten worden verplicht om spoorlijnen en stations duidelijk op hun kaarten weer te geven.

Uitgave: Technische Universiteit tu/e Eindhoven FACULTEIT **BOUWKUNDE**

Conjoint experiments (also called stated preference methods) involve the use of designed hypothetical choice situations to measure individuals' preferences and predict their choice behaviour in new conditions. The research reported in this thesis aimed to investigate how conjoint experiments can be developed so that public and private sector retail planners can benefit more from the advantages of this method. Conjoint experiments are developed for two problem areas in retail planning. The first is the prediction of effects of shopping centre changes on consumer choice behaviour. Issues addressed are how to define shopping centre attributes and how to include larger numbers of attributes in conjoint tasks. The second problem area concerns the prediction of how retailers will react to changes that they observe in their sales volumes and retail environments. Such changes may result from, for example, a planned new retail development. This thesis investigates how conjoint approaches can be used to model this type of behaviour. It develops a conceptual model of retailer behaviour and a research design that employs hypothetical sales trend scenarios. The proposed new ideas were tested in applications among consumers and retailers in Maastricht.

Conjuncte meetmethoden (ook wel 'stated preference' methoden genoemd) behelzen het gebruik van speciaal ontworpen denkbeeldige keuzesituaties om voorkeuren van individuen te meten en hun keuzegedrag in nieuwe situaties te voorspellen. Dit proefschrift doet verslag van een onderzoek dat ten doel had na te gaan hoe deze methoden geschikt kunnen worden gemaakt voor toepassing in onderzoek naar winkelcentra, teneinde de voordelen van deze methode beschikbaar te laten komen voor planners bij de overheid en in het bedrijfsleven. Het onderzoek richtte zich op twee probleemvelden in de distributieplanning. Het eerste is het voorspellen van de invloed van wijzigingen in winkelcentra op het keuzegedrag van consumenten. Problemen die hierbij optreden en waarvoor in de proefschrift een oplossing wordt aangedragen zijn de definiëring van kenmerken van winkelcentra en het opnemen van grotere aantallen kenmerken in een conjuncte meettaak. Het tweede probleemveld betreft het voorspellen van reacties van winkeliers op veranderingen die zij in hun omzet en winkelomgeving waarnemen, bijvoorbeeld als gevolg van een geplande ingreep. Onderzocht wordt hoe de hiervoor benodigde gegevens met conjuncte experimenten verzameld kunnen worden. Hiertoe presenteert het proefschrift een conceptueel kader voor winkeliersgedrag en een onderzoeksopzet die gebruik maakt van denkbeeldige omzetscenario's. De voorgestelde ideeën zijn getest in een onderzoek onder consumenten en winkeliers in Maastricht.