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**NEW PRODUCT ENTRY AND COMPETITIVE RESPONSE:
AN EMPIRICAL INVESTIGATION OF
INCUMBENTS' DEFENCE STRATEGIES**

Sabine E. Kuester

A DISSERTATION

IN MARKETING

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ABSTRACT

NEW PRODUCT ENTRY AND COMPETITIVE RESPONSE:

AN EMPIRICAL INVESTIGATION OF

INCUMBENTS' DEFENCE STRATEGIES

Sabine E. Kuester

Thomas S. Robertson (Supervisor)

In recent years the marketing discipline has shown increasing interest in market defence strategies, one of the classic areas of research in industrial organisation and economics. Market defence strategies refer to the attempts of established competitors (the incumbents) to deter or slow down the entry of an actual or potential new competitor in their market. A range of defence mechanisms have been discussed in the literature, including price, costs, diversification and advertising. The focus of my study is on the investigation of how an incumbent will react to a competitor entering the market with a new product. The question of interest is how strongly the established competitor will retaliate against this new product.

Marketing scholars have long been calling for more empirical research on competitive issues. My research is in line with this call for more empirical research on competitive response, as its main objective is to understand how established firms respond to a new product in their market. In addition to adding to the limited empirical base in this field my research attempts to make established firms more

aware of the crucial role of competitive interplay in industries. This is important because strong competitors often experience reversals of their fortunes due to a failure in anticipating and counter-acting new competitive forces.

Based upon the review of the relevant literature in economics, industrial organisation, strategy and marketing, I have generated a number of hypotheses that try to explain the strength of the incumbent's competitive retaliation. The explanatory variables fall into the following categories a) the type of innovation (incremental versus radical), b) industry characteristics (e.g., market concentration, growth, barriers to exit), c) incumbent characteristics (market size, buyers' price sensitivity) and d) the entrant's characteristics (e.g., competitive familiarity). To test these hypotheses, a cross-sectional mail survey was conducted to ask U.K. marketing executives about their response to an innovation in their market. Before testing the hypotheses an analysis of the data was conducted to assess the reliability of the measures that have been developed for the survey instrument.

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CHAPTER 1: INTRODUCTION

1.1 Motivation

Competitive marketing theory explains price, product, promotion and distribution as the most important means of competitive conduct. The concept of competitive marketing was derived from traditional economic theory which predominantly deals with price as the main competitive variable. In many industries, however, it can be observed that price is a less frequently used weapon and that non-price competition plays a more significant role. Over the last decade it has emerged that companies with vigorous product innovation strategies were able to maintain their competitive advantage or could leapfrog industry leaders. We find many examples of industries where the product itself is a vital competitive initiative.

The aim of this dissertation is to explore the issue of product competition. More specifically, I am interested in how incumbents react when challenged on the product mix by product variations or by completely new products. Competitive reaction and defence are crucial because an effective and appropriate reaction can help to maintain competitive strength. On the other hand, an ineffective and inappropriate reaction to a competitive new product can have a negative effect on firm performance.

1.2 The Problem

Prior research in competitive marketing has focused on some of these issues but the empirical base is still very limited. Also, the existing research has an important deficiency: most empirical competitive marketing research fails to emphasise the exact nature of the product competition, that is, it fails to identify whether a firm is threatened by a product that is only marginally refined compared with existing products or by a radically new product. Interestingly, the literature seems to suggest that the *innovativeness* of the new product influences the competitive reaction (e.g., Cubbin and Domberger 1988, Robinson 1988a). Unfortunately, the empirical literature has found no conclusive results as to what the exact effect is. This is mainly because most studies dealing with competitive reaction have not addressed conceptually the innovativeness of the new product.

In the following I shall discuss two competing hypotheses about the effect of the innovativeness of a new product entry on competitive reaction. Both rationales have been derived from existing research. My conceptual framework will deal explicitly with the nature of product competition and will therefore describe the new product in terms of its innovativeness, to test the competing arguments.

The dominant theory suggests that if a competitor is threatened by an incremental innovation, a strong defensive reaction is very likely to occur because the established firm will still be able to benefit from its competitive advantage. By contrast, this is not the case where initial differences in the competitive positions of companies dissolve in line with a shift in the technology paradigm. If a firm is locked into a certain technology when such a paradigm shift occurs, a rival might use the new technology to leapfrog the incumbent in order to achieve competitive

advantage. A strong defensive reaction might then be ineffective and may therefore occur less often. Other explanations for a failure to respond to radical advances in product technology are organisational inertia or the defender's fear of cannibalising its own stream of rents from existing products (e.g., Reinganum 1983).

The competing hypothesis stems predominantly from game-theoretical research. This literature suggests that the threatened competitor may retaliate tit-for-tat, i.e., would react domain specifically on exactly the same dimension - the product mix - whether challenged by a minor or a major innovation. The defender, for example, can leapfrog to a new technology or enhance its current product to make it more competitive. The defender is likely to have the financial back-up - the "deep pockets" - to launch a counter-attack. Gilbert and Newbery (1982) show, for example, that in markets where entry is not blocked, dominant incumbent firms will, rationally, invest even in radical innovations in order to profit from the extension of existing market power.

Despite the appeal of the concept of technological paradigm shift and incumbent inertia (whether caused by inability, for example in the organisational sense (e.g., Hannan and Freeman 1984) or by fear of self-cannibalisation) the evidence in the scholarly literature is not consistent. There are well known examples of where established competitors were out-competed by companies on a new technology dimension because the defender failed to respond with a similarly attractive product. By the same token, we are aware of industries where the attacked competitor launched a very successful counter-attack and thrived (Foster 1986).

The purpose of my research is to examine these competing arguments by analysing the effects of product competition on competitive reaction, more specifically on the

strength of competitive reaction. The focal point will be the incumbent competitor that is faced with a new product entry by a rival.

1.3 Intended Contribution

Scholars of marketing have been emphasising the need for more empirical research on competition (e.g., Weitz 1985, Robinson 1988a, Bowman and Gatignon 1995). My research is in line with this call for more empirical research. The main objective is to understand how established firms respond to a new product in their market and I am including the nature of this competition explicitly in my conceptual framework to broaden previous research. In this sense my contribution is in adding to the limited empirical base in the field of competitive response and conceptually in framing the problem.

Furthermore, this research attempts to make established firms more aware of the crucial role of competitive interplay. Often, strong competitors experience reversals of their fortunes because they fail to anticipate and counter-act new competitive forces. This investigation is also important from the point of view of the rival competitor, in helping to anticipate how incumbent firms will react, depending on the innovation to be introduced in the marketplace. To predict how an established competitor will respond to entry is a crucial factor in competitive analysis (Porter 1980) and an important area of strategic marketing. More specifically, if companies fail to estimate the effect of anticipated competitive moves to their new products, the new product is very likely to underperform original forecasts (Kuczmarski 1992). This question should therefore be of keen interest for managers, especially in times where technological change is accelerating and product life cycles are shortening (e.g., Rosenau 1988, von Braun 1990 and 1991, Gaimon and Singhal

1992).

It has to be acknowledged that the marketing discipline is only one business function that supports a successful competitive strategy. A successful reaction to a competitive threat is determined by numerous managerial and technical tasks all aimed at sustaining competitive advantage. Still, the marketing discipline has the potential to provide flexible tools for handling new competition. Effective deployment and use of these tools can help diminish the power and success of competitors and bridge the time until other business functions have adapted to the new situation.

1.4 Objectives and Dissertation Outline

The main objective of my study is to explore the relationship between the degree of innovativeness of a competitor's new product and the *strength of an incumbent's reaction*. How strongly do incumbents react to an *incremental* innovation as opposed to a *radical* innovation? What other factors influence the incumbent's decision to react to a new product entry?

Chapter 2 will review the literature in economics, industrial organisation, strategy and marketing on competitive reactions to potential and actual market entry. The industrial organisation and strategy literature has mainly contributed towards theoretical inquiry, whereas the marketing literature tends to be more empirically oriented. Both bodies of literature provide rationales for arguing both cases as described above. Drawing on this literature, I shall develop and contrast the relevant hypotheses in Chapter 3. One set of hypotheses refers to the innovativeness of the new product entry, whereas another addresses firm- and

industry-specific effects. Chapter 4 will then discuss methodological issues, such as the research design and measurement issues. Chapter 5 provides a detailed description of the data analysis, followed by Chapter 6 with conclusions, implications and directions for future research. Here I will also address the limitations of my research.

The following chapter gives a conceptual review of the literature on market defence (pre-entry and post-entry) followed by a brief outline of the relevant theories of innovation. The chapter will conclude with the analysis of the marketing literature which deals explicitly with competitive response, especially the empirical literature. A summary of the literature review provides an opportunity to position my own research.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

In economics, research on competitive reactions to market entry has spanned decades. This stream of literature has originated from and predominantly emphasised reactions of incumbent competitors that had the potential to slow down or deter the entry of new competition, i.e., new firms. This thesis is concerned with the entry of new products which may be introduced either by established competitors or by new companies. I shall introduce a twofold notion of market defence. In the first instance, market defence is *proactive* and this type of defence is to deter a potential competitor from entering the market at all (entry-deterrence). Secondly, market defence can be *reactive* and refers to incumbents' reactions to an actual competitor (entry has materialised either in the form of a new competitor or in the form of a new product).

First, I shall provide an overview of the research on entry-deterrence which mainly stems from industrial organisations. Then an examination of related literature in marketing will follow, with an introduction to the theory of innovation and competitive reaction. A summary of the state of knowledge in competitive defence, especially in the empirical domain, will conclude this chapter.

2.2 Entry-Deterrence Literature

Reactions to entry have often been referred to as a classical problem in the theoretical economics literature. With regard to incumbents' strategies to deter or slow entry of potential or actual rivals, barriers to entry are seen as major determinants of such entry behaviour. Barriers to entry basically refer to the advantages an incumbent has over potential entrants and Bain explained in his seminal work, *Barriers to New Competition* (1956) how these barriers determine performance in an industry¹ As the following discussion will point out, it is crucial to look not only at entry barriers, but also at the combination of these structural factors *and* industry behaviour (Gilbert 1989a) to appreciate fully the defence logic.

If an established firm is faced with a threat of entry, Bain (1956) suggested that it might exhibit the following types of behaviour:

- a) *Blockaded Entry*: Incumbent competitors compete as if there were no threat of entry. Even so, entry does not occur because the market is not attractive enough to entrants. This may be due to unfavourable market entry conditions such as, for example, low prices due to economies of scale. In this cases strategic interactions do not occur.

In the more interesting case, where entry is not blockaded, established firms have

¹ Bain (1956) explicitly defined his theory of incumbents' conduct *vis-à-vis* potential competition, i.e. entrants. He defined entrants as a) newly established independent legal entities and b) as production capacities that were not in existence prior the establishment of the new firm (p.5). This narrow view was subsequently broadened and most of its implications hold true for potential competition from any source, which includes mergers and acquisitions or expansions and growth of existing firms. The U.S. courts, for example, use the broader definition in the judgement of merger litigations (see Nti and Shubik 1979 for this comment and for an interesting discussion of the development of entry theory).

to compare the benefits of an entry-impeding strategy against the costs of such an endeavour. Depending on a set of factors (to be discussed later) the incumbent might then choose to:

- b) *Deter/block entry*: Established firms modify their behaviour with the objective of impeding entry.
- c) *Accommodate entry*: The cost of entry prevention exceeds the benefits of such behaviour and the new rival is therefore accommodated in the market.

Barriers to entry play an important role in these considerations. According to Bain, barriers to entry include: (1) economies of scale, (2) product differentiation and (3) absolute cost advantages. This categorisation was based on his notion of barriers to entry, defined as conditions that allow established firms to earn supranormal profits without inducing new rivals to enter the industry (Bain 1968). Bain's view also implies that these structural conditions determine incumbents' behavioural responses. Alternative definitions have since been offered to address such considerations as economic efficiency (Ferguson 1974), cost asymmetries (Stigler 1968) and - giving a normative viewpoint - welfare implications (von Weizsäcker 1980, based on Stigler).

Gilbert (1989a), in a recent review, criticised these past definitions of barriers to entry, because they fail to provide explanations of why an established firm benefits from incumbency, a fact which he considers to be of major importance. Gilbert's definition captures a much broader notion of an entry barrier: "*A barrier to entry is a rent that is derived from incumbency*. It is the additional profit that a firm can

earn as a sole consequence of being established in an industry" (p. 478). Geroski, Gilbert and Jacquemin (1990, p. 14) argued that "(t)he size of these rents will depend on the behaviour of established firms." These notions have introduced a more behaviourally oriented school of thought, which attempts to account for the controversy and ambiguity that has resulted from the different approaches previously used to identify and define barriers to entry.

The likelihood of entry-detering behaviour by an incumbent in an industry depends therefore on a) factors that determine the level of entry barriers in the industry and b) the incumbent's *ability* to maintain its output by successfully influencing the behaviour of potential rivals (Gilbert 1989a). *Conditio sine qua non* for the latter is that the entrant's rational conjecture about post-entry competition is based on an assessment of current competitive behaviour of firms in the target industry.

A starting point of discussion is Bain's notion of barriers to entry. He described the following three conditions as necessary and sufficient for easy entry to exist:

- (1) Established firms have no absolute cost advantages over potential entrant firms.
- (2) Established firms have no product differentiation advantages over potential entrant firms.
- (3) Economies of scale advantages are negligible.

On an intuitive basis one might infer that if all three conditions are present simultaneously, then the entry of new rivals would be very difficult to prevent and hence, incumbents might choose not to engage in strategic entry-deterrence. In industries where high entry barriers exist, entry may be so difficult that new rivals

can be ignored altogether. As described above, Bain referred to this situation as "blockaded entry". Most regulated industries, for example, exhibit conditions of blocked entry.

The following discussion will show that the identification of situations where incumbents spend resources on entry-preventing strategies is neither straightforward nor free of ambiguity. (For comprehensive reviews of this subject see Gilbert (1989a) and Geroski, Gilbert and Jacquemin (1990).)²

Economies of Scale

When production technology exhibits economies of scale, entry is limited by the size of the market. One might begin by arguing that the existence of economies of scale in an industry is sufficient to protect a firm from potential competition and hence, the likelihood of entry-detering behaviour by an incumbent would be negatively correlated with existing scale economies. The statement is based on the contention that economies of scale *per se* lead to the protection of incumbents. This point will be investigated by considering the limit-pricing model developed by Bain (1956), Modigliani (1958) and Sylos-Labini (1962) all of whom have examined the consequences of market size for the conditions of entry.

The concept of limit-pricing is based on the idea that if there is a positive relationship between the pre-entry price and the degree of new entry, the established firm has an incentive to cut its price. The incumbent firm may then sustain a price so low that it discourages entry by the potential entrant. This will

² The subsequent discussion of entry barriers is based on Gilbert (1989b) and Geroski et al. (1990).

be the case when the potential entrant expects post-entry profits to be negative.³

Here, the incumbent has to compare the costs and benefits of an entry-deterring strategy. In the case where market conditions make entry very difficult, i.e., the limit output (which refers to the incumbent's output given the limit-price)⁴ is relatively small, the benefits of strategic deterrence exceed the cost of this strategy. Bain referred to this situation, where the incumbent is better off preventing entry, as effectively impeded entry. Ineffectively impeded entry describes the opposite situation where accommodation is more profitable because market conditions make entry very easy and therefore, the limit-price is too low. As described earlier there are also situations when entry is blocked, as in the case where the limit output is smaller than the optimal output of incumbent firms when they compete as if there were no threat of entry. This situation is void of strategic interaction. The limit-pricing theorem is not restricted to the application as described above. Dixit (1979) found that an incumbent with a differentiated product can utilise a similar strategy. Consumer preferences can be exploited when the manufacturing technology exhibits increasing returns.

It has to be noted that the limit-pricing model is very sensitive to the entrant's expectation about the nature of competition after entry has occurred. In the case of Cournot or perfect competition, the pre-entry behaviour of incumbents can no longer be indicative of post-entry profitability. For pre-entry competitive conditions

³ The assumption is that the potential entrant expects the incumbent's established output in t_1 to be maintained in all consecutive periods. The entrant's profit depends on both its cost function and on the residual demand $D(P) - x_1$ where x_1 is the incumbent's output. Entry can then be successfully deterred when the entrant expects post-entry profits to be negative. Hence, the incumbent has to establish a price so that there is no output where the entrant can earn a positive profit, i.e., the limit price is below the entrant's average cost.

⁴ Following Modigliani's (1958) definition, the limit output is the smallest pre-entry output for which entry is not profitable.

to be important and crucial for the expectations of the potential rival, the commitment by the incumbent has to be credible. Credibility can be established when investments are irreversible, i.e., they involve sunk costs. Costs are sunk for those investments that produce a stream of benefits over a long horizon but can never be recouped (Tirole 1993). One such an example was developed by Dixit (1980) in his description of how sunk cost investment in capacity makes an entry-detering limit output credible. Dixit illustrates that an irreversible commitment of investment prior to the entry of a prospective rival can change the initial conditions of the post-entry game to the advantage of the established firm.

The Dixit model has similar implications to the limit-pricing model for the entrant's behavioural expectations. With sunk costs also being a potential barrier to exit for an incumbent, it can be inferred that an incumbent is more likely to deter entry in situations where its capital expenditures are sunk and less likely to deter entry in cases where costs are not locked in. In cases where investing in sunk capital gives rise to economies of scale, the incumbent has an incentive for strategic entry-deterrence. This, therefore, describes a case where scale economies act as an entry barrier as theorised by Bain (Geroski, Gilbert and Jacquemin 1990).

Milgrom and Roberts (1982) reconsider the limit-pricing model in a dynamic setting based on asymmetry of information between the incumbent and the entrant. In their model, where an incumbent is threatened by several potential entrants, predatory behaviour emerges as a rational, profit-maximising strategy against early entrants because such behaviour has the potential to create a reputation for toughness. They show that this consideration is consistent with the price war situation that occurred when Procter and Gamble introduced its Folger's brand of coffee into local markets in the Eastern U.S. against Maxwell House, a well

established competitor's brand. P&G's decision to stop expansion may have been induced by the strong competitive stance of the established competitor. Milgrom and Roberts's suggestion is based on Selten's chain store model (1978) (the incumbent operates in N identical markets) which has very similar implications for the incumbent's behaviour. In a similar case, NutraSweet tried to prevent the entry of the Holland Sweetener Company (HSC) in the European and Canadian artificial sweetener market by employing a very aggressive competitive stance. NutraSweet, an operating entity set up by the U.S. pharmaceuticals company Searle & Co., although not successful in deterring HSC from entering this highly lucrative market, did limit its rival's market penetration with a multi-year contract regime that locked in its customers - mainly from the softdrink industry - for long periods of time and with a strong focus on price competition (Brandenburger, Costello and Kou 1993).

It can be concluded from this discussion that scale economies do not in every case act as an efficient barrier to entry *per se* and that the importance of the incumbent's ability to exploit this entry barrier has to be stressed. In more general terms, the specific formulation of the limit-pricing model is less important than the implication that incumbents can exploit structural conditions of the industry to achieve supra-normal profits. Or, as Geroski, Gilbert and Jacquemin (1990) put it, "the pre-entry strategic action is unlikely to create an advantage for the incumbent in a situation where one does not already exist" (p. 15). This suggests, and it does seem intuitively appealing, that incumbents will attempt strategic entry-deterrence only when some barriers to entry already exist.

To find empirical evidence for any such behaviour is not an easy matter and Geroski, Gilbert and Jacquemin noted that "(l)imit pricing is (difficult) to detect

because it is triggered by the mere threat of entry and is designed to foreclose entry, since the threat of entry is, in general, difficult to observe" (p. 36). They conclude with some examples where entry barriers changed due to exogenous factors, for example, due to deregulation. In these cases significant price decreases could in fact be observed and therefore provide some evidence for limit-pricing behaviour of established firms⁵. Also, price decreases for products that come off patent, are indicative for limit-pricing competition. This can, for example, often be observed in the pharmaceuticals industry.

Absolute Cost Advantages

Absolute cost advantages exist when certain factors of production are not available to the potential entrant. The established firm may own superior production techniques (learned through research and development or through experience) or may possess superior raw material deposits. Following the discussion in Gilbert (1989a) and Geroski, Gilbert and Jacquemin (1990), absolute cost advantages can only establish an entry barrier when the value of the factor that creates this advantage is specific to its owner. Otherwise any such advantage would be void due to opportunity cost considerations. An absolute cost advantage establishes an entry barrier when it confers a higher value for the incumbent than for the potential competitor. Patenting can, for example, constitute an absolute cost advantage entry barrier and can therefore be used for strategic entry-deterrence.⁶ The incumbent may, for example, have an incentive for patenting if it owns superior production techniques which would otherwise be imitated. However, once the patent has

⁵ For examples refer to Geroski et al. (1990, p. 36).

⁶ For examples where patents establish absolute cost-advantage entry barriers see Shaw & Shaw (1977) or Bresnahan (1985).

expired, alternative means of entry-deterrence have to be sought. Even if the diffusion of knowledge is no longer artificially constrained, however, empirical evidence suggests that market penetration by newcomers is generally slow and often occurs with a considerable time-lag (see: Bain 1956, Mann 1966 and Freeman 1965). This observation is mainly due to first-mover advantages gained by learning effects. There are, however, examples where industry leaders were unable to benefit from these advantages and lost their market leadership to rival competitors.⁷

Cost asymmetries can be exogenous, for example tariffs in international trade or, more generally, through governmental intervention. More importantly, they can be endogenous, for example induced through learning by doing. The learning effect is induced when firms gain efficiency through repetition of their activities (Tirole 1993). Learning by doing is a feature of technological progress causing gradual (yet persistent) shifts in a firm's production function (Arrow 1962). Gilbert (1989a) argues that learning effects do not *per se* constitute a barrier to entry for two main reasons: 1) the benefits of learning economies may spill over to other industry members and 2) the efficiency gains may diminish the incumbent's competitive vulnerability to a level where it would be willing to let entry occur.

Product Differentiation

There are situations where investments in advertising and product differentiation can be used for strategic entry-deterrence. Dixit's model (1979) gives an example where entry-deterrence becomes more difficult because the products involved are

⁷ This trend is especially apparent in pharmaceuticals. One example is SmithKline Beecham's Tagamet, an ulcer treatment, its US patent protection expired in 1994 and rival drug companies unleashed a flood of cheaper generics (Lepree 1994).

poor substitutes (as measured by cross-price effects). Limit-pricing behaviour may therefore only be observable in situations where products are close substitutes. Otherwise, when products are poor substitutes, the incumbent may not be concerned about potential competition and may not commit resources to entry-detering strategies.

There are several types of structural factors which appear to give rise to product differentiation barriers in a fairly wide range of circumstances. This is especially the case where product space is constrained due to some exogenous factor. In those cases incumbents may pre-empt or regulate entrants through space packing. This can be particularly beneficial where product differentiation advantages can be combined with scale effects. Schmalensee (1978) found that pre-emption in product space seems to have blocked entry in the U.S. ready-to-eat breakfast cereals market. In this industry economies of scale are small and the manufacturing technology is relatively simple. Perhaps surprisingly, no new firms entered this market between the 1950s and the early 1970s, even though profits remained consistently high. However, the number of *brands* of breakfast cereal tripled over this period. The incumbents clearly pre-empted new entry through product differentiation, without the need to use pricing strategies against entrants.

Schmalensee concluded that space crowding will always dominate price strategies. This is by no means counter-intuitive considering the ease with which price strategies are reversible and hence, are less powerful with respect to credibility considerations. However, this argument is in contrast to the earlier discussion about price competition. The effectiveness of product differentiation barriers may also depend on the entry strategy of the potential rival. The case of the U.K. crisp market is an example, where the innovativeness of a new entrant's strategy

overcame product differentiation barriers (Bevan 1974).

Exit Barriers

Barriers to exit constitute the opposite case of entry barriers. These do not exist "if a firm could move its capital into another market and achieve a higher return than it is earning in its present market" (Geroski, Gilbert and Jacquemin 1990). As can be shown in the Dixit model of credible entry-deterrence (1980), investment in sunk capital - a potential exit barrier - provides the incumbent with the incentive to take a more competitive posture toward potential rivals. In general, for a capital investment to have a commitment value (hence creating the conditions for strategic entry-deterrence by the incumbent) such an investment must be difficult to reverse. This principle is described in the notion of "burning one's bridges".⁸ The power of sunk costs as entry barriers can, however, be substantially diminished in multiproduct industries (Judd 1985).

Synthesis of Entry-Deterrence Literature

The literature reviewed so far is predominantly occupied with issues of entry-deterrence and hence deals with the response by a firm to anticipated entry of a rival. Its implications can be extended to the field of new product entry in that the structural characteristics described here as important for entry-deterrence are also relevant to explain competitive behaviour a) between incumbents and new entrants

⁸ Often cited is the following example: Two armies aim to occupy an island that is located between their territories. Both territories are connected by a bridge to this island and each army prefers letting its opponent have the island to fighting. Army 1 occupies the island and burns the bridge connecting it to their territory. Army 2 instantly knows that army 1 has no other option than to fight back if army 2 attacks (because army 1 can no longer retreat) and will therefore let army 1 have the island. This example shows that army 1 is better off by reducing its set of options (this is referred to as the paradox of commitment) (Tirole 1993).

(entry has materialised) and b) between incumbent competitors. The general conclusion that can be drawn from this body of research is that competition is likely to have an asymmetrical effect on existing firms. To clarify this point consider Chamberlin's view which subsequently revolutionised traditional oligopoly theory:

"Again, if high average profits lead new competitors to invade the general field, the markets of different established producers cannot be wrested from them with equal facility. Some will be forced to yield ground, but not enough to reduce their profits below the minimum necessary to keep them in business. Others may be cut to the minimum, and still others may be forced to drop out..." (Chamberlin 1933, p. 82)

Chamberlin implicitly captured the concept of barriers to entry, which discussion was later systematised by Bain (1956). I will carry the discussion of entry barriers further - into the field of new product entry, an area which Bain excluded from his analysis for reasons of simplicity (Nti and Shubik 1979).

In Chapter 3 I shall therefore refer back to this literature as it provides rationales for the development of the relevant hypotheses regarding competitive response to new product entry. It grants insights into the question of why certain reaction patterns arise given a specific constellation of structural and firm-specific characteristics. In the following paragraphs I shall examine how the discipline of marketing has contributed to the study of competitive entry before I draw general conclusions about the state of knowledge in this field.

2.3 Research on Competitive Reaction in Marketing

2.3.1 Sales Response Functions and Reaction Functions

To anticipate how competitors respond to a rival's move is a critical aspect of competitive analysis (Weitz 1985). Traditionally the literature has been mainly occupied with the question of *how* competitors react rather than *why* these reactions occur. This literature was pioneered by the modelling of sales response functions to marketing mix variables such as advertising, price, distribution and product (Oxenfeldt and Moore 1978). Such sales response models are formalistic descriptions of the relation between a company and its environment (Hanssens, Parsons and Schultz 1990) and are designed to support the decisions marketing managers face when selecting the marketing mix. Important input for these modelling processes are 1) the company's marketing decisions, 2) the industry demand and 3) the competition. There is a multitude of studies modelling company sales, industry demand and market share but they do not explicitly take into account the interdependence between the actions of firms in the market (see Hanssens, Parsons and Schultz 1990 for a review of these models).

Most of the aforementioned models are single variable models and we distinguish pricing models, advertising models (see Aaker and Carman (1982) and Assmus, Farley and Lehmann (1984) for meta-analyses) and salesforce models (see Zoltner and Gardner 1980, for a review of over 60 articles in this field). More interesting are the modelling efforts which simultaneously take the market response and the reactions of competing firms into account. This involves the development of sales response functions that include decision variables of competitors as well as the firm's own decision variables (e.g., Clarke 1973, Naert and Leeflang 1978, Simon

1979).

To capture the true scope of competitive behaviour, however, reaction functions have to be developed. A reaction function is "a function which determines for a firm in a given time period its actions (price and/or quantity) as a function of the actions of (all) other firms during the preceding time period" (Friedman 1977, p. 140). Traditionally, economists have used the concept to describe how firms in markets with oligopolistic structures make their decisions.⁹ In this sense, reaction matrices summarise the reaction behaviour of firms. This concept was pioneered in marketing by Lambin, Naert and Bultez (1975) who generalised the Dorfman-Steiner theorem (1954)¹⁰ taking the Stackelberg leader-follower perspective. Their model enables the researcher to distinguish between simple competitive reactions (rival counter-attacks on the same submix as the one used by the firm inducing the reaction) and multiple competitive reactions (counter-attack takes place not only on the same submix but on other submix elements). The following example illustrates

⁹ The classical model was developed by Cournot in 1838, postulating the quantity market model. The key assumptions are that each seller assumes the output of rival firms to be constant; firms do not set prices, rather they determine profit maximising output. The market price is the determinant for the total industry production. Firms are single-period maximisers and, knowing each other's profit functions the market will converge to an equilibrium. In this Cournot equilibrium no firm can obtain a higher profit by changing its level of output. This classical model has subsequently been modified. Bertrand (1883), introduced the notion that firms set prices, not production levels. Bowley (1924) relaxed Cournot's assumption that competitors will produce the same amount in period t as in $t-1$ and formulated a conjectural variation model. This model is based on the assumption that each firm believes that its choice of price will affect the price selected by its rival (Tirole 1993). Stackelberg (1934) characterised firms as followers (who assume the competitors' output constant from last period's level) and as leaders (who assume that rivals are followers) and defined the Stackelberg leader-follower equilibrium.

¹⁰ The Dorfman-Steiner theorem (1954) is a model of marketing mix optimisation. For three marketing mix elements (price, advertising and product quality) it states whether a firm is operating at an optimal level. This is the case when the values of price, advertising, distribution, and product quality are set at levels that price elasticity, the marginal revenue products of advertising and distribution, and the quality elasticity times price over unit costs are equal. If this equality is not satisfied with the existing marketing mix combination an adjustment is necessary (Kotler 1971, Fitzroy 1976).

their approach (based on Dolan 1981 and Lilien, Kotler and Moorthy 1992):

- Assume:
- Two competitors in the market (firm 1 and firm 2)
 - Firms compete on price (P) and advertising (A)¹¹.

The reaction matrix (R) for this situation is a 2 x 2 matrix with elasticity entries:

		<u>FIRM 2</u>	
		Price	Advertising (Lagged)
<u>FIRM 1</u>	Price	0.664* (0.030)	1.898* (0.825)
	Advertising	0.008 (0.005)	0.273* (0.123)

() = standard error

* = significant at 0.05 level

Source: Lambin, Naert and Bultez 1975, p. 119 (the example here stems from a small electrical appliance market)

Tracking P and A for both firms, R can be estimated via simultaneous equation regression of one firm's marketing mix against the rival's:

$$\log P_1(t) = a_1 + b_1 \log P_2(t) + b_2 \log A_2(t)$$

$$\log A_1(t) = a_2 + b_3 \log P_2(t) + b_4 \log A_2(t).$$

The b's are then interpreted as the respective elasticities that are entered in the

¹¹ The original model by Lambin, Naert and Bultez also includes distribution as a competitive parameter.

reaction matrix R. The fact that the elasticities on the diagonal are all significant at the 0.05 level indicates that firm 2 reacts directly to firm 1's changes in the marketing mix. More interestingly, the matrix also signifies indirect responses (the lagged advertising-price elasticity is significant, too). This result shows that the nature of competitive response is complex and the analysis of direct effects alone would be an incomplete representation of the competitive interactions that occur. Parsons and Schultz (1976) and Hanssens (1980) provided important extensions of the Lambin, Naert and Bultez model. Lambin (1976), Schultz and Hanssens (1976) and Bensoussan, Bultez and Naert (1978), for example, contributed to the field of reaction matrices with empirical studies.

Most of the literature I have reviewed so far indicates that companies can react in different ways to competitive stimuli. Although reaction matrices allow the projection of competitive response they do not provide any insights as to why these reaction differences prevail. In the following sections I shall focus on literature that investigates the reasons for behavioural differences in competitive reactions. As this thesis is concerned with competitive reactions to new products I shall concentrate on research that takes market entry as the competitive stimulus.¹²

2.3.2 Research on Competitive Reactions to Market Entry

Theoretical Contributions

Hauser and Shugan's DEFENDER model (1983) is often cited as the marketing literature's most important contribution in the area of market defence strategies.

¹² There is of course a large body of literature which focuses on other competitive events, like new product preannouncements, price decreases or increases, advertising, etc. (See Eliashberg and Chatterjee 1985, for a review).

The model provides an analysis of how an established firm should adjust its marketing mix (changing price, advertising expenditures, distribution expenditures or brand position) in response to competitive entry. This involves analysing the competitive response to a new brand entering at a known position in a multiattribute product space (see, for example, Lancaster 1971). Based on a set of assumptions, Hauser and Shugan developed a normative analytical model which predicts that under certain conditions a negative reaction (i.e., cutting back resources on advertising and distribution or even increasing price) represents the profit-maximising strategy. This somewhat surprising result follows from their assumption that all products in the target market remain passive, except the defender's and the challenger's products and hence, the profit of the established product will decrease when entry cannot be prevented. The DEFENDER model has been criticised because of its assumption that all other incumbents do not react to the new brand. As such, the model does not represent a full equilibrium analysis. Hauser (1988) extended the model to full equilibrium analysis (but did not include the new entrant).

The DEFENDER model has been tested in several markets with generally encouraging results, e.g., in computer software and over-the-counter analgesics (Hauser and Gaskin 1984). Similarly, Kumar and Sudharshan (1988) investigate the development of optimal defence strategies for existing products when attacked by a new product, by extending the DEFENDER model to a full equilibrium analysis. The authors arrive at similar results to those originally suggested by Hauser and Shugan. Gruca, Kumar and Sudharshan (1992) assume that the effects of marketing mix variables are not independent (as assumed in DEFENDER and in Kumar and Sudharshan's analysis) and use coupled response functions to model the optimal response to entry. Similar models have been developed by Lane (1980),

Hauser and Wernerfelt (1988), Carpenter (1989) and by Choi, DeSarbo and Harker (1990).

Empirical Contributions

Research in the area of competitive defence is inherently difficult due to the lack of reliable competitive data (a problem which will be elaborated in Chapter 6). In general, there is relative paucity of empirical research in this field, although some researchers have begun to break ground. To be able to understand fully the state of knowledge in this field we shall review the empirical contributions on market defence against potential competition (entry-deterrence) and against actual competition (rivalry of incumbents with occurrence of entry).

Smiley (1988, 1992) surveyed 293 U.S. firms using a mail questionnaire to gauge the frequency and relative importance of different entry-detering strategies. The results show that incumbents emphasise the use of advertising and R&D to slow the entry of competitors and to maintain their market position. Learning advantages, the installation of excess capacity and limit-pricing were either never used or were used infrequently, with capacity creation and limit-pricing ranked near the bottom of the list of possible strategies. Singh, Utton and Waterson (1991a and 1991b) used a similar questionnaire to compare results for the U.K. with those reported by Smiley in the US, finding largely consistent results.

However, both of the empirical studies mentioned above suggest that quite a high proportion of incumbent firms do not feel that any action is necessary to prevent

new competition. In a recent review on mobility barriers¹³ Gilbert (1989b) concluded that "... evidence that established firms act strategically to discourage entry is more anecdotal than actual" (p. 125).

In general, the demarcation line between pre-entry and post-entry incumbent behaviour is rather difficult and often only important for theoretical considerations. *A posteriori*, the investigator may not know when a market entry attempt was detected by the incumbent or whether a pre-entry reaction may be interpreted as a post-entry reaction simply because of the time it takes to implement a strategy (e.g., in the case where incumbents react with new product positioning or modification of distribution strategies). The following studies explore competitive reactions to an actual new rival and therefore refer to the case where entry has actually materialised. We may want to conclude that barriers to entry in these industries were not substantial enough to prevent entry of new competition or new products altogether or that the competition was successful in finding gateways to get around those barriers (Yip 1982a). Nevertheless, the structural characteristics in these industries are still suitable to explain certain incumbent behaviour and may be applicable in explaining especially retaliatory moves.

Biggadike (1979) studied the performance of new entrants by conducting a small scale survey (n = 37) of U.S. Fortune 200 firms which had entered markets dominated by incumbent firms. The respondents were asked about their perceptions of industry response to their arrival in the product market. Three basic types of reactions were envisaged: no change, an increase and a decrease in an element of the reaction mix which included: price, capacity, product, marketing expenditures

¹³ Mobility barriers is a more general notion of entry barriers referring to "factors that deter the movement of firms from one strategic position to another" (Porter 1980, p. 130).

(i.e., advertising) and distribution changes. The reaction on these variables was measured individually (increases and decreases were broken down into gradations) and then combined into an index of reaction. The results show that about half (54%) of the entrants said they faced entry-deterring competitive reactions on at least one element of the marketing mix. If competitive response did occur, it was most often in terms of increased marketing expenditures (32%) and capacity changes (32%), rather than in terms of shifts in pricing (24%), product (27%) or distribution strategies (11%).

Yip (1982b) conducted a similar study recruiting 31 of the 793 U.S. businesses that had supplied PIMS data on themselves and their markets for his main study on barriers to entry. Each of the respondents were incumbents in markets that had experienced entry during the period of 1972 to 1979 by at least one direct or acquisition entrant. Data on a total of 90 entrants were reported and detailed data were obtained for 39 entrants. Respondents were asked to report changes they and other incumbents made as a response, along the following dimensions: product quality, prices, costs, production effectiveness, salesforce effectiveness, distribution effectiveness, advertising and promotion expenditures, reputation and brand name. There was virtually no response for entrants who came into the market via acquisition of an existing firm and only a small reaction for *de novo* entry (10% to 20%). Most frequently, relative product quality and relative price were changed (30%).

The results of both of the above studies have to be treated with caution. Due to the restricted sample size, multivariate analysis could not be conducted to explain the variation in competitive reactions. The ability to generalise from these studies is therefore limited.

Lieberman (1987) examined how incumbent firms in chemical product industries responded to entry by estimating equations specifying investment rates for established firms and new entrants (based on the Manne model (1967) and the scale frontier model). He found that entry into industries characterised by relatively high concentration levels was typically followed by an expansion of capacity by the incumbent firms.

Cubbin and Domberger (1988) investigated a specific type of competitive reaction to market entry. Utilising time-series and cross-sectional analysis, the authors estimated advertising response of 48 incumbents to a *new product* in their market. From the analysis, they infer "that response to entry does indeed occur" (p. 132), finding a positive advertising reaction in 38% of the analysed cases. From the set of explanatory variables, which can be summarised as market share, growth rate and individual firm variables for both incumbents and new product entrants, market share and market growth were significant. The overall finding is that the higher the market share of incumbents and the lower market growth, the higher the likelihood of an advertising reaction to the new product.

Whereas some firms react to new entry by decreasing their marketing effort, as shown in the previously mentioned DEFENDER model by Hauser and Shugan (1983), some firms increase their marketing effort (counter-attacking) or do not react at all. To explain the variation in competitive reactions to market entry, Gatignon, Anderson and Helsen (1989) found that firms counter-attack with their most effective marketing mix variables and "retreat" with their less effective marketing mix variables (the effectiveness was measured in terms of elasticities).

In a more recent work, Heil and Walters (1993) attempt to explain the strength of

competitive reactions to new products by employing a market signalling framework. The notion of market signalling stems from economics and is an important conceptual model in game theory research. In Heil and Walter's study, market signals are defined as a firm's intentions and motives which are unobservable to other competitors (see also Heil and Robertson 1991). Yet by observing competitive market actions, such as a new product introduction, inferences can potentially be made about the underlying competitive rationales. The authors use primary data to test empirically the relationship between certain signal characteristics (hostility, consequences and commitment) and the strength of the competitive reaction and they find that new product introductions, characterised by signal hostility and significant consequences for the competing firm, trigger strong competitive reactions. Robertson, Rymon and Eliashberg (1995) conceptually step back by examining competitive reactions to new product *preannouncements*. Also using the signalling paradigm (see Spence 1974, for a seminal application of the signalling logic) their main results show that aggressive and credible new product signals lead to more aggressive responses. Interestingly, in their sample of U.S. and U.K. companies 50% of the respondents claimed to have reacted to a new product preannouncement, of which 63.7% did so on the product mix (42.0% introduced a new product and 21.7% signalled a new product preannouncement).

Robinson's study (1988a) was motivated by the earlier works by Biggadike (1976) and Yip (1982b). Using start-up business data¹⁴ from the Strategic Planning Institute (SPI) he explored marketing mix reactions to entry into oligopolistic markets in the first two years after entry. He explained initial product, price, distribution and marketing expenditure reactions as a function of the entrant's

¹⁴ This database provides detailed information on reactions of entry that start-up businesses (i.e., new business ventures no more than seven years old) faced from the three leading incumbents during the first two years of commercialisation (Start-Up Data Manual, 1978).

strategy, the incumbent characteristics and industry characteristics. Robinson concluded that in year one, about 20% of the entrants faced an aggressive reaction along a single marketing mix element and only 4% faced multiple aggressive reactions along two or more marketing mix elements. By year two, reactions were more aggressive with 25% of the entrants facing retaliations on one marketing mix parameter and approximately 17% facing multiple reactions. Robinson explained the differences in reactions by a high carryover of reactions from year one to year two and by the required lead-time for adequate competitive response.

Interestingly, Robinson assessed how the degree of innovativeness of the entrant's strategy influences the incumbent's reaction. In year one the data reveal small but positive reactions and in year two innovative strategies face substantially higher reactions. Reactions occur more frequently in year two due to the fact that the implementation of appropriate defence strategies is time consuming.

So far, the empirical literature reviewed here mostly examined the likelihood and intensity of incumbents' reactions to new entrants (Smiley; Singh, Utton and Waterson; Biggadike; Yip; Lieberman; Gatignon, Anderson and Helsen; Robinson) or to new product entry (Cubbin and Domberger; Heil and Walters). Two very recent studies in marketing are taking a different slant by trying to predict reaction speed (Bowman and Gatignon 1995) and success of the defence (Gatignon, Robertson and Fein 1995). The *speed of reaction* is an important dimension of the phenomenon of competitive reaction and has previously been emphasised in the strategy literature (for conceptual work in this area see Porter 1980 and Smith and Grimm 1991). The empirical strategy literature is predominantly based on single industry research (mainly the U.S. domestic airline industry) and investigates in addition to response time/response lag: reaction imitation, likelihood and order

(Smith, Grimm, Gannon and Chen 1991), the likelihood of non-response (Chen and MacMillan 1992), total number of responses (Chen, Smith and Grimm 1992) and the impact of response time and organisational performance (Smith *et al.* 1989). Bowman and Gatignon (1995), who base their investigation of competitor response time to a new product introduction on PIMS data, find that in general firms react strongly and quickly if the market exhibits high attractiveness and if the firm already benefits from an existing competitive advantage.

While the research by Smith *et al.* (1989) shows in a single industry study that reaction timing has a significant positive impact on performance, Gatignon, Robertson and Fein (1995) investigate performance implications of reaction strategies on a broader scale. They confirm the research findings by Smith *et al.* (1989) in their analysis of a wide range of industries and they discover that the broader the reaction (which they define as the number of marketing instruments used) the less successful the defence is perceived by the respondent. This managerially important finding can be explained by the research by Gatignon, Anderson and Helsen (1989). Competitors will first and foremost retaliate with their effective marketing mix instruments. The broader the defence, the more likely it is that instruments are used which are less effective and hence a suboptimal use of resources is likely to render the defence less successful.

Synthesis of Literature on Competitive Reaction to Market Entry

Some general observations can be drawn from the empirical work in this area:

There are structural conditions in industries and firm-specific characteristics which potentially allow incumbent firms to defend their markets against competition.

These conditions can help to explain variations in incumbents' reactions.

We have also learnt that there is evidence that companies do indeed defend their markets. In cases where a start-up company, or *de novo* entry in economic parlance, threatens an established competitor, it is likely to defend less strongly than against a new product entry from an established competitor. This has been explained with the uncertainty that surrounds new businesses. Whether an incumbent defends against a new competitor or a familiar rival seems to be an important determinant of incumbents' defence behaviour.

This finding sheds a new perspective on the industrial organisation literature which has made most of the theoretical contributions to this field. If companies are less inclined to defend against a newly established business entering their markets how likely is it then that firms defend against potential competition? Gilbert (1989b) found the evidence for strategic entry-deterrence "more anecdotal than actual" (p. 125) and Smiley (1988 and 1991) and Singh, Utton and Waterson (1991) provide empirical support that in most cases incumbents do not attempt to deter entry.

Interestingly, there is also scattered evidence of whether the nature of the product competition plays a role in the incumbent's decision of how to defend. Robinson (1988a) included the innovativeness of the new product introduced by new entrants. He found that the more innovative a product, the stronger the incumbent's reaction in the second year after introduction. The inclusion of the entrant's innovativeness in Robinson's analysis was based on the contention that innovative strategies are potentially threatening and can therefore motivate strong incumbent reactions. Surprisingly, Cubbin and Domberger (1988) found that innovative entry appeared to have no effect on the likelihood of *advertising response* to product entry. The

research by Heil and Walters (1993) addresses a related problem; they find that the hostility of a new product signal has a significant, positive, effect on the strength of the competitive reaction. Maybe the more innovative a new product, the more hostile it is perceived by the competitor and therefore reactions are stimulated. Bowman and Gatignon (1995) actually claim that "(i)nnovative entries, in particular, represent a major threat and thus they are expected to incite strong reactions" (p. 51). Although Robinson (1988a) found this positive relationship, there is evidence in the literature on innovation that shows that a different behaviour is prevalent when new product entries are innovative or radical. To demonstrate that there is need for further scrutiny of this important issue I shall first explain the notion of innovation, its forms and different types and then examine its potential impact on competition.

2.4 Technological Innovation and Competition

2.4.1 Technological Change and Innovation

Given that this thesis is concerned with the relationship between competitive behaviour and technological innovation, the following sections provide a brief conceptual review of relevant theories on innovation.

The strict relationship between economic growth and change, on the one hand and technical progress on the other, is a rather evident and well recognised "fact" in economic theory. Technology can be defined as those tools, devices and know-how that mediate between inputs and outputs (process technology) and/or that create new products or services (product technology) (Rosenberg 1972) or, more generally, "as reproducible capabilities, whether these capabilities are embodied

in procedures or equipment" (Adler 1989). Technological progress may be viewed as occurring in four steps: invention, development, implementation and diffusion (Scherer and Ross 1990). *Invention* is the act of conceiving a new product or process and working out the details in its essential but rudimentary form. *Development* is the lengthy sequence of trial-and-error testing through which the invention is modified, perfected and worked out in detail to make it technically ready for practical application. *Innovation* involves implementing the finalised version of the invention and putting it into practice for the first time. To distinguish invention from innovation, Freeman (1974) explains "An invention is an idea or a model for a new or improved device, product, process or system. An innovation is accomplished only with the first *commercial* transaction involving the new product, process ..." (p. 22). *Diffusion* relates to the rate and speed at which the innovation disseminates and gains consumer acceptance (Robertson 1967 and 1971) and to the rate at which other enterprises follow the lead of the innovator.

There is a substantial literature on technological evolution and change (e.g., Sahal 1981, Dutton and Thomas 1985). The theories of technical change have generally been classified into two broad categories, namely "technology-push" and "demand-pull" theories, recognising that there can be - and generally are - different origins of inventive activity. The first theory is associated with Phillips (1966), although it can be traced to Nelson (1959) and places major emphasis on the role of innovation in scientific knowledge, i.e., it views technology as the "prime mover". "Demand-pull" theories point to market forces as the main determinants of technical change. Tushman and Anderson (1986) conclude, however, from an analysis of many different technologies over years of evolution, that neither of these types of theory alone seems to be adequate to explain the emergence of new technologies. Rather, technology seems to evolve in response to the interplay of

history, individuals and market demand (see also Sahal 1981).

A central concept in the literature on technological innovation is the distinction between refining and improving existing products, processes or systems and the introduction of a new paradigm that departs in a significant way from past practice (Dosi 1982). Incremental innovation refines and extends an established design. Improvement occurs in individual components, but the underlying core design concept, i.e., the technological paradigm, remains the same. Radical innovation establishes a new technology paradigm and hence, a new set of core design concepts. The distinction between "radical" and "incremental" change is based on a common punctuated equilibrium model of how industries and technology-based organisations evolve. This model describes how industries remain relatively stable until the *status quo* is interrupted or "punctuated" by unforeseen events, such as radically innovative technologies. These events then unleash chaotic periods characterised by rapid changes (Page, Wiersena and Perry 1990).

There is increasing recognition, however, that this punctuated equilibrium model does not apply to a variety of today's industrial settings, in particular to those that have been characterised as uncertain and rapidly changing (Bahrami and Evans 1989, Covin and Slevin 1989, Eisenhardt and Bourgeois 1987). In such environments, a punctuated disequilibrium model may be more appropriate. This model assumes that there are no long periods of stable design convergence. Instead, discontinuity and change are the norm and innovation is technologically driven. Under such conditions, new firms seeking a technological gateway to an industry will be more likely to pursue "architectural innovation" rather than radical or revolutionary change. Architectural innovation is basically the reconfiguration of an established system to link together existing components in a new way. This

form of innovation is often triggered by a change in a component (Henderson and Clark 1990).

In this thesis the term "innovation" refers to *product changes*. The different types of innovation are in practice difficult to distinguish. For the purpose of this study I distinguish more incremental from more radical innovations. An incremental (or minor) innovation refers to a new product that has been refined or enhanced. A radical innovation refers to a new product that uses a new underlying technology. The central thesis of my study is based on the fact that a shift in the technological paradigm enables new competition to disrupt the status quo and to surpass incumbents by deploying a *radical* new technology. In this situation, the incumbent is unable to sustain competitiveness through internal efforts that would otherwise enable it to move fast enough continually to recreate small "temporary barriers" as shown by Ghemawat (1991). Such a "radical" threat would make a defensive action to sustain competitive advantage less effective given the incumbent's existing capabilities. On the other hand, a defensive action of the established competitor might still be effective when it is threatened by a minor innovation, because in this case the existing capabilities represent a formidable artillery against the new player. We could conclude from this argument that the more radical the new product entry, the weaker the competitive response. This conclusion would point in the opposite direction to the one made by Robinson (1988a) and Bowman and Gatignon (1995). To shed more light on these contradictory results, the following sections will examine asymmetric effects of innovation on established competition.

2.4.2 Innovation and Competitive Reaction

Technological innovation is a specific entry barrier that has received

attention in the economics literature (Mueller and Tilton 1969, Pavitt and Wald 1971, Kamien and Schwartz 1982). For example, an *established firm* can use innovation to gain an advantage over rivals by being the first to introduce successful new products or processes protected by patents or trade secrets. The marketing literature has mainly focused on the examination of first-mover or market pioneer advantages derived from incumbency (Abell and Hammond 1979; Biggadike 1979; Whitten 1979; White 1983; Robinson and Fornell 1985; Urban, *et al.* 1986; Lambkin 1988; Robinson 1988b; Moore, Boulding and Goodstein 1991; Kalyanaram and Urban 1992 and Kerin, Varadarajan and Peterson 1992). These first-mover advantages are viewed from the established firm's perspective as barriers to entry (see, for example, Comanor 1964, Freeman 1965).

However, there are also a number of studies that suggest that *actual and potential new competition* will be able to overcome existing entry barriers through innovation which creates gateways of entry into an industry (see, for example, Yip 1982a, 1982b). The industrial organisation and management literature has been successful in identifying reasons why incumbents often fail to be early entrants into new technical fields (see, for example, Arrow 1962, Reinganum 1983, Hannan and Freeman 1984, Tushman and Anderson 1986, Ghemawat 1991). Ghemawat (1991), for example, describes a case where market incumbency led to technological inertia. He describes the case of AT&T in the private branch exchange (PBX) industry and how it lost its market to new entrants that came up with a "new to the world" innovation. AT&T, a well established and strong competitor and two other existing companies, Rolm and Northern Telecom, were surpassed by new players whose innovation created the new technological subfield of voice-and-data PBXs in the early 1980s. The lack of AT&T's competitive response was explained by Ghemawat as being due to a fear of cutting into the sales of existing products (self-

cannibalisation).

Reinganum (1983) provides the theoretical support for this phenomenon by showing that an established competitor invests less than a new entrant, if the entrant develops a sufficiently revolutionary innovation. Reinganum's model triggered a debate because she contradicted the results of a study by Gilbert and Newbery (1982). Gilbert and Newbery's research investigated under which conditions Arrow's (1962) well known thesis about incumbents' investment behaviour holds true. Arrow stated that firms in competitive markets have significantly greater incentive to invest in innovation than do firms in monopolistic markets. Gilbert and Newbery show that this result does not hold if there is free entry to the industry. In these cases, monopolistic firms will rationally pre-empt potential entrant investment in innovation. They do so in order to continue to profit from the extension of existing market power to a new generation of technology. The model is based on the assumption that the date at which the innovation is introduced is not contingent upon any single firm's investment and that the innovation is incremental (older technology remains a viable substitute for the new technology).

Reinganum (1983), on the other hand, argues that this would not be the case where the innovation is surrounded by uncertainty. She shows that if the innovation is radical and if the date at which it will be introduced is dependent on the investments made by each firm, then incumbents with market power have less incentive to innovate. This result can be explained by the potential cost of cannibalisation of the revenues from the incumbent's existing products as, for example, described in the case of AT&T in the PBX market.

This well-known debate between Gilbert/Newbery and Reinganum shows the fruitfulness of distinguishing between radical and incremental innovation as a basis for understanding competitive response.

Cases like AT&T, where established competition is out-flanked by new competition, are by no means isolated. In fact, a common empirical finding is that the first companies to introduce major innovations frequently are newcomers to an industry (Jewkes, Sawyers and Stillerman 1969; Abernathy and Utterback, 1978). That new competition has an important impact in technology development has been suggested by a number of studies in economics; and according to Scherer and Ross (1990), new entrants - whether actual or potential - stimulate technical progress directly through their own development of innovations and indirectly as "spurs" to established competition.

Cooper and Schendel's research (1976) appears to have been the first attempt to study empirically major product innovations from the viewpoint of firms threatened by such innovations. The authors studied 22 established firms in seven industries using secondary data. The industries that were selected all exhibited a process of technology substitution (for example vacuum tube vs. transistor, fountain pen vs. ball-point pen, aircraft propeller vs. jet engine etc.). From the very limited data base, they attempted to draw conclusions about the substitution pattern of new-for-old technologies.

They found that the traditional firm continued to make substantial commitments to the old technologies, even when their sales had already begun to decline because of the competitive pressures of the new technologies. Most of the firms studied followed a strategy of dividing their resources so as to have substantial stakes in

both the old and the new technologies. In this sample the new technology surpassed the old in sales within five to fourteen years of introduction. Cooper and Schendel showed that the traditional firms were unable to build and maintain a strong competitive position in the new technology. Due to the limited sample size, however, these findings have to be regarded as tentative.

The following investigation is based on my contention that a threat of a rival posed to an incumbent does indeed have consequences on the competitive reaction. These consequences seem to differ depending on whether this innovation is incremental or radical. Hence, the nature of the innovation - whether "*radical*" or "*incremental*" - is an important determinant to explain differences in competitive responses to product entry. A number of researchers, for example, suggest that during periods of incremental innovation, established firms may have an advantage over new entrants (Abernathy and Utterback 1978, Ettlie, Bridges and O'Keefe 1984, Burns and Stalker 1986, Dewar and Dutton 1986, Tushman and Anderson 1986). Radical innovation, however, may be used as a gateway into a new industry (Roberts 1980, Utterback *et al.* 1980, Abernathy and Clark 1985) where incumbents are relatively vulnerable. What happens when such situations arise? Do incumbent competitors exhibit different reactions depending on the radicality of the rival's new product? If the incumbent retaliates, how strongly does it retaliate against incremental innovations and how strongly does it retaliate against radical innovations? How can these results be contrasted with the empirical findings by Robinson (1988a), Cubbin and Domberger (1988) and Heil and Walters (1993)?

The focus of my thesis is on the investigation of incumbent reaction to rival new products. Given the competing arguments in previous research I intend to include the nature of the product competition conceptually in my research to scrutinise



these issues further. In the next chapter I shall explain my dependent variable and derive a set of hypotheses which specifies my expectations about the phenomenon of competitive retaliation.

CHAPTER 3: HYPOTHESES

3.1 Competitive Actions and Reactions

A competitive event is defined as a competitive action followed by a reaction of a competitor, a concept that was first explored by Schumpeter (1934, 1950). In general, competitive reactions are defined as a set of decisions by a firm in response to an observed competitive action. Porter (1980) defines a competitive reaction as a clear-cut and discernible counter-action taken by a competing firm to defend or improve its competitive position. An action is a specific and detectable competitive move, such as a new product introduction or a price cut (Schumpeter 1934, 1950) which is perceived by the competitor as having potentially material consequences. The impact of such a competitive move is highly dependent on the reactions of rival competitors.

Porter (1980) characterises competitive moves as a) cooperative or non-threatening moves, b) threatening moves and c) defensive moves.

Cooperative moves have the property that they do not interfere with the objectives of the rival. These are, for example, actions that improve the profitability of the whole industry (e.g., effective awareness advertising with positive spill-over effects to the entire industry sector) or moves which improve the situation for the

competition if they match it (price increases are generally designed as cooperative moves, the initiator anticipates that other competitors will follow). Moves are non-threatening if they go unnoticed (e.g., internal adjustments like reorganisations) or if they are misperceived by other competitors regarding their potential to make inroads into their revenue streams. The latter situation often arises when new competitors enter a market pursuing a niche strategy. Examples are numerous, especially of Japanese firms successfully conquering many industries by entering niches in the low-end of the market and successively occupying more segments of the market (generally moving upmarket). In most cases incumbent competitors did not perceive their entry as threatening at first only to discover later that the entrant's strategy was damaging for their long-term profitability. Honda, for example, utilised this approach and created upheaval in the motorcycle industry because established competitors did not perceive its entry into the low end of the market as a threat to their industry (Purkayastha 1978). Cooperative or non-threatening moves do not provoke competitive reactions.

Threatening moves, in general, have the potential to influence negatively the short-term or long-term profitability of other players in the industry. In such cases, counter-moves have to be expected by the initiating firm, i.e., they tend to trigger competitive retaliation. Price decreases, for example, are threatening moves. They need to be matched by the competition to minimise their impact on profitability. New product introductions also are threatening moves, as seen from the previous discussion. In the following I shall elaborate on competitive reactions, or defensive moves in Porter's language, that occur in response to a new product in the market.

3.2 Competitive Reactions to New Product Entry

The focus of my study is on competitive reactions to the introduction of a new product by a competitor. This competitor may be an established competitor, a new company or a competitor that has before competed in a different market domain. It has often been argued that the way a firm responds to competitive actions can add greatly to the ability to sustain or even enhance competitive advantage and may determine its ultimate organisational performance (Porter 1980). Therefore, the effectiveness of a competitive move depends largely on whether that action goes unchallenged.¹ In cases where the established competitor reacts strongly to the new product, the effects of the new product introduction may be diluted and the success of the launch can be seriously jeopardised (Hanssens 1980).

Competitive reaction to new product entry is a multidimensional concept and can basically be defined in terms of the following key characteristics (Gatignon 1990, Robertson and Gatignon 1990 and 1991, Gatignon and Bansal 1990):

1. Marketing Mix Instrument Used for Reaction/Breadth of Reaction

The reaction strategy can be implemented through the marketing mix variables and may be indicated by changes in the pricing mix, advertising and promotion mix, product mix, distribution mix or a combination of these. It can be observed that competitors either imitate an action (tit-for-tat) or respond with an entirely new kind of action on a different submix

¹ This is different from price increases. These are viewed as signals of price leadership intended to encourage competitors to follow suit by matching the price increase (collusion).

(Schumpeter 1950, Axelrod 1984). Other potentially important reactions include reactions outside the marketing mix such as lawsuits, patents, alliances, extent of vertical integration, capacity utilisation, absolute and relative firm size, geographic scope, investment behaviour, R&D intensity and stock price. The breadth of reaction refers to how many marketing mix instruments have been used in reacting to a competitor.

2. *Magnitude of Reaction*

This dimension concerns the extent or intensity of the response and refers to the size of the changes in the reaction parameters (price, advertising etc.) (Heil 1988).

3. *Speed of Reaction*

The speed of reaction specifies the time it takes for the incumbent to respond to a competitive action and is often referred to as the response lag. The literature reviewed earlier suggests that this dimension is crucial to the competitive advantage and performance of both the acting and the responding firm (MacMillan, McCaffrey and Van Wijk (1985), Nelson and Winter (1982), Porter (1980, 1985), Smith *et al.* (1989) Bowman and Gatignon (1995)). Issues of response time have been implicitly dealt with in the literature on first-mover advantages (see, for example, Lieberman and Montgomery 1988).

4. *Domain of Reaction*

The domain of reaction describes the field of competition in which the response takes place, i.e., the market or subfield where the incumbent is going to direct its counter-attack. Gatignon (1990) provides examples where the domain of reaction is a) the attacked market, b) another business of the established firm and c) other markets where the incumbent is not present at all (see also Gatignon and Bansal 1990).

5. *Direction of Reaction*

The direction of reaction was first defined by Bain (1956). His notion was that in a situation where an incumbent is faced with a potential entrant a) the entry may be blockaded, so that the incumbent can ignore entry, b) the incumbent deters or blocks new entrants or c) accommodates entry. In the case where the entry has materialised, Scherer and Ross (1990) propose either to retaliate, accommodate or ignore the new competition. A retaliatory move is associated with a counter-attack to the competitive move. This counter-attack may occur via the same marketing mix variable (e.g., a new product is counter-attacked with a new product or a price cut is matched), with a different marketing mix variable (e.g., a new product is counter-attacked with a new advertising campaign) or the counter-attack involves multiple marketing instruments (e.g., a competitor responds to a new product with cutting prices and special promotions) (see Lambin, Naert and Bultez 1975). Gatignon (1990) provides a fourth response option, the one of abandonment of the market, which refers to the situation where the incumbent exits the attacked market and leaves it to the competitor. Reactions

can also be classified as aggressive (aggravate circumstances for market entry), passive (no competitive response) or accommodating (ease entry for new competition) (as used by Robinson 1988a). They may also be classified as zero reaction (no reaction), positive reaction (counter-attack by increasing marketing expenditures) or negative reaction (retreat by decreasing marketing expenditures) (as used by Gatignon, Anderson and Helsen 1989).

The design of the incumbent's reaction strategy can best be described as a sequential set of decisions. Robertson and Gatignon (1990) present this notion in the following illustration (p. 2):

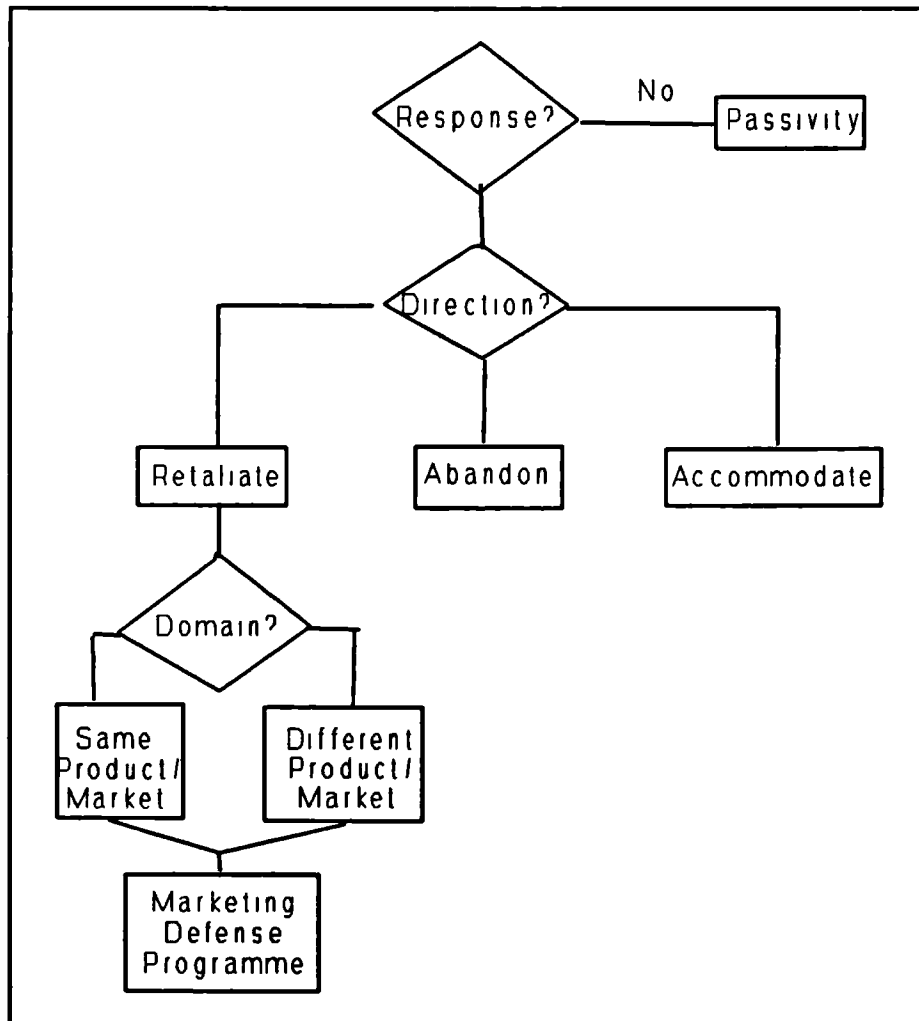


Figure 3.1: Decision Model for Determining Response to New Product Entry

Retaliatory moves are of particular interest in the field of new product introductions². They refer to those sets of defensive activities which counter-attack the new product introduction. This strategy usually involves increasing marketing expenditures and therefore has a potentially negative impact on profitability. In this sense, a retaliatory move may occur because firms pursue other objectives than profit-maximisation. Gatignon, Anderson and Helsen (1989) discussed this issue and argued that firms, in these cases, either behave irrationally or pursue the goal of market dominance or other market growth objectives.³

The focus on retaliation is important and interesting from two standpoints. First, the success of the new product is highly dependent on the competitive response. The attacker has to assess whether and when retaliation will occur and how effective and how aggressive it will be (Porter 1980). Secondly, the threatened competitor's profitability will depend on how it assesses the likely impact of the new product on its revenue stream from its existing products. The decision of whether a defence should take place is determined by the outcome of this assessment. If a defence is necessary, how soon will it occur, how effective and how aggressive will it be?

The construct of aggressiveness is strongly intertwined with the notion of strength of retaliation. Does the retaliation strategy entail only one marketing mix element (e.g., a counter-attack on the product mix by launching a new product) or does it

² It is necessary to point out that the literature, to a large extent, uses 'retaliation' and 'competitive reaction/response' interchangeably or synonymously. I shall, in the following, refer to retaliation as it is a more precise description of the phenomenon.

³ They also point out that the DEFENDER model arrives at specific recommendations, such as cutting back marketing expenditures in the event of a new brand entering the market, because their model is based on the assumptions that the firms behave rationally and that they pursue the objective of profit-maximisation. This, however, is not generally the case.

involve multiple marketing mix elements? These elements can also be used with varying strength. Recall the model by Lambin, Naert and Bultez (1975). They identified simple competitive reactions and multiple competitive reactions. The former describes reactions that employ the same marketing mix element as the one used by the initiating firm (a new product introduction would lead to a new product in retaliation). Multiple reactions would involve retaliation on other marketing mix elements, too (a new product could be countered with a new product and, for example, with a new advertising campaign as well). My objective is to examine the strength of competitive retaliation by gauging how many marketing mix elements were utilised in the defence and to what extent. The main objective is to find factors that influence the strength of a firm's retaliation.

3.3 Conceptual Framework

The focus on factors that determine the retaliatory behaviour of firms is important, as an appropriate defence by the incumbent competitor can dampen the success of the rival's new product and can therefore help to sustain the incumbent's competitive advantage. As proposed earlier, the new product's characteristics, in terms of innovativeness, will be explicitly included in the conceptual model as they are expected to have an important influence on the incumbent's defence mechanism.

In his study, Robinson (1988a) addressed explicitly the innovativeness of the entrant. As his results suggest, the innovativeness of the entrant's strategy has an impact on the incumbent's reaction. Robinson utilised three measures to assess whether or not "the entrant had a major product advantage, held a product patent or trade secret and was a market pioneer but was not first to enter the market" (p.

375). The latter descriptor was due to the fact that the Strategic Planning Institute (SPI) sample used, comprised companies that faced at least one established competitor at the time of market entry. Thus "pioneering market pioneers" were *ex definitione* excluded from this investigation, restricting it to companies that were not the first in the market but *were* responsible for the initial development of the market⁴.

Robinson tested whether the entrant's innovativeness, as defined above, had a negative or positive effect on the competitive reactions in year one and two. This procedure was based on the opposing arguments that a) innovativeness represents a major threat stimulating a strong reaction versus b) limited reactions can be expected due to the fact that it would be both too difficult and too costly to counter-attack an innovation. The empirical results support the former contention, showing a weak positive influence in year one and substantially stronger reactions in year two. In summary, although time-delays restrict first-year reactions, by the second year important reactions do occur.

As mentioned above, Cubbin and Domberger (1988), who investigated advertising response to new products, found no difference in incumbent behaviour with regard to innovative versus non-innovative entries. Utilising a two-stage methodology they identified the advertising response to new product entry for a sample of 42 companies in consumer goods markets. Their results suggest a systematic response by dominant firms in static markets but found that incumbents are as likely to respond to innovative as to copycat products. Their finding therefore contradicts Robinson's conclusion that the innovativeness does play a significant role in

⁴ Robinson (1988a) cited the example of Ford in this situation, since Ford was not first in automobile manufacturing but is still considered as the pioneer in this field.

determining the incumbent's response on the advertising mix.

It is interesting to note how both studies operationalised the innovativeness of the entry. Robinson included three measures in his analysis to assess whether the entrant had a major product advantage, held a product patent or trade secret and was a market pioneer but was not first to enter the market (pioneers that were first to enter were excluded from the database as described earlier). This assessment implicitly captures the notion of innovativeness. Unfortunately, Cubbin and Domberger do not reveal any information on how they decide what constitutes an innovative product in their study. They only state that "... we also classified the entrants' products into innovative and non-innovative types" (p. 136). Therefore we have to cast some methodological doubt on their findings. Also they investigate a specific type of response, namely the advertising response to a new product. We effectively do not know from their analysis whether a more innovative product has been counter-attacked with a reaction on the product mix (or on any other non-advertising related mix). These tit-for-tat reactions are not captured in their research.

Heil and Walters (1993) assessed the strength of competitive reactions to new product introductions using a signalling paradigm. They found that the more hostile the new product signal the stronger the incumbent competitor's reaction. Also, new product introductions that signal significant consequences for competing firms triggered stronger competitive reactions than new product signals with little or no consequence. These findings support Robinson's results as a radically new product is likely to be perceived as a serious threat to the incumbent's long-term competitiveness and the consequences are likely to be significant. Research by Gilbert and Newbery (1982) shows that incumbents will rationally pre-empt entrant

investment in innovation in order to continue to profit from the extension of existing market power to a new generation of technology. From these arguments we may infer that the more innovative a new product entry, the stronger the incumbent will retaliate. Hypothesis 1a expresses therefore a positive relationship between innovativeness and strength of retaliation.

Hypothesis 1a:

The innovativeness of the new product is positively related to the strength of retaliation by the incumbent competitor.

The empirical evidence in the literature, however, is not conclusive and arguments have arisen that lead to a different argument. The economics and industrial organisation literature, for example, suggests that a defensive reaction against actual or potential new entrants has to be evaluated in the light of the benefits and costs that are associated with such an endeavour. In general, if the costs of a defensive strategy are higher than the expected benefits of deterring or limiting market entry, the incumbent will be less likely to respond. In the opposing situation, where the expected benefits of a particular defence strategy are higher than its cost, the incumbent may be more inclined to engage in such a defence strategy. The competitors' incentive to respond is therefore driven by their expected payoffs (Schelling 1960). This cost-benefit consideration will be very much determined by the potential effectiveness of a defence strategy. This, in turn, will be influenced by existing capabilities of the incumbent and by its ability to maintain its competitive advantage in the light of changing competitive patterns. The basic premise here is that new competitive products are not all alike. As explained they can reflect minor changes, i.e., the refining or enhancing of existing

products or major changes, i.e., the employment of radical new technologies.⁵

The radicality of the new product has an important impact on the incumbent's ability to benefit from its existing capabilities and hence from its competitive advantage. More specifically, an incremental (minor) innovation is less likely to destroy structural asymmetries and existing capabilities. In fact, research suggests that incremental innovation often reinforces the dominance of established firms (Nelsen and Winter 1982, Ettlie, Bridges and O'Keefe 1984, Dewar and Dutton 1986, Tushman and Anderson 1986). In this case the incumbent's capabilities can be used as a formidable artillery against a new player and we may expect a *strong* retaliation move. An example is the very strong retaliation by Pizza Hut and Dominos against McDonalds' decision to serve pizza in their outlets. A similar reaction was shown by KFC when Pizza Hut test-marketed a range of chicken products (Hume 1992). For a radical new product, the likelihood of a retaliatory move might be dampened since a counter-attack would be difficult and existing capabilities may no longer be utilised as effectively (an example would be AT&T in the PBX market as described by Ghemawat 1991). Hence, in the situation of a radical innovation, a strong head-to-head competition is most likely to be avoided and the incumbent is more likely to rearrange features of its marketing mix marginally (e.g., by introducing a small price decrease to make the product more competitive).

The counter-hypothesis to Hypothesis 1a is then formulated as:

⁵ Arrow (1962) used the formulation "drastic" to refer to radical innovations. In cases where the innovation is drastic it represents such a technological advance that the previous technology is no longer a viable substitute and the demand for this technology falls to zero when the new product is being introduced.

Hypothesis 1b:

The innovativeness of the new product is negatively related to the strength of retaliation by the incumbent competitor.

Competitive reactions are, however, determined by structural characteristics of the industry and by firm characteristics. In the following paragraphs I shall examine how these sets of conditions relate to the strength of retaliation.

3.3.1 Industry Characteristics

In this section I explain differences in reaction strategies that can be attributed to the environment of an industry. Many industry characteristics can be suggested as possible explanations of why retaliation occurs more in some industries than in others. The literature often identifies and advances three particular characteristics, which are discussed in the following sections. These are the level of growth in the market, the competitive structure of the industry at the time of new product entry and the level and importance of the incumbent's exit costs.

Market Growth

Market growth rates and relatedly, the stages of product life cycles, can affect competitive response. The literature on this relationship, however, is conflicting. Porter (1980), for example, suggested that slowing growth rates would make competition more aggressive but also that the likelihood of "irrational" retaliation is great. This contention is in line with the finding by Cubbin and Domberger (1988) that advertising responses are more frequently used in stable environments

than in growing markets. Robinson (1988a), on the other hand, found reactions to be stronger in high growth markets than in low growth markets. One reason for this observation could be that market growth signals the potential for future profitability and therefore increases the attractiveness of these markets - for entrants *and* for incumbents.

A new entrant in a market can potentially have two effects 1) a market-widening effect if it increases primary demand and 2) a substitution-effect on existing products if primary demand does not expand. Hauser and Shugan (1983), for example, assumed that the introduction of the attacking products does not increase primary demand. This effect is more likely in stable and mature markets where market growth rates are low and companies will therefore be inclined to defend their market shares strongly. In growing markets, it is more likely that the new product increases primary demand. In these cases, we may argue that the competitors react less strongly if their sales growth is satisfactory (Frey 1988). Day (1986), on the other hand, suggests that even in high growth markets companies have certain expectations regarding sales development. If deviations from these trajectories occur, the incumbent is very likely to take counter-measures. Therefore I expect, that in growth markets the incumbent will retaliate more strongly than in markets characterised by low or negligible growth rates.

Hypothesis 2:

Market growth is positively related to the strength of retaliation by the incumbent competitor.

Industry Concentration

The number of competitors affects the level of expected cooperation and hence, the level of competitive rivalry. Research in game theory, for example, suggests that rivalry tends to intensify as the number of competitors increases and as they become more equal in size and capability. Burke and Moore (1990) show that rates of cooperation are lower the more subjects participate in an interaction. This would indicate a higher likelihood of competitive response in less concentrated markets. However, one important determinant of the motivation to react to a new player is whether future profitability can be secured. This is unlikely in industries that have a low concentration. Markets with atomistic competition are likely to remain very competitive. Furthermore, a concentrated market exhibits a high visibility of competitive movements and firms are likely to monitor the competition very closely (Bowman and Gatignon 1995). Also, Porter (1980) argues, the higher the industry's concentration, the more noticeable an entrant becomes in terms of the impact on incumbents' market position; in low-concentration industries this impact may only be marginal.

Hypothesis 3:

Industry concentration is positively related to the strength of retaliation by the incumbent competitor.

Exit Costs

In Chapter 2, I discussed exit barriers as the opposite case of entry barriers. Exit costs are the costs that have to be borne by an incumbent when abandoning the market. Exit costs therefore constrain the movement of a competitor from one

industry or industry segment into another. In the case where established firms face high exit costs, these firms will be more inclined to defend their current position even if they are earning subnormal returns on investment (Porter 1980). Dixit (1980) showed that exit barriers provide the incumbent with the incentive to take a more competitive posture toward potential rivals. In fact, exit costs were the only economic variable in Heil and Walters' (1993) investigation on strength of response that proved to be significant. I expect therefore, that high exit costs will be an important determinant for explaining an incumbent's reactions, since the consequences of a new product introduction poses a threat to its profitability and therefore potentially has an impact on the livelihood of the established competitor.

Hypothesis 4:

Exit costs are positively related to the strength of retaliation by the incumbent competitor.

3.3.2 Incumbent's Competitive Position

Size of the Incumbent

A key factor that affects response is the size of the incumbent. For example, larger incumbents, in general, have lower capital costs and thus lower costs of defending their market (Smiley 1992). In addition, it has been argued that larger incumbents have "deep pockets" providing them with the capability to thwart their rivals (Rhoades 1973). Also, the greater the market share (as a proxy for size) the more the incumbent has to lose. Robinson (1988a) found that reactions are more likely when the incumbent is dependent on sales from one market or market segment. My expectation then is that firms with a high market share in a particular segment

might be dependent on that market. This suggestion is also in line with Cubbin and Domberger (1988) who argued that the benefits of an incumbent defending will be proportional to its market share. Their results show indeed, that "dominant" firms were much more likely to respond aggressively than others. In line with their findings, I expect that the larger the incumbent the more likely it is to retaliate strongly against a new product entry.

Hypothesis 5:

The larger the incumbent the more strongly it retaliates to a rival new product.

Customers' Price Sensitivity

There are situations where the incumbent's market is characterised by customers that are relatively sensitive to price changes of the product. This observable price sensitivity of a market segment is an indicator of buyer's switching costs, which affects competitive rivalry because it defines the ease with which buyers can change over to a substitute. In situations where switching costs are low, buyers will exhibit a higher price sensitivity to discrepancies in competitors' prices. This effect would occur in those cases where the rival new product is introduced at a lower price than the incumbent's product. In these cases the new product entry potentially poses a greater threat to the incumbent competitor and a strong retaliation, to prevent customers from being lured away to the new product is likely.

Hypothesis 6:

If the competitor has introduced the new product at a lower price than the incumbent and the market is price sensitive then the incumbent is more likely to retaliate strongly against the new product.

3.3.3 Characteristics of the Rival Competitor

The reaction strategy of the incumbent firm also depends on a number of characteristics of the competitor introducing the new product. Especially important are a) the perceived threat posed by the rival and b) whether the competitor is already established in the industry or is a new entrant. The latter point has been shown to have a significant impact on whether incumbents react strongly or not (Biggadike 1979, Yip 1982b, Robinson 1988a). Both aspects are discussed below.

Degree of Threat Posed by Rival

The empirical research in marketing that used the signalling paradigm has led to two important conclusions: hostile actions and actions which signal significant consequences for the threatened firm, trigger strong competitive reactions (Heil and Walters 1993) and aggressive actions lead to more aggressive responses (Robertson, Rymon and Eliashberg 1995). These characteristics - hostility, consequence and aggressiveness - are captured in the construct of threat. The more hostile and aggressive and the more consequential an action, the more threatening it potentially becomes for the attacked firm. In these cases I expect a stronger, more aggressive retaliation to occur than in situations where the competitive attack is less hostile, aggressive or consequential.

Hypothesis 7:

The perceived threat posed by the rival competitor is positively related to the strength of retaliation by the incumbent competitor.

Incumbent Versus New Competitor

From the literature review in Chapter 1, I concluded that more frequent and stronger reactions can be observed in cases where a new product has been introduced by a rival incumbent than by a *de novo* entry or by an entrant coming into the industry via acquisition. The incumbent's familiarity with the competitor therefore seems to be an important influence in determining whether it will retaliate strongly or not.

Hypothesis 8:

An established competitor elicits a stronger retaliation than a competitor new to the product category.

3.3.4 Interaction Effect

I have hypothesised that in growth markets incumbents are likely to retaliate stronger than in static markets. To account for the possibility that in high growth markets only dominant incumbents, i.e., firms with the largest market share, find it worthwhile to retaliate strongly, an interaction term has to be introduced. To operationalise this interaction, dummy variables are defined for a) dominance (DOM; dominance = 1, 0 otherwise) and b) for growth markets (GROW; growth market = 1, 0 otherwise). The interactive variable GROWDOM is then constructed ($GROWDOM = GROW \times DOM$). This variable assumes the value of 1 for a dominant firm in a growth market, 0 otherwise.

Hypothesis 9:

A dominant incumbent in a high growth market retaliates more strongly.

A summary of the hypotheses can be found in Appendix 3.1. The following diagram gives the proposed conceptual model:

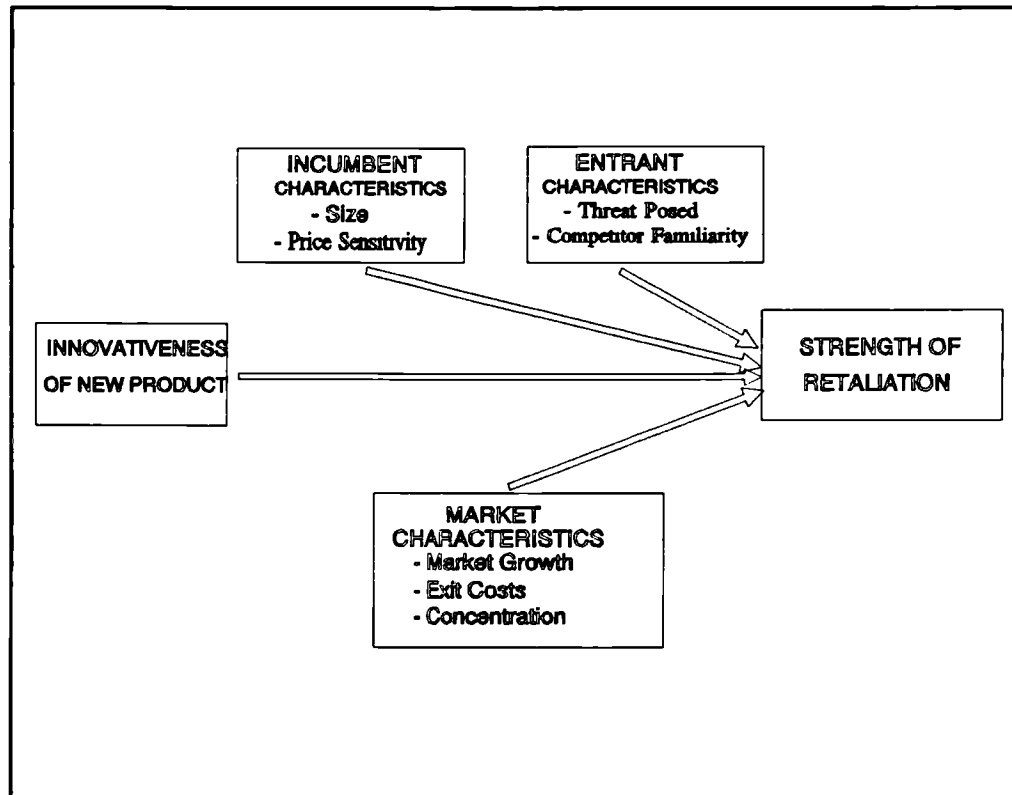


Figure 3.2: Conceptual Model

The following Chapter 4 discusses methodological issues such as sampling and sampling procedure, pretesting and construct development.

CHAPTER 4: METHODOLOGY

4.1 Introduction

It has been stated that there is a lack of empirical research on competition within the marketing discipline (Eliashberg and Chatterjee 1985) and, specifically, on entry and defensive strategies (Gatignon and Bansal 1990). The majority of research in these areas is of a normative analytical nature and, therefore, poses several limitations with regard to empirical tests. Most of the empirical studies mentioned earlier, such as those by Yip (1982b), Biggadike (1979), Robinson (1988a) and Bowman and Gatignon (1995) utilise secondary data sources.

This study seeks to add to the limited empirical base by studying actual managerial reaction in the context of new product introductions. The challenge is to find an appropriate method that provides insight into the phenomenon of competitive reaction so that a broader understanding and knowledge can be gained. Therefore, the research method applied has to be able to distinguish, from a set of competitive activities, those that are intentional versus those that are unintentional. On the basis of secondary data sources, for example the PIMS¹ database, the feasibility of such

¹ The Profit Impact of Market Strategy database was established in 1972 by the Strategic Planning Institute.

a discrimination is rather limited. First, the researcher has to control for market forces and developments other than the one induced by competition. Second, even if it is possible to identify certain events in the market that would potentially trigger a competitive reaction, the researcher cannot be certain that the reacting manager chose a particular course of action due to the manager's perception of the event.

The PIMS database, although widely utilised in marketing strategy research, has in recent years been criticised. Its critics especially question the representativeness of the sample as the majority of participating businesses are Fortune 1000 companies which also pay a fee to participate (Buzzell and Gale 1987). Also, although the database contains measures on a large range of strategy variables it is less suitable for investigations that measure constructs that are not included in PIMS. A central measure in my research was, for example, the innovativeness of the new product entry - a measure not adequately conceptualised in PIMS.

Given these limitations especially with regard to the lack or inadequacy of measures on strategy issues, I employed a survey technique. The collection of primary data through survey methodology has the advantage that the instrument can be specifically designed for the subject under study. It therefore allows me a) to develop measures for the constructs under investigation (e.g., innovativeness, threat etc.) and b) to ask managers directly about their reactions to a new entry and therefore also captures incumbents' reactions that have not been perceived by the competitor. Furthermore, it allows me to study such behaviour cross-sectionally to investigate whether certain patterns in the choice of defence strategies can be observed.

My study represents a departure from the PIMS study tradition in the field of market defence. The survey methodology has previously been employed in marketing to study competition: for example, investigating product preannouncing behaviour (Eliashberg and Robertson 1988), competitive reactions to product preannouncements (Heil and Walters 1993) and more recently the success of incumbents' defence strategies to new product introductions (Gatignon, Robertson and Fein 1995).

Several sets of questions were used for the survey. One set established a profile of the incumbent firm, of the responding manager and of the industry. The other set asked about the new product introduction, the new entrant and the respondents' reactions to the new product. These questions were developed to operationalise the constructs that were specified in the hypotheses.

In the remainder of this chapter, I shall discuss the pretesting procedure, the development of the questionnaire, sampling issues and measurement development.

4.2 Pretest Procedure

Pretesting (or pilot testing) is the stage in the development of a questionnaire that determines its potential effectiveness. The necessity of pretesting questionnaires is stressed in the literature and is a prerequisite for successful survey research (e.g., Churchill 1991). It is also of crucial importance if newly developed measures are used as it is the in my study. The pretest phase provides then the opportunity to test whether the measures perform satisfactorily before the survey instrument is administered on a large scale.

The questionnaire was pretested on groups of managers from diverse industries taking part in executive education programmes. These executives were in upper level management positions (strategy, marketing and planning) and had knowledge of the firm's competitive intentions and activities. The pretest sample in this regard was similar to the final group. This requirement is recommended in the contemporary pretesting literature (e.g., Boyd, Westfall and Stasch 1989, Bolton 1991). The pretesting procedure should ensure that the intended meaning of the questions is conveyed to the respondent, to correct sequencing of the questions and to confirm that the time allowed for completion of the questionnaire is reasonable. In general, the pretest is used to identify errors which may only be apparent to the population concerned (Hunt, Sparkman and Wilcox 1982). The literature provides different suggestions on the issue of the testing medium. The question is whether personal interviews should be conducted or whether the method proposed for the final study is more appropriate. In most cases the literature recommends personal interviews as the pretest medium (e.g., Boyd, Westfall and Stasch 1989). The respondents' reaction to the questionnaire can be monitored using either protocol methods (interviewee's reaction is monitored during the completion) or debriefing methods (interviewee's reaction is discussed after completion of questionnaire).

In total three pretests were conducted. For the first pretest I utilised the debriefing method. The participating executives (n=15) were briefed on the purpose of the study and were asked to complete the questionnaire. After completing the questionnaire, they were interviewed face-to-face. Interviews typically lasted half an hour and each question was discussed to eliminate sources of ambiguity. These in-depth interviews were an important step in assessing the overall acceptability and perceived complexity of the questionnaire. It was also an invaluable input for further refinement and development of the measures utilised. This phase led to the

elimination of certain words and to a reduction in complexity (to reduce the initial 35 minutes fill-in time to more acceptable 20 minutes).

I conducted the second pretest with a similar group of subjects ($n=25$) to assess whether amendments and alterations did introduce further or new problems. The final stage was a mail-out to a subset of the sample frame ($n=200$). This stage was important to test the mailing procedure and the response rate. The effective pretest response rate was 20.5 %.

4.3 Sample and Sampling Procedure

In the main study the questionnaire was aimed at senior executives in marketing positions from a broad range of industries, including both consumer and industrial products. The mailing was based on a commercially-purchased list which specifies manufacturers in the U.K. including Northern Ireland. The selection criteria were by Standard Industrial Classification (SIC Divisions 2 to 4)², by title (marketing director) and by size of firm (over £10 million in sales). In total, a randomly drawn sample frame of 1,000 potential respondents was obtained.

Procedure

First, a prenotification letter was sent to the potential respondents. The prenotification was decided upon to introduce the purpose of the study, to request cooperation and to screen the respondents. Previous research has shown that prenotification by letter enhanced the response rate (Haggett and Mitchell 1994). This initial screening led to a deletion of 91 addresses from the database a) because

² The 1980 version was used.

respondents had left their companies and b) when firms replied that it was against company policy to respond to mail surveys.

In the second stage, a total of 910 questionnaires were mailed. The materials mailed included a cover letter with instructions, a questionnaire and a prepaid return envelope. As an incentive respondents were offered a copy of the results if they sent their business cards in separate envelopes. A reminder postcard was sent one week after the main mailing date. The questionnaire and the cover letter are included in Appendix 4.1 and 4.2.

Instructions

In the cover letter the respondents were informed that the questionnaire was designed as a series of check-off answers to short questions. They were asked to "recall the last time a competitor introduced a new product into their product category". An explanation was provided to clarify the meaning of product category and examples were given. If the respondent could not recall a new product from a competitor, they were asked to return the questionnaire. Respondents recalling a new product were asked to indicate how long ago the new product entered the market before continuing to answer the second section of the questionnaire. After responding to questions regarding the respondent's business, questions followed to investigate the exact nature of the new product entry and of their competitive response.

Sample and Response Rate

The questionnaire mailing resulted in a returned sample size of 280 questionnaires

of which 249 were usable; 31 responses were unusable due to missing data or due to low involvement of the respondent (the issue of the respondent's involvement will be discussed below). This yields an effective response rate of 27.4% and an overall response rate of 30.8%. My response rate is above average when compared with other studies dealing with marketing strategy issues and employing business executives as respondents (Iwamura and Jog 1991, Sinclair and Stalling 1990, Howard and Ryans 1989, Heil and Walters 1993, Robertson, Rymon and Eliashberg 1995). This may be explained by the screening and follow-up effort and by the elaborate pretesting phase (discussed under 4.2). In the final pretest phase I achieved an effective response rate of 20.5%. As this mailing did not include the prenotification and the follow-up, the increase of 6.9% may most likely be attributed to these additional measures.

In terms of breakdown by industry: 18.9% of the sample comprised electrical and electronic engineering; 18.5% mechanical engineering; 10.0% food, drink and tobacco; 9.2% paper, paper products, printing and publishing; 8.4% chemicals and pharmaceutical; 6.8% automobiles and 28.2% various other industries. Refer to Tables 4.1 and 4.2 for industry distributions in the sample frame and in the final sample, respectively.

SIC Class	Industry Description	N	% of Sample Frame
22	Metal Manufacturing	20	2.2%
24	Manufacture of Non-Metallic-Mineral Products	25	2.7%
25	Chemical Industry	72	7.9%
31	Manufacture of Metal Goods	12	1.3%
32	Mechanical Engineering	157	17.3%
33	Manufacture of Office Machinery & Data Processing Equipment	25	2.7%
34	Electrical & Electronic Engineering	168	18.5%
35/36	Manufacture of Motor Vehicles & Parts Thereof / Other Transport Equipment	65	7.1%
37	Instrument Engineering	37	4.1%
41/42	Food, Drink & Tobacco	81	8.9%
43/44	Textile & Leather Industry	34	3.7%
45	Footwear & Clothing Industry	28	3.1%
46	Timber & Wooden Furniture	35	3.8%
47	Manufacture of Paper/Paper Products, Printing & Publishing	99	10.9%
48	Processing of Rubber & Plastics	22	2.4%
49	Other Manufacturing Industries	<u>30</u>	<u>3.4%</u>
	Total	910	100.0%

Table 4.1: Distribution of Industries Represented in Sample Frame

A chi-square test was conducted to check for non-response bias, by comparing the distribution of the sample with the distribution of the mailing list on multiple dimensions including size, industry and early versus late respondents. The distributions on all these dimensions were statistically identical, leading to the conclusion that a significant non-response bias is not evident in this survey.

SIC Class	Industry Description	N	% of Final Sample
22	Metal Manufacturing	6	2.4 %
24	Manufacture of Non-Metallic-Mineral Products	6	2.4 %
25	Chemical Industry	21	8.4 %
31	Manufacture of Metal Goods	4	1.7 %
32	Mechanical Engineering	46	18.5 %
33	Manufacture of Office Machinery & Data Processing Equipment	8	3.2 %
34	Electrical & Electronic Engineering	47	19.0 %
35/36	Manufacture of Motor Vehicles & Parts Thereof / Other Transport Equipment	17	6.8 %
37	Instrument Engineering	9	3.6 %
41/42	Food, Drink & Tobacco	25	10.0 %
43/44	Textile & Leather Industry	9	3.6 %
45	Footwear & Clothing Industry	8	3.2 %
46	Timber & Wooden Furniture	9	3.6 %
47	Manufacture of Paper/Paper Products, Printing & Publishing	23	9.2 %
48	Processing of Rubber & Plastics	5	2.0 %
49	Other Manufacturing Industries	<u>6</u>	<u>2.4 %</u>
	Total	249	100.0 %

Table 4.2: Distribution of Industries Represented in Final Sample

In total, 186 respondents (74.7 %) indicated that a new product had been introduced into their product category. The respondents were asked to recall how long ago the competitor's new product was introduced. The mean for this variable is 13.4 months ($s=11.9$) with a minimum of 0.5 months and a maximum value of 60 months. Of the respondents in the sample, 50.3 % indicated that they became aware of the new product before its actual market launch, 37.3 % at the time of its launch

and 12.4% after launch.

The final sample shows reasonable variability on a number of dimensions. The combined market share of the top four firms in the product category ranges from 10% to 100%. Annual turnover of the firms participating in this study range from £10 million (lower boundary) to more than £4 billion.

It has been suggested that managers may give biased responses due to their function within the firm (Phillips 1981). This bias has been minimised by:

- including specific questions about the involvement of the respondent in the decision process under investigation, with the objective of dismissing low-involvement respondents (Campbell 1955)
- asking direct and specific questions and using the language of managers as much as possible. Questions which asked informants to report on relatively objective, observable phenomena were intended to be less demanding and less subject to distorting influences (Phillips 1981).

The involvement of the respondent was measured by asking them "How involved were you in the decision of how to respond to the competitor's new product?" A scale from 1 to 4 was used to measure their degree of involvement, where 1 corresponds to "highly involved" and 4 "not involved". Answer 1 was given to the question by 83.5% of respondents, 13.7% answered 2 and 2.8% answered 3 or 4. These latter cases (2.8%) were eliminated from the analysis. (For a summary of the descriptive statistics see Appendix 4.3.)

4.4 Construct Development

In this sections I shall describe how I operationalised the constructs which were introduced in Chapter 3. This operationalisation or measurement involves "rules for assigning numbers to objects to represent quantities of attributes" (Nunnally 1967, p. 2). The crucial issue here is to find measures which adequately capture the construct under investigation. Generally, I attempted to used multi-item measures whenever possible. Multi-item measures have considerable advantages over single-item measures in terms of their validity and reliability (Churchill 1979). Single-item measures are often inappropriate for making fine distinctions among respondents and their specificity tends to yield only a low correlation with the intended measurement (Churchill 1979). Multi-item measures should therefore be preferred. To operationalise a construct or a concept, items have to be generated which capture the domain of the construct. The input for this stage originates from literature searches and experience surveys (Selltitz *et al.* 1976). I developed most of the initial items by conducting a survey of the literature in marketing, strategy, economics and industrial organisation. This initial item-pool was subsequently refined in the pretest phase by interviewing the participants of the focus group.

4.4.1 Multi-Item Measures

Although the literature has some extant measures for notions similar to some of the constructs under investigation, no exact measures seem to exist for the constructs' measurement in the context of competitive response. Multiple-item scales had to be developed for most of the constructs hypothesised, using six-point Likert scales, usually anchored "strongly disagree" and "strongly agree".

The next section explains how the constructs are defined and measured and which additional variables were measured using single-item measures. For all multi-item constructs I will report the total item-pool used in the questionnaire. In Chapter 5 a detailed description will follow on how I generated the set of items that was subsequently used in the analysis.

Competitive Retaliation

As outlined earlier, a competitor's reaction can be identified along several dimensions. Robinson (1988a), for example, used SPI data and classified competitive reactions into: 1. aggressive reactions (aggravate circumstances for market entry), 2. passive reactions (no change) and 3. accommodating reactions (ease entry for new competition). This classification is problematic since the author is not specific in defining these categories (Robinson 1988a, p. 371), nor does he describe the procedure by which and by whom it was decided in which category the competitive reactions belong. This is a major caveat because this categorisation is at the core of Robinson's investigation and represents what he aims to predict. To measure whether a reaction was of a particular type, Robinson generated a reaction index which can be used to describe the reactions on an entrant-by-entrant basis. The reaction index is formed by setting accommodating reactions equal to +1, passive to 0 and aggressive reactions to -1. Since Robinson considered four instrument-specific reactions (on product, distribution, marketing expenditures and price) the index can have a maximum value of +4 (-4) if accommodating (aggressive) reactions occur across the entire instrument mix.

Although the index can be conveniently used in regression analysis it also has two deficiencies. The first, mentioned by the author himself, is the loss of information

when only frequencies are examined. The second deficiency is that such an index is inappropriate for providing useful insights on competitive behaviour when it is applied to a cross sectional study. This is because firms across industries are heterogeneous with regard to their instrument-specific reaction because of the structural determinants that prevail in their particular industries. In some industries the incumbent may react with a new product introduction (for example in fast moving consumer goods) whereas in other industries such a reaction is constrained by lead times (for example in the automobile industry). This criticism with regard to instrument choice has been formulated by Heil and Walters (1993). They define the strength of competitive reaction "as the *reacting managers' perception* of the strength of the competitive reaction that their firms actually carried out relative to the maximum amount of reaction the firm could have undertaken" (p. 56). In their opinion such a reaction measure does allow for the cross sectional comparison of reactions. The dependent variable is then measured by four items including the reaction's strength and intensity relative to industry practice, the reaction's strength relative to the reacting firm's capabilities and the reaction's power relative to industry practice.

The focal point of my study is competitive retaliation and hence reactions that aggravate the market conditions for a new product introduction. The main objective is to understand the strength of such reactions, i.e., the strength of the incumbent's retaliatory moves. For this purpose a formative index was used to measure domain-specific reactions on the marketing mix instruments. For each possible reaction parameter the respondent had to indicate whether a reaction occurred (yes/no) and, if a reaction on a specific submix occurred, whether it was a minor (1) or major (6) reaction. In total, 9 retaliatory reactions were given:

Product Mix:	Product Improvement New Product Introduction Product Repositioning
Distribution Mix:	Expansion of Salesforce Expansion of Distribution Expansion Into New Channels of Distribution
Pricing Mix:	Price Cuts Introduction of Special Trade Discounts
Promotion Mix:	Increase of Advertising and Promotion Budget

An open-ended question could be used by respondents who reacted on other parameters not included in this list (see Appendix 4.4 for a list of selected respondents' comments). The interpretation of these responses will be discussed in Chapter 6.

Each response option could obtain a value of 0 (not used) and of 1 (minor utilisation) up to 6 (major utilisation). The response scores were added to build a reaction index. This gives us an indicator of 'strength of retaliation'. This scale captures two important dimensions: the breadth of reaction (number of marketing mix instruments used in reacting to the new product) *and* the relative strength of the incumbents response (ranging from minor to major adjustments). Robinson's and Heil and Walter's approaches are therefore both incorporated in this formative index of 'strength of retaliation'.³

³ In the pretest phase I tried to replicated Heil and Walter's measure of 'strength of reaction' which captures 1) the strength of the competitor's reaction relative to industry practice and 2) the intensity of the competitor's reaction relative to industry practice. Interestingly, the respondents were not able to make sufficient distinctions between both constructs and this approach of measuring the dependent variable was therefore discarded.

Innovativeness

The degree of innovativeness of the new product plays an important role in the hypothesised relationships. It is important to make the distinction between process innovations and product innovations. As described earlier, process innovation (e.g., catalytic cracking of petroleum, oxygen steel-making, recombinant DNA technology) refers to an innovation in production techniques. Product innovation (e.g., the ball-point pen, cellophane, lycra, pen-based computers) refers to a finished good to be supplied in the market (Jewkes, Sawyers and Stillerman 1969). The focus here is on product innovations that entered a market. These were measured in terms of their radicality as *perceived* by the incumbent. The perception of the established competitor is of importance because the fact of whether or not the new product was perceived as a threat plays a major role in the design of the defence strategy. Multi-item measures were employed in order to measure whether the new product was perceived as being incremental or as radical. This construct was initially measured by the following items:

- The competitor's new product represented a substantial change in technology.
- The competitor's new product is only superficially different from those currently available (me-too); (reverse coded)
- Customers saw the competitor's new product as a major innovation in the product category.
- The competitor utilised existing technology so that the product quality of the new product was improved (second-but-better).
- The competitor's new product enhanced existing product design; (reverse coded)
- The competitor's new product added significant customer benefits.
- Customers saw the competitor's new product as a minor improvement to the benefits offered by existing products; (reverse coded)
- The competitor found a new application for an existing technology which greatly improved the performance of the new product.
- The competitor's new product refined existing products.

Market Growth

Industry sales develop according to the product life cycle concept. Here it is important to distinguish whether the market is in a growth stage or in decline. This variable measures the category growth rate and the stage of the product life cycle of the respondent's product category. The items used for this construct were:

- In this product category sales were growing fast.
- This was a high-growth product category.
- This product category was reaching maturity; (reverse coded)
- The growth in this product category was negligible; (reverse coded)
- This product category had been on the market for many years; (reverse coded)

Exit Costs

High barriers to exit keep companies competing in businesses even though they may be earning low returns on investment. Exit costs mainly result from economic (e.g., asset specialisation) and strategic factors (e.g., strategic interrelationships) (Porter 1980). The scale for this construct has previously been developed by Burke (1984) and applied in a study of strategic decision making by business-unit managers in multiproduct firms. A twelve-item, seven-point Likert-like summated ratings scale measures the degree to which the informant describes an industry as having barriers to exit. Because of its complexity the scale is reported in Appendix 4.5.

Price Sensitivity

This measure gauges the price sensitivity of customers and is important in combination with the variable 'competitor's relative price' which is a single-item

measure explained below. Price sensitivity is an indicator of customer switching cost, the higher the price sensitivity the lower the customer switching cost, i.e., the less loyal the customer base. The measures used are listed below.

- This product category was highly price sensitive.
- Price changes in this category had limited effects on sales; (reverse coded)
- This was a product category where price was the only thing that mattered to customers.
- Only a few customers were price sensitive in this category; (reverse coded)

Threat

This variable assesses whether the responding manager perceived the competitor's new product introduction as a threatening. A threatening move refers to competitive actions that directly attack a major strategic position of a rival competitor (MacMillan et. al 1985) and has been measured as follows:

- The competing firm tried to gain sales at our expenses.
- The competitor's new product posed a serious threat toward our company.
- The new product introduction constituted a hostile act toward our company.

4.4.2 Single-Item Measures

Some of the constructs under investigation do not lend themselves to be measured with multiple indicators. The following single-items have therefore also been measured with the survey instrument.

Concentration

The combined market share of the top four firms is measured (CR4). The CR4 is

widely accepted as a reliable measure of industry concentration and is also being used in the PIMS database.⁴

Dominance

This variable gauges whether a company is a dominant player in a given market and is represented as a dummy variable. If the informant indicates 'We had the #1 market share' the dummy DOM is 1, 0 otherwise.

Competitor Familiarity

This variable assessed whether the incumbent was familiar with the competitor before the new product was introduced. Choices were:

- They were already competing in this product category.
- They were competing with us in another product category but not this one.
- They had competed at an earlier point but dropped-out.
- They were never a competitor of ours before.

Incumbent's Size

The pound sterling sales for the last fiscal year were reported and the incumbent's market share.

Standard Industry Code (SIC)

The codes for the Standard Industry Classification will be used in the analysis as a dummy variable.

Competitor's Relative Price

Gauged with the single-item scale "The competitor's new product was priced lower than ours" anchored "strongly disagree" and "strongly agree".

Manager's Involvement

The respondent was asked about his/her involvement in the decision of how to respond to the competitor's new product. Choices were: 1) highly involved, 2) moderately involved, 3) somewhat involved and 4) not involved.

⁴ Concentration was also measured with multiple items but yielded only a low reliability (Cronbach's alpha = 0.706).

4.5 General Methodological Issues

In Chapter 5, I shall describe the measurement analysis and the test of the hypotheses. The measurement analysis has been conducted in a two-stage approach: first the total item-pool for each multiple-indicator construct was reduced using principal components factor analysis. Then the resulting measurement models were assessed with a confirmatory factor analysis using the LISREL software by Jöreskog and Sörbom (1993). The following sections provide a brief general discussion of the underlying methodology.

Principal Components Analysis

Principal Components Analysis is a statistical technique for data reduction (Bagozzi 1994); it transforms a set of variables into a substantially smaller set of uncorrelated variables that captures most of the information in the original set of items (Dunteman 1994). The use of a reduced set of variables facilitates understanding and further analysis. Principal component analysis tries to explain part of the variation in the set of observed variables on the basis of a few underlying dimensions. This technique does not assume the existence of a statistical model of the observed variables; the total variation in the data set is explained on the basis of the maximum variance properties of principal components. For detailed discussion of principal component analysis refer to Mulaik 1972, Dunteman 1994 or Iacobucci 1994.

Structural Equation Modelling (LISREL)

Structural Equation Modelling - or more generally covariance structure analysis -

is a multivariate technique which evolved through a combination of two disciplines: the (confirmatory) factor analysis rooted mainly in psychometric theory and the multi-equation modelling approach typically associated with econometrics (Goldberger 1971). Its aim is to explain the structure or pattern among a set of latent (i.e., unobserved or theoretical) variables, each measured by one or more manifest (i.e., observed or empirical) indicators (Diamantopoulos 1994).

There are several situations where structural equation modelling is superior to traditional multivariate techniques (e.g., regression analysis) (Goldberger 1973):

- (1) When the observed measurements contain measurement errors: This refers to errors of measurement caused by imperfection of the measuring technique or, more generally, to situations where the researcher is faced with the problem of unobservable variables, which have to be represented by proxies or latent variables.
- (2) When there is interdependence or simultaneous causation among the observed response variables.
- (3) When important explanatory variables have not been observed.

Under these conditions, structural equation modelling provides a tool which enables the researcher to estimate multiple and interrelated dependence relationships and to represent unobserved constructs in these relationships (Hair et. al 1992). Jöreskog (1973, 1977) proposed a generalised form of structural equation model, the LISREL model, which accounts for the problems stated above (Jöreskog and Sörbom 1982 and 1988). LISREL, which stands for *L*inear *S*tructural *REL*ationships, can be used to test a system of structural equations by determining the extent to which the postulated structure is consistent with the data. More

specifically, confounding effects of variables, direction of causality and mediating effects can be detected and measurement errors can be modelled (Bagozzi 1994).

A structural equation model, or more generally a covariance structure model, consists of two parts: the *measurement* part which specifies how each of the latent variables is operationalised via the manifest variables and the *structural* part which specifies the relationships between the latent variables themselves and the amount of unexplained variance (Hair *et al.* 1992). The measurement model also provides important measurement properties (validity and reliability). To test whether the theorised structure is consistent with the data, the covariance matrix implied by the specified model is compared with the covariance matrix based on the empirical data (Diamantopoulos 1994).

In Chapter 5 LISREL will be applied to test the measurement models for the multiple-indicator constructs. As such it is a versatile technique to assess the quality of the measures utilised. LISREL potentially provides the opportunity to develop better measurement models than can be generated with conventional techniques.

CHAPTER 5: DATA ANALYSIS

5.1 Descriptive Analysis of Response Pattern

5.1.1 General Findings

In the questionnaire respondents were asked how they responded to a new product which was introduced by a competitor in their product category. An open-ended question asked respondents to describe the competitor's new product briefly, in order to gain more insight into the nature of the product competition. As earlier described in Chapter 4, 186 respondents had recognised a new product entry, with the degree of innovativeness varying between minor innovation like product refinements and radically new product. The following tables provide some examples from the consumer goods industry and industrial markets (Appendix 5.1 gives a full list of the new product descriptions).

Interestingly, most incumbents indicated that they did indeed react to the competitive new product. In total, 93.0% reacted on *at least* one marketing mix element. This high incidence of reaction can be contrasted with previous research in two ways. The studies by Biggadike (1979), Yip (1982b) and Robinson (1988a) all observed that there is typically no reaction from an incumbent. These research projects focus on situations where the incumbent is faced with a *new competitor*.

New Product Entries in Consumer Goods Markets
LCD colour monitor
Leak proof food container
CD video format
Oil-based paste of herbs and spices
English apple juice
Alloy satellite antenna
Luxury car
Flybridge motor yacht
Self-refrigerating canned beer
Orthopaedic (surgical) footwear
Fluorescent photocopier paper

Table 5.1: New Product Entries in Consumer Goods Markets

New Product Entries in Industrial Markets
Fully hydraulic crawler lift crane
Personal gas monitor
Digital realout counter
Amphoteric surface active agent
Windows operated EPOS with touch-screen technology
CAD system with parametric 3D design capability
Object orientated spatial analysis software
Low cost high-tech microwave signal synthesiser
Sodium salt (C ₁₂ -C ₁₄ sulphate) with ultralow impurity
Low application temperature hot melt adhesive

Table 5.2: New Product Entries in Industrial Markets

The uncertainty surrounding new enterprises may leave existing competitors less concerned and therefore less reactive to such competitive attacks, thus accounting for the low reported reaction rates. Furthermore, the results of Biggadike and Yip should be treated with caution as they were based on small samples ($n < 50$).

There are, however, more recent studies which report very similar reaction frequencies to the ones observed in my study. Bowman and Gatignon (1995), investigating response times to new product introductions in PIMS, found that 60.1% of the competitors "made a move in reaction to the new product" (p. 46). Gatignon, Robertson and Fein (1995) found an even higher reaction frequency. Studying 346 incumbents they concluded that 90% "reacted in some way". Similarly, Heil, Morrison and Walters (1994), studying competitive reactions to price signals, found that price reductions were countered by a domain-specific response in 95% of the observed cases. The last three studies focused on competitive reactions to a new product and not on reactions to new entrants, i.e., new companies in a particular market - as studied by Biggadike, Yip or Robinson. With respect to competitive reactions to new products, the literature gives numerous indications that the incumbent's propensity to react to new product entry is quite high. My study further supports these findings.

5.1.2 Response Pattern on Submixes

For the 186 new product entries in the study, Table 5.3 shows the frequency of competitive reactions on the different marketing mix elements.

Marketing Mix Reaction	Total	%
No reaction on marketing mix	13	7.0
Reaction on at least one element of the marketing mix	173	93.0
Reaction on the product mix	151	81.2
Reaction on the price mix	102	54.8
Reaction on the promotion mix	78	41.9
Reaction on the distribution mix	77	41.4

Table 5.3: Frequency of Marketing Mix Reactions

Reactions were most frequently on the **product mix**, either as product improvements, new product introductions, product repositionings or a combination of these (81.2%). In 21% of the cases, respondents reacted to the new product with a new product introduction, 8.6% repositioned and 7% improved their existing products. If reactions occurred on multiple elements of the product submix then the combination of product improvement and new product introduction was the most favoured response pattern (15.6%). (Please refer to Appendix 5.2 for the descriptive analysis of the observed response pattern.)

Surprisingly, there was little evidence of pricing response being used as frequently as the literature suggests. Variations on the pricing submix occurred in 54.8% of the cases, of which 27.4% were price cuts - either alone (17.2%) or introduced in addition to special trade discounts (10.2%); 11.3% of the respondents indicated that they raised the price for their existing products when faced with a new product entry. This finding, which is in line with the recommendations of the normative DEFENDER model described earlier, generally contradicts common management belief.

Reactions on the distribution submix or the promotion submix occurred in less than half of the cases: 41.9% changed the budgeting of advertising (39.8%) or of promotional activities (only 2.2%) and 41.4% reacted with variations in the distribution policy. The relatively high incidence of retaliation on the distribution mix in response to a new product entry is a surprising result. In fact, retaliation on the distribution mix seems to be more prevalent than generally assumed in the literature. The analysis of other response types (an open-ended question) indicate that often the sales force is informed immediately about a new product entry and adequate sales arguments are prepared to be communicated to the customer base.

Overall, the response pattern I observed are remarkably similar to the patterns in the study by Gatignon, Robertson and Fein (1995). In their study on success of competitive reaction they report that 82% reacted on the product mix, 56% made a communication reaction and 27% cut price. Interestingly, the research by Gatignon, Robertson and Fein (1995) was conducted in the U.S. using U.S. managers as respondents, whereas my research is based on U.K. data.

5.2 Measurement Analysis

5.2.1 Purification of Measures

For each of the multiple-indicator constructs hypothesised, the item-pool had to be purified (Churchill 1979). This is usually accomplished by conducting Varimax rotated principal component factor analysis. All items were factored and the construct scales were then developed based on the resulting factor loadings. It is recommended that the scales are formed by assigning to the same scale the items that load at least moderately on the same factor. My approach was to use Jolliffe's

criteria of $\lambda = 0.70$, i.e., principal components with a loading greater than 0.70 were retained (Dunteman 1994). As can be seen from Table 5.4 below, which reports the constructs' factor loadings, total communality estimates and eigenvalues, all factor loadings are larger than 0.70.

The analysis did show a clear one-factor solution for each construct. All constructs have only one eigenvalue larger than 1.0 and according to the scree test, a technique of ocular judgement (Cattell 1978, Iacobucci 1994), the differences between the eigenvalue of the first factor and successive eigenvalues indicate a steep gradient. Bagozzi (1994) recommends to retain the number of factors that number before the break (or 'elbow') in the curve, to cut out factors that represent random fluctuations.

CONSTRUCTS	MULTI-ITEMS (with item numbers)	FACTOR LOADINGS
<u>Innovativeness</u>	1) The competitor's new product represented a substantial change in technology. 2) The competitor's new product is only superficially different from those currently available. 3) Customers saw the competitor's new product as a major innovation in the product category. 4) The competitor's new product added significant customer benefits. Final Communality Estimate: Total = 2.870069 Eigenvalue: 3.2806	.87102 .81805 .86263 .83550
<u>Growth</u>	5) In this product category sales were growing fast. 6) This was a high-growth product category. 7) This product category was reaching maturity. 8) The growth in this product category was negligible. Final Communality Estimate: Total = 2.714822 Eigenvalue: 2.7148	.87722 .88150 .71735 .82581

Table 5.4: Constructs' Factor Loadings and Eigenvalues

CONSTRUCTS	MULTI-ITEMS (with item numbers)	FACTOR LOADINGS
<u>Exit Costs</u>	9) ability of firm to absorb production personnel (easy/hard) 10) ability of firm to absorb management personnel (easy/hard) 11) alternate uses for facilities within company (many/few) 12) alternate uses for capital equipment within the company (many/few) 13) impact on costs of other businesses within the company (large decrease/large increase) 14) size of immediate loss to the company (very small/very large) 15) relative size of product category to other business units (much smaller/much larger) 16) contribution to current profits (much smaller/much larger) Final Communality Estimate: Total = 6.063367 Eigenvalue: 4.9063	.84885 .76550 .75587 .72951 .77457 .86367 .78878 .72674
<u>Threat</u>	21) The competing firm tried to gain sales at our expenses. 22) The competitor's new product posed a serious threat towards our company. 23) The new product introduction constituted a hostile act toward our company. 24) We felt severely threatened by the new product. Final Communality Estimate: Total 1.872575 Eigenvalue: 1.8726	.77547 .73592 .85419 .73442
<u>Price Sensitivity</u>	17) This product was highly price sensitive. 18) Price changes in this category had limited effects on sales. 19) This was a product category where price was the only thing that mattered to customers. 20) Only a few customers were price sensitive in this category. Final Communality Estimate: Total = 2.353669 Eigenvalue: 2.3537	.80547 .78813 .73133 .74087

Table 5.4 (cont.): Constructs' Factor Loadings and Eigenvalues

5.2.2 Reliability

Reliability refers to the degree to which measures are free from error and therefore gives an indication whether they yield consistent results (Peters 1979). Reliability is a necessary condition for the validity of the measurement. One of the most frequently employed measures of reliability is coefficient alpha (Cronbach 1951) a measure for internal consistency reliability.¹ Before applying Cronbach's alpha as a measure for internal consistency reliability (Peters 1979) the assumptions underlying this method should be tested (Bagozzi 1994). In order to test whether coefficient alpha can be applied to the measures the researcher needs more information about the errors contained in those measures. The main reason is that errors can inflate parameter estimates in multivariate analyses. A more contemporary approach is to build measurement models to describe how well the observed indicators serve as a measurement instrument for the theoretical or

¹ Cronbach's alpha is basically a split-halves method (item scores from a measurement scale are split in half to compute the correlation of the obtained half scores) where the reliability is determined by correlating all possible sets of split-halves of the item-pool (Peters 1979). The following formula is used for multi-point items:

$$\alpha = \left(\frac{k}{k-1} \right) \left(1 - \frac{\sum_{i=1}^k \sigma_i^2}{\sigma_t^2} \right)$$

where:

k = number of items in the scale
 σ_i^2 = variance of item i
 σ_t^2 = total variance of the scale.

See Peterson (1994) for a meta-analysis of Cronbach's coefficient alpha.

hypothetical construct or latent variable². Jöreskog (1971) developed the most common type of measurement model, the congeneric measurement model (see Appendix 5.3 for a pictorial model of the congeneric measurement model).

To illustrate the following procedure consider the following equation (based on the path diagram in Appendix 5.3):

$$x_i = \lambda_i \xi + \delta_i$$

where x_i represent the observed variables or items, ξ stands for the latent construct, λ_i is a parameter (or factor) relating x_i to ξ and δ_i is an error term. Based on the classical true-score theory (Lord and Novick 1968)³ the assumptions are that the errors have zero means, are uncorrelated with the latent variable and also are mutually uncorrelated among themselves. The variables x_i , ξ , δ_i are all random variables. The system of equations is empirically testable by analysing the covariance or correlation matrix of the observed variables.

In the following I will ascertain the psychometric properties of multiple-indicator constructs which I measured with the survey instrument by conducting a series of

² Theoretical variables, constructs and concepts are used to refer to latent variables which are not directly measureable or observable. They can, however, be measured with a number of indicators which are referred to as observable variables, measures, indicators or items.

³ Lord and Novick (1968) developed the true-score theory which maintains that any measurement of a theoretical variable (y) is a linear sum of a true part (true score) (T) and an error term (e), as depicted in the following equation:

$$y = T + e$$

T captures systematic deviations and e includes all non-systematic or random deviations from the true score T and it is assumed that a) both parts are independent and b) that the errors are uncorrelated with each other. This means that as the number of observations increases the mean of the error term will approach zero and that the mean of the observed score equals the mean of the true scores (i.e., the mean of y is an unbiased estimator of the mean of T) (see Crocker and Algina 1986).

confirmatory factor analyses on the covariance matrices using LISREL8. The development of congeneric models is useful in testing unidimensionality and estimating the reliability of the measures utilised. Indices of reliability for individual items, composite reliability indices and fit statistics can be computed readily.

The multiple-indicator constructs in my study are innovativeness, market growth, exit costs, price sensitivity and threat posed by rival ('threat') (Please refer to Table 5.4 for the items contained in each constructs). Note that the construct strength of retaliation ('retaliation') is a formative index which is determined by a linear combination of measures (Bagozzi 1994). Under formative indices, the latent variable is a function of the measurements, comparable to an index. Therefore, reliability estimates are not meaningful for formative indices.

The aim of the following analysis is to test the null-hypothesis that the congeneric model suitably describes the measurement models used in this research. In classical test theory the failure to reject this hypothesis leads to the conclusion that Cronbach alpha can be applied with a reasonable degree of confidence (Bagozzi 1994). Contemporary test theory, however, regards the composite reliability estimate of the congeneric measurement model always as superior to Cronbach's alpha. Table 5.5 gives the parameter estimates (λ_i), t-values, indices for individual and composite item reliabilities (the item numbers in row 2 correspond with the item numbers in Table 5.4).

CONSTRUCT	Item #	λ_i	t-value	$\rho_i^{1)}$	$\rho_c^{2)}$
<u>Innovativeness</u>	1	1.346	8.924	0.659	0.8617
	2	1.262	15.939	0.543	
	3	1.336	10.944	0.654	
	4	1.224	15.322	0.584	
<u>Growth</u>	5	1.245	13.404	0.800	0.8353
	6	1.192	12.072	0.658	
	7	1.190	9.220	0.491	
	8	1.123	10.691	0.476	
<u>Exit Costs</u>	9	1.710	11.541	0.565	0.8920
	10	1.419	9.093	0.428	
	11	1.324	8.753	0.401	
	12	1.281	8.245	0.365	
	13	0.970	11.169	0.577	
	14	1.790	14.680	0.829	
	15	1.275	11.000	0.565	
	16	1.183	9.835	0.481	
<u>Price Sensitivity</u>	17	0.981	9.123	0.411	0.8001
	18	0.990	8.787	0.561	
	19	1.231	10.001	0.476	
	20	1.414	9.814	0.401	
<u>Threat</u>	21	0.864	6.790	0.342	0.7988
	22	0.854	6.526	0.313	
	23	1.413	9.116	0.709	
	24	1.390	4.674	0.609	

Table 5.5: Parameter Estimates and Reliabilities

¹⁾ Index of reliability of individual items:

$$\rho_i = (\lambda_i^2) / (\lambda_i^2 + \theta_{ii})$$

²⁾ Index of reliability of composite formed by sum of measures:

$$\rho_c = (\Sigma \lambda_i)^2 / [(\Sigma \lambda_i)^2 + \Sigma \theta_{ii}]$$

The parameter estimates for the constructs market growth, exit costs and threat are all highly significant (minimum t-value = 6.526). Most of the estimates have high to moderate individual item reliabilities. In cases where ρ_i is relatively low as in

'threat' the composite reliability is still acceptable. All composite reliabilities are quite high indicating that the items have a strong relationship with the constructs measured.

In the following I will report overall fit indices. For this statistic I have chosen to examine chi-square, GFI/AGFI (goodness of fit index/adjusted goodness of fit index), CFI (comparative fit index) and the TLI (Tucker-Lewis index). Chi-square tests the model against the alternative that the covariance matrix of the observed variables is unconstrained (Hayduk 1987). It measures the distance between the sample covariance/correlation matrix and the fitted covariance/correlation matrix. As chi-square is relatively sensitive with regard to the sample size (Jöreskog and Sörbom 1993) it is advisable to consult fit indices that adjust for the degrees of freedom. Therefore, in addition to chi-square, the GFI and AGFI will be reported. The CFI and the TLI are measures of comparison between the model and the baseline model.

CONSTRUCTS	χ^2	(d.f.)	GFI/AGF	CFI	TLI
Innovativeness	7.78	(2)	0.98/0.88	0.98	0.94
Market Growth	16.73	(2)*	0.96/0.89	0.95	0.95
Exit Costs	28.44	(12)*	0.95/0.89	0.98	0.96
Threat	10.51	(2)*	0.99/0.92	0.98	0.94
Retaliation	3.20	(1)*	0.95/0.89	0.97	0.93

Table 5.6: Fit Statistics

*) significant at 0.01 level

Chi-squares provide a test that the measures can be explained by a single

underlying factor plus error. Large values of the chi-square index relative to the degrees of freedom would lead to the rejection of the hypothesis of unidimensionality. The table above shows relatively small values compared to the degrees of freedom which generally leads to a failure to reject the hypothesis of unidimensionality. Although most of the constructs are significant (a p-value greater than 0.05 indicates a good fit) the other fit statistics are all at acceptable levels (close to 0.9). Bentler (1983) proposes that a model still can be accepted even when the analysis yields p-values smaller than 0.05 if other fit measures such as the one used above indicate a good fit. Cronbach alpha could therefore be applied to assess internal consistency. However, the composite reliability estimates are regarded as superior. As Bagozzi (1994) notes: "The congeneric model appears to be the most justified model and yields more diagnostic information" (p. 325).⁴

Table 5.4 shows the final constructs together with the number of items measuring each. After the various constructs were developed, the next step was to create a single index for each of the multiple-item measures. This was done by adding the raw scores of the items for each variable. To ensure consistency and to enhance interpretability, scores for items that were phrased negatively in the questionnaire were reversed in the calculation. The obtained average scores are used in the OLS-regression. The literature recommends comparing the results with regression results obtained when factor scores are employed instead of the raw data (Lehmann 1985). If consistent results are achieved with either technique then additional evidence for

⁴ For comparison I computed Cronbach's alpha which were as follows:

	α
Innovativeness	0.868
Growth	0.834
Exit costs	0.905
Price sensitivity	0.767
Threat	0.701

the validity of the results is provided.

5.3 Hypothesis Testing

The *strength of retaliation* will be regressed on the hypothesised predictor variables. The proposed model is linear in parameters and will be estimated using Ordinary Least Squares:

$$\begin{aligned} \text{RETALIATE}_i = \beta_0 &+ \beta_1 \text{INNOV}_i + \beta_2 \text{GROWTH}_i + \beta_3 \text{CONC}_i + \beta_4 \text{EXIT}_i \\ &+ \beta_5 \text{INCSIZ}_i + \beta_6 \text{PRICSEN}_i + \beta_7 \text{THREAT}_i \\ &+ \beta_8 \text{COMFAM}_i + \beta_9 \text{GROWDOM}_i + \mu_i \end{aligned}$$

where:

RETALIATE _i	=	Strength of retaliation of incumbent respondent i
INNOV _i	=	Innovativeness of new product as perceived by respondent i
GROWTH _i	=	Growth of product category for incumbent respondent i
CONC _i	=	Level of concentration in market of incumbent respondent i, measured with the combined market share of the four largest competitors (CR4)
EXIT _i	=	Exit costs for incumbent respondent i
INCSIZ _i	=	Size of incumbent respondent i
PRICSEN _i	=	Price sensitivity in product category incumbent respondent i
THREAT _i	=	Degree of threat perceived by incumbent respondent i
COMFAM _i	=	Dummy for competitor familiarity; dummy = 1 when new product is introduced by rival incumbent; 0 otherwise
GROWDOM _i	=	Dummy for dominant incumbent in growth market, then GROWDOM = 1; 0 otherwise
μ _i	=	Disturbance term.

The scores for the final constructs were calculated from the average scores for these items. These scores were then used in the OLS-regression. Although there was no obvious indication for the presence of multicollinearity in the data I checked whether any of the independent variables were highly correlated. Neither

the inspection of the Pearson correlation coefficients nor the examination of the variance inflation factors (VIFs)⁵ led to the conclusion that multicollinearity exists. To provide further proof that multicollinearity does not represent a problem the same regression model was based on factor scores. This analysis yielded very similar results as in the regression where raw scores were utilised for the analysis. The results' insensitivity to either type of the technique further suggests that multicollinearity is unlikely to inflate the variances of the parameter estimates. Furthermore, that both approaches (analysis with factor scores and raw data) led to similar findings provides support for the validity of the results (Cook and Campbell 1979).

To test whether the here applied linear model methodology is appropriate it has to be examined whether any of the underlying assumptions are violated. Such violations may occur when the data contains outliers or when the errors exhibit heteroscedasticity. Outlier detection was conducted by producing plots of the residuals and studentised residuals (residuals divided by their standard errors) as well as by Cook's D. These tests led to the detection of 2 outliers which were physically eliminated from the data set. Finally, it was checked whether heterogeneous variances (heteroscedasticity) represented a problem in the data. Since the residuals exhibit a scatter pattern I conclude that no violation of the assumption of equal variances is evident.

⁵ VIFs are useful in identifying problems of multicollinearity. For the i th independent variable, the variance inflation factor is defined as $1/(1-R^2_i)$, where R^2_i is the coefficient of determination for the 'regression' of the i th independent variable on all other independent variables. With this statistic we can determine whether and how multicollinearity diminishes an estimate's stability (see Myers 1990 Chapter 8 for a discussion).

5.4 Results

The proposed model yields an adjusted R-squared of 0.3147 and is highly significant ($F=4.233$, $p<0.001$). The β -coefficients, t-values and significance-levels are reported in Table 5.7 below. All significance levels are based on two-tailed tests.

Hypo-thesis	Variable Name	hypo-thesised	Parameter	T for H0	P > T
H1a/b	Innovativeness	+/-	0.234464	3.003	0.0031
H2	Market Growth	+	0.266994	3.132	0.0021
H3	Concentration	+	-0.927688	-1.979	0.0496
H4	Exit Costs	+	-0.069187	-0.972	0.3328
H5	Incumbent's Size	+	-0.182519	-1.998	0.0475
H6	Price Sensitivity	+	0.041850	0.789	0.4312
H7	Threat	+	0.185703	2.973	0.0034
H8	Competitor Familiarity	+	0.587225	2.827	0.0053
H9	Interaction GROWDOM Consumer Goods vs. Industrial Goods*)	+	-0.200617	-0.443	0.6586
			-0.108049	-0.490	0.6249

Table 5.7: Results of Regression Model

N = 184
F = 3.238
p = 0.0004
R² = 0.3312

Note: Figures in bold are significant.

*) A dummy variable was included for the type of industry; 1 = consumer goods, 0 = industrial goods

Innovativeness

With regard to the relationship between strength of retaliation and innovativeness of the new product, I had provided two opposing arguments: 1) Innovative new products represent a major threat and incite strong retaliatory moves (H1a) *versus* 2) The response to an innovative entry is difficult and costly and therefore the incumbent's reactions are limited so that only marginal retaliations occur (H1b). From the regression analysis, hypothesis 1a has been confirmed while the counter-hypothesis 1b has to be refuted. The results show that the innovativeness of the new product has a significant *positive* effect on the incumbent's retaliation ($\beta=0.23$; $p<0.01$). The incumbent competitor retaliates strongly when threatened by a rival new product and this retaliation is stronger the more innovative the new product.

Industry Characteristics

As expected, *market growth* has a positive impact on the strength of retaliation, this effect is significant ($\beta=0.27$, $p<0.01$). This gives evidence to my previous argument that incumbent competitors react more strongly to new product entries, when the market is in a growth phase. H2 has therefore been confirmed. The alternative relationship often argued in the literature, that competitors in stable markets or markets in decline are more inclined to competitive rivalry, has been rejected.

Regarding the relationship between *industry concentration* and strength of retaliation the analysis indicates that the level of industry concentration, as measured by CR4, has a negative impact on the dependent variable ($\beta=-0.93$,

$p < 0.05$). The coefficient suggests that the more concentrated the market is, the less likely are retaliatory moves to new products entering the market. In markets with low levels of concentration there is a strong likelihood of retaliatory behaviour.

Exit costs (H4), however, has neither the expected sign nor is significant. This finding is somewhat surprising as the literature is concurring in suggesting a clear positive relationship between exit costs and competitive reactions. This association could not be confirmed.

Incumbent's Competitive Position

The independent variable *size of the incumbent* has a negative impact on the strength of retaliation indicating that the larger the incumbent, as measured by market share, the less likely a strong retaliation becomes (H5). The data lends significant support that the impact of size is negative ($\beta = -0.18$, $p < 0.05$). A plausible explanation could be that large incumbents are sluggish and inert and that therefore their proclivity to retaliate is lower (Robinson 1988a).

Price Sensitivity, hypothesised to have a positive effect (H6), on the other hand, has no impact on the strength of retaliation.

Threat Posed by Rival

The threat posed by the rival competitor (H7) has a positive effect on the incumbent's likelihood to strongly defend its market ($\beta = 0.19$, $p < 0.005$). This finding is in line with the results by Heil and Walters (1993) who used a similar construct - signal hostility - and found a positive relationship between this construct

and the strength of competitive reaction.

Competitor Familiarity

The literature, especially in economics but also in marketing, suggests that incumbents may feel less inclined to react to a competitor that is new in the market (new entrant). This may be explained with the uncertainty that surrounds new businesses. This argument has been tested by introducing an indicator variable for rival competitors that were already established in the industry and for competitors that newly entered the market (H8). I find indeed a positive and significant relationship ($\beta=0.59$, $p<0.01$) indicating that an established competitor retaliates more strongly against another incumbent than against a newcomer in the market.

Dominant Incumbent in Growth Market

The estimated parameter for this interaction term was not significant. This is mainly due to the fact that the size of the incumbent has a negative effect on the dependent variable, so that market dominance does not indicate a stronger proclivity to react to rivals.

Type of Industry

A dummy variable was included for the type of goods marketed by the respondent, given the cross-sectional nature of the sample which contains consumer goods and industrial goods (dummy = 0 for consumer goods markets; 1 for industrial markets). This indicator variable did not yield a significant parameter estimate.

In the following Chapter 6, I shall discuss my findings in more depth. An important issue after this discussion are the implications and the contributions of my research. The chapter will conclude with an evaluation of the limitations of my research and with an agenda for future research.

CHAPTER 6: DISCUSSION, CONCLUSIONS AND IMPLICATIONS

6.1 Discussion and Conclusions

This study was concerned with competitive reactions in response to a new product entry. The principal objective of this dissertation was to provide insight into the phenomenon of competitive retaliation by identifying the factors that influence such competitive behaviour. For this purpose I studied product, price, promotion and distribution reactions by incumbent competitors that were faced with a new product entry in their markets. The conceptual model posited that the strength of an incumbent's retaliation is influenced by the innovativeness of the rival's new product and the characteristics of the incumbent, the industry and the entrant.

This research has found significant empirical evidence for the following:

- Innovative new products elicit strong retaliation; the reaction to less innovative new products is weaker.
- In growing markets incumbents are more inclined to retaliate strongly against new products.

- Incumbents in more concentrated markets are less likely to retaliate strongly against a new product introduced by a rival.
- Incumbent's size is negatively related to the strength of retaliation; we therefore expect smaller incumbents to react more strongly to rival new products.
- The more threatening a new product entry by a competitor the more strongly an incumbent will retaliate.
- The incumbent will react more strongly to a familiar competitor (i.e., to another incumbent) than to a new competitor (i.e., to a new entrant).

A main issue addressed in this research was whether the innovativeness of a new product entry has an influence on the incumbent's decision whether to react strongly or not to the new product entry. Opposing arguments were derived from the literature. One stream of literature argues that a competitor bases its decision to retaliate on a cost-benefit analysis (Schelling 1960). This theory suggests that if a competitor is threatened by an incremental innovation, a strong defensive reaction is very likely to occur, because the established firm is likely to benefit from its competitive advantage. However, if a radical innovation is introduced by a rival competitor, this competitive advantage might not be suitable to compete with this new product and strong defence mechanisms might then be ineffective and hence, costly. This argument therefore suggests a negative relationship between the innovativeness of the new product entry and the strength of retaliation by the incumbent.

A different strand of research suggests that the incumbent would rationally retaliate tit-for-tat (Axelrod 1984). Tit-for-tat suggests that a cooperative move (e.g., a

price increase) elicits a cooperative response and a non-cooperative move (e.g., a new product introduction) elicits a non-cooperative response. In the competitive context this means that firms always imitate the competitive move by a rival; the objective being to maintain their existing market power.

The competing hypotheses were therefore: 1) It is difficult and costly for the incumbent to respond to an innovative new product entry and this limits its reactions and 2) innovative new product entries represent non-cooperative moves which incite strong retaliations.

My research supports the second hypothesis in that I found that the more innovative the new product entry the stronger the incumbent retaliates against the rival. This is in line with the findings by Robinson (1988a) who examined reactions to *new entrants*. He found that innovative entries have limited positive influence on reactions in the first year after market entry but that they increased significantly in the second year. My research broadens the scope of his investigation in the following ways:

- Robinson studied new entrants whereas my research focuses on new product entry capturing both, product introductions by start-up businesses *and* by existing competitors.
- Robinson addressed explicitly the innovativeness of the entrant by using three measures to assess whether or not "the entrant had a major product advantage, held a product patent or trade secret and was a market pioneer but was not first to enter the market" (p. 375). As described earlier this scope was due to the fact that the Strategic Planning Institute sample comprised

companies that faced at least one established competitor at the time of market entry. The merit of a specifically designed survey instrument is that a concept like innovativeness can be more precisely conceptualised. In my study I was able to ask incumbent competitors about a new product entry which was subsequently measured with a carefully designed measure of innovativeness. Database research is often rather limited in this respect. (The problem of measurement in strategy research and the related problem of scale inadequacy will be addressed in Paragraph 6.3.)

Of the various industry characteristics hypothesised to influence the strength of retaliation, the effect of market growth is particularly well delineated in the results. Strong retaliations are more likely to occur in high growth markets, suggesting an interplay between competitive forces and the stage of the product life cycle (Lambkin and Day 1989). This finding can be contrasted with the common view that firms in high growth markets react less frequently to competitors due to capacity or general managerial or financial constraints (Scherer and Ross 1990). My result, however, signifies that growing markets show a large profit potential and, therefore, firms are more likely to invest and defend their positions. Therefore we observe stronger retaliations in such markets. This view is also supported by Day (1986), Day and Wensley (1983) and Wensley (1981) who argue that firms develop certain expectations when committing resources and sinking investment into new businesses. Expectations are likely to be proportional to the profit potential and firms will be inclined to defend if competitors jeopardise their plans.

The competitive structure of the market also plays a significant role in determining the strength of reaction. The analysis reveals the interesting finding that the greater

the market concentration, the less likely the incumbents are to retaliate strongly against a new product introduced by another firm. This negative relationship is somewhat surprising as the prevalent view is that competitive retaliation is more likely in highly concentrated markets because the incumbent is more likely to suffer a significant share loss as the loss would be proportional to their market share (Robinson 1988a). Porter (1980) posits that as concentration increases, reactions are expected to increase (p. 343). My result suggests the opposite; retaliation is more likely to occur in markets with low levels of concentration and less often in industries characterised by high concentration. Game theoretical research actually suggests that cooperation increases as the level of concentration grows. Burke and Moore (1990), for example, show that rates of cooperation are lower the more subjects participate in an interaction indicating higher rates of cooperation in markets with only a few players. Moore and Moore (1990) show that cooperation is more likely to occur as the probability of continued play increases. Maybe incumbents in highly concentrated markets try to avoid strong competitive behaviour as the likelihood of a significant share loss is given. The rational strategy would therefore be to prevent competitive warfare.

The analysis of the influence of incumbent's size on the strength of retaliation shows that larger incumbents are less likely to retaliate strongly. Larger incumbents may exhibit more inflexibility and inertia and therefore may be less inclined to react to new products. This finding is in line with the result on the relationship between the concentration and the strength of retaliatory behaviour. In concentrated markets firm sizes tend to be larger than in less concentrated markets and we would therefore expect a similar response pattern.

Porter (1980) and Dutton and Jackson (1987) propose that competitors are motivated to respond if an action is viewed as threatening. In my analysis I investigated the effect of the threat posed by the new product and found that this has a positive impact on the strength of retaliation. This is contrary to the view of Heil and Walters (1993) who argue that a threatening new product signal dampens incumbents' reactions because of their fear to trigger even stronger reactions in the future. Research in the strategy area on response time support my view: MacMillan *et al.* (1985) found that the more a competitor's actions threaten a firm's existing position, the quicker the firm responded. The concept of threat, which is the declaration of the intention to inflict harm, is related to the notion of aggressiveness. Aggressiveness also entails hostility or destructive behaviour and both constructs are therefore intertwined. Robertson, Rymon and Eliashberg (1995) investigated competitive new product signals and incumbent reactions. They found that aggressive signals were more likely to trigger reactions lending further support for my result that threatening new product introductions are more likely to be retaliated strongly.

An interesting finding is that incumbents do react more strongly to other incumbents than to new competitors in their market. This is in line with the observations I made after reviewing the literature on entry-deterrence and competitive reactions to market entry. The industrial organisations literature has developed an extensive research stream examining entry-deterrence and strategic pre-emption. However, empirical research in this area finds that most incumbents do not attempt to deter entry as these strategies are too costly or that entry of new products cannot effectively be prevented (Smiley 1992; Singh, Utton and Waterson 1991a and 1991b). As Scherer notes about the state of knowledge in this field "It

is now widely recognised that a sorting-out based on solid empirical work, quantitative and qualitative, is needed" (Scherer 1988).

As noted earlier, new businesses are surrounded by uncertainty. This is perhaps the reason why incumbents do not spend resources on combating these businesses. They may then be even less inclined to prepare against potential competition. This could be due to the fact that entry in many industries is inevitable, new firms eventually will find gateways to entry (Yip 1982a).

This line of arguments leads back to the interesting starting point of this discussion: incumbents retaliate stronger against other existing rivals in their markets. This could be explained with the fact that existing rivals have established norms of conduct - they have a "competitive history". Some of the risk involved in designing reaction strategies is therefore eliminated making defence less costly.

When comparing the differences between the reactions to incumbents and new entrants it is important that the sample is balanced. The data shows that 34.2% of the final sample were competitors that did not compete with the incumbent before the introduction of the new product. It is therefore unlikely that the results are strongly influenced by the dominance of either type of competitors with regard to their familiarity to the incumbent.

6.2 Implications and Contributions

Scholars of marketing have been emphasising the need for more empirical research on competition for many years (e.g., Weitz 1985, Robinson

1988a, Bowman and Gatignon 1995). My research is in line with this call for more empirical research. The present study contributes to an under-researched, yet very important area in strategic marketing. The main objective was to understand how established firms respond to a new product entry into their market and I included the nature of this competition explicitly in my conceptual framework to broaden previous research. My research sheds more light on the question of how incumbents react given the characteristics of the industry, the competitive strength of the incumbent and the characteristics of the new product entry and the competitor. In this regard my work is different to empirical research on competition which describes the results of competitive activities but provides little insight as to why these outcomes occur (which is, for example, the case with research on response functions and reaction matrices).

Generally, there is a paucity of research on competition especially in the area of business strategy research. My intention was to contribute to this field by conducting research using primary data as the most prevalent stream of empirical research is based on secondary data, mainly PIMS. The benefits of the PIMS database notwithstanding, concerns have been raised about the quality of the data. The main concern is the representativeness of the sample (mostly Fortune 1,000 companies). I collected my data from a randomly drawn sample of U.K. companies, a sampling procedure that generates a more representative sample than in PIMS where companies pay a fee in order to participate in the programme. Furthermore, the research design provided me with the opportunity to use measures specifically designed for my study. I have therefore not been constrained by recorded data like Biggadike (1979), Yip (1982b) or Robinson (1988a) who all used PIMS data. As such I see my research as an important addition to the

empirical base of primary data.

Most importantly, my research represents an extension of the research on competitive reactions to new entrants as studied by Biggadike (1979), Yip (1982b), Robinson (1988a) and Smiley (1992) to name but a few. My main goal was to understand competitive reactions to new product entries which occur more frequently than an entry of a new competitor.

6.3 Limitations and Future Research

In general, the research paradigm chosen in this research, the survey methodology, has some limitations. The methodology relies on a person's perception of an event in the past and inevitably we have to address issues of recall and post hoc-rationalisation. However, research in the field of strategy comparing archival data with managers' self-reports has shown that there is congruence between the two data-sources (Keats and Hitt 1988). The survey methodology has the advantage that data can be collected for a specific set of research questions. In this study I was interested in assessing the impact of the innovativeness of a competitor's product on the retaliatory behaviour of an incumbent. The notion of innovativeness has not been adequately captured with any available secondary database. The survey instrument was therefore chosen to address this specific research question. Another distinct advantage of my methodology over secondary data sources is, that I asked incumbents how they reacted to entry, therefore my data captures reactions that may not have been perceived by the rival competitor.

Another potential concern with a survey instrument administered at just one point

in time is that it cannot capture dynamics. As a result my research cannot examine the timing of reactions and their evolution over time. One important question therefore remains unanswered: How strongly do incumbents react initially to a new product entry and how do they adjust their defence strategy over time? Future research projects should aim to capture competitive dynamics as a much richer insight into the nature of competition can be gained.

Earlier I had categorised competitive response and (based on the decision model by Robertson and Gatignon 1990 in Figure 3.1) we distinguished the following types of competitive behaviour in response to a new product entry:

- Passivity
- Retaliation
- Accommodation
- Abandonment.

It has to be noted that the distinction between the different types of behaviour is very difficult. Consider, for example, a situation where a company does not change any competitive parameter in response to a new product. We cannot ascertain with a high degree of confidence whether this reaction is passive, retaliatory or accommodating. The incumbent may, for example, have planned a price decrease and may have abandoned this plan to signal cooperation. There will be no change on the price mix but we would have to classify this reaction as accommodation. A respondent in the computer industry indicated the opposite case: "We intended to raise prices in our homemarket to adjust for inflation. After the new product was introduced by our competitor, however, we revised this decision and keep prices at previous year's level to stay competitive." Competitive data will not reveal this intention and the fact that the incumbent retaliated.

Both cases signify that accommodation or retaliation can be disguised as a zero-response. This is especially problematic when secondary data is used. Consider Robinson's study (1988a) which is based on PIMS data. He classified competitive reactions into: 1. aggressive reactions (aggravate circumstances for market entry), 2. passive reactions (no change) and 3. accommodating reactions (ease entry for new competition). Robinson does neither provide a precise description of these categories (see Robinson 1988a, p. 371) nor does he describe the procedure by which it was decided in which category the competitive reactions belong. I regard this as a major caveat of his study.

With a survey instrument the researcher has potentially the opportunity to take the problem of zero-response into account when designing the survey instrument. In addition to the formative index for competitive reaction (indicating on which parameter the reaction occurred and to what extent) I included an open-ended question to allow respondents to report any other reactions not captured in the section with the closed questions. In the total sample only one respondent (the one cited above) describes a case where passivity was actually a retaliatory move. Although this could indicate that the response types have been captured adequately, the problem of zero-response has to be mentioned as a limitation of my research.

There are some important reactions that have not been captured in my research. These are, for example, reactions outside the marketing mix such as capacity additions, patent issues, financial announcements and lawsuits. The inclusion of reaction parameters outside the marketing mix could potentially enrich the investigation. Related to this, the potential reactions on the promotion mix do not seem to have been adequately conceptualised. The open-ended responses revealed

that this is indeed an important response parameter that is readily used by incumbents when faced with a rival new product. Some responses give evidence of this type of behaviour:

"We ensured that all our sales people had relevant competitive information [about the new product]."

"We focused on more aggressive targeting of key and potential accounts by existing sales force ..."

"All sales staff were re-trained in the shortfall of the competitor's product..."

The finding is intuitively appealing as the promotion mix is potentially a flexible tool in the overall marketing mix. Sales personnel can be summoned immediately when competitive conditions change and sales procedures and arguments can be altered with relatively little lead-time. Interestingly, Singh, Utton and Waterson (1991) arrive at a very similar conclusion. They observe that "firms place great weight ... on having an assured selling network, in their attempts to slow down new entry and compete with existing firms" (p. 16). Our results clearly signal that this factor has been neglected in theoretical work on market defence. Further research should emphasise this dimension of response in order to deepen our understanding of the importance of the promotion mix in defensive strategies.

A critical issue in conducting marketing strategy research is the problem of scale inadequacy. This problem refers to the paucity of established measurement scales to address concepts of strategy content, organisational characteristics or strategic processes. In the consumer behaviour domain, on the other hand, we find a large range of well established scales for a variety of different constructs and concepts.

For my research, for example, there was only one scale readily available which was the exit cost-scale developed by Burke (1984). All other scales had to be developed to measure the constructs of interest. Future research should therefore emphasise the development of valid and reliable measures for strategy research with the objective to build a pool of measures similar to the one in consumer behaviour research. The implication for the research practice is therefore to develop measures according to contemporary measurement theory, to communicate those measures adequately to the academic community and to validate them by applying them repeatedly in different contexts.

While the present findings are important, future research can make several extension some of which are mentioned above. One interesting extension is to assess the likely profitability of different reaction alternatives. Insights on how established competitors *should* react to different scenarios could be worth considering. Here questions of optimal reaction strategies and normative rules for this decision process could prove useful. My database gives the opportunity to extend my research in this direction.

In general, the database I created with the survey instrument is extensive and can be used to address other problems of competitive response. One interesting area for future research could be the speed of response as I measured the time span between detection of the new product (pre-launch, at launch or post-launch) and competitive reaction. Are companies that detect a new product before it is going to be launched in the market faster in responding? Does this have any implications for the success of the defence?

An important avenue of exploration is the development of a full structural model to allow for the possibility that simultaneous causations occur. This dissertation sought to investigate major determinants of retaliatory behaviour of incumbent firms. The regression analysis in Chapter 5 indicated that innovativeness, market growth, the size of the incumbent, industry concentration, the threat posed by the rival and competitor familiarity have a significant impact on the strength of retaliation. Re-examining the model we might want to include simultaneous causations and indirect effects and conventional regression analysis is not suitable for such an analysis (Goldberger 1973).

By considering the model proposed so far I have not modelled any indirect relationships; all variables are assumed to have only direct effects on the dependent variable. In general, most studies in this field do not investigate whether any indirect relationships exist. Rethinking the suggested model one may want to include an indirect relationship between market growth and innovativeness as it seems reasonable to assume that high growth markets exhibit innovative activities to a larger extent than low growth markets (a causal link between market growth and innovativeness is then to be included). In more general terms, one might want to include structural features that are determinants of innovative activities. Schumpeter (1942, 1975), for example, suggests a positive relationship between monopoly power and innovation. On the other hand, in a perfectly competitive industry, imitation is immediate, giving the firms no incentive to innovate. Taking concentration as a proxy to measure market structure, Mansfield *et al.* (1977) noted that beyond a moderate amount of concentration, further increases are not related to more innovative activity. Kamien and Schwartz (1982) suggest that intermediate values of market structure may be most supportive for innovative

activities in an industry. The overall objective of using a structural equation modelling approach would then be to test a more complete model structure of competitive response than has been reported previously.

The study of market defence and competitive response is interesting and managerially important. The empirical approach taken here could also be supplemented and extended by trying to model the incumbent's decision process of how to defend. This research would provide a normative dimension to the study of market defence and would further enrich our insight into this field.

APPENDICES

APPENDIX 3.1: SUMMARY OF HYPOTHESES

Variables	Hypothesis	Relationship
Innovativeness of New Product	H1a	positive
Innovativeness of New Product	H1b	negative
Market Growth	H2	positive
Concentration	H3	positive
Exit Costs	H4	positive
Size of Incumbent	H5	positive
Customers' Price Sensitivity	H6	positive
Degree of Threat Posed by Rival	H7	positive
Incumbent Versus New Competitor	H8	positive
Dominant Incumbent in Growth Market	H9	positive

APPENDIX 4.1:

QUESTIONNAIRE

LONDON BUSINESS SCHOOL

INNOVATION STUDY

Thank you for participating in this study. We would like to ask you to recall the last time a competitor introduced a new product into your product category. Think of a product category as a specific set of products or services. Here are some examples: the antibiotic category within the pharmaceutical industry, the polyurethane category within the chemical industry, the instant coffee category within the food industry, or the workstation category within the computer industry. If your company is active in multiple product categories please choose a category in which the entry of a competitive new product occurred most recently.

1. *Please think of the last time a new product from a competitor entered the market in this category. If you cannot recall a new product from a competitor, tick below, answer questions 2, 3, and 4 ONLY, and send back the survey. Thank you very much.*

☐ Tick here if you cannot remember a new product from a competitor.

- a. *If you remember a new product from a competitor in this product category, how long ago did it enter the market?*

_____ (number of months)

- b. *Could you please describe the competitor's new product briefly:*

- c. *Please indicate when you became aware of the competitor's new product.*

- ☐ before its market launch
☐ at the time of its market launch
☐ after its market launch

2. *How would you characterise this product category at the time of the entry of the competitor's new product? (Please circle one number for each line. Note: Some of these statements may appear to be the same. This is necessary to ensure statistical validity.)*

	Strongly Disagree			Strongly Agree		
In this product category sales were growing fast.	1	2	3	4	5	6
Life cycles were short.	1	2	3	4	5	6
This was a high-growth product category.	1	2	3	4	5	6
Demand in this product category was stable.	1	2	3	4	5	6
This product category was reaching maturity.	1	2	3	4	5	6
The growth in this product category was negligible.	1	2	3	4	5	6
This product category had few competitors.	1	2	3	4	5	6
This product category was highly price sensitive.	1	2	3	4	5	6
This product category had been on the market for many years.	1	2	3	4	5	6
New products often entered the market in this category.	1	2	3	4	5	6
Competitors in this product category were coming and going constantly.	1	2	3	4	5	6
Product life cycles were long in this category.	1	2	3	4	5	6
Price changes in this category had limited effects on sales.	1	2	3	4	5	6
Demand in this product category was distributed among many competitors.	1	2	3	4	5	6
A handful of firms dominated this product category.	1	2	3	4	5	6
This was a category where price was the only thing that mattered to customers.	1	2	3	4	5	6
This product category was at the decline stage of the product life cycle.	1	2	3	4	5	6
We were still in the process of creating a customer base in this product category.	1	2	3	4	5	6
Only a few customers were price sensitive in this category.	1	2	3	4	5	6

3. *Which industry does your product category belong to? (For example computers, food and beverages, industrial equipment, health products, chemicals etc.)*

(please specify) _____

4. *On each line below, please circle the most appropriate description of your firm's products in this product category.*

Non-technical	1	2	3	4	5	6	Technical
Low engineering content	1	2	3	4	5	6	High engineering content
Slow changing	1	2	3	4	5	6	Fast changing
Unsophisticated	1	2	3	4	5	6	Sophisticated
Commodity	1	2	3	4	5	6	Customised
Simple	1	2	3	4	5	6	Complex
It takes our salesforce a short time to learn our products	1	2	3	4	5	6	It takes our salesforce a long time to learn our products

5. a. *Please tell us how you responded to your competitor's new product.*

	Strongly Disagree			Strongly Agree		
We reacted very quickly.	1	2	3	4	5	6
We reacted very aggressively.	1	2	3	4	5	6
We decided to wait and see what would happen.	1	2	3	4	5	6
We decided not to respond at all.	1	2	3	4	5	6
We responded immediately.	1	2	3	4	5	6
We thought it best to delay any reaction.	1	2	3	4	5	6
We decided that it was best to live and let live.	1	2	3	4	5	6
We reacted in a manner designed to show that we would not yield any of our market.	1	2	3	4	5	6
We thought it best to accommodate the competitor's new product.	1	2	3	4	5	6
We reacted slowly and cautiously.	1	2	3	4	5	6
We reacted quite aggressively to the new product.	1	2	3	4	5	6
We did everything we could to suppress the performance of the new product.	1	2	3	4	5	6
We reacted very aggressively to establish a reputation for being a strong competitor.	1	2	3	4	5	6
A new competitor in this product category is generally welcomed to get the market going.	1	2	3	4	5	6
We chose to ignore the competitor's new product.	1	2	3	4	5	6
The addition of a new competitor in this product category is beneficial in stimulating demand.	1	2	3	4	5	6
The new product was targeted towards a niche and therefore we felt that a response was unnecessary.	1	2	3	4	5	6
We thought of co-pioneering with the competitor.	1	2	3	4	5	6
A new competitor in this product category helps in the creation of customer awareness.	1	2	3	4	5	6

b. *If you reacted, WHEN did you react to this competitive new entry?*

- ☐ before its market launch
☐ at the time of its market launch
☐ after its market launch

c. *If you reacted AFTER its market launch, how long did it take your company to react to the competitor's new product?* _____ (number of months)

d. *If you reacted, please give us an indication of the strength of your reaction:*

	Not Strong			Very Strong		
Relative to our own capabilities our reaction was:	1	2	3	4	5	6
Relative to industry practice our reaction was:	1	2	3	4	5	6

6. a. *Please tell us what your firm did in response to your competitor's new product. Check yes or no and if yes, circle the level of response on the scale to the right.*

- We improved our existing product. A Minor Improvement A Major Improvement
yes ☐ no ☐ → 1 2 3 4 5 6
- We introduced a new product. A Minor Innovation A Major Innovation
yes ☐ no ☐ → 1 2 3 4 5 6
- We repositioned our existing product. A Minor Repositioning A Major Repositioning
yes ☐ no ☐ → 1 2 3 4 5 6
- We expanded our salesforce. A Minor Expansion A Major Expansion
yes ☐ no ☐ → 1 2 3 4 5 6
- We expanded our distribution. A Minor Expansion A Major Expansion
yes ☐ no ☐ → 1 2 3 4 5 6
- We expanded into new channels of distribution. A Minor Expansion A Major Expansion
yes ☐ no ☐ → 1 2 3 4 5 6
- We increased our advertising and promotion budget. A Minor Increase A Major Increase
yes ☐ no ☐ → 1 2 3 4 5 6
- We decreased our advertising and promotion budget. A Minor Decrease A Major Decrease
yes ☐ no ☐ → 1 2 3 4 5 6

- _____
- _____
- _____
- _____

- They were already competing in this product category ☐
- or
- They were competing with us in another product category but not this one ☐
- or
- They had competed at an earlier point in this product category but dropped-out ☐
- or
- They were never a competitor of ours before ☐

	A Major Innovation				A Minor Innovation	
The competitor's new product is:	1	2	3	4	5	6

- b. Please tell us more about the innovativeness of the competitor's new product and its marketing programme. Indicate how much you agree or disagree with each statement.

	Strongly Disagree			Strongly Agree		
The competitor's new product represented a substantial change in technology.	1	2	3	4	5	6
The competitor's new product is only superficially different from those currently available (me-too).	1	2	3	4	5	6
The new product was priced lower than ours.	1	2	3	4	5	6
Customers saw the competitor's new product as a major innovation in the product category.	1	2	3	4	5	6
The competitor utilised existing technology so that the product quality of the new product was improved (second-but-better).	1	2	3	4	5	6
The competitor's new product had the same positioning as our product.	1	2	3	4	5	6
The competitor's new product went after the same target market as our product.	1	2	3	4	5	6
The competitor's new product enhanced existing product design.	1	2	3	4	5	6
The competitor's new product used the same channels of distribution as we used.	1	2	3	4	5	6
The competitor's new product was priced the same as ours.	1	2	3	4	5	6
The competitor utilised an innovative distribution strategy for the new product.	1	2	3	4	5	6
The competitor's new product added significant customer benefits.	1	2	3	4	5	6
The competing firm tried to gain sales at our expenses.	1	2	3	4	5	6
Customers saw the competitor's new product as a minor improvement to the benefits offered by existing products.	1	2	3	4	5	6
The competitor's new product posed a serious threat toward our company.	1	2	3	4	5	6
The competitor found a new application for an existing technology which greatly improved the performance of the new product.	1	2	3	4	5	6
The competitor developed an innovative advertising campaign for the new product.	1	2	3	4	5	6
The new product introduction constituted a hostile act toward our company.	1	2	3	4	5	6
The competitor's new product refined existing products.	1	2	3	4	5	6

8. a. *At the time of the competitor's new product entry, how many firms (in addition to your own) were already competing in this product category?*

_____ other firm(s)

- b. *At the time of the competitor's new product entry, what was your firm's position in the market in terms of market share? (Please make an estimate even if you don't know precisely).*

- ☐ We had the # 1 market share.
☐ We had the # 2 market share.
☐ We had the # 3 market share.
☐ We had the # 4 market share.
☐ We had the # 5 or lower market share.

- c. *At the time of the competitor's new product entry, what was the percentage of sales accounted for by the four largest competing businesses in your product category? Include your business if it is one of the four largest.*

_____ percent

- d. *How interdependent was this product category with your firm's other product categories?*

	Strongly Disagree				Strongly Agree	
We shared production resources.	1	2	3	4	5	6
We shared marketing and sales resources.	1	2	3	4	5	6
We used the same brand name.	1	2	3	4	5	6
We marketed through the same channels of distribution.	1	2	3	4	5	6
We shared common R&D resources.	1	2	3	4	5	6

9. a. *Please tell us about the performance of your product category after the competitor's new product has been introduced in the market. Please indicate how much you agree or disagree with each of the following statements.*

	Strongly Disagree				Strongly Agree	
Our sales are down since the competitor's new product entry.	1	2	3	4	5	6
We have not been affected by our competitor's new product.	1	2	3	4	5	6
We have maintained almost all of our market share.	1	2	3	4	5	6
Our profits from this product category are down.	1	2	3	4	5	6
We now must make higher levels of investment in this product category.	1	2	3	4	5	6
We have lost momentum in this product category.	1	2	3	4	5	6
Overall, we were not disadvantaged by the competitor's new product.	1	2	3	4	5	6
If we had to do it again, we would have responded very differently.	1	2	3	4	5	6

b. *How would you judge your company's performance in this product category using the following scale from 1 to 10?*

→ Our company's performance in this product category *before* the introduction of the competitor's new product:

poor					excellent				
1	2	3	4	5	6	7	8	9	10

→ Our company's performance in this product category *after* the introduction of the competitor's new product:

poor					excellent				
1	2	3	4	5	6	7	8	9	10

c. *IF the business unit serving this product category were eliminated, please evaluate the:*

1. ability of your firm to absorb production personnel

EASY $\frac{\quad}{1} : \frac{\quad}{2} : \frac{\quad}{3} : \frac{\quad}{4} : \frac{\quad}{5} : \frac{\quad}{6} : \frac{\quad}{7}$ HARD

2. ability of your firm to absorb management personnel

EASY $\frac{\quad}{1} : \frac{\quad}{2} : \frac{\quad}{3} : \frac{\quad}{4} : \frac{\quad}{5} : \frac{\quad}{6} : \frac{\quad}{7}$ HARD

3. alternate uses for the facilities within your company

MANY $\frac{\quad}{1} : \frac{\quad}{2} : \frac{\quad}{3} : \frac{\quad}{4} : \frac{\quad}{5} : \frac{\quad}{6} : \frac{\quad}{7}$ FEW

4. alternate uses for capital equipment within your company

MANY $\frac{\quad}{1} : \frac{\quad}{2} : \frac{\quad}{3} : \frac{\quad}{4} : \frac{\quad}{5} : \frac{\quad}{6} : \frac{\quad}{7}$ FEW

5. impact on costs of other businesses within your company

LARGE DECREASE $\frac{\quad}{1} : \frac{\quad}{2} : \frac{\quad}{3} : \frac{\quad}{4} : \frac{\quad}{5} : \frac{\quad}{6} : \frac{\quad}{7}$ LARGE INCREASE

6. size of the immediate loss to your company

VERY SMALL $\frac{\quad}{1} : \frac{\quad}{2} : \frac{\quad}{3} : \frac{\quad}{4} : \frac{\quad}{5} : \frac{\quad}{6} : \frac{\quad}{7}$ VERY LARGE

Relative to other business units in your firm, rate this one's:

7. size (in terms of sales in £)

MUCH SMALLER $\frac{\quad}{1} : \frac{\quad}{2} : \frac{\quad}{3} : \frac{\quad}{4} : \frac{\quad}{5} : \frac{\quad}{6} : \frac{\quad}{7}$ MUCH LARGER

8. contribution to current profits

MUCH SMALLER $\frac{\quad}{1} : \frac{\quad}{2} : \frac{\quad}{3} : \frac{\quad}{4} : \frac{\quad}{5} : \frac{\quad}{6} : \frac{\quad}{7}$ MUCH LARGER

9. size of margin

MUCH SMALLER $\frac{\quad}{1} : \frac{\quad}{2} : \frac{\quad}{3} : \frac{\quad}{4} : \frac{\quad}{5} : \frac{\quad}{6} : \frac{\quad}{7}$ MUCH LARGER

10. stability of profit margin

MORE
VOLATILE : : : : : : MORE
STABLE

11. long-run profit potential

NEGLECTIBLE : : : : : : SUBSTANTIAL

12. sales to other parts of your company

VERY LOW : : : : : : VERY
HIGH

10. *How involved were you in the decision of how to respond to the competitor's new product?*

- ☐ Highly involved
- ☐ Moderately involved
- ☐ Somewhat involved
- ☐ Not involved

11. *Please estimate your company's total UK sales for the last fiscal year.*

- | | |
|--|--|
| <input type="checkbox"/> Less than £ 50 million | <input type="checkbox"/> £ 750 million - £ 1 billion |
| <input type="checkbox"/> £ 51 - £ 100 million | <input type="checkbox"/> £ 1.01 - £ 2 billion |
| <input type="checkbox"/> £ 101 - £ 500 million | <input type="checkbox"/> £ 2.01 - £ 3 billion |
| <input type="checkbox"/> £ 501 million - £ 750 million | <input type="checkbox"/> £ 3.01 billion or more |

12. *At this point please feel free to make any comments you may have.*

Thank you very much for your time. We appreciate your help.

Please mail this questionnaire in the attached postage-paid envelope to:

**Sabine Kuester
London Business School
Marketing Department
Sussex Place, Regent's Park
London NW1 4SA**

If you would like to receive a report of this study please send us your business card in a separate envelope with the words "Innovation Study" written on it and we will send you a copy of the results as soon as they are tabulated.

APPENDIX 4.2: COVER LETTER

14 February 1995

1 ~
3 ~
4 ~
5 ~
6 ~ 7 ~
8 ~ 9 ~ 10 ~

Dear 2 ~,

A few days ago, you received a letter informing you about the major new research project which is being conducted by researchers at London Business School. As we explained the purpose of this study is to investigate how companies react to new products that are introduced in their market domains. In particular, we wish to understand in what ways established competitors defend and protect their market positions.

For the purpose of this study we have developed the enclosed self-administered questionnaire. This questionnaire has been designed as a series of check-off answers to short questions, so it can be answered quickly and easily. Even if you are uncertain about a particular question, please give us your best opinion rather than leaving it blank. When you have completed the questionnaire, please return it in the attached pre-paid envelope.

All information provided will be treated with the utmost care to ensure confidentiality. You can be assured that no company will be identified in any published reports, nor will any information be provided that could enable individual companies to be identified. London Business School is the sole sponsor of this academic survey.

The researcher in charge of this project is Sabine Kuester. She would be pleased to answer any questions you may have. We look forward to receiving your response and would like to thank you in advance for your co-operation. A report summarising the findings of this survey will be available to respondents at no cost. For this purpose simply send us your business card in a separate envelope (to maintain confidentiality) with the words "Innovation Study" written on it and we will send you a copy of the results as soon as they are tabulated.

Yours faithfully,

Thomas S. Robertson
Chair, Faculty of Marketing

Sabine Kuester
Research Associate

APPENDIX 4.3: DESCRIPTIVE STATISTICS

Sample Breakdown	Total
Total Sample Frame:	910
Total Sample (usable):	249
Respondents with New Product Introduction:	187
Respondent's Awareness of Competitor's New Product	%
- Awareness before market launch:	50.3
- Awareness at time of market launch:	37.3
- Awareness after market launch:	12.4
Key Informant Issue	%
- Highly involved respondents:	83.5
- Moderately involved respondents:	13.7
- Somewhat or low involved respondents:	2.8*)

*) excluded from analysis

APPENDIX 4.4: OTHER RESPONSE TYPES (OPEN-ENDED QUESTION)

Response No.	Industry	Respondents' comments regarding other responses they made
#6	Printing	We segmented the market into experts and non experts based on computer knowledge and literacy. No competitor in the LFDP market has done this.
#9	Scientific Instrument Engineering	Ensured that all our sales people had relevant competitive information to show the superiority of our product including questions to ask the competitor and answers covering the value and superior performance of our own.
#11	Electrical Engineering	We forged a new partnership with a supplier to make both our customer base and increasing business more secure.
#15	Mechanical Engineering	In the U.K. where we have a 30% market share we worked with our existing field sales force to counter the new entry. (In overseas markets we have increased distribution coverage and in the U.S.A. increased the manufacturers reps base.)
#17	Safety Design	Our product launch prior to theirs.
#32	Packaging	Special promotional activity: Launch in Bristol to 120 international visitors.
#38	Food	Trade communication including trade mailers reinforcing our market strength and category initiatives.
#42	Passenger Transport	We introduced a new product but not in direct competition with our competitor's new product - offering a different solution to the customers' needs and at the same time we improved a current product.
#45	Mechanical Engineering	More aggressive targeting of key & potential accounts by existing sales force, to ensure our product benefits are brought to the fore.

Response No.	Industry	Respondents' comments regarding other responses they made
#46	Mechanical Engineering	We did not consider the new product to have any strength other than price. Although it would win some price-only-customers we strengthened our sales team's product knowledge to sell technically orientated benefits and service benefits more forcefully.
#46	Electronic Engineering	We warned our competitor that we believed he was infringing our patent protection.
#52	Scientific Instrument Engineering	Our response was to marshal technical arguments as to why competitor's new product was <u>not</u> a step forward.
#53	Mechanical Engineering	Intensified our sales activities in market places that the competitor was strongest in.
#57	Aerospace	Continued with our consistent, professional approach, consistency increased market share.
#61	Electrical Engineering	Production of 'know sheet' to sales outlets giving our advantages/competitor's disadvantages.
#64	Transport	All sales staff were re-trained in the shortfall of the competitor's product - we need to sow doubt about the innovation and to do so our sales force needed sound product knowledge of our competitor's product.
#70	Mechanical Engineering	Introduced changes to our organization to provide better quality of product and customer care.
#71	Food Manufacturing	We re-emphasised the advantages of our <u>dry</u> system.
#74	Electronic Engineering	We redesigned and tooled up for a lower cost version of our existing alloy antenna.
#77	Pharmaceuticals	We funded research in our product.
#86	Chemicals	We ensured that the market was aware of our own better product.
#89	Electronic Engineering	Technical performance and facilities debate with potential customers and in trade press.

Response No.	Industry	Respondents' comments regarding other responses they made
#93	Electrical Engineering	In addition to improving the product we also resourced manufacture, resulting in a decreased cost making us more competitive.
#94	Aerospace	Moved away from the specific sector, although this was already part of a carefully defined strategy. (Respondent referred to flight control equipment)
#97	Electronic Engineering	We visited major specifiers with an advanced prototype of our new product and let them help with customising software to get their personal preferences embodied into the equipment.
#99	Pharmaceutical Packaging	We changed our strategic marketing direction.
#110	Automobile	Bought forward another product launch to coincide with competitor product launch to dilute competitor impact.
#119	Chemicals (agricultural)	We worked with existing distribution to adapt a product in development to give distinct advantage over the competitor.
#122	Paper Production	We took the product to Europe which the competition is weak in doing.
#125	Aerospace	We were unsure how to respond.
#137	Mechanical Engineering	This level of complex equipment demands good demonstration facilities with high class R&D. We have neither capability.
#176	Contact Lenses	We began to work with customers on segmenting and positioning the market - showing that the new product was aimed at a niche and that high price point would deter consumers.
#221	Office Products	Held price when an increase would normally have been implemented.
#236	Leisure Machines	We discussed product performance with trade buyers and assessed consumer attitudes before replying with our product, i.e. we conducted a major research project.
#240	Steel Manufacturing	Began a JV with another competitor.

APPENDIX 4.5: SCALE ITEM: BARRIERS TO EXIT

Measurement: 7 point Likert-Scale

Anchors: shown in parantheses

If the business unit serving this product category were eliminated, please evaluate the:

1. ability of your firm to absorb production personnel (easy/hard)
2. ability of your firm to absorb management personnel (easy/hard)
3. alternate uses for facilities within your company (many/few)
4. alternate uses for capital equipment within your company (many/few)
5. impact on costs of other businesses within your company (large decrease/large increase)
6. Size of immediate loss to your company (very small/very large)

Relative to other business units in your firm, rate this one's:

7. size (in terms of sales in £) (much smaller/much larger)
8. contribution to current profits (much smaller/much larger)
9. size of margin (much smaller/much larger)
10. stability of profit margin (more volatile/more stable)
11. long-run profit potential (negligible/substantial)
12. sales to other parts of the company (very low/very high)

Source: Burke (1984)

APPENDIX 5.1: LIST OF NEW PRODUCT INTRODUCTIONS

- LCD colour monitor
- new designs of ice cream cones
- bonded clip seal for PVC pipe fittings
- leak proof food container
- new style of corrugated die-cut to hold four pairs of shoes (packaging)
- large format digital print - "The direct imaging and printing of computer created or manipulated graphic files to sizes from A3 up to and beyond A0 via inkjet and electrostatic production systems"
- multi-function tester for the electrical contracting market
- fresh prepared vegetable terrine
- benchtop mass spectrometer for GLC-MS operation
- CD video format
- pipe freezing
- fully hydraulic crawler lift crane
- micro soldering station
- personal gas monitor having 4 sensors and powered by an integral battery (Ni-Cad) for use by workers entering confined spaces in the water, petrochemical, construction etc. industries
- large liquid ring vacuum pump for use in paper industry - energy efficient
- new safety-sign design
- direct competitor to a similar professional S-VHS video recorder marketed by us
- technically equivalent type of floor covering
- digital read-out counter (for linear measurement of machine tools)
- self-seal bags
- foam PVC sheet
- plastic tapping-tee for iron pipes
- amphoteric surface-active agent
- all plastic tamper-evident cap for non-carbonated drinks
- very small light-detector
- low-cost measuring tape
- electronic central-heating programmes
- totally recyclable blister-card
- oil-based paste of herbs and spices
- new mid-range cartoning machine
- English apple juice
- new aerosol paint product
- special coloured material for laser printers
- office seating: very low cost plastic components imported from Italy
- web offset printing press
- Indian mango chutney
- plastic membrane for use as a base cloth in the production of press felts for the paper industry
- liquid centre medicated confectionery

APPENDIX 5.1 (cont.): LIST OF NEW PRODUCT DESCRIPTIONS

- vacuum-formed lightweight folding table
- underfloor tail-lift for use with wheelchairs
- plastics raw material equivalent to our product
- EPOS running with windows operating system and using touch screen technology from AT&T
- air-pressure adjustable torque-limiting clutch
- bubble-top domestic unvented cylinder
- thermoresistant composite based on a glass/kevlar/carbon substrate in a phenolic resin matrix designed for use as rotor vanes in sliding-vane rotary pumps and compressors
- filter regulator lubricator in compressed air market
- built-in oven
- pump for biotech/pharmaceutical industry
- transducer
- vertical steam boiler for use in process industry
- CAD system with parametric 3D design capability
- A5 free leisure magazine
- range of fudges in a variety of flavours
- replay and analysis system to convert flight-data, recorded on board the aircraft, into management information
- wheel gearbox
- automatic voltage stabiliser
- gas analyser used for measuring oxygen for control of process plants, oil refineries, chemical works etc.
- a desensitising toothpaste offering a better flavour
- new entry into LV/MV switchgear
- new bolted construction of road-trailer bodywork
- shower doors
- scallop-edged table-mats
- electric fan-heater, 3kW for industrial/commercial applications in shops, hotels, offices, etc.
- new style of rotary control-valve
- new cutting facility
- air compressor
- wet debris removal
- self-contained breathing apparatus
- fire detector
- alloy satellite antenna
- membrane switch contact
- sodium salt at 70% active with ultra-low level of impurity
- personnel radiation monitor (nuclear installations industry)

APPENDIX 5.1 (cont.): LIST OF NEW PRODUCT DESCRIPTIONS

- manually operated but semi-automatic system for refilling used ink-jet cartridges for ink-jet printers; used cartridges can thus be recycled easily - economic and environmentally friendly
- factory prefinishing of a previously unfinished timber product
- low-cost high technology microwave signal synthesiser
- multi wires of copper on a single spool enabling bunched wire products to be manufactured more competitively
- low application-temperature hot-melt adhesives
- low-current electrical connector - IP68 rated
- round, rigid nesting tree shelter
- high definition real-time CCD telecine (film to HDTV scanner)
- part of a cable management system for commercial offices: floorbox set within a raised access floor to allow power, voice & data services to terminate at floor level
- Diesel engine pump-control system
- PC controlled infra-red connection oven for reflow soldering of surface-mount electronic devices onto printed-circuit boards
- direct-pull electromagnetic lock
- flight control equipment for a specific aircraft (name omitted to ensure confidentiality)
- electrical distribution panelboard
- push-in seal/closure to secure the lids on plastic distribution containers
- advanced lighting-control console for use in major theatres, opera houses and TV studios
- metered-dose inhaler valve for non-CFC propellants
- new style of pleated lampshade
- Werther's - a premium butter candy
- packaged refrigeration system for the brewery industry
- vehicle seating component
- object-oriented spatial analysis software for facilities management, land use, and environmental analysis
- 240hp agricultural tractor
- new HID lamp
- glazed fire vent
- Mercedes S-Class luxury car - specifically the 6.0 litre VIZ 600 SEL
- CD-ROM authoring for publishing clients
- tank radar gauge for measuring DENV in tanks (standard) with the innovative features of interface identification and density measurement (via an additional device)
- new computer operational control system
- new flybridge motor yacht
- "broadcast" quality small vision mixer, analogue or digital video inputs
- sulphur-containing fertilisers for use in oil-seed rape and cereal markets

APPENDIX 5.1 (cont.): LIST OF NEW PRODUCT DESCRIPTIONS

- small air-conditioning products
- fluorescent photocopier paper
- soft-drinks cooler carbonator for vending machine manufacturers
- substitute material for aero alloys (epoxy resin, plastic, ceramics, laminates)
- high density memory module-flash
- detergent raw material
- new lightweight bottle
- disposable pen using 'gel-ink' technology
- modified PVC pressure pipe
- high-resolution contact-lens lathe
- toughened-glass car sunroofs (new and retro-fit)
- new video pan-and-tilt head
- high-speed cigarette packer - 250 packs per minute
- lightbox for display purposes
- new design of flowbox used in papermaking to provide cross-directional uniformity with basis-weight profile control taking place through local consistency control
- new pharmaceutical intermediate aimed at a new pharmaceutical being developed in USA
- helicopter twin-store carrier, capable of carrying e.g., 2 rockets pops on one stores pylon
- electric deep-fryer with removable bowl for easy cleaning
- pullover waterproof jacket
- large single-jet water meter
- orthopaedic (surgical) footwear
- fine micron mohair in a count (weight-length ratio) almost 50% beyond our present machine capability
- elasticated file for document storage
- commercial tableware in a new ceramic material
- innovative new design of mobile home with a 'cottage like' exterior
- new coin-operated amusement game
- double density polyurethane soling for safety footwear
- coin-operated photoboos
- additional industrial robot to attack pick&place applications within electronic industry
- vitrified ceramic floor tile
- new variable-speed AC drive with 'Direct Torque Control' claiming dramatically improved speed and torque control of standard AC motors
- turkey and chicken shapes covered in breadcrumbs, made into shapes as PowerRangers logo (bright orange packaging)
- 'Widget' ales - Boddingtons

APPENDIX 5.2: DESCRIPTIVE ANALYSIS OF OBSERVED RESPONSE PATTERNS

0. Summary Statistic [N=186]

13 (7.0 %) no reaction on marketing mix
 173 (93.0 %) reacted on at least one marketing mix element

151 (81.2%) reacted on the product mix
 102 (54.8 %) reacted on the price mix [of which 51 (27.4%) cut price]
 78 (41.9%) reacted on the promotion mix
 77 (41.4%) reacted on the distribution mix

1. Response Pattern on Product Mix

Response-Option 1: Product Improvement
 Response-Option 2: New Product Introduction
 Response-Option 3: Product Repositioning

Option			Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	2	3				
N	N	N	35	18.8	35	18.8
Y	N	N	13	7.0	48	25.8
Y	Y	N	29	15.6	77	41.4
Y	Y	Y	26	14.0	103	55.4
N	N	Y	16	8.6	119	64.0
N	Y	Y	8	4.3	127	68.3
N	Y	N	39	21.0	166	89.2
Y	N	Y	20	10.8	186	100.0

2. Response Pattern on Price Mix

Response-Option 1: Price Decrease
 Response-Option 2: Price Increase
 Response-Option 3: Introduction of Special Trade Discounts

Option			Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	2	3				
N	N	N	84	45.2	84	45.2
Y	N	N	32	17.2	116	62.4
Y	Y	N	0	0.0	116	62.4
Y	Y	Y	0	0.0	116	62.4
N	N	Y	21	11.3	137	73.7
N	Y	Y	9	4.8	146	78.5
N	Y	N	21	11.3	167	89.8
Y	N	Y	19	10.2	186	100.0

APPENDIX 5.2 (cont.): DESCRIPTIVE ANALYSIS OF OBSERVED RESPONSE PATTERNS

3. Response Pattern on Distribution Mix

Response-Option 1: Expansion of Salesforce
 Response-Option 2: Expansion of Distribution
 Response-Option 3: Expansion into New Channels of Distribution

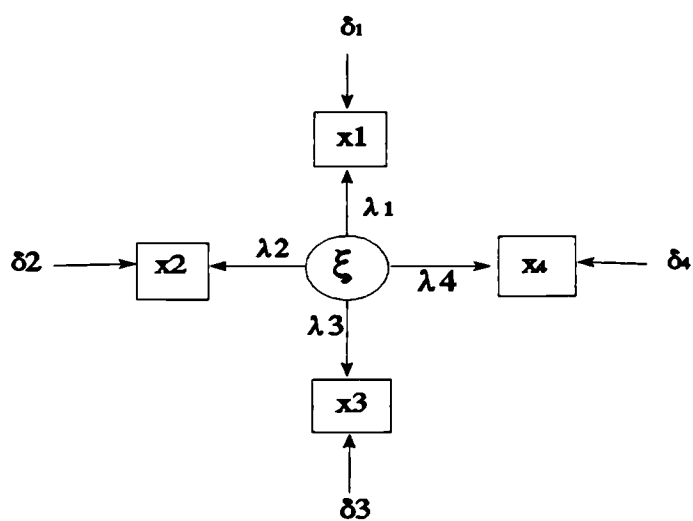
Option			Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	2	3				
N	N	N	109	58.6	109	58.6
Y	N	N	5	2.7	114	61.3
Y	Y	N	2	1.1	116	62.4
Y	Y	Y	11	5.9	127	68.3
N	N	Y	16	8.6	143	76.9
N	Y	Y	24	12.9	167	89.8
N	Y	N	14	7.5	181	97.3
Y	N	Y	5	2.7	186	100.0

4. Response Pattern on Promotion Mix

Response-Option 1: Increase of Advertising & Promotion Budget
 Response-Option 2: Decrease of Advertising & Promotion Budget

Option		Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	2				
N	N	108	58.1	108	58.1
Y	N	74	39.8	182	97.8
Y	Y	0	0.0	182	97.8
N	Y	4	2.2	186	100.0

APPENDIX 5.3: CONGENERIC MEASUREMENT MODEL



Source: Jöreskog and Sörbom 1988

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